

IVQs in Construction (6161)

Level 3 IVQ Advanced Diploma in

- Timber Vocations (6161-22) (500/5818/6)
- Trowel Vocations (6161-23) (500/5786/8)
- Painting and Decorating (6161-24) (500/5834/4)
- Plumbing (6161-25) (500/6030/2)
- Refrigeration and Air Conditioning (6161-26) (500/6028/4)
- Electrical Installation (6161-27) (500/6029/6)

Qualification handbook for centres



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Contents

05 Important notice	
07 Levels of City & Guilds qualifications	
09 IVQ in Construction Industry 6161	
09 About City & Guilds	
09 Introduction to this programme	
09 Certificate	
09 Diploma	
09 Advanced Diploma	
09 Making entries for assessments	
09 Resources	
10 Assessments	
10 Advanced Diploma in Timber Vocations	
10 Advanced Diploma in Trowel Vocations	
10 Advanced Diploma in Painting and Decorating	
11 Advanced Diploma in Plumbing	
11 Advanced Diploma in Refrigeration and Air Conditioning	
11 Fixed and free dates	
11 Results and certification	
12 How to offer this programme	
12 Subject approval	
12 Examination centre approval	
12 Other information	
12 Designing courses of study	
12 Presentation format of units	
12 Practical competences	
12 Knowledge requirements	
13 Practical assessments	
13 Entry levels	
13 Progression routes and recognition	
13 Useful publications	
15 Syllabus	
IVQ in Construction Industry 6161	
16 61 Site carpentry 3 – Summary of syllabus sections	
17 Safety at Work	
19 Materials	
21 Calculations, Setting Out and Drawing	
23 Advanced Practical Skills	
29 Communications and Information Technology	
31 Alteration, Repair and Renovation	
32 Supervision, Planning and Administration	
34 Assessment	
35 61 Site Carpentry 3: Safety at Work	
36 61 Site Carpentry 3: Materials	
37 61 Site Carpentry 3: Calculations, Setting Out and Drawing	
38 61 Site Carpentry 3: Advanced Practical Skills	
40 61 Site Carpentry 3: Communications and Information Technology	
41 61 Site Carpentry 3: Alteration, Repair and Renovation	
42 61 Site Carpentry 3: Supervision, Planning and Administration	
43 62 Bench Joinery 3 – Summary of Syllabus Sections	
44 Safety at Work	
45 Materials	
47 Calculations, Setting Out and Drawing	
49 Advanced Practical Skills	
54 Communications and Information Technology	
56 Planned Machine Maintenance	
57 Supervision, Planning and Administration	
59 Assessment	
60 62 Bench Joinery 3: Safety at Work	
61 62 Bench Joinery 3: Materials	
62 62 Bench Joinery 3: Calculations, Setting Out and Drawing	
63 62 Bench Joinery 3: Advanced Practical Skills	
65 62 Bench Joinery 3: Communications and Information Technology	
66 62 Bench Joinery 3: Planned Machine Maintenance	
67 62 Bench Joinery 3: Supervision, Planning and Administration	
68 63 Trowel Vocations 3 – Summary of Syllabus Sections	
69 Safety at Work	
70 Materials	
72 Calculations, Setting Out and Drawing	
74 Advanced Practical Skills	
77 Communications and Information Technology	
79 Alteration, Repair and Renovation	
80 Supervision, Planning and Administration	
82 Assessments	
83 63 Trowel Vocations 3: Safety at Work	
84 63 Trowel Vocations: Materials	
85 63 Trowel Vocations: Calculations, Setting Out and Drawing	
86 63 Trowel Vocations: Advanced Practical Skills	
87 63 Trowel Vocations: Communications and Information Technology	
88 63 Trowel Vocations 3: Alteration, Repair and Renovation	
89 63 Trowel Vocations 3: Supervision, Planning and Administration	
90 64 Painting and Decorating 3 – Summary of Syllabus Sections	
91 Safety at Work	
92 Materials	
94 Calculations, Setting Out and Drawing	
95 Advanced Practical Skills	
97 Communications and Information Technology	
99 Repair, Restoration and Interior Decorative Techniques	
100 Supervision, Planning and Administration	

102	Assessments
103	64 Painting and Decorating 3: Safety at Work
104	64 Painting and Decorating 3: Materials
105	64 Painting and Decorating 3: Calculations, Setting Out and Drawing
106	64 Painting and Decorating 3: Advanced Practical Skills
107	64 Painting and Decorating 3: Communications and Information Technology
108	64 Painting and Decorating 3: Repair, Restoration and Interior Decorative Techniques
109	64 Painting and Decorating 3: Supervision, Planning and Administration
110	65 Plumbing 3 – Summary of Syllabus Sections
111	Safety at Work
112	Materials
114	Calculations, Setting Out and Drawing
116	Advanced Practical Skills
118	Communications and Information Technology
120	Alteration, Repair and Planned Maintenance
121	Supervision, Planning and Administration
123	Assessments
124	65 Plumbing 3: Safety at Work
125	65 Plumbing 3: Materials
126	65 Plumbing 3: Calculations, Setting Out and Drawing
127	65 Plumbing 3: Advanced Practical Skills
128	65 Plumbing 3: Communications and Information Technology
129	65 Plumbing 3: Alteration, Repair and Planned Maintenance
130	65 Plumbing 3: Supervision, Planning and Administration
131	66 Refrigeration and Air Conditioning 3 – Summary of Syllabus Sections
132	Safety at Work
134	Materials (Plant and Refrigerants)
136	Calculations, Science and Drawing
139	Advanced Practical Skills
142	Communications and Information Technology
144	Alteration and Repair
146	Supervision, Planning and Administration
148	Assessments
149	66 Refrigeration and Air Conditioning 3: Safety at Work
150	Refrigeration and Air Conditioning 3: Materials (Plant and Refrigerants)
151	Refrigeration and Air Conditioning 3: Calculations, Science and Drawing
152	Refrigeration and Air Conditioning 3: Advanced Practical Skills
153	Refrigeration and Air Conditioning 3: Communications and Information Technology
154	Refrigeration and Air Conditioning 3: Alteration and Repair

155	Repair and Planned Maintenance
156	Refrigeration and Air Conditioning 3: Supervision, Planning and Administration
157	67 Electrical Installation 3 – Summary of Syllabus Sections
158	Safety at Work
160	Materials
162	Calculations, Setting Out and Drawing
163	Advanced Practical Skills
165	Communications and Information Technology
167	Alteration, Repair and Planned Maintenance
169	Supervision, Planning and Administration
171	Assessments
172	67 Electrical Installation 3: Safety at Work
173	67 Electrical Installation 3: Materials
174	67 Electrical Installation 3: Calculations, Setting Out and Drawing
175	67 Electrical Installation 3: Advanced Practical Skills
176	67 Electrical Installation 3: Communications and Information Technology
177	67 Electrical Installation 3: Alteration, Repair and Planned Maintenance
178	67 Electrical Installation 3: Supervision, Planning and Administration
179	Appendix A
	Assessments
179	Practical assessment
179	Preparation, supervision and marking
179	Records, results and certification
179	Question paper assessments
179	General information
179	Visiting verifier

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 05–06.

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

Changes to the qualification titles

The qualification titles have changed as follows:

Advanced Diploma in Timber Vocations – Site Carpentry (6161-22)
changed to

Level 3 IVQ Advanced Diploma in Timber Vocations (Site Carpentry) (6161-22)

Accreditation number: 500/5818/6

Advanced Diploma in Timber Vocations – Bench Joinery (6161-22)
changed to

Level 3 IVQ Advanced Diploma in Timber Vocations (Bench Joinery) (6161-22)

Accreditation number: 500/5818/6

Advanced Diploma in Trowel Vocations (6161-23)
changed to

Level 3 IVQ Advanced Diploma in Trowel Vocations (6161-23)

Accreditation number: 500/5786/8

Advanced Diploma in Painting and Decorating (6161-24)
changed to

Level 3 IVQ Advanced Diploma in Painting and Decorating (6161-24)

Accreditation number: 500/5834/4

Advanced Diploma in Plumbing (6161-25)
changed to

Level 3 IVQ Advanced Diploma in Plumbing (6161-25)

Accreditation number: 500/6030/2

Advanced Diploma in Refrigeration and Air Conditioning (6161-26)
changed to

Level 3 IVQ Advanced Diploma in Refrigeration and Air Conditioning (6161-26)

Accreditation number: 500/6028/4

Advanced Diploma in Electrical Installation (6161-27)
changed to

Level 3 IVQ Advanced Diploma in Electrical Installation (6161-27)

Accreditation number: 500/6029/6

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 3 IVQ Advanced Diploma in Timber Vocations (Site Carpentry) (6161-22)

Accreditation number: 500/5818/6

R/502/2765 – Site Carpentry 3 Principles

Y/502/2766 – Site Carpentry 3 Practice

Level 3 IVQ Advanced Diploma in Timber Vocations (Bench Joinery) (6161-22)

Accreditation number: 500/5818/6

D/502/2767 – Bench Joinery 3 Principles

H/502/2768 – Bench Joinery 3 Practice

Level 3 IVQ Advanced Diploma in Trowel Vocations (6161-23)

Accreditation number: 500/5786/8

K/502/2769 – Trowel Vocations 3 Principles

D/502/2770 – Trowel Vocations 3 Practice

Level 3 IVQ Advanced Diploma in Painting and Decorating (6161-24)

Accreditation number: 500/5834/4

H/502/2771 – Painting and Decorating 3 Principles

K/502/2772 – Painting and Decorating 3 Practice

Level 3 IVQ Advanced Diploma in Plumbing (6161-25)

Accreditation number: 500/6030/2

M/502/2773 – Plumbing 3 Principles

T/502/2774 – Plumbing 3 Practice

Level 3 IVQ Advanced Diploma in Refrigeration and Air Conditioning (6161-26)

Accreditation number: 500/6028/4

F/502/2776 – Refrigeration and Air Conditioning 3 Principles

J/502/2777 – Refrigeration and Air Conditioning 3 Practice

Level 3 IVQ Advanced Diploma in Electrical Installation (6161-27)

Accreditation number: 500/6029/6

L/502/2778 – Electrical Installation 3 Principles

R/502/2779 – Electrical Installation 3 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	Licentiate'ship (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 5 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 5 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

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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 3. The standards and assessments for the certificate (level 1) and the diploma (level 2) are published separately.

Making entries for assessment

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.

Advanced 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 number

- 6161-
- 22 Advanced Diploma in Timber Vocations
- 23 Advanced Diploma in Trowel Vocations
- 24 Advanced Diploma in Painting and Decorating
- 25 Advanced Diploma in Plumbing
- 26 Advanced Diploma in Refrigeration and Air Conditioning
- 27 Advanced Diploma in Electrical Installation

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

Component numbers

- 061 Site Carpentry 3 Principles
- 161 Site Carpentry 3 Practice
- 062 Bench Joinery 3 Principles
- 162 Bench Joinery 3 Practice
- 063 Trowel Vocations 3 Principles
- 163 Trowel Vocations 3 Practice
- 064 Painting and Decorating 3 Principles
- 164 Painting and Decorating 3 Practice
- 065 Plumbing 3 Principles
- 165 Plumbing 3 Practice
- 066 Refrigeration and Air Conditioning 3 Principles
- 166 Refrigeration and Air Conditioning 3 Practice
- 067 Electrical Installation 3 Principles
- 167 Electrical Installation 3 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.

Advanced Diploma in Timber Vocations

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

Either

- 6161-22-061 Site Carpentry 3 Principles (written question paper which lasts three hours)
- [6161-22-161] Site Carpentry 3 Practice
(Total one written paper)

or

- 6161-22-062 Bench Joinery 3 Principles (written question paper which lasts three hours)
- [6161-22-162] Bench Joinery 3 Practice
(Total one written paper)

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.)

Advanced Diploma in Trowel Vocations

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

- 6161-23-063 Trowel Vocations 3 Principles (written question paper which lasts three hours)
- [6161-23-163] Trowel Vocations 3 Practice
(Total one written paper)

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.)

Advanced Diploma in Painting and Decorating

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

- 6161-24-064 Painting and Decorating 3 Principles (written question paper which lasts three hours)
- 6161-24-164 Painting and Decorating 3 Practice
(Total one written paper)

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.)

Advanced Diploma in Plumbing

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

- [6161-25-065] Plumbing 3 Principles (written question paper which lasts three hours)
- [6161-25-165] Plumbing 3 Practice
(Total one written paper)

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.)

Advanced Diploma in Refrigeration and Air Conditioning

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

- 6161-26-066 Refrigeration and Air Conditioning 3 Principles (written question paper which lasts three hours)
- [6161-26-166] Refrigeration and Air Conditioning 3 Practice
(Total one written paper)

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.)

Advanced Diploma in Electrical Installation

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

- 6161-27-067 Electrical Installation 3 Principles (written question three hours)
- [6161-27-167] Electrical Installation 3 Practice
(Total one written paper)

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 programmes to be relevant preparation for this programme.

Diploma Awards in the Construction Industry (6161)
Carpentry and Joinery Craft Certificate part 2 (8340)
Machine Woodworking Craft Certificate part 2 (8350)
Blocklaying, Bricklaying, and Concreting Craft Certificate (8310)
Painting and Decorating Craft Certificate (5940)
Plumbing Craft Certificate (8320)
Refrigeration 2 (8270)
Electrical Installation Technology Part 2 (8230)

We also consider the following Pitman Qualifications award as relevant alongside this programme.

English for Speakers of Other Languages – higher intermediate level

Progression routes and recognition

A number of UK universities and other higher-education institutions may accept success in this programme combined with the Diploma award 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 applies to the 6161 Advanced Diploma Awards in the Construction Industry regulations on pages 09 to 13.

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Syllabus

IVQ in Construction Industry 6161

Unit numbers

16 61 Site Carpentry 3

17 Safety at Work

19 Materials

21 Calculations, Setting Out and Drawing

23 Advanced Practical Skills

29 Communications and Information Technology

31 Alteration, Repair and Renovation

32 Supervision, Planning and Administration

43 62 Bench Joinery 3

44 Safety at work

45 Materials

47 Calculations, Setting Out and Drawing

49 Advanced Practical Skills

54 Communications and Information Technology

56 Planned Machine Maintenance

57 Supervision, Planning and Administration

68 63 Trowel Vocations 3

69 Safety at Work

70 Materials

72 Calculations, Setting Out and Drawing

74 Advanced Practical Skills

77 Communications and Information Technology

79 Alteration, Repair and Renovation

80 Supervision, Planning and Administration

90 64 Painting and Decorating 3

91 Safety at Work

92 Materials

94 Calculations, Setting Out and Drawing

95 Advanced Practical Skills

97 Communications and Information Technology

99 Repair, Restoration and Interior Decorative Techniques

100 Supervision, Planning and Administration

110 65 Plumbing 3

111 Safety at Work

112 Materials

114 Calculations, Setting Out and Drawing

116 Advanced Practical Skills

118 Communications and Information Technology

120 Alteration, Repair and Planned Maintenance

121 Supervision, Planning and Administration

131 66 Refrigeration and Air Conditioning 3

132 Safety at Work

134 Materials (Plant and Refrigerants)

136 Calculations, Science and Drawing

139 Advanced Practical Skills

142 Communications and Information Technology

144 Alteration and Repair

146 Supervision, Planning and Administration

157 67 Electrical Installation 3

158 Safety at Work

160 Materials

162 Calculations, Setting Out and Drawing

163 Advanced Practical Skills

165 Communication and Information Technology

167 Alteration, Repair and Planned Maintenance

169 Supervision, Planning and Administration

61 Site Carpentry 3 – Summary of syllabus sections

Page 17 Safety at Work

(Objectives 61.1 to 61.17)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 19 Materials

(Objectives 61.18 to 61.35)

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

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

Page 21 Calculations, Setting Out and Drawing

(Objectives 61.36 to 61.56)

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 23 Advanced Practical Skills

(Objectives 61.57 to 61.174)

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

- a set up, change tooling and operate woodworking machinery
- b set out, manufacture and install components, frames and products
- c set out and manufacture various types of formwork

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

Page 29 Communications and Information Technology

(Objectives 61.175 to 61.223)

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 31 Alteration, Repair and Renovation

(Objectives 61.224 to 61.234)

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

Page 32 Supervision, Planning and Administration

(Objectives 61.235 to 61.260)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

Practical competences

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

The candidate must be able to do the following:

- 61.1 Inspect and keep records on the condition of excavations.
Record: subsoil condition (drying, freezing, effects of rainfall)
- 61.2 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 61.3 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 61.4 Carry out a risk assessment and prepare a report identifying the potential hazards of site operations.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 61.5 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 61.6 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub-frame (timber, metal)
- 61.7 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 61.8 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: power tools (eg electric drill, router, planing machine, lighting), hand tools (eg hammers, spanners, chisel, saw)

- 61.9 Carry out a risk assessment and prepare a report identifying the potential hazards of a portable power hand tool.
Risk assessment: process, working practices, location, hazard identification, noise
Portable power tool: eg circular saw, router, planing machine

- 61.10 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 61.11 State possible faults and potential hazards when working in deep excavations.
Faults: deterioration of subsoil, change in type of subsoil
Hazards: change in condition of subsoil condition (drying, freezing, effects of rainfall), lights (defective, removal), interference with trench supports, interference with barriers
- 61.12 State the possible faults or potential defects in trench support systems.
Faults/defects: metal components (corrosion, distortion), timber components (displacement, splits, cracks)
- 61.13 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 61.14 Explain the need for communication systems to ensure safe use of lifting or excavating machines.
Communication systems: hand signals, bell systems, two way radio
- 61.15 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome

- 61.16 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 61.17 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity

Materials

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

Practical competences

The candidate must be able to do the following:

- 61.18 Prepare a report on the suitability of various tooling materials for specific applications.
Tooling materials: alloy steel, high carbon steel, high speed steel, tungsten carbide, tempered steel
Applications: sawing (circular, band), planing, morticing, materials (softwood, hardwood, abrasive timbers, sheet materials, manufactured boards)
- 61.19 Identify and select materials suitable for producing packings and mouth pieces for circular rip saws based on their technical properties.
Materials: hardwood, felt, hemp
- 61.20 Identify and select oil and slip stones for specific applications based on their technical properties.
Oil/slip stones: eg materials (natural, carborundum, diamond), size, shape, grade (fine, medium, coarse)
Applications: planing blades (sharpening, honing, changing blade angle, removing burrs), tooling materials (high speed steel, tungsten carbide)
- 61.21 Identify and select liquids suitable for use with oil/slip stones for specific applications based on their technical properties.
Liquids: eg water, honing oil, oil/paraffin mix
Applications: diamond stone (tungsten carbide), natural/carborundum stones (high speed steel)
- 61.22 Identify and select the various components used in the construction of suspended ceilings based on their technical properties.
Components: eg metal/plastic sections (L, T, Z), tile clips, wire hangers, tiles (infill, ceiling, grooved edge, transparent), sheet material (plasterboard, plywood, insulation board), splicing pieces, light fittings
- 61.23 Identify and select the various components and materials used in formwork based on their technical properties.
Components: eg adjustable metal props, column clamps, beam clamps
Materials: exterior grade plywood, polystyrene (shaping, infill pieces)
- 61.24 Identify and select hinges suitable for hanging double swing doors based on their technical properties.
Hinges: double action spring, double action pivoted floor spring, hawgood

- 61.25 Identify and select various fixings for specific applications based on their technical properties.
Fixings: connector plates (single toothed, double toothed, split ring, shear plate), bolts (coach, high tensile, square head, hexagonal head), nail plates, hangers, anchors, clips, straps
Applications: joining timber, supporting, locating

- 61.26 Identify and select various components used in the construction of shoring.
Components: needles, metal dogs, adjustable metal props

Knowledge requirements

The instructor must ensure the candidate is able to:

- 61.27 State the characteristics of the various tooling materials used for sawing, planing and morticing.
Characteristics: ease of sharpening, wear rate, sharpness, strength
Tooling materials: alloy steel, high carbon steel, high speed steel, tungsten carbide, tempered steel
Sawing: circular, band
- 61.28 State the technical properties of the materials suitable for producing packings and mouth pieces for circular rip saws.
Properties: stability, wear rate, absorbency
Materials: hardwood, felt, hemp
- 61.29 State the technical properties of oil and slip stones.
Properties: hardness, porosity, absorbency
Oil/slip stones: materials (natural, carborundum, diamond), size, shape, grade (fine, medium, coarse)
- 61.30 State the technical properties of liquids suitable for use with oil/slip stones.
Properties: cleaning, lubricating
Liquids: water, honing oil, oil/paraffin mix
- 61.31 State the technical properties of the various components used in the construction of suspended ceilings.
Properties: strength, weight, insulation (sound, heat), appearance (texture, colour), design
Components: metal/plastic sections (L, T, Z), tile clips, wire hangers, tiles (infill, ceiling, grooved edge, transparent), sheet material (plasterboard, plywood, insulation board), splicing pieces, light fittings
- 61.32 State the technical properties of the various components and materials used in formwork.
Properties: load bearing capacity, moisture resistance, surface finish, non-stick
Components: adjustable metal props, column clamps, beam clamps
Materials: exterior grade plywood, polystyrene (shaping, infill pieces)

- 61.33 State the technical properties of hinges suitable for hanging double swing doors.
Properties: load bearing capacity, fixing methods, material, finish, colour, design, security
Hinges: double action spring, double action pivoted floor spring, hawgood
- 61.34 State the technical properties of various fixings.
Properties: load bearing capacity (tensile, shear, torsion, bending), corrosion resistance, design (fixing system, size, shape)
Fixings: connector plates (single toothed, double toothed, split ring, shear plate), bolts (coach, high tensile, square head, hexagonal head), nail plates, hangers, anchors, clips, straps
Applications: joining timber, supporting, locating
- 61.35 State the technical properties of various components used in the construction of shoring.
Properties: load bearing capacity, weather resistance
Components: needles, metal dogs, adjustable metal props

Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 61.36 Calculate the minimum blade diameter for a circular saw from given specifications.
Specifications: maximum diameter, formula for minimum diameter
- 61.37 Calculate the number and pitch of teeth on a circular saw blade.
- 61.38 Calculate the length of a band saw blade to suit machine specifications.
Specifications: pulley diameter, distance between pulley centres
- 61.39 Calculate the cutting speed of various machine tools.
Tools: circular saw blades, planing machine cutter blocks
- 61.40 Calculate the cutter pitch marks (wave field) produced by rotary cutting machines.
Machines: surface planer, thickness planer
- 61.41 Calculate the quantity and cost of labour required for the construction of domestic premises from given data.
Quantity: total hours, number of tradesmen
Domestic premises: eg roofs, floors, stud partitioning, formwork, installing (doors, windows, skirting, fitments)
Data: labour (output, cost), duration of contract

Setting out

- 61.42 Set out dormer roofs to scale with tolerances to industry standards.
Set out: lengths, bevels, angles
Roofs: eg flat, segmental, pitched, eyebrow
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm, angles $\pm 2^\circ$, bevels $\pm 2^\circ$
- 61.43 Set out a mansard/gambrel roof to scale with tolerances to industry standards.
Set out: lengths, bevels, angles
Roof: hipped end, gable end
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm, angles $\pm 2^\circ$, bevels $\pm 2^\circ$
- 61.44 Set out component spacings of complex circular, semi-circular and semi-elliptical structures/ products.
Component: eg joists, ribs

Drawing

- 61.45 Produce working drawings from plans and details of complex circular, semi-circular and semi-elliptical structures/products.
Drawing: dimensions, detail (eg joists, facias, laggings, ribs), exploded views, isometric
- 61.46 Produce developments of raking mouldings.

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 61.47 Identify calculations involving the minimum blade diameter for a circular saw from given specifications.
Specifications: maximum diameter, formula for minimum diameter
- 61.48 Identify calculations involving the number and pitch of teeth on a circular saw blade.
- 61.49 Identify calculations involving the length of a band saw blade to suit machine specifications.
Specifications: pulley diameter, distance between pulley centres
- 61.50 Identify calculations involving the cutting speed of various machine tools.
Tools: circular saw blades, planing machine cutter blocks
- 61.51 Identify calculations involving the cutter pitch marks (wave field) produced by rotary cutting machines.
Machines: surface planer, thickness planer
- 61.52 Identify calculations involving the quantity and cost of labour required for the construction of domestic premises from given data.
Quantity: total hours, number of tradesmen
Domestic premises: eg roofs, floors, stud partitioning, formwork, installing (doors, windows, skirting, fitments)
Data: labour (output, cost), duration of contract

Setting out

- 61.53 Describe, with the aid of a sketch, the method for setting out dormer roofs to scale with tolerances to industry standards.
Set out: lengths, bevels, angles
Roofs: eg flat, segmental, pitched, eyebrow
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm, angles $\pm 2^\circ$, bevels $\pm 2^\circ$

61.54 Describe, with the aid of a sketch, the method for setting out a mansard/gambrel roof to scale with tolerances to industry standards.

Set out: lengths, bevels, angles

Roof: hipped end, gable end

Scale: eg 1:5, 1:20

Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm, angles $\pm 2^\circ$, bevels $\pm 2^\circ$

61.55 Describe, with the aid of a sketch, the method for setting out component spacings of complex circular, semi-circular and semi-elliptical structures/products.

Component: eg joists, ribs

Drawing

61.56 Identify working drawings from plans and details of complex circular, semi-circular and semi-elliptical structures/products.

Drawing: dimensions, detail (eg joists, facias, laggings, ribs), exploded views, isometric

Advanced Practical Skills

Practical competences

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

The candidate must be able to do the following:

Woodworking Machinery

Circular rip saw

- 61.57 Set and operate a hand fed circular rip saw for cutting timber.
Cutting: flat, deep, bevel, angle
Timber: eg hardwood, softwood, sheet material
- 61.58 Use jigs, bed pieces, saddles and templates to aid the cutting of components.
Components: firing strips, wedges, angle fillets/glue blocks.
- 61.59 Use feeding aids to assist cutting operations.
Aids: push stick, push spike.
Operations: ripping.
- 61.60 Select suitable blades for the material being cut.
Selection: tooth (parts, angles), blade material (alloy steel, tungsten carbide)
Materials: eg hardwood, softwood, sheet
- 61.61 Change blades, riving knife, mouth piece and packings.
- 61.62 Position the fence to suit the material being cut.
Position: in line with gullets, running through.
Materials: eg solid timber, sheet material.
- 61.63 Check and set the fence lead in to industry standards.
Set: 0.3mm over 600mm.
- 61.64 Safety equipment and machine guards to be used in accordance with local/national standards.
- #### Narrow band saw
- 61.65 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
- 61.66 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

- 61.67 Change blade/mouthpiece and set guides/thrust wheel.
- 61.68 Fold and store a blade in a safe and efficient manner.
- 61.69 Set and adjust tracking and tension devices to suit the blade.
- 61.70 Check the tension of the blade is within accepted limits.
Check: by hand
Limits: 9mm sideways movement from the centre line, 45° of twist
- 61.71 Safety equipment and machine guards to be used in accordance with local/national standards.

Surface planer

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

Thickness planer (panel planer)

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

Chisel morticing machine

- 61.83 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
- 61.84 Select suitable components for the mortice being produced.
Selection: dimensions
Components: eg chisels, augers, bushes, collets
- 61.85 Change and set the components to suit the mortice being produced.
Components: eg chisels, augers, bushes, collets
Set: square, clearance, ejection slot direction
- 61.86 Lubricate the chisel and auger.
- 61.87 Safety equipment and machine guards to be used in accordance with local/national standards.

Carcassing and first fixing

Pitched roofs

- 61.88 Set out a complex equal pitched roof to scale with tolerances to industry standards.
Set out: lengths, bevels, angles
Roof: hipped end, valley
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm, angles $\pm 2^\circ$, bevels $\pm 2^\circ$
- 61.89 Prepare components to form a complex equal pitched roof with tolerances to industry standards.
Prepare: select, cut, space
Components: ridge board, rafters, purlins, valley rafter/layboard, wall plate, ties, soffit, fascia board
Tolerances: overall dimensions ± 3 mm
- 61.90 Assemble and fix components to form a complex equal pitched roof with tolerances to industry standards.
Components: ridge board, rafters, purlins, valley rafter/layboard, wall plate, ties, soffit, fascia board
Tolerances: components plumb/level ± 3 mm, rafters ends cut level ± 3 mm, overall dimensions ± 5 mm

Suspended ceilings

- 61.91 Set out components to scale to form a suspended ceiling with tolerances to industry standards.
Set out: lengths, components section, overall dimensions
Suspended ceilings: timber framed
Scale: eg 1:5, 1:20
Tolerances: overall dimensions ± 1 mm, components dimensions ± 0.5 mm

- 61.92 Prepare components to form a suspended ceiling with tolerances to industry standards.
Prepare: select, cut, space
Components: joists, noggins, battens, binders, straps, ceiling boards/sheets (eg plasterboard, tongue and grooved)
Tolerances: overall dimensions ± 3 mm
- 61.93 Assemble and fix components to form a suspended ceiling with tolerances to industry standards.
Components: joists, noggins, battens, binders, straps, ceiling boards/sheets (eg plasterboard, tongue and grooved)
Tolerances: components plumb/level ± 3 mm, joist/noggin ends cut level ± 3 mm, overall dimensions -0mm +5mm

Formwork

Temporary formwork

- 61.94 Set out formwork suitable for the construction of a brick arch with tolerances to industry standards.
Formwork: temporary framed/ribbed arch centre
Arch: eg semi-circular, segmental, three centred
Tolerances: overall dimensions ± 5 mm
- 61.95 Prepare components to form a temporary arch centre as detailed in 61.94 above with tolerances to industry standards.
Prepare: select, cut, space
Components: rib, strut, lagging, stiffener, tie
Tolerances: overall dimensions ± 3 mm
- 61.96 Assemble and fix components to form a temporary arch centre with tolerances to industry standards.
Components: rib, strut, lagging, stiffener, tie
Tolerances: overall dimensions ± 5 mm, free from twist
- 61.97 Set out formwork suitable for the construction of a concrete cill with tolerances to industry standards.
Formwork: mould box
Concrete cill: minimum 1m long, rebate, weather
Tolerances: overall dimensions ± 5 mm
- 61.98 Prepare components to form a mould box for the construction of a concrete cill with tolerances to industry standards.
Prepare: select, cut, position
Components: sides, base, tops, bearers, infill pieces, distance pieces, wedges
Tolerances: overall dimensions ± 3 mm

- 61.99 Assemble and fix components to form a mould box for the construction of a concrete cill with tolerances to industry standards.
Components: sides, base, tops, bearers, infill pieces, distance pieces, wedges
Tolerances: overall dimensions $\pm 5\text{mm}$, free from twist
- 61.100 Set out formwork suitable for the construction of a concrete steps with tolerances to industry standards.
Concrete steps: minimum 3 steps
Tolerances: overall dimensions $\pm 5\text{mm}$
- 61.101 Prepare components to produce the formwork for the construction of concrete steps with tolerances to industry standards.
Prepare: select, cut, position
Components: strings, risers, cleats, struts
Tolerances: overall dimensions $\pm 3\text{mm}$
- 61.102 Assemble and fix components to produce formwork for the construction of concrete steps with tolerances to industry standards.
Components: strings, risers, cleats, struts
Tolerances: overall dimensions $\pm 5\text{mm}$, free from twist
- 61.108 Describe the correct positions of the fence in relation to the blade.
Positions: in line with gullets, running through
- 61.109 Explain the reason for having a 'fence lead in'.
Reason: prevent binding
- 61.110 Identify and describe the various types of blades.
Blades: spring set, alloy steel, parallel plate, tungsten carbide tipped
- 61.111 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
- 61.112 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
- 61.113 Describe how set is applied to saw teeth and explain its function.

Finishing and second fixing

- 61.103 Prepare and hang a double swing timber based door with tolerances to industry standards.
Tolerances: 2mm clearance (+ 0mm -2mm), free from binding, hinge recess with gaps not exceeding 1mm

Knowledge requirements

The instructor must ensure the candidate is able to:

Woodworking machinery

Circular rip saw

- 61.104 State the types of operation that can be undertaken with a circular rip saw.
Operation: cutting (flat, deep, bevel, angle)
- 61.105 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
- 61.106 Explain the purpose of the finger plate, mouth piece and packings.
- 61.107 State the types of materials used for the mouth piece and packings.
Materials: hardwood, felt, hemp

- 61.114 Identify calculations involving the maximum and minimum blade diameters allowed on machines.
Calculation: minimum diameter = 60% of maximum diameter
- 61.115 Explain the probable effects of using the wrong blade size.
- 61.116 Explain, with the aid of a sketch, how jigs, bed pieces, saddles and templates are used to assist in cutting components.
- 61.117 Explain the function of a riving knife.
Function: prevent binding, act as a guard
- 61.118 State the correct setting of guards and safety devices in accordance with local/national standards.
Guards/safety devices: crown guard, extension guard, riving knife, extension table, push stick, push spike

Narrow band saw

- 61.119 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
- 61.120 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

61.121 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

61.122 Describe the method of checking the blade tension by hand.
Tension: limit (9mm sideways movement from the centre line, 45° of twist)

61.123 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

61.124 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

61.125 Explain the factors which influence blade size.
Factors: machine specification, curvature of cut, thickness of material

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

61.127 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

61.128 State the types of operation that can be undertaken with a surface planer.
Operations: flattening, edging, rebating, chamfering, bevelling

61.129 Identify and name the various components of a surface planer.
Components: main frame, machine beds/tables, fence, cutter block, guards, switches (start, stop, isolator)

61.130 Explain the operating principles and functions of various components.
Components: machine beds, fence

61.131 Identify and describe the various types of cutter block.
Cutter block: cap hold, wedge bar hold, bar hold

61.132 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

61.133 Explain the importance of allowing cutters to overhang the cutter block and out feed table.

61.134 State the correct position of the out feed table in relation to cutting circle.
Position: parallel, in line

61.135 Describe the correct methods of planing problem materials.
Problem materials: wide, cupped, bowed, twisted, abrasive

61.136 Explain how cutting speed, feed speed and depth of cut affects the surface finish.

61.137 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

61.138 State the types of operation that can be undertaken with a thickness planer.
Operations: width, thickness, taper, bevel

61.139 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)

61.140 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

61.141 Identify and describe the various types of cutter block.
Cutter block: circular (cap hold, bar hold, wedge bar hold), square

61.142 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

61.143 Explain the reason for adjusting the height of anti-friction rollers when feeding material.
Reason: material (sound, rough sawn, resinous, high moisture content)

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

61.145 Describe the correct methods of planing problem materials.
Problem materials: thin, wide, abrasive, interlocked grain

61.146 Explain the reason for recalibrating the thickness scale after setting/changing cutters.

61.147 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

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

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

61.149 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)

61.150 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

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

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

61.153 Explain the need for lubrication the chisel and auger.

61.154 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.

61.155 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

61.156 Explain the ejection, removal and exhausting of waste.

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

Carcassing and first fixing

Pitched roofs

61.158 Describe, with the aid of a sketch, the various type of roof.

Types: mansard, gambrel, jerkin-head, hexagonal turret, shell roof

61.159 Describe, with the aid of a sketch, the various types of dormer roof.

Types: flat, segmental, pitched, eyebrow

61.160 Identify the various components used in complex roof construction.

Components: decking, ceiling joists, noggins, gutter, fascia, fillets, soffit, firrings, hangers, anchors, joist clips, wall ties, wall plate, wall bracket, verge, flashing, insulation, purlin, hips, spars, rafters (common, jack, crown, cripple, valley), lay boards, struts, collars, queen post, king post, tie beam, sprockets, trimming, trimmer, ridge board, pitch board, barge boards, gable ladder, roof trusses, finials

61.161 Describe, with the aid of sketches, the construction and assembly of various types of complex roof.

Construction: components, materials, joints
Assembly: sequence of operations, fixings methods, measurements, checking for alignment
Roofs: mansard, gambrel, jerkin-head, hexagonal turret, shell

61.162 Describe, with the aid of sketches, the construction and assembly of various types of dormer roof.

Construction: components, materials, joints
Assembly: sequence of operations, fixings methods, measurements, checking for alignment
Roofs: flat, segmental, pitched, eyebrow

Suspended ceilings

61.163 Explain, with the aid of sketches, the differences between timber framed, exposed grid and concealed Z-bar systems.

Differences: appearance, application, construction

61.164 State the reasons for installing suspended ceilings.

Reasons: insulation (thermal, sound), fire protection, conceal (structures, services), integral lighting, reduce ceiling height

61.165 Identify the various components used in the construction of suspended ceilings.

Components: timber joists, noggins, battens, metal/plastic sections (L, T, Z), tile clips, wire hangers, tiles (infill, ceiling, grooved edge, transparent), sheet material, splicing pieces, light fittings

- 61.166 State the various methods for transferring levels and datum points for a suspended ceiling.
Methods: water level, optical level, spirit level, instruments (electronic, laser)

Formwork

- 61.167 Describe, with the aid of a sketch, the various types of formwork suitable for the construction of a brick arch.
Formwork: turning piece, ribbed framed, solid plywood ribs
Arch: semi-circular, segmental, three centred, bulls-eye
- 61.168 Identify the various components used in formwork suitable for the construction of a brick arch.
Components: rib, strut, lagging, stiffener, tie
- 61.169 State the various design features and properties of formwork suitable for the construction of a brick arch.
Properties: accuracy of shape, load bearing capacity, method of support, method of removal
- 61.170 Explain the differences between pre-cast and in-situ formwork.
- 61.171 Identify the various components used in the construction of formwork.
Components: plywood sheeting, bearers, braces, props, stiffeners, spacers, column clamps, beam clamps, yokes, ties, reinforcing bars/mesh, infill pieces
- 61.172 State the various design features and properties of pre-cast and in-situ concrete formwork.
Properties: accuracy of shape, load bearing capacity, method of support, rigidity to withstand working forces, method of removal, surface finish, modular construction
- 61.173 State the reasons for using releasing agents with pre-cast and in-situ concrete formwork

Finishing and second fixing

- 61.174 Identify and explain the operation of hinges used for hanging double swing doors.
Hinges: double action spring, double action pivoted floor spring, hawgood

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 61.175 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation,
- 61.176 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 61.177 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations),
- 61.178 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 61.179 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 61.180 Access a database applications software package.
- 61.181 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 61.182 Enter data into a database file.
- 61.183 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 61.184 Edit data in an existing database file.
Edit: add, delete, amend

- 61.185 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after

- 61.186 Modify a database structure.
Modify: fields (add, delete), change data type, change field length

- 61.187 Print selected forms from a database.
Selected forms: from 61.185 above

- 61.188 Define and execute sort criteria for numeric, character and date fields.

- 61.189 Print a summary report of selected data from a database file.

- 61.190 Exit database software.

Spreadsheet

- 61.191 Access a spreadsheet applications software package.

- 61.192 Create a new spreadsheet file for a given application.

- 61.193 Set single and global column widths.

- 61.194 Create and insert appropriate spreadsheet column and row titles.

- 61.195 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.

Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars

- 61.196 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date

- 61.197 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete

- 61.198 Insert and delete columns and rows in a spreadsheet.

- 61.199 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages

- 61.200 Use absolute and relative cell addresses.

- 61.201 Replicate formula in a row or column.

- 61.202 Use the sum and average functions in a spreadsheet for rows and columns.

- 61.203 Print a spreadsheet.
- 61.204 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 61.205 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 61.206 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 61.207 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation,
- 61.208 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 61.209 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations),
- 61.210 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 61.211 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 61.212 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 61.213 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 61.214 Describe the method for defining and executing sort criterion for numeric, character and date fields.

Spreadsheet

- 61.215 Describe the method for creating a new spreadsheet file for a given application.
- 61.216 Describe the method for setting single and global column widths.
- 61.217 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 61.218 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 61.219 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 61.220 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 61.221 Explain the terms 'absolute' and 'relative' cell addresses.
- 61.222 Describe the method for replicating formula in a row or column.
- 61.223 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Alteration, Repair and Renovation

Practical competences

The candidate must be able to do the following:

- 61.224 Form an opening for a doorway in an existing partition wall.
Opening: remove existing coverings, form opening, install (studs, noggins), make good
- 61.225 Install a new dormer roof into an existing pitched roof.
Install: remove existing roof covering, set out, form opening, prepare/fix components, make good in preparation for new roof covering
- 61.226 Remove a damaged section of floor joist and replace with new material.
- 61.227 Shore up an existing wall in preparation for major structural alterations.
Shore up: raking shore, 3m minimum height

- 61.234 Identify the various components used in the construction of shoring.
Components: wall plate, raker, braces, cleats, needles, dogs, sleepers, folding wedges, sole plate, shores, battens, base plate, adjustable metal prop, timber prop

Knowledge requirements

The instructor must ensure the candidate is able to:

- 61.228 Describe the procedure for forming an opening for a doorway in an existing partition wall.
Procedure: remove existing coverings, form opening, install (studs, noggins), make good
- 61.229 Describe the procedure for installing a new dormer roof into an existing pitched roof.
Procedure: remove existing roof covering, set out, form opening, prepare/fix components, make good in preparation for new roof covering
- 61.230 Describe the procedure for removing a damaged section of floor joist and replacing with new material.
Procedure: remove flooring, remove damaged material, prepare new material, join new material to existing (jointing methods, fixings), replace flooring
- 61.231 Identify and describe the use of various fixings.
Fixings: connector plate (single toothed, double toothed, split ring, shear plate), bolts (coach, high tensile, square head, hexagonal head), nail plates, hangers, anchors, clips, straps
- 61.232 State the applications of timber shoring.
Applications: structural (failure, weakness), building alteration, supporting formwork
- 61.233 Describe, with the aid of sketches, the various types of timber shoring.
Types: raking (single, double, multiple), vertical, horizontal, dead

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 61.235 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 61.236 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 61.237 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 61.238 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 61.239 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 61.240 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 61.241 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 61.242 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 61.243 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 61.244 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making

- 61.245 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 61.246 Make recommendations to improve the performance of a team.
- 61.247 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme,

Knowledge requirements

The instructor must ensure the candidate is able to:

- 61.248 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non critical
- 61.249 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 61.250 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 61.251 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 61.252 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 61.253 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 61.254 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 61.255 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 61.256 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 61.257 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 61.258 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 61.259 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 61.260 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessment

Test specification for written paper Site Carpentry 3 Principles (6161-22-061)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	35
Communications and information technology	10
Alteration, repair and renovation	10
Supervision, planning and administration	15

61 Site Carpentry 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- | | | |
|-------|---|--------------------------|
| 61.1 | Inspect and keep records on the condition of excavations. | <input type="checkbox"/> |
| 61.2 | Inspect and keep records on the condition of scaffold platforms over 2m high. | <input type="checkbox"/> |
| 61.3 | Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic. | <input type="checkbox"/> |
| 61.4 | Carry out a risk assessment and prepare a report identifying the potential hazards of site operations. | <input type="checkbox"/> |
| 61.5 | Complete an accident report for a simulated accident resulting in injury. | <input type="checkbox"/> |
| 61.6 | Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions. | <input type="checkbox"/> |
| 61.7 | Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations. | <input type="checkbox"/> |
| 61.8 | Check equipment and inspection records to ensure tools are to standard prior to issue. | <input type="checkbox"/> |
| 61.9 | Carry out a risk assessment and prepare a report identifying the potential hazards of a portable power hand tool. | <input type="checkbox"/> |
| 61.10 | Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment. | <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 _____

61 Site Carpentry 3: Materials

Practical competences

The candidate must be able to do the following:

- | | | |
|-------|---|--------------------------|
| 61.18 | Prepare a report on the suitability of various tooling materials for specific applications. | <input type="checkbox"/> |
| 61.19 | Identify and select materials suitable for producing packings and mouth pieces for circular rip saws based on their technical properties. | <input type="checkbox"/> |
| 61.20 | Identify and select oil and slip stones for specific applications based on their technical properties. | <input type="checkbox"/> |
| 61.21 | Identify and select liquids suitable for use with oil/slip stones for specific applications based on their technical properties. | <input type="checkbox"/> |
| 61.22 | Identify and select the various components used in the construction of suspended ceilings based on their technical properties. | <input type="checkbox"/> |
| 61.23 | Identify and select the various components and materials used in formwork based on their technical properties. | <input type="checkbox"/> |
| 61.24 | Identify and select hinges suitable for hanging double swing doors based on their technical properties. | <input type="checkbox"/> |
| 61.25 | Identify and select various fixings for specific applications based on their technical properties. | <input type="checkbox"/> |
| 61.26 | Identify and select various components used in the construction of shoring. | <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

61 Site Carpentry 3: Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

- | | | |
|-------|---|--------------------------|
| 61.36 | Calculate the minimum blade diameter for a circular saw from given specifications. | <input type="checkbox"/> |
| 61.37 | Calculate the number and pitch of teeth on a circular saw blade. | <input type="checkbox"/> |
| 61.38 | Calculate the length of a band saw blade to suit machine specifications. | <input type="checkbox"/> |
| 61.39 | Calculate the cutting speed of various machine tools. | <input type="checkbox"/> |
| 61.40 | Calculate the cutter pitch marks (wave field) produced by rotary cutting machines. | <input type="checkbox"/> |
| 61.41 | Calculate the quantity and cost of labour required for the construction of domestic premises from given data. | <input type="checkbox"/> |
| 61.42 | Set out dormer roofs to scale with tolerances to industry standards. | <input type="checkbox"/> |
| 61.43 | Set out a mansard/gambrel roof to scale with tolerances to industry standards. | <input type="checkbox"/> |
| 61.44 | Set out component spacings of complex circular, semi-circular and semi-elliptical structures/products. | <input type="checkbox"/> |
| 61.45 | Produce working drawings from plans and details of complex circular, semi-circular and semi-elliptical structures/products. | <input type="checkbox"/> |
| 61.46 | Produce developments of raking mouldings. | <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

61 Site Carpentry 3: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

61.57	Set and operate a hand fed circular rip saw for cutting timber.	<input type="checkbox"/>	61.76	Safety equipment and machine guards to be used in accordance with local/national standards.	<input type="checkbox"/>
61.58	Use jigs, bed pieces, saddles and templates to aid the cutting of components.	<input type="checkbox"/>	61.77	Set and operate a thickness planer to reduce timber.	<input type="checkbox"/>
61.59	Use feeding aids to assist cutting operations.	<input type="checkbox"/>	61.78	Use jigs and bed pieces to produce tapers and bevels.	<input type="checkbox"/>
61.60	Select suitable blades for the material being cut.	<input type="checkbox"/>	61.79	Select suitable blades for the material being planed.	<input type="checkbox"/>
61.61	Change blades, riving knife, mouth piece and packings.	<input type="checkbox"/>	61.80	Change and set blades.	<input type="checkbox"/>
61.62	Position the fence to suit the material being cut.	<input type="checkbox"/>	61.81	Hone blades to remove burrs and produce a fine edge.	<input type="checkbox"/>
61.63	Check and set the fence lead in to industry standards.	<input type="checkbox"/>	61.82	Safety equipment and machine guards to be used in accordance with local/national standards.	<input type="checkbox"/>
61.64	Safety equipment and machine guards to be used in accordance with local/national standards.	<input type="checkbox"/>	61.83	Set and operate a chisel morticing machine for cutting mortices in timber.	<input type="checkbox"/>
Narrow band saw			61.84	Select suitable components for the mortice being produced.	<input type="checkbox"/>
61.65	Set and operate a narrow band saw machine for cutting timber.	<input type="checkbox"/>	61.85	Change and set the components to suit the mortice being produced.	<input type="checkbox"/>
61.66	Select suitable blades for the material being cut.	<input type="checkbox"/>	61.86	Lubricate the chisel and auger.	<input type="checkbox"/>
61.67	Change blade/mouthpiece and set guides/thrust wheel.	<input type="checkbox"/>	61.87	Safety equipment and machine guards to be used in accordance with local/national standards.	<input type="checkbox"/>
61.68	Fold and store a blade in a safe and efficient manner.	<input type="checkbox"/>	Carcassing and first fixing		
61.69	Set and adjust tracking and tension devices to suit the blade.	<input type="checkbox"/>	Pitched roofs		
61.70	Check the tension of the blade is within accepted limits.	<input type="checkbox"/>	61.88	Set out a complex equal pitched roof to scale with tolerances to industry standards.	<input type="checkbox"/>
61.71	Safety equipment and machine guards to be used in accordance with local/national standards.	<input type="checkbox"/>	61.89	Prepare components to form a complex equal pitched roof with tolerances to industry standards.	<input type="checkbox"/>
Surface planer			61.90	Assemble and fix components to form a complex equal pitched roof with tolerances to industry standards.	<input type="checkbox"/>
61.72	Set and operate a surface planing machine to prepare timber.	<input type="checkbox"/>	Suspended ceilings		
61.73	Select suitable blades for the material being planed.	<input type="checkbox"/>	61.91	Set out components to scale to form a suspended ceiling with tolerances to industry standards.	<input type="checkbox"/>
61.74	Change and set blades.	<input type="checkbox"/>	61.92	Prepare components to form a suspended ceiling with tolerances to industry standards.	<input type="checkbox"/>
61.75	Hone blades to remove burrs and produce a fine edge.	<input type="checkbox"/>	61.93	Assemble and fix components to form a suspended ceiling with tolerances to industry standards.	<input type="checkbox"/>

- | | | |
|------------------------------------|--|--------------------------|
| 61.94 | Set out formwork suitable for the construction of a brick arch with tolerances to industry standards. | <input type="checkbox"/> |
| 61.95 | Prepare components to form a temporary arch centre as detailed in 61.94 above with tolerances to industry standards. | <input type="checkbox"/> |
| 61.96 | Assemble and fix components to form a temporary arch centre with tolerances to industry standards. | <input type="checkbox"/> |
| 61.97 | Set out formwork suitable for the construction of a concrete cill with tolerances to industry standards. | <input type="checkbox"/> |
| 61.98 | Prepare components to form a mould box for the construction of a concrete cill with tolerances to industry standards. | <input type="checkbox"/> |
| 61.99 | Assemble and fix components to form a mould box for the construction of a concrete cill with tolerances to industry standards. | <input type="checkbox"/> |
| 61.100 | Set out formwork suitable for the construction of a concrete steps with tolerances to industry standards. | <input type="checkbox"/> |
| 61.101 | Prepare components to produce the formwork for the construction of concrete steps with tolerances to industry standards. | <input type="checkbox"/> |
| 61.102 | Assemble and fix components to produce formwork for the construction of concrete steps with tolerances to industry standards. | <input type="checkbox"/> |
| Finishing and second fixing | | |
| 61.103 | Prepare and hang a double swing timber based door with tolerances to industry standards. | <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

61 Site Carpentry 3: Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 61.175 Draw an organisational chart showing the structure of a multi-trade construction company.
- 61.176 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 61.177 Prepare a report describing the administration systems of a multi-trade construction company.
- 61.178 Prepare a report on the key issues of customer service/care in a construction company.
- 61.179 Use information technology systems for communication.

Information Technology

Database

- 61.180 Access a database applications software package.
- 61.181 Define and create a database structure to store a given set of data.
- 61.182 Enter data into a database file.
- 61.183 Save a database file to disk with an appropriate filename in a given location.
- 61.184 Edit data in an existing database file.
- 61.185 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 61.186 Modify a database structure.
- 61.187 Print selected forms from a database.
- 61.188 Define and execute sort criteria for numeric, character and date fields.

- 61.189 Print a summary report of selected data from a database file.
- 61.190 Exit database software.

Spreadsheet

- 61.191 Access a spreadsheet applications software package.
- 61.192 Create a new spreadsheet file for a given application.
- 61.193 Set single and global column widths.
- 61.194 Create and insert appropriate spreadsheet column and row titles.
- 61.195 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 61.196 Insert and format character and numeric data.
- 61.197 Edit the contents of a cell in a spreadsheet file.
- 61.198 Insert and delete columns and rows in a spreadsheet.
- 61.199 Insert formula containing cell addresses and numbers to carry out calculations.
- 61.200 Use absolute and relative cell addresses.
- 61.201 Replicate formula in a row or column.
- 61.202 Use the sum and average functions in a spreadsheet for rows and columns.
- 61.203 Print a spreadsheet.
- 61.204 Present and print data in graphical format.
- 61.205 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 61.206 Exit spreadsheet software.

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 _____

61 Site Carpentry 3: Alteration, Repair and Renovation

Practical competences

The candidate must be able to do the following:

- 61.224 Form an opening for a doorway in an existing partition wall.
- 61.225 Install a new dormer roof into an existing pitched roof.
- 61.226 Remove a damaged section of floor joist and replace with new material.
- 61.227 Shore up an existing wall in preparation for major structural alterations.

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

61 Site Carpentry 3: Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|--------|---|--------------------------|--------|--|--------------------------|
| 61.235 | Identify various elements of a construction project and arrange in a logical sequence of events. | <input type="checkbox"/> | 61.247 | Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance. | <input type="checkbox"/> |
| 61.236 | Calculate the time required for each element of a construction project from given data. | <input type="checkbox"/> | | | |
| 61.237 | Calculate the resources required for each element of the project to complete them within the time allowed. | <input type="checkbox"/> | | | |
| 61.238 | Analyse data produced on each element of the project to determine their individual effect on the programme. | <input type="checkbox"/> | | | |
| 61.239 | Produce planning programmes for a domestic construction project. | <input type="checkbox"/> | | | |
| 61.240 | Write a method statement to carry out a craft operation. | <input type="checkbox"/> | | | |
| 61.241 | Prepare material orders with deliveries planned to support the programmed sequence of events. | <input type="checkbox"/> | | | |
| 61.242 | Record daily and weekly progress and compare with the project programme. | <input type="checkbox"/> | | | |
| 61.243 | Provide feedback to individuals and teams on daily and weekly progress. | <input type="checkbox"/> | | | |
| 61.244 | Use effective leadership methods to supervise individuals/teams working in the construction industry. | <input type="checkbox"/> | | | |
| 61.245 | Use communication skills within a team environment to achieve agreement with individuals/teams. | <input type="checkbox"/> | | | |
| 61.246 | Make recommendations to improve the performance of a team. | <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

62 Bench Joinery 3 – Summary of syllabus sections

Page 44 Safety at Work

(Objectives 62.1 to 62.14)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 45 Materials

(Objectives 62.15 to 62.33)

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

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

Page 47 Calculations, Setting Out and Drawing

(Objectives 62.34 to 62.54)

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

- a apply calculations to problems associated with machines and tooling
- 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 49 Advanced Practical Skills

(Objectives 62.55 to 62.154)

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

- a set up, change tooling and operate woodworking machinery
- b set out, manufacture and assemble complex components, frames and products
- c install components, frames and products

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

Page 54 Communications and Information Technology

(Objectives 62.155 to 62.203)

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 56 Planned Machine Maintenance

(Objectives 62.204 to 62.215)

The aim of this unit is to enable the candidate to clean, service and maintain woodworking machinery.

Page 57 Supervision, Planning and Administration

(Objectives 62.216 to 62.241)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

Practical competences

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

The candidate must be able to do the following:

- 62.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
Records: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 62.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 62.3 Carry out a risk assessment and prepare a report identifying the potential hazards of site operations.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 62.4 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 62.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 62.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 62.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: power tools (eg electric drill, router, planing machine, lighting), hand tools (eg hammers, spanners, chisel, saw)

- 62.8 Carry out a risk assessment and prepare a report identifying the potential hazards of a fixed woodworking machine.
Risk assessment: process, working practices, hazard identification, noise
Woodworking machine: eg circular saw, surface planer, single ended tenor, vertical spindle moulder
- 62.9 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 62.10 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 62.11 Explain the need for communication systems to ensure safe use of lifting or excavating machines.
Communication systems: hand signals, bell systems, two way radio
- 62.12 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 62.13 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 62.14 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity

Practical competences

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

The candidate must be able to do the following:

- 62.15 Prepare a report on the suitability of various tooling materials for specific applications.
Tooling materials: alloy steel, high carbon steel, high speed steel, tungsten carbide, tempered steel
Applications: sawing (circular, band), planing, morticing, tenoning, shaping, materials (softwood, hardwood, abrasive timbers, sheet materials, manufactured boards)
- 62.16 Identify and select materials suitable for producing packings and mouth pieces for circular rip saws based on their technical properties.
Materials: hardwood, felt, hemp
- 62.17 Identify and select oil and slip stones for specific applications based on their technical properties.
Oil/slip stones: eg materials (natural, carborundum, diamond), size, shape, grade (fine, medium, coarse)
Applications: planing blades, tenoning cutters, shaping cutters, process (sharpening, honing, changing blade angle, removing burrs) tooling materials (high speed steel, tungsten carbide)
- 62.18 Identify and select liquids suitable for use with oil/slip stones for specific applications based on their technical properties.
Liquids: eg water, honing oil, oil/paraffin mix
Applications: diamond stone (tungsten carbide), natural/carborundum stones (high speed steel)
- 62.19 Identify and select door ironmongery and accessories based on their technical properties.
Ironmongery: butt hinges, double action swing hinges, locks (mortice, cylinder, multi-point), handles, latches, letter plates
Accessories: seals, intermittent strips
- 62.20 Identify and select window ironmongery and accessories based on their technical properties.
Ironmongery: multi-point locks, pivot hinges, sash mechanisms, tilt/turn mechanisms
Accessories: seals, vents
- 62.21 Identify and select various mouldings for specific applications.
Mouldings: sectional size, profile, material, finish
Applications: skirting, architrave, picture rail, dado, cornice

- 62.22 Identify and select various drive belts for specific applications based on their technical properties.
Drive belts: flat, vee, multi-vee, toothed, segmental
Applications: eg circular rip saw, narrow band saw, surface planer, thickness planer, vertical spindle moulder, manufacturers' specifications
- 62.23 Identify and select oils and greases for specific applications based on their technical properties.
Oils/greases: synthetic, mineral
Applications: bearings, gearboxes, slides, threads, manufacturers' specifications
- 62.24 Identify and select stud extractors, taps and dies for specific applications based on their technical properties.
Applications: removal of broken studs, repair/renovate internal/external threads

Knowledge requirements

The instructor must ensure the candidate is able to:

- 62.25 State the characteristics of the various tooling materials used for sawing, planing, morticing, tenoning and shaping.
Characteristics: ease of sharpening, wear rate, sharpness, strength
Tooling materials: alloy steel, high carbon steel, high speed steel, tungsten carbide, tempered steel
Sawing: circular, band
- 62.26 State the technical properties of the materials suitable for producing packings and mouth pieces for circular rip saws.
Properties: stability, wear rate, absorbency
Materials: hardwood, felt, hemp
- 62.27 State the technical properties of oil and slip stones.
Properties: hardness, porosity, absorbency
Oil/slip stones: materials (natural, carborundum, diamond), size, shape, grade (fine, medium, coarse)
- 62.28 State the technical properties of liquids suitable for use with oil/slip stones.
Properties: cleaning, lubricating
Liquids: water, honing oil, oil/paraffin mix
- 62.29 State the technical properties of door ironmongery and accessories.
Properties: load bearing capacity, fixing methods, material, finish, colour, design, security, draft proofing, fire retardant
Ironmongery: butt hinges, double action swing hinges, locks (mortice, cylinder, multi-point), handles, latches, letter plates
Accessories: seals, intermittent strips

- 62.30 State the technical properties of window ironmongery and accessories.
Properties: load bearing capacity, fixing methods, material, finish, colour, design, security, draft proofing, ventilation
Ironmongery: multi-point locks, pivot hinges, sash mechanisms, tilt/turn mechanisms
Accessories: seals, vents
- 62.31 State the various types and properties of drive belts.
Types: flat, vee, multi-vee, toothed, segmental
Properties: rating (power, speed), size (cross section, length)
- 62.32 State the technical properties of oils and greases.
Properties: viscosity
Oils/greases: synthetic, mineral
- 62.33 State the technical properties of stud extractors, taps and dies.
Properties: size (diameter, pitch), thread type, taper

Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 62.34 Calculate the minimum blade diameter for a circular saw from given specifications.
Specifications: maximum diameter, formula for minimum diameter
- 62.35 Calculate the number and pitch of teeth on a circular saw blade.
- 62.36 Calculate the length of a band saw blade to suit machine specifications.
Specifications: pulley diameter, distance between pulley centres
- 62.37 Calculate the cutting speed of various machine tools.
Tools: circular saw blades, cutter blocks (spindle moulders, planing machines, tenoning machines)
- 62.38 Calculate the cutter pitch marks (wave field) produced by rotary cutting machines.
Machines: surface planer, thickness planer, vertical spindle moulder
- 62.39 Calculate output speeds for a drive belt system from given specifications.
Specifications: motor speed, pulley diameters
- 62.40 Calculate the quantity and cost of labour required for the manufacture of joinery products from given data.
Quantity: total hours, number of tradesmen
Joinery products: eg doors, windows, staircases
Data: labour (output, cost), duration of contract

Setting out

- 62.41 Measure and set out components to produce workshop rods and drawings of complex circular, semi-circular and semi-elliptical structures/products.
Workshop rods: vertical sections, horizontal sections
Drawings: elevations
Products: eg bulls-eye window, semi-elliptical headed door, bow window
Complex products: using rebated/grooved/moulded cross sectioned timbers
- 62.42 Draw cut away and hidden detail onto setting out rods of complex circular, semi-circular and semi-elliptical structures/products.
Detail: eg hammer head key
- 62.43 Set out component spacings of complex circular, semi-circular and semi-elliptical structures/products.
Component: eg glazing bars, mullions, transom, rails, muntins

Drawing

- 62.44 Produce working drawings from plans and details of complex circular, semi-circular and semi-elliptical 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

- 62.45 Identify calculations involving the minimum blade diameter for a circular saw from given specifications.
Specifications: maximum diameter, formula for minimum diameter
- 62.46 Identify calculations involving the number and pitch of teeth on a circular saw blade.
- 62.47 Identify calculations involving the length of a band saw blade to suit machine specifications.
Specifications: pulley diameter, distance between pulley centres
- 62.48 Identify calculations involving the cutting speed of various machine tools.
Tools: circular saw blades, cutter blocks (spindle moulders, planing machines, tenoning machines)
- 62.49 Identify calculations involving the cutter pitch marks (wave field) produced by rotary cutting machines.
Machines: surface planer, thickness planer, vertical spindle moulder
- 62.50 Identify calculations involving output speeds for a drive belt system from given specifications.
Specifications: motor speed, pulley diameters
- 62.51 Identify calculations involving the quantity and cost of labour required for the manufacture of joinery products from given data.
Quantity: total hours, number of tradesmen
Joinery products: eg doors, windows, staircases
Data: labour (output, cost), duration of contract

Setting out

- 62.52 Describe, with the aid of a sketch, the method for measuring and setting out components to produce workshop rods and drawings of complex circular, semi-circular and semi-elliptical structures/products.
Workshop rods: vertical sections, horizontal sections
Drawings: elevations
Products: eg bulls-eye window, semi-elliptical headed door, bow window
Complex products: using rebated/grooved/moulded cross sectioned timbers

62.53 Describe, with the aid of a sketch, the method for setting out component spacings of complex circular, semi-circular and semi-elliptical structures/products.
Component: eg glazing bars, mullions, transom, rails, muntins

Drawing

62.54 Identify scale working drawings of items taken from plans and details of complex circular, semi-circular and semi-elliptical structures/products.
Drawing: dimensions, detail (eg glazing bars, rails, stiles, heads, jambs, transom, mullion, muntin), exploded views, isometric

Advanced Practical Skills

Practical competences

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

The candidate must be able to do the following:

Woodworking Machinery

Single ended tenon machine

- 62.55 Set and operate a single ended tenon machine for cutting tenons.
Tenons: bare faced, shoulder (square, off set, scribed, double scribed, angled)
- 62.56 Make and use jigs, bed pieces, saddles and templates to aid the cutting of components.
Components: eg angled, compound angled
- 62.57 Make and use backing pieces to aid the cutting of components.
Components: planed all round, pre-moulded
- 62.58 Select suitable tooling for the material being cut.
Selection: tooling materials (eg alloy steel, tungsten carbide, high speed steel/HSS, mild steel), saw blades, blocks, cutters
Materials: eg hardwoods, softwoods
- 62.59 Change and set saw blades, blocks and cutters to suit the component being manufactured.
- 62.60 Hone cutters to remove burrs and produce a fine edge.
- 62.61 Safety equipment and machine guards to be used in accordance with national/local standards.

Vertical spindle moulding machine

- 62.62 Set and operate a vertical spindle moulding machine to produce component features.
Features: rebated, grooved, bevelled, chamfered, moulded, profiled
- 62.63 Make and use jigs, bed pieces, saddles and templates to aid the cutting of components.
Components: stopped, curved, angled
- 62.64 Make and use false fences to suit the components being manufactured.
- 62.65 Select suitable tooling for material and component being cut.
Selection: tooling materials (tungsten carbide, high speed steel/HSS), saw blades, blocks, cutters, bed rings
Materials: eg hardwoods, softwoods, sheet
Components: rebated, grooved, bevelled, chamfered, moulded, profiled

- 62.66 Change and set saw blades, blocks and cutters to suit the component being manufactured.
- 62.67 Select and fit bed rings to suit tooling.
- 62.68 Hone cutters to remove burrs and produce a fine edge.
- 62.69 Safety equipment and machine guards to be used in accordance with national/local standards.

Disc sanding machine

- 62.70 Set and operate a disc sanding machine to finish components.
Components: end grain, curved, straight, angled, compound angled
- 62.71 Set and adjust the fence and bed to finish components.
Components: square, angled, compound angled
- 62.72 Select suitable abrasive discs to suit the material and the finish required.
Discs: grit size, coat type, abrasive material
Materials: hardwood, softwood, sheet
- 62.73 Change abrasive discs and reset machine to suit the component being finished.
- 62.74 Clean used abrasive discs.
- 62.75 Safety equipment and machine guards to be used in accordance with national/local standards.

Bobbin sanding machine

- 62.76 Set and operate a bobbin sanding machine to finish components.
Components: curved, angled
- 62.77 Set and adjust the bed to finish components.
Components: curved, angled
- 62.78 Select suitable abrasive sheets, bobbins and bed rings to suit the material and the finish required.
Sheets: grit size, coat type, abrasive material
Bobbins/bed rings: diameter
Materials: hardwood, softwood, sheet
- 62.79 Change abrasive sheets, bobbins and bed rings and reset machine to suit the component being finished.
- 62.80 Adjust bobbin height to allow efficient use of abrasive sheets.
- 62.81 Clean used abrasive sheets.
- 62.82 Safety equipment and machine guards to be used in accordance with national/local standards.

Framed Products

Doors

- 62.83 Set out an external semi-circular headed door with glazed viewing panel and match boards with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm
- 62.84 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: component dimensions ± 1 mm
- 62.85 Manufacture and assemble components to produce an external semi-circular headed door with glazed viewing panel and match boards with tolerances to industry standards.
Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5 mm, diagonals ± 2 mm, free from twist
- 62.86 Finish a semi-circular headed door suitable for surface coating using hand tools and portable power tools.

Windows

- 62.87 Set out a splayed bay window with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm
- 62.88 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: component dimensions ± 1 mm
- 62.89 Manufacture and assemble components to produce a splayed bay window with tolerances to industry standards.
Tolerances: product overall dimensions ± 3 mm, gaps not exceeding 0.5 mm, diagonals ± 2 mm, free from twist
- 62.90 Finish a splayed bay window suitable for surface coating using hand tools and portable power tools.

Stairs

- 62.91 Set out a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders with tolerances to industry standards.
Tolerances: product overall dimensions ± 1 mm, component dimensions ± 0.5 mm
- 62.92 Prepare materials and mark out components with tolerances to industry standards.
Tolerances: component dimensions ± 1 mm

- 62.93 Manufacture and assemble components to produce a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders with tolerances to industry standards.
Tolerances: product overall dimensions ± 5 mm, gaps not exceeding 1 mm
- 62.94 Finish a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders suitable for surface coating using hand tools and portable power tools.

Second fixing

- 62.95 Prepare and hang timber based doors with tolerances to industry standards.
Doors: internal, external
Tolerances: 2 mm clearance +0 mm -2 mm, free from binding, hinge recess with gaps not exceeding 1 mm
- 62.96 Select, fit and fix ironmongery to a timber based door.
Ironmongery: butt hinges, locks (mortice, cylinder), handles, latches, letter plate
- 62.97 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 0.5 mm, scribe joint gaps not exceeding 1 mm, skirting (level ± 2 mm in 1 m), architrave (plumb ± 1 mm in 1 m, margin ± 2 mm)
- 62.98 Prepare, fit and fix fitments with tolerances to industry standards.
Fitments: eg kitchen units, bedroom units, built in furniture
Tolerances: plumb ± 1 mm in 1 m, level ± 1 mm in 1 m
- 62.99 Transfer levels and datum points with tolerances to industry standards.
Tolerances: level ± 1 mm in 3 m.

Knowledge requirements

The instructor must ensure the candidate is able to:

Woodworking Machinery

Single ended tenon machine

- 62.100 State the type of operations that can be undertaken with a single ended tenon machine.
Operations: tenoning, scribing, trimming, trenching, combing
- 62.101 Identify and name the various components of a single ended tenon machine.
Components: main frame, cutting heads, head adjustments, table, guards, fences, brakes, control panel
- 62.102 Identify and describe various types of tooling.
Tooling: tenon cutting heads (circular, rectangular, tapered seating), scribing heads, cut-off saws, shoulder/spur cutters, trenching heads
- 62.103 Explain, with the aid of a sketch, the operating principles and functions of various components.
Components: tenon cutting heads (circular, rectangular, tapered seating), scribing heads, cut-off saws, shoulder/spur cutters, head adjustments, fences, backing pieces, stops, brackets (dead, turnover, disappearing), cramping devices (manual, pneumatic), bed pieces, saddles
- 62.104 Explain, with the aid of a sketch, the procedure for manufacturing backing pieces.
- 62.105 Identify cutter setting templates and explain their use.
Cutters: tenon, scribe
- 62.106 State the use of various types of tooling material.
Material: alloy steel, tungsten carbide, high speed steel/HSS, mild steel
- 62.107 Explain the procedure for balancing a cutting head.
Balance: static balance, dynamic balance, dynamic couple
- 62.108 Identify and state the cause of common machining defects.
Defects: tenon, scribe
Cause: incorrect cutter setting, incorrect cutter shape
- 62.109 State the correct setting of guards and safety devices in accordance with national/local standards.

Vertical spindle moulding machine

- 62.110 State the type of operations that can be undertaken with a vertical spindle moulding machine.
Operations: producing component features (straight, stopped, curved, angled)
- 62.111 Identify and name the various components of a vertical spindle moulding machine.
Components: main frame, spindle shaft, spindle lock, motor/drive system, spindle rise/fall adjustment, table, safety devices (guards, top pressure, side pressure), fences, brake, control panel
- 62.112 Identify and describe various types of tooling.
Tooling: circular moulding blocks, flush top/mounted block, disposable tip blocks, grooving blocks (solid, segmental, adjustable), chip thickness limiting blocks, solid profile blocks
- 62.113 Explain, with the aid of a sketch, the operating principles and functions of various components.
Components: spindle lock, motor/drive system (flat belt, V-belt), spindle rise/fall adjustment, safety devices (guards, top pressure, side pressure), fences, bed rings
- 62.114 Explain the use of bed pieces and saddles.
- 62.115 Explain the use of jigs.
Use: stopped work, curved work
- 62.116 Explain, with the aid of a sketch, the features incorporated into jig design.
Features: lead in/out, component stops, fences, securing devices, hand holds
- 62.117 Describe the method and reason for offsetting fences.
- 62.118 Explain the procedure for balancing a cutting head.
Balance: static balance, dynamic balance, dynamic couple
- 62.119 Explain the factors that affect the maximum running speed of tooling.
- 62.120 State the use of various types of tooling material.
Material: high speed steel, tungsten carbide, diamond composite
- 62.121 Describe the relationship between cutting speed, feed speed, type of material, depth of cut and surface finish.
- 62.122 State the correct setting of guards and safety devices in accordance with national/local standards.

Disc sanding machine

- 62.123 State the type of operations that can be undertaken with a disc sanding machine.
Operations: end grain, curved, straight, angled, compound angled
- 62.124 Identify and name the various components of a disc sanding machine.
Components: main frame, table, sanding disc, backing disc, machine controls, table adjustment, motor, fence, guards
- 62.125 Identify the various types of materials used in the manufacture of sanding discs.
Materials: abrasive (type, grit size, coat), backing, bond
- 62.126 Identify the various types of adhesives used to bond sanding discs to the backing disc.
Adhesives: brush on, spray on, pre-coated
- 62.127 State the correct setting of guards and safety devices in accordance with national/local standards.

Bobbin sanding machine

- 62.128 State the type of operations that can be undertaken with a bobbin sanding machine.
Operations: curved, angled
- 62.129 Identify and name the various components of a bobbin sanding machine.
Components: main frame, table, bobbin, drive system, bobbin height adjustment, bed rings, machine controls, motor, guards
- 62.130 Identify the various types of materials used in the manufacture of sanding sheets.
Materials: abrasive (type, grit size, coat), backing, bond
- 62.131 State the correct setting of guards and safety devices in accordance with national/local standards.

Framed Products

Doors

- 62.132 Identify various types internal and external door.
Types: semi-circular, arched, double margin, revolving, bowed
- 62.133 Describe, with the aid of sketches, the various types of joints used in the construction of doors.
Joints: dowelled, mortice and tenon, gunstock, diminished stiles, twin mortice and tenon, bare faced mortice and tenon, hammer head key, bridle, false tenons, handrail bolts

- 62.134 Describe, with the aid of sketches, the construction and assembly of various types of internal and external doors.
Construction: components, materials, joints
Assembly: sequence of operations, clamping methods, measurements, checking for alignment
Doors: semi-circular, arched, double margin, revolving, bowed
- 62.135 Identify various types internal and external door frames and linings.
Frames: semi-circular, semi-circular with transom, arched, storey height, storey height with fan light
Linings: plain, skeleton, panelled, splayed
- 62.136 Describe, with the aid of sketches, the various types of joints used in the construction of door frames and linings.
Joints: mortice and tenon, double mortice and tenon, hammer head key, bridle joint, false tenons, housings, handrail bolts, draw boring
- 62.137 Describe, with the aid of sketches, the construction and assembly of various types of internal and external door frames and linings.
Construction: components, materials, joints, type (solid timber, built up section, segmental, laminated)
Assembly: sequence of operations, clamping methods, measurements, checking for alignment
Frames: semi-circular, semi-circular with transom, arched, storey height, storey height with fan light
Linings: plain, skeleton, panelled, splayed
- 62.138 Describe, with the aid of sketches, various types of ironmongery for internal and external doors.
Ironmongery: multi-point locks, double action spring hinges, revolving door mechanism

Windows

- 62.139 Identify various types of windows.
Types: square bay, splay bay, segmented bay, bow, semi-circular headed, pivot, bulls-eye, sliding, sash, tilt and turn
- 62.140 Describe, with the aid of sketches, the various types of joints used in the construction of windows.
Joints: mortice and tenon, twin mortice and tenon, false tenons, comb, housing, hammer head key, handrail bolts
- 62.141 Describe, with the aid of sketches, the construction and assembly of various types of windows.
Construction: components, materials, joints
Assembly: sequence of operations, clamping methods, measurements, checking for alignment
Windows: square bay, splay bay, segmented bay, bow, semi-circular headed, pivot, bulls-eye, sliding, sash, tilt and turn

62.142 Describe, with the aid of sketches, various types of fixings and ironmongery for windows.
Fixings: handrail bolts, star dowels, corrugated fasteners
Ironmongery: multi-point fastening/locking, pivot hinges, sash mechanism, seals, tilt and turn mechanism, vents

Stairs

62.143 Identify various types of staircase.

Types: dog-leg, winding, geometric, wreathed, with landings

62.144 Describe, with the aid of sketches, the various types of joints used in the construction of staircases.
Joints: mortice and tenon, twin mortice and tenon, butt, mitre, dovetail, housing, dowel, handrail bolts

62.145 Describe, with the aid of sketches, the construction and assembly of various types of staircase.
Construction: components, materials, joints, methods (staving wreathed strings, cut/bracketed strings, shaped bottom steps, intersection of wall strings, intersection of dog-leg strings, development of newel faces)
Assembly: sequence of operations, clamping methods, measurements, checking for alignment
Staircases: dog-leg, winding, geometric, wreathed, with landings

62.146 Identify calculations involving the rise and going of various types of staircases from given parameters.
Calculations: individual (rise, going), total number of steps
Parameters: total (rise, going), design
Staircases: dog-leg, winding, geometric, wreathed, with landings

Second Fixing

Door hanging

62.147 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

62.148 Identify various types of wall moulding.
Types: materials (solid wood, composite board), cross section (plain, moulded), mouldings (skirting, architrave, dado, picture rail)

62.149 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)

62.150 Identify and explain the use of plinth blocks and architrave blocks.

62.151 Describe the various methods and applications for jointing plinth and architrave blocks.
Methods: dovetails, butted, lapped
Applications: polished, painted, material (timber, composite)

Fitments

62.152 Describe the method for fitting units and fitments to walls and floors.

Method: scribing techniques

62.153 Identify methods of fixing and securing units and fitments.
Methods: fixing to (walls, each other, bearers, battens)

62.154 Describe various methods used for levelling units and fitments.
Methods: adjustable feet, wedges, packings, chopping out, scribing

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 62.155 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 62.156 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 62.157 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 62.158 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 62.159 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 62.160 Access a database applications software package.
- 62.161 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 62.162 Enter data into a database file.
- 62.163 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 62.164 Edit data in an existing database file.
Edit: add, delete, amend

- 62.165 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 62.166 Modify a database structure.
Modify: fields (add, delete), change data type, change field length
- 62.167 Print selected forms from a database.
Selected forms: from 62.165 above
- 62.168 Define and execute sort criteria for numeric, character and date fields.
- 62.169 Print a summary report of selected data from a database file.
- 62.170 Exit database software.

Spreadsheet

- 62.171 Access a spreadsheet applications software package.
- 62.172 Create a new spreadsheet file for a given application.
- 62.173 Set single and global column widths.
- 62.174 Create and insert appropriate spreadsheet column and row titles.
- 62.175 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars
- 62.176 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 62.177 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete
- 62.178 Insert and delete columns and rows in a spreadsheet.
- 62.179 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 62.180 Use absolute and relative cell addresses.
- 62.181 Replicate formula in a row or column.
- 62.182 Use the sum and average functions in a spreadsheet for rows and columns.

- 62.183 Print a spreadsheet.
- 62.184 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 62.185 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 62.186 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 62.187 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation,
- 62.188 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 62.189 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 62.190 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 62.191 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 62.192 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 62.193 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 62.194 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 62.195 Describe the method for creating a new spreadsheet file for a given application.
- 62.196 Describe the method for setting single and global column widths.
- 62.197 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 62.198 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 62.199 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 62.200 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 62.201 Explain the terms 'absolute' and 'relative' cell addresses.
- 62.202 Describe the method for replicating formula in a row or column.
- 62.203 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Planned Machine Maintenance

Practical competences

The candidate must be able to do the following:

- 62.204 Clean and service woodworking machinery and tooling in accordance with the manufacturers servicing schedule.
Clean/service: remove (dust, debris, build up), oil/grease components, drive belt (condition, tension), visual inspection of power cables/switchgear for damage
Machinery: any two machines from (circular rip saw, cross cut saw, narrow band saw, surface planer, thickness planer, chisel morticing, single ended tenon, vertical spindle moulder, disc sander, bobbing sander, overhead belt sander)
- 62.205 Remove and replace machine V-drive belts.
- 62.206 Remove and replace a sheared stud bolt using a stud extractor.
- 62.207 Use taps and dies to repair/renovate internal and external screw threads.
- 62.214 Describe the method for removing a sheared stud bolt by use of a stud extractor.
- 62.215 Describe the method for using taps and dies to repair/renovate internal and external screw threads.

Knowledge requirements

The instructor must ensure the candidate is able to:

- 62.208 State the use of lubricants used for servicing woodworking machinery and tooling.
Lubricants: oils, greases
Use: lubricating, cooling
- 62.209 Explain the term viscosity.
- 62.210 Identify the methods of applying lubricants.
Methods: nipples (grease, oil), cups (grease, oil), guns (grease, oil), oil can, oil reservoir
- 62.211 State the items to be included when carrying out the visual inspection of machinery electrical power cables and switchgear.
Items: damaged (cable sheathing, switchgear housings), exposed conductors, loose switches, loose fixings (conduit, trunking, cables)
- 62.212 Describe, with the aid of sketches, various types of drive systems.
Drive systems: direct drive, belt drive (flat, vee, multi-vee, toothed, segmental)
- 62.213 Describe the procedure for replacing a V-belt drive.
Procedure: remove guard, release tension, remove existing belts, replace all belts with a matched set of V-belts, re-tension, check alignment, replace guard, test run, re-check tension

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 62.216 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 62.217 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 62.218 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 62.219 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 62.220 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 62.221 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 62.222 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 62.223 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 62.224 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 62.225 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 62.226 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 62.227 Make recommendations to improve the performance of a team.
- 62.228 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 62.229 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non critical
- 62.230 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 62.231 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 62.232 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 62.233 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 62.234 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 62.235 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 62.236 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 62.237 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 62.238 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 62.239 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 62.240 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 62.241 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessment

Test specification for written paper Bench Joinery 3 Principles (6161-22-062)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	35
Communications and information technology	10
Planned machine maintenance	10
Supervision, planning and administration	15

62 Bench Joinery 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- | | | |
|------|---|--------------------------|
| 62.1 | Inspect and keep records on the condition of scaffold platforms over 2m high. | <input type="checkbox"/> |
| 62.2 | Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic. | <input type="checkbox"/> |
| 62.3 | Carry out a risk assessment and prepare a report identifying the potential hazards of site operations. | <input type="checkbox"/> |
| 62.4 | Complete an accident report for a simulated accident resulting in injury. | <input type="checkbox"/> |
| 62.5 | Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions. | <input type="checkbox"/> |
| 62.6 | Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations. | <input type="checkbox"/> |
| 62.7 | Check equipment and inspection records to ensure tools are to standard prior to issue. | <input type="checkbox"/> |
| 62.8 | Carry out a risk assessment and prepare a report identifying the potential hazards of a fixed woodworking machine. | <input type="checkbox"/> |
| 62.9 | Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment. | <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

62 Bench Joinery 3: Materials

Practical competences

The candidate must be able to do the following:

- 62.15 Prepare a report on the suitability of various tooling materials for specific applications.
- 62.16 Identify and select materials suitable for producing packings and mouth pieces for circular rip saws based on their technical properties.
- 62.17 Identify and select oil and slip stones for specific applications based on their technical properties.
- 62.18 Identify and select liquids suitable for use with oil/slip stones for specific applications based on their technical properties.
- 62.19 Identify and select door ironmongery and accessories based on their technical properties.
- 62.20 Identify and select window ironmongery and accessories based on their technical properties.
- 62.21 Identify and select various mouldings for specific applications.
- 62.22 Identify and select various drive belts for specific applications based on their technical properties.
- 62.23 Identify and select oils and greases for specific applications based on their technical properties.
- 62.24 Identify and select stud extractors, taps and dies for specific applications based on their technical properties.

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 _____

62 Bench Joinery 3: Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

- 62.34 Calculate the minimum blade diameter for a circular saw from given specifications.
- 62.35 Calculate the number and pitch of teeth on a circular saw blade.
- 62.36 Calculate the length of a band saw blade to suit machine specifications.
- 62.37 Calculate the cutting speed of various machine tools.
- 62.38 Calculate the cutter pitch marks (wave field) produced by rotary cutting machines.
- 62.39 Calculate output speeds for a drive belt system from given specifications.
- 62.40 Calculate the quantity and cost of labour required for the manufacture of joinery products from given data.

Setting out

- 62.41 Measure and set out components to produce workshop rods and drawings of complex circular, semi-circular and semi-elliptical structures/products.
- 62.42 Draw cut away and hidden detail onto setting out rods of complex circular, semi-circular and semi-elliptical structures/products.
- 62.43 Set out component spacings of complex circular, semi-circular and semi-elliptical structures/products.

Drawing

- 62.44 Produce working drawings from plans and details of complex circular, semi-circular and semi-elliptical 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

62 Bench Joinery 3: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

- 62.55 Set and operate a single ended tenon machine for cutting tenons.
- 62.56 Make and use jigs, bed pieces, saddles and templates to aid the cutting of components.
- 62.57 Make and use backing pieces to aid the cutting of components.
- 62.58 Select suitable tooling for the material being cut.
- 62.59 Change and set saw blades, blocks and cutters to suit the component being manufactured.
- 62.60 Hone cutters to remove burrs and produce a fine edge.
- 62.61 Safety equipment and machine guards to be used in accordance with national/local standards.

Vertical spindle moulding machine

- 62.62 Set and operate a vertical spindle moulding machine to produce component features.
- 62.63 Make and use jigs, bed pieces, saddles and templates to aid the cutting of components.
- 62.64 Make and use false fences to suit the components being manufactured.
- 62.65 Select suitable tooling for material and component being cut.
- 62.66 Change and set saw blades, blocks and cutters to suit the component being manufactured.
- 62.67 Select and fit bed rings to suit tooling.
- 62.68 Hone cutters to remove burrs and produce a fine edge.
- 62.69 Safety equipment and machine guards to be used in accordance with national/local standards.

Disc sanding machine

- 62.70 Set and operate a disc sanding machine to finish components.
- 62.71 Set and adjust the fence and bed to finish components.
- 62.72 Select suitable abrasive discs to suit the material and the finish required.

- 62.73 Change abrasive discs and reset machine to suit the component being finished.

- 62.74 Clean used abrasive discs.

- 62.75 Safety equipment and machine guards to be used in accordance with national/local standards.

Bobbin sanding machine

- 62.76 Set and operate a bobbin sanding machine to finish components.
- 62.77 Set and adjust the bed to finish components.
- 62.78 Select suitable abrasive sheets, bobbins and bed rings to suit the material and the finish required.
- 62.79 Change abrasive sheets, bobbins and bed rings and reset machine to suit the component being finished.
- 62.80 Adjust bobbin height to allow efficient use of abrasive sheets.
- 62.81 Clean used abrasive sheets.
- 62.82 Safety equipment and machine guards to be used in accordance with national/local standards.

Framed Products

Doors

- 62.83 Set out an external semi-circular headed door with glazed viewing panel and match boards with tolerances to industry standards.
- 62.84 Prepare materials and mark out components with tolerances to industry standards.
- 62.85 Manufacture and assemble components to produce an external semi-circular headed door with glazed viewing panel and match boards with tolerances to industry standards.
- 62.86 Finish a semi-circular headed door suitable for surface coating using hand tools and portable power tools.
- 62.87 Set out a splayed bay window with tolerances to industry standards.
- 62.88 Prepare materials and mark out components with tolerances to industry standards.
- 62.89 Manufacture and assemble components to produce a splayed bay window with tolerances to industry standards.

- 62.90 Finish a splayed bay window suitable for surface coating using hand tools and portable power tools.
- 62.91 Set out a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders with tolerances to industry standards.
- 62.92 Prepare materials and mark out components with tolerances to industry standards.
- 62.93 Manufacture and assemble components to produce a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders with tolerances to industry standards.
- 62.94 Finish a staircase with newel post and bull nosed bottom step incorporating a quarter space of winders suitable for surface coating using hand tools and portable power tools.

Second fixing

- 62.95 Prepare and hang timber based doors with tolerances to industry standards.
- 62.96 Select, fit and fix ironmongery to a timber based door.
- 62.97 Cut, joint and fix wall mouldings and finishes with tolerances to industry standards.
- 62.98 Prepare, fit and fix fitments with tolerances to industry standards.
- 62.99 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 _____

62 Bench Joinery 3: Communications and Information Technology

Practical competences

The candidate must be able to do the following:

- 62.155 Draw an organisational chart showing the structure of a multi-trade construction company.
- 62.156 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 62.157 Prepare a report describing the administration systems of a multi-trade construction company.
- 62.158 Prepare a report on the key issues of customer service/care in a construction company.
- 62.159 Use information technology systems for communication.

Information Technology

Database

- 62.160 Access a database applications software package.
- 62.161 Define and create a database structure to store a given set of data.
- 62.162 Enter data into a database file.
- 62.163 Save a database file to disk with an appropriate filename in a give location.
- 62.164 Edit data in an existing database file.
- 62.165 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 62.166 Modify a database structure.
- 62.167 Print selected forms from a database.
- 62.168 Define and execute sort criteria for numeric, character and date fields.

- 62.169 Print a summary report of selected data from a database file.
- 62.170 Exit database software.

Spreadsheet

- 62.171 Access a spreadsheet applications software package.
- 62.172 Create a new spreadsheet file for a given application.
- 62.173 Set single and global column widths.
- 62.174 Create and insert appropriate spreadsheet column and row titles.
- 62.175 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 62.176 Insert and format character and numeric data.
- 62.177 Edit the contents of a cell in a spreadsheet file.
- 62.178 Insert and delete columns and rows in a spreadsheet.
- 62.179 Insert formula containing cell addresses and numbers to carry out calculations.
- 62.180 Use absolute and relative cell addresses.
- 62.181 Replicate formula in a row or column.
- 62.182 Use the sum and average functions in a spreadsheet for rows and columns.
- 62.183 Print a spreadsheet.
- 62.184 Present and print data in graphical format.
- 62.185 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 62.186 Exit spreadsheet software.

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

62 Bench Joinery 3: Planned Machine Maintenance

Practical competences

The candidate must be able to do the following:

- 62.204 Clean and service woodworking machinery and tooling in accordance with the manufacturers servicing schedule.
- 62.205 Remove and replace machine V-drive belts.
- 62.206 Remove and replace a sheared stud bolt using a stud extractor.
- 62.207 Use taps and dies to repair/renovate internal and external screw threads.

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

62 Bench Joinery 3: Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 62.216 Identify various elements of a construction project and arrange in a logical sequence of events.
 - 62.217 Calculate the time required for each element of a construction project from given data.
 - 62.218 Calculate the resources required for each element of the project to complete them within the time allowed.
 - 62.219 Analyse data produced on each element of the project to determine their individual effect on the programme.
 - 62.220 Produce planning programmes for a domestic construction project.
 - 62.221 Write a method statement to carry out a craft operation.
 - 62.222 Prepare material orders with deliveries planned to support the programmed sequence of events.
 - 62.223 Record daily and weekly progress and compare with the project programme.
 - 62.224 Provide feedback to individuals and teams on daily and weekly progress.
 - 62.225 Use effective leadership methods to supervise individuals/teams working in the construction industry.
 - 62.226 Use communication skills within a team environment to achieve agreement with individuals/teams.
 - 62.227 Make recommendations to improve the performance of a team.
- 62.228 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.

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 _____

63 Trowel Vocations 3 – Summary of syllabus sections

Page 69 Safety at Work

(Objectives 63.1 to 63.16)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 70 Materials

(Objectives 63.17 to 63.34)

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

Note: The properties of locally manufactured materials or materials in local general use should be tendered

Page 72 Calculations, Setting Out and Drawing

(Objectives 63.35 to 63.56)

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

- a apply calculations to problems associated with practical operations and planning
- b set out offsets and levels
- c produce working drawings of large span arches and openings in wall

Page 74 Advanced Practical Skills

(Objectives 63.57 to 63.108)

The aim of this unit is to enable the candidate to carry out advanced construction operations.

Page 77 Communications and Information Technology

(Objectives 63.109 to 63.157)

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 79 Alteration, Repair and Renovation

(Objectives 63.158 to 63.169)

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

Page 80 Supervision, Planning and Administration

(Objectives 63.170 to 63.195)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

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:

- 63.1 Inspect and keep records on the condition of excavations.
Record: subsoil condition (drying, freezing, effects of rainfall)
- 63.2 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 63.3 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 63.4 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 63.5 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 63.6 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 63.7 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 63.8 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: electric power tools (eg cement mixer, disc cutter, lighting), pneumatic power tools (eg jackhammer), hydraulic cutter, hand tools (eg guillotine, hammer, chisel, bolster, masonry hand saw, scribe/tile cutter)

- 63.9 Instruct a new team member in site safety procedures/ rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 63.10 State possible faults and potential hazards when working in deep excavations.
Faults: deterioration of subsoil, change in type of subsoil
Hazards: change in condition of subsoil condition (drying, freezing, effects of rainfall), lights (defective, removal), interference with trench supports, interference with barriers
- 63.11 State the possible faults or potential defects in trench support systems.
Faults/defects: metal components (corrosion, distortion), timber components (displacement, splits, cracks)
- 63.12 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 63.13 Explain the need for communication systems to ensure the safe use of lifting or excavating machines.
Communication systems: hand signals, bell systems, two way radio
- 63.14 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 63.15 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 63.16 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity

Practical competences

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

The candidate must be able to do the following:

- 63.17 Identify and select bricks or blocks for liquid retaining structures in drainage work and industrial effluents based on their technical properties.
Bricks/blocks: acid resistant, alkali resistant
Applications: acid/alkali industrial waste treatment/storage
- 63.18 Identify and select bricks or blocks for high temperature and insulating applications based on their technical properties.
Bricks/blocks: fireclay, silica, ganister, alumina, diatomaceous
Applications: heat resistant structures (eg kiln linings, furnaces, ladles), insulating structures
- 63.19 Identify and select bricks or blocks for acid or alkali resistant applications based on their technical properties.
Bricks/blocks: Class A engineering bricks/blocks, ceramic tiles, glazed fireclay bricks
Applications: chemical works (lining storage tanks, bases, plinths)
- 63.20 Identify and select mortars and adhesives for specific applications based on their technical properties.
Mortars/adhesives: poxy resin, cement based epoxy mortar, two part epoxy mortars/adhesives, high alumina cement/fire resistant aggregates, sulphate resistant cement/aggregates
Applications: chemical resistance in industrial processes
- 63.21 Identify and select preformed flue liners and blocks for specific applications based on their technical properties.
Applications: gas, solid fuel
- 63.22 Identify and select bricks or blocks for glazed or glass walling applications based on their technical properties.
Bricks/blocks: glazed fireclay bricks, glass blocks
- 63.23 Identify and select additives for mortars and concrete based on their technical properties.
Additives: plasticisers, air-entraining agents, retarders, accelerators, colouring pigment, integral waterproofer, pulverised fuel ash/P.A.
- 63.24 Identify and select fixings and cramps for specific applications based on their technical properties.
Fixings/cramps: door cramps, window fixings, expander bolts, plugs/screws, wall extension clips, expanded metal, dowels
- 63.25 Identify and select limes, Roman (natural) cements, casein and lime additives for specific applications based

on their technical properties.

Applications: refurbishment, repairing damage

Knowledge requirements

The instructor must ensure the candidate is able to:

- 63.26 State the technical properties of bricks and blocks specifically used for aggressive industrial effluents.
Bricks/blocks: acid resistant, alkali resistant
Properties: resistance to concentrated acids/alkali combined with abrasive wear
- 63.27 State the technical properties of bricks and blocks suitable for high temperature resistant and insulating walling.
Bricks/blocks: fireclay, silica, ganister, alumina, diatomaceous
Properties: very high temperature resistance, abrasive resistance, compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 63.28 State the technical properties of bricks or blocks suitable for acid or alkali resistant applications.
Bricks/blocks: Class A engineering bricks/blocks, ceramic tiles, glazed fireclay bricks
Properties: resistance to concentrated acids/alkali combined with specific aggressive problems, compressive strength, water absorption, sulphate resistance, acid resistance, resistance to soluble salts, resistance to efflorescence, heat resistance, frost resistance
- 63.29 State the technical properties of mortars and adhesives for chemical resistant applications.
Mortars/adhesives: epoxy resin, cement based epoxy mortar, two part epoxy mortars/adhesives, high alumina cement/fire resistant aggregates, sulphate resistant cement/aggregates
Properties: resistance to concentrated acids/alkali combined with abrasive wear
- 63.30 State the technical properties of preformed flue liners and blocks suitable for gas and solid fuel applications.
Properties: compressive strength, water absorption, sulphate resistance, acid resistance, soluble salts resistance, resistance to efflorescence, heat resistance, frost resistance
- 63.31 State the technical properties of bricks or blocks suitable for glazed or glass walling.
Bricks/blocks: glazed fireclay bricks, glass blocks
Properties: water resistance, light reflection, light transmission, decorative effect

- 63.32 State the technical properties of additives for mortars and concrete.
Additives: plasticisers, air-entraining agents, retarders, accelerators, colouring pigment, integral waterproofers, pulverised fuel ash (PFA)
- 63.33 State the technical properties of fixings and cramps.
Fixings/cramps: door cramps, window fixings, expander bolts, plugs/screws, wall extension clips, expanded metal, dowels
Properties: type of metal (stainless steel, bronze, copper, mild steel, high tensile steel), tensile strength, compressive strength, corrosion resistance
- 63.34 State the technical properties of various types of limes, Roman (natural) cements, casein and lime additives suitable for refurbishment and damage repair applications.
Types: hydraulic, non hydraulic, natural cements, crushed ash, slag lime
Properties: setting time, hardening time, flexibility, match existing materials

Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 63.35 Calculate loadings on and widths of foundations from given data.
Data: wall (construction, dimensions), roof (loadings, dimensions), floor (loadings, dimensions), load bearing capacity of subsoil
- 63.36 Calculate the volume of various shapes of excavations and trenches.
Shapes: varying depth, sides (plumb, battering), plan (rectangular, trapezoidal)
- 63.37 Calculate the costs for removing subsoil from excavations and trenches from given data.
Costs: labour, machine
Data: machine (output, cost), labour (output, cost)
- 63.38 Calculate the increase in subsoil volume when excavated from given data.
Data: subsoil type, bulking factor chart, excavation dimensions
- 63.39 Calculate the costs for transporting excavated material from given data.
Data: costs per m³ per kilometre, distance from site to waste tip
- 63.40 Calculate the quantity and cost of labour required for the construction of domestic premises from given data.
Quantity: total hours, number of tradesmen
Domestic: foundations (concrete), walls (cavity, solid), materials (brick, block, stone)
Data: labour (output, cost), duration of contract

Setting out

- 63.41 Set out offsets for a curve with an inaccessible centre point.
- 63.42 Set out offsets for a taper from given ratios.
Taper: drainage (pipework, concrete slabs), trench side batter, battered retaining walls
- 63.43 Set out levels to site rails and level pegs from the site datum or bench mark.
Levels: eg pipe inverts, manhole covers, gully gratings, excavation base

Drawing

- 63.44 Produce working drawings for a large span arch from plans and details.
Drawings: dimensions, front elevation, cross section
Arch: type (eg semi-circular, segmental, three centred), material (eg brick, block, stone, cavity trays, preformed damp-proof course/dpc)
- 63.45 Produce sectional drawings of openings in cavity and solid walls from plans and details.
Drawings: dimensions, detail (thresholds, sills, lintels, jambs)

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 63.46 Identify calculations involving the loadings on and widths of foundations from given data.
Data: wall (construction, dimensions), roof (loadings, dimensions), floor (loadings, dimensions), load bearing capacity of subsoil
- 63.47 Identify calculations involving the volume of various shapes of excavations and trenches.
Shapes: varying depth, sides (plumb, battering), plan (rectangular, trapezoidal)
- 63.48 Identify calculations involving the costs for removing subsoil from excavations and trenches from given data.
Costs: labour, machine
Data: machine (output, cost), labour (output, cost)
- 63.49 Identify calculations involving the increase in subsoil volume when excavated from given data.
Data: subsoil type, bulking factor chart, excavation dimensions
- 63.50 Identify calculations involving the costs for transporting excavated material from given data.
Data: costs per m³ per kilometre, distance from site to waste tip
- 63.51 Identify calculations involving the quantity and cost of labour required for the construction of domestic premises from given data.
Quantity: total hours, number of tradesmen
Domestic: foundations (concrete), walls (cavity, solid), materials (brick, block, stone)
Data: labour (output, cost), duration of contract

Setting out

- 63.52 Describe, with the aid of a sketch, the method of setting out offsets for a curve with an inaccessible centre point.
- 63.53 Describe, with the aid of a sketch, the method of setting out offsets for a taper from given ratios.
Taper: drainage (pipework, concrete slabs), trench side batter, battered retaining walls
- 63.54 Describe, with the aid of a sketch, the method of setting out levels to site rails and level pegs from the site datum or bench mark.
Levels: eg pipe inverts, manhole covers, gulley gratings, excavation base

Drawing

- 63.55 Identify scale working drawings for a large span arch from plans and details.
Drawings: dimensions, front elevation, cross section
Arch: type (semi-circular, segmental, three centred), material (brick, block, stone, cavity trays, preformed dpc)
- 63.56 Identify sectional drawings of openings in cavity and solid walls from plans and details.
Drawings: dimensions, detail (thresholds, sills, lintels, jambs)

Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

Substructure

- 63.57 Identify various types of subsoil.
Types: eg soft sand, peat, compact gravel, clays, shale, rock, made up ground, re-used demolition sites, filled ground
- 63.58 Carry out tests to determine the characteristics of various types of subsoil.
Tests: probes, trial holes, boreholes, penetrometer test, shrinkage/expansion tests (clay soil samples), effects of frost action on soils
Characteristics: condition, bearing capacity
- 63.59 Install supports to a basement excavation.
Supports: materials (eg steel sheeting, close boarding, open spaced supports), protection of workforce from machinery/vehicles)
Excavation: greater than 2m deep
- 63.60 Install the formwork for a basement foundation retaining wall and reinforced sub-floor.
- 63.61 Set out and build a basement retaining wall in block work including a damp proof membrane with plumbing and levelling to industry standards.
Block work: stretcher bond
Damp proof membrane: eg polyvinyl chloride (PVC) sheet, bitumen sheet
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length

Drainage

- 63.62 Set out and build a petrol/oil interceptor chamber.
Interceptor: material (eg brick, block, concrete)
- 63.63 Set out and build a back-drop manhole.
Manhole: material (eg brick, block, concrete precast sections)
- 63.64 Set out and build a septic tank or cesspool.
Septic tank/cesspool: material (eg brick, block), type (eg 2 chamber septic tank, single chamber cesspool)
- 63.65 Set out and install a new connection to an existing main drain or sewer.
Installation: cut hole in the existing pipe, fit saddle/collar fitting

- 63.66 Set out, fabricate and install a domestic drainage pipework system.
Drainage: domestic (foul, rainwater)
Pipework: material (eg concrete, clay, plastic)
Installation: minimum (four connections/outlets, 6m run), fittings (two bends, two junctions, two channel junctions, inspection chamber/manhole, rodding point), gradients

- 63.67 Carry out tests on a completed domestic drainage pipework system.
Tests: eg air pressure, water pressure, smoke

Superstructure

- 63.68 Set out and build external corners at angles greater than 90° with plumbing and levelling to industry standards.
Setting out: template
Corners: material (eg brick, block, stone, purpose-made specials, hand/machine cut with reinforcing ties)
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.69 Set out and build internal corners at angles greater than 90° with plumbing and levelling to industry standards.
Setting out: template
Corners: material (eg brick, block, stone, purpose-made specials, hand/machine cut with reinforcing ties)
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.70 Set out and build a solid or cavity curved wall with plumbing and levelling to industry standards.
Setting out: eg curved template board, radius trammel rods, offsets
Curved wall: curved on plan, minimum (3m length, 1m high, 5m radius), material (eg brick, block, stone)
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.71 Set out and build a reinforced wall in brickwork, block work or stonework with plumbing and levelling to industry standards.
Brickwork: vertical rods grouted in, horizontal reinforcement
Block work: hollow blocks, vertical rods with concrete filling, horizontal reinforcement
Stone work: vertical rods grouted in
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.72 Set out and build a battered face retaining wall with plumbing and levelling to industry standards.
Setting out: eg profiles, tapered rules, preset spirit plumb
Wall: minimum (1m straight length, 1m curved on plan, 1m high), material (eg brick, block, stone)
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length

Concrete Work

- 63.73 Set up formwork, fix reinforcement and pour concrete for an insitu concrete column with plumbing to industry standards.
Setting up: column reinforcement, formwork
Concrete: pour, compact, cure, strip formwork, clean formwork for re-use
Column: minimum (1m high, 200mm wide, 200mm deep)
Plumbing: 2mm in 1m height
- 63.74 Set up formwork, fix reinforcement and pour concrete for an insitu beam with levelling to industry standards.
Setting up: beam reinforcement, formwork
Concrete: pour, compact, cure, strip formwork, clean formwork for re-use
Beam: minimum (1m span, 200mm wide, 200mm deep)
Levelling: 2mm in 2m length
- 63.75 Set up formwork, fix reinforcement and pour concrete for suspended floor slab with levelling to industry standards.
Setting up: slab reinforcement, formwork, support
Concrete: pour, compact, cure, strip formwork, clean formwork for re-use
Slab: minimum (1m², 150mm deep)
Levelling: 2mm in 2m length

Decorative Features

- 63.76 Set out and build decorative brickwork bonds and courses with plumbing and levelling to industry standards.
Bonds: basketweave, herringbone (single, double)
Courses: plinths, decorative strings, laying bricks to a rake, soldiers, brick on edge, dentils
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.77 Set out and build decorative block work with plumbing and levelling to industry standards.
Block work: eg purpose-made facing blocks, plinth blocks, profiled specials
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length
- 63.78 Set out and build a bulls-eye in brickwork or block work with plumbing to industry standards.
Bulls eye: materials (eg purpose-made, cut)
Plumbing: 2mm in 2m length
- 63.79 Set out, support and build a large span arch with plumbing and levelling to industry standards.
Setting out/support: eg preformed arch supports, arch centres
Arch: type (eg semi-circular, segmental, three centred), material (eg brick, block, stone, cavity trays, preformed dpc)
Plumbing: 2mm in 1m height
Levelling: 2mm in 2m length

Knowledge requirements

The instructor must ensure the candidate is able to:

Substructure

- 63.80 Interpret borehole logs and trial hole data to determine the soil type and bearing capacity.
Soil types: soft sand, peat, compact gravel, clays, shale, rock, made up ground, re-used demolition sites, filled ground
- 63.81 Describe two methods of basement excavation.
Methods: dumpling (excavate external wall trenches, construct external retaining walls, excavate centre), total area excavation (supports to sides in timber/steel sheeting)
- 63.82 Explain what is meant by the term 'bulking of soil' and describe its effects.
Bulking: increase in bulk, bulking factors for different types of soil
Effects: volume of transport required for excavated materials
- 63.83 Explain what is meant by the terms 'angle of repose' and effects on excavations.
Effects: types of support required
- 63.84 Describe the implications of the water table on excavations.
Implications: increasing water pressure with depth of excavation, control of water, effect on supports
- 63.85 Describe, with the aid of a sketch, the construction of a basement.
Construction: tanked construction, materials (concrete, brick, block), method of waterproofing
- 63.86 Describe, with the aid of a sketch, foundations suitable for subsoils of low or uneven load bearing capacity.
Foundations: reinforced strip foundations, concrete rafts, cantilever foundations, deep strip, wide strip, short bored piles with ground beams

Drainage

- 63.87 Describe the construction and working principles of a petrol interceptor.
Principles: evaporation of petrol/volatile oils
- 63.88 Describe the operation of a back drop manhole.
- 63.89 Describe the operation of a septic tank for sewage disposal.
Operation: anaerobic/aerobic bacteria, avoid entry of surface water, discharge of treated water

63.90 Explain the use of a cesspool.
Cesspool: reception/storage of foul water, pumped out at regular intervals

63.91 Sketch various types of saddle connectors.
Types: clay, concrete, plastic

63.92 Describe, with the aid of a sketch, the construction of various types of open storm water culverts.
Types: insitu concrete, precast concrete, stone, blocks, brick, geotextile/PVC linings

Superstructure

63.93 Describe, with the aid of a sketch, the bonding arrangements for external corners with angles greater than 90°.
Bonding arrangements: material (brick, block, stone, purpose-made specials, hand/machine cut with reinforcing ties)

63.94 Describe, with the aid of a sketch, the bonding arrangements for internal corners with angles greater than 90°.
Bonding arrangements: material (brick, block, stone, purpose-made specials, hand/machine cut with reinforcing ties)

63.95 Describe, with the aid of a sketch, the various methods of setting out and building walls curved on plan.
Methods: radius trammel rods, internal/external radius templates, reverse curve setting out, offsets from a tangent

63.96 Describe, with the aid of a sketch, the reinforcement used in brick, block and stone walling.
Reinforcement: functions of vertical/horizontal reinforcement, types
Brickwork: vertical rods grouted in, horizontal reinforcement
Block work: hollow blocks, vertical rods with concrete filling, horizontal reinforcement
Stone work: vertical rods grouted in

63.97 Describe, with the aid of a sketch, the method of building a battered face retaining wall.
Methods: battering profiles, tapered plumb rules, preset spirit levels

Concrete work

63.98 Identify the various types of concrete mixer and batcher plant.
Concrete mixers: revolving drum, reversing drum, paddle
Batcher plant: weigh batcher, volume batcher

63.99 Describe the method for placing concrete by the use of pumps.
Method: concrete (mix, additives), pump types (pneumatic, reciprocating)

63.100 Describe, with the aid of a sketch, where tension, shear and compression are likely to occur in reinforced concrete columns, beams, and suspended slabs.

63.101 Identify the various forms of standard reinforcing bars, stirrups and spacers.

63.102 Describe, with the aid of a sketch, the formwork/reinforcing bar assemblies for columns, beams and floor slabs.
Formwork: material (timber, steel), telescopic props, timber supports/wedges

63.103 Describe, with the aid of a sketch, the construction of precast concrete beams and filler block flooring units.
Construction: beam sections, filler blocks (solid, hollow)

63.104 Describe the properties of freshly mixed concrete.
Properties: water content, workability, compaction factor, segregation, tests (slump, compaction factor), rapid analysis machine/RAM

Decorative Features

63.105 Describe, with the aid of a sketch, bonding arrangements for decorative brickwork.
Bonding: herringbone (single, double), basketweave, diagonal bond, plinths, string courses, dentils, raking brick to a gable or ramp, brick on edge/solders, corbelled knees to a gable, kneelers/water tabling

63.106 Describe, with the aid of a sketch, bonding arrangements for decorative block work.
Bonding: basketweave, stack bonds, plinths, profiled panels, raking courses, gable features

63.107 Describe, with the aid of a sketch, a method of building a bulls-eye in brickwork of block work.
Method: cutting invert, voussoirs (template, bedding), setting up centring

63.108 Describe, with the aid of a sketch, the construction of large span arches.
Arch: type (semi-circular, segmental, three centred), material (brick, block, stone), use of preformed arch centres, damp-proofing methods (cavity trays, preformed dpc)

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 63.109 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 63.110 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 63.111 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 63.112 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 63.113 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 63.114 Access a database applications software package.
- 63.115 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 63.116 Enter data into a database file.
- 63.117 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 63.118 Edit data in an existing database file.
Edit: add, delete, amend

- 63.119 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 63.120 Modify a database structure.
Modify: fields (add, delete), change data type, change field length
- 63.121 Print selected forms from a database.
Selected forms: from 63.119 above
- 63.122 Define and execute sort criteria for numeric, character and date fields.
- 63.123 Print a summary report of selected data from a database file.
- 63.124 Exit database software.
- #### Spreadsheet
- 63.125 Access a spreadsheet applications software package.
- 63.126 Create a new spreadsheet file for a given application.
- 63.127 Set single and global column widths.
- 63.128 Create and insert appropriate spreadsheet column and row titles.
- 63.129 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars
- 63.130 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 63.131 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete
- 63.132 Insert and delete columns and rows in a spreadsheet.
- 63.133 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 63.134 Use absolute and relative cell addresses.
- 63.135 Replicate formula in a row or column.
- 63.136 Use the sum and average functions in a spreadsheet for rows and columns.

- 63.137 Print a spreadsheet.
- 63.138 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 63.139 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 63.140 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 63.141 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 63.142 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 63.143 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 63.144 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 63.145 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 63.146 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 63.147 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 63.148 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 63.149 Describe the method for creating a new spreadsheet file for a given application.
- 63.150 Describe the method for setting single and global column widths.
- 63.151 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 63.152 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 63.153 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 63.154 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 63.155 Explain the terms 'absolute' and 'relative' cell addresses.
- 63.156 Describe the method for replicating formula in a row or column.
- 63.157 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Alteration, Repair and Renovation

Practical competences

The candidate must be able to do the following:

- 63.158 Form an opening for a doorway or window in an existing wall.
Opening: set up dead shores to support needles, bridge over new opening with lintel/arch, make good jambs, insert threshold/sill
- 63.159 Fix stone or precast concrete cladding to existing walls and columns.
Fixing: expander bolt, grouted dowel, corbel plate, cramp
- 63.160 Cut out and insert cavity trays where a new roof is to be attached to an existing wall.
Trays: inserted into walls (eg cavity, solid), provision of stepped trays in solid walling
- 63.161 Carry out underpinning to an existing foundation to form a deeper foundation.
Underpinning: minimum 1 m length
- 63.162 Carry out underpinning to an existing solid wall to insert a new stepped damp proof course.
Damp proof course: minimum (1 m length, 1 material joint), make good to match existing finish
- 63.163 Cut and form a new movement joint in an existing wall and make good.
Joint: saw joint, fix pre-formed flexible joint, seal with flexible mastic

Knowledge requirements

The instructor must ensure the candidate is able to:

- 63.164 List, with the aid of sketches, the sequence of operations involved in forming a new opening in an existing wall.
Sequence: measure/mark position of opening, set up dead shores to support needles, bridge over new opening with lintels/arch, make good jambs, insert threshold/sill
- 63.165 Describe, with the aid of sketches, the fixings and cramps used to secure cladding slabs to walling, concrete columns and beams.
Fixings: expander bolt, grouted dowel, corbel plate, cramp
- 63.166 Describe, with the aid of a sketch, the position of cavity trays where a new roof is to be attached to an existing wall.
- 63.167 Describe, with the aid of a sketch, the operations required to carry out underpinning to an existing foundation to form a deeper foundation.
Operations: divide work into sections, determine sequence of working, supports required for each section of excavation, positing of continuity reinforcement, concrete foundation (new, existing), new brick/block walling
- 63.168 Describe, with the aid of a sketch, the operations required to carry out underpinning to an existing solid wall to insert a new stepped damp proof course.
Operations: divide work into sections, determine sequence of working, cut/remove existing brick/stone, insert damp-proof course (dpc), replace removed brick/stone, make good to match existing finish
- 63.169 Identify the reasons for using steel ties across a movement joint.
Reasons: allow for future movement, keep wall aligned

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 63.170 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 63.171 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 63.172 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 63.173 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 63.174 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 63.175 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 63.176 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 63.177 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 63.178 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 63.179 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making

- 63.180 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 63.181 Make recommendations to improve the performance of a team.
- 63.182 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 63.183 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non-critical
- 63.184 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 63.185 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 63.186 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 63.187 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 63.188 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 63.189 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 63.190 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 63.191 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 63.192 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 63.193 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 63.194 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 63.195 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessments

Test specification for written paper Trowel Vocations 3 Principles (6161-23-063)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	35
Communications and information technology	10
Alteration, repair and renovation	10
Supervision, planning and administration	15

63 Trowel Vocations 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- 63.1 Inspect and keep records on the condition of excavations.
- 63.2 Inspect and keep records on the condition of scaffold platforms over 2m high.
- 63.3 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
- 63.4 Carry out a risk assessment and prepare a report identifying the potential hazards.
- 63.5 Complete an accident report for a simulated accident resulting in injury.
- 63.6 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
- 63.7 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
- 63.8 Check equipment and inspection records to ensure tools are to standard prior to issue.
- 63.9 Instruct a new team member in site safety procedures/rules and issue appropriate safety 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

63 Trowel Vocations: Materials

Practical competences

The candidate must be able to do the following:

- 63.17 Identify and select bricks or blocks for liquid retaining structures in drainage work and industrial effluents based on their technical properties.
- 63.18 Identify and select bricks or blocks for high temperature and insulating applications based on their technical properties.
- 63.19 Identify and select bricks or blocks for acid or alkali resistant applications based on their technical properties.
- 63.20 Identify and select mortars and adhesives for specific applications based on their technical properties.
- 63.21 Identify and select preformed flue liners and blocks for specific applications based on their technical properties.
- 63.22 Identify and select bricks or blocks for glazed or glass walling applications based on their technical properties.
- 63.23 Identify and select additives for mortars and concrete based on their technical properties.
- 63.24 Identify and select fixings and cramps for specific applications based on their technical properties.
- 63.25 Identify and select limes, Roman (natural) cements, casein and lime additives for specific applications based on their technical properties.

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 _____

63 Trowel Vocations: Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 63.35 Calculate loadings on and widths of foundations from given data.
- 63.36 Calculate the volume of various shapes of excavations and trenches.
- 63.37 Calculate the costs for removing subsoil from excavations and trenches from given data.
- 63.38 Calculate the increase in subsoil volume when excavated from given data.
- 63.39 Calculate the costs for transporting excavated material from given data.
- 63.40 Calculate the quantity and cost of labour required for the construction of domestic premises from given data.

Setting out

- 63.41 Set out offsets for a curve with an inaccessible centre point.
- 63.42 Set out offsets for a taper from given ratios.
- 63.43 Set out levels to site rails and level pegs from the site datum or bench mark.

Drawing

- 63.44 Produce working drawings for a large span arch from plans and details.
- 63.45 Produce sectional drawings of openings in cavity and solid walls from plans and details.

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

63 Trowel Vocations: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

Substructure

- 63.57 Identify various types of subsoil.
- 63.58 Carry out tests to determine the characteristics of various types of subsoil.
- 63.59 Install supports to a basement excavation.
- 63.60 Install the formwork for a basement foundation retaining wall and reinforced sub-floor.
- 63.61 Set out and build a basement retaining wall in block work including a damp proof membrane with plumbing and levelling to industry standards.

Drainage

- 63.62 Set out and build a petrol/oil interceptor chamber.
- 63.63 Set out and build a back-drop manhole.
- 63.64 Set out and build a septic tank or cesspool.
- 63.65 Set out and install a new connection to an existing main drain or sewer.
- 63.66 Set out, fabricate and install a domestic drainage pipework system.
- 63.67 Carry out tests on a completed domestic drainage pipework system.

Superstructure

- 63.68 Set out and build external corners at angles greater than 90° with plumbing and levelling to industry standards.
- 63.69 Set out and build internal corners at angles greater than 90° with plumbing and levelling to industry standards.

- 63.70 Set out and build a solid or cavity curved wall with plumbing and levelling to industry standards.

- 63.71 Set out and build a reinforced wall in brickwork, block work or stonework with plumbing and levelling to industry standards.

- 63.72 Set out and build a battered face retaining wall with plumbing and levelling to industry standards.

Concrete work

- 63.73 Set up formwork, fix reinforcement.

- 63.74 Set up formwork, fix reinforcement and pour concrete for an insitu beam with levelling to industry standards.

- 63.75 Set up formwork, fix reinforcement and pour concrete for suspended floor slab with levelling to industry standards.

- 63.76 Set out and build decorative brickwork bonds and courses with plumbing and levelling to industry standards.

Decorative features

- 63.77 Set out and build decorative block work with plumbing and levelling to industry standards.

- 63.78 Set out and build a bulls-eye in brickwork or block work with plumbing to industry standards.

- 63.79 Set out, support and build a large span arch with plumbing and levelling 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 _____

63 Trowel Vocations: Communications and Information Technology

Practical competences

Communications

- 63.109 Draw an organisational chart showing the structure of a multi-trade construction company.
- 63.110 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 63.111 Prepare a report describing the administration systems of a multi-trade construction company.
- 63.112 Prepare a report on the key issues of customer service/care in a construction company.
- 63.113 Use information technology systems for communication.

Information Technology

Database

- 63.114 Access a database applications software package.
- 63.115 Define and create a database structure to store a given set of data.
- 63.116 Enter data into a database file.
- 63.117 Save a database file to disk with an appropriate filename in a given location.
- 63.118 Edit data in an existing database file.
- 63.119 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 63.120 Modify a database structure.
- 63.121 Print selected forms from a database.
- 63.122 Define and execute sort criteria for numeric, character and date fields.
- 63.123 Print a summary report of selected data from a database file.

63.124 Exit database software.

Spreadsheet

- 63.125 Access a spreadsheet applications software package.
- 63.126 Create a new spreadsheet file for a given application.
- 63.127 Set single and global column widths.
- 63.128 Create and insert appropriate spreadsheet column and row titles.
- 63.129 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 63.130 Insert and format character and numeric data within a spreadsheet using cursor keys and mouse control.
- 63.131 Edit the contents of a cell in a spreadsheet file.
- 63.132 Insert and delete columns and rows in a spreadsheet.
- 63.133 Insert formula containing cell addresses and numbers to carry out calculations.
- 63.134 Use absolute and relative cell addresses.
- 63.135 Replicate formula in a row or column.
- 63.136 Use the sum and average functions in a spreadsheet for rows and columns.
- 63.137 Print a spreadsheet.
- 63.138 Present and print data in graphical format.
- 63.139 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 63.140 Exit spreadsheet software.

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 _____

63 Trowel Vocations 3: Alteration, Repair and Renovation

Practical competences

The candidate must be able to do the following:

- 63.158 Form an opening for a doorway or window in an existing wall.
- 63.159 Fix stone or precast concrete cladding to existing walls and columns.
- 63.160 Cut out and insert cavity trays where a new roof is to be attached to an existing wall.
- 63.161 Carry out underpinning to an existing foundation to form a deeper foundation.
- 63.162 Carry out underpinning to an existing solid wall to insert a new stepped damp proof course.
- 63.163 Cut and form a new movement joint in an existing wall and make good.

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

63 Trowel Vocations 3: Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|--------|---|--------------------------|--------|--|--------------------------|
| 63.170 | Identify various elements of a construction project and arrange in a logical sequence of events. | <input type="checkbox"/> | 63.182 | Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance. | <input type="checkbox"/> |
| 63.171 | Calculate the time required for each element of a construction project from given data. | <input type="checkbox"/> | | | |
| 63.172 | Calculate the resources required for each element of the project to complete them within the time allowed. | <input type="checkbox"/> | | | |
| 63.173 | Analyse data produced on each element of the project to determine their individual effect on the programme. | <input type="checkbox"/> | | | |
| 63.174 | Produce planning programmes for a domestic construction project. | <input type="checkbox"/> | | | |
| 63.175 | Write a method statement to carry out a craft operation. | <input type="checkbox"/> | | | |
| 63.176 | Prepare material orders with deliveries planned to support the programmed sequence of events. | <input type="checkbox"/> | | | |
| 63.177 | Record daily and weekly progress and compare with the project programme. | <input type="checkbox"/> | | | |
| 63.178 | Provide feedback to individuals and teams on daily and weekly progress. | <input type="checkbox"/> | | | |
| 63.179 | Use effective leadership methods to supervise individuals/teams working in the construction industry. | <input type="checkbox"/> | | | |
| 63.180 | Use communication skills within a team environment to achieve agreement with individuals/teams. | <input type="checkbox"/> | | | |
| 63.181 | Make recommendations to improve the performance of a team. | <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

64 Painting and Decorating 3 – Summary of syllabus sections

Page 91 Safety at Work

(Objectives 64.1 to 64.15)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 92 Materials

(Objectives 64.16 to 64.32)

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

- a identify and select specialist materials for specific applications based on their technical properties
- b describe the technical properties of the main types of specialist materials in use

Page 94 Calculations, Setting Out and Drawing

(Objectives 64.33 to 64.42)

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

- a calculate standard unit costs and total contract costs from given data to assist in preparing, costing and estimating
- b set out motifs and stencil templates
- c produce working drawings

Page 95 Advanced Practical Skills

(Objectives 64.43 to 64.81)

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

- a prepare and apply advanced decorative effects
- b prepare and apply spray paints
- c identify and use specialist wall hanging adhesives
- d identify and hang specialist wall hangings

Page 97 Communications and Information Technology

(Objectives 64.82 to 64.130)

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 99 Repair, Restoration and Interior Decorative Techniques

(Objectives 64.131 to 64.145)

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

- a carry out the repair and restoration of interior specialist decorated surfaces
- b produce domestic colour schemes and schedules
- c apply specialist decorative effects to small artifacts

Page 100 Supervision, Planning and Administration

(Objectives 64.146 to 64.171)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

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:

- 64.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 64.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 64.3 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 64.4 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 64.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 64.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 64.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: electric power tools (eg steam strippers, sanders, compressors, lighting), pneumatic power tools (eg sanders, needles guns), hand tools (eg scrapers, shave hooks, chisel knives)
- 64.8 Carry out safe working practices using various paint spray equipments.
Safe working practices: adequate ventilation, protective equipment (eg face masks, goggles), suitability of paint for application (eg non-lead products for interior use)

- 64.9 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 64.10 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 64.11 Explain the need for communication systems to ensure the safe use of lifting machines.
Communication systems: hand signals, bell systems, two way radio
- 64.12 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 64.13 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 64.14 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 64.15 Identify safe working practices using various paint spray equipments.
Safe working practices: adequate ventilation, protective equipment (eg face masks, goggles), suitability of paint for application (eg non-lead products for interior use)

Practical competences

The candidate must be able to do the following:

- 64.16 Identify and select glazes, stains and scumbles suitable for interior decorative effects based on their technical properties.
Glazes/scumbles: oil based, water based
Stains: oil based, water based, spirit based
Decorative effects: wood graining, marbling, wood restoration, verdigris, crazed
- 64.17 Identify and select oil based surface coating materials for paint spray applications based on their technical properties.
Oil based coatings: non-reversible (convertible), primers, undercoats, sealers, finishes
Applications: new/previously painted (wood, metal, plaster), stencilling
- 64.18 Identify and select water based surface coating materials for paint spray applications based on their technical properties.
Water based coatings: non-reversible (convertible), primers, undercoats, sealers, finishes
Applications: new/previously painted (wood, metal, plaster), stencilling
- 64.19 Identify and select cellulose based surface coating materials for paint spray applications based on their technical properties.
Cellulose based coatings: reversible (non-convertible), primers, undercoat, finish
Applications: new/previously painted (wood, metal, plaster), internal furniture
- 64.20 Identify and select multi-colour paints for spray applications based on their technical properties.
Multi-colour paint: vinyl/oil resin medium, cellulose/water medium
Applications: spattering, flecking
- 64.21 Identify and select specialist wall hanging materials in various widths for specific applications based on their technical properties.
Materials: eg cloth backed vinyl, paper backed hessian, paper backed felt, lincrusta, metallic foils, flock, cork
Applications: living, staircase, cooking, washing
- 64.22 Identify and select specialist wall hanging pastes and adhesives for specific applications based on their technical properties.
Paste/adhesives: ready mixed (starch, PVA), lincrusta glue
Applications: living, staircase, cooking, washing
- 64.23 Identify and select metallic leaf decorative materials for specific applications based on their technical properties.

Metallic leaf: eg gold, silver, schlag, aluminium
Applications: highlight ornamental work

Knowledge requirements

The instructor must ensure the candidate is able to:

- 64.24 State the technical properties, characteristics and storage requirements of glazes and scumbles.
Glazes/scumbles: oil based, water based
Properties: non-reversible (convertible)
Characteristics: semi-transparent, carrying medium
Storage: oil based (no particular requirements), water based (not below freezing point)
- 64.25 State the technical properties, characteristics and storage requirements of stains.
Stains: oil based, water based, spirit based
Properties: reversible (non-convertible)
Characteristics: pigment free dyes
Storage: oil based (no particular requirements), water based (not below freezing point), spirit based (fire risk)
- 64.26 State the technical properties, characteristics and storage requirements of oil based surface coating materials for paint spray applications.
Properties: non-reversible (convertible)
Characteristics: decorative finish, colour, protection
Storage: no particular requirements
- 64.27 State the technical properties, characteristics and storage requirements of water based surface coating materials for paint spray applications.
Properties: non-reversible (convertible)
Characteristics: decorative finish, colour, protection
Storage: not below freezing point
- 64.28 State the technical properties, characteristics and storage requirements of cellulose based surface coating materials for paint spray applications.
Properties: reversible (non-convertible)
Characteristics: decorative finish, colour, protection
Storage: fire risk
- 64.29 State the technical properties, characteristics and storage requirements of multi-colour paints for spray applications.
Properties: non-reversible (convertible)
Characteristics: camouflaging decorative effect, hardwearing, abrasive resistant
Storage: not below freezing point
- 64.30 Describe the physical properties of multi-colour paints.
Properties: use of two incompatible materials

- 64.31 State the technical properties, characteristics and storage requirements of specialist wall hanging materials.
Properties: specialist trimming, short soaking time
Characteristics: decorative finish
Storage: dry, cool
- 64.32 State the technical properties, characteristics and storage requirements of specialist wall hanging pastes and adhesives.
Properties: fungicidal (effect, safety), adhesive strength
Characteristics: low water content
Storage: dry, cool, not below freezing point

Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 64.33 Calculate the standard unit costs for various work from given data.
Unit costs: cost per m², inclusive of (labour, materials, overheads), excluding profit
Data: total hours, hourly wage rate, local/national taxes, total area covered, materials (costs, coverage rate), consumables, overheads (expenses, management/supervision, rent/rates, insurances, telephone/postage, plant)
- 64.34 Calculate the total costs of a contract from given specifications and standard unit costs values.
Total costs: = unit cost per m² x total area of coverage, excluding profit margin

Setting out

- 64.35 Use tools and equipment to enlarge and set out motifs.
Tools/equipment: tape measure, rule, spirit level
Enlarge/set out: squaring method, centring, level
- 64.36 Use tools and equipment to set out a stencil template.
Tools/equipment: tape measure, rule, spirit level, line band
Set out: centring (equal pattern at each end), level

Drawings

- 64.37 Produce plan and elevation drawings to a scale of proposed interior schemes.
Drawings: dimensions, detail (eg door/window openings, ceilings, skirting boards, archways, circular windows), exploded views, perspective views (one vanishing point, two vanishing points)

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 64.38 Identify calculations involving standard unit costs for various work from given data.
Unit costs: cost per m², inclusive of (labour, materials, overheads), excluding profit
Data: total hours, hourly wage rate, local/national taxes, total area covered, materials (costs, coverage rate), consumables, overheads (expenses, management/supervision, rent/rates, insurances, telephone/postage, plant)
- 64.39 Identify calculations involving total costs of a contract from given specifications and standard unit costs values.
Total costs: = unit cost per m² x total area of coverage, excluding profit margin

Setting out

- 64.40 Describe the methods for enlarging and setting out motifs.
Methods: squaring, overhead projector
- 64.41 Describe the method for setting out a stencil template.
Method: centring (equal pattern at each end), level

Drawings

- 64.42 Identify plan and elevation drawings to a scale of proposed interior schemes.
Drawings: dimensions, detail (eg door/window openings, ceilings, skirting boards, archways, circular windows), exploded views, perspective views (one vanishing point, two vanishing points)

Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

- 64.43 Prepare and apply various types of glazes and stains to obtain specialist marbling decorative effects.
Prepare: manufacturers instructions
Application: even distribution of material, even distribution of technique, area (minimum 700mm x 450mm)
Glaze/stains: water based, oil based
Marbling: sienna, vert de mare, fantasy
Decorative effect: ragging, softening, splattering, sign writing pencil, pencils, feathers (negative veining, positive veining)
- 64.44 Design and produce a stencil template.
- 64.45 Apply decorative effects by stencil templates, lining fitches, tapes and sign writing pencils.
Application: even distribution of material, even distribution of technique, stencils (minimum 3 repeats)
Decorative effect: motifs, stencil templates, painted lines/borders, free brush work
- 64.46 Prepare and apply various types of scumbles to obtain simulated wood grain decorative effects.
Prepare: manufacturers instructions
Application: even distribution of material, even distribution of technique, area (minimum 700mm x 450mm)
Wood grain: mahogany, figured oak
Scumbles: oil based
- 64.47 Select, assemble, dismantle for cleaning, clean, maintain and store pressure fed paint spraying equipment.
Assemble: compressor, leads, cup, gun
Equipment: pressure fed cup, remote pressure fed cup
- 64.48 Select the correct pressure fed spray gun set up.
Set up: fluid tip, needle, air cap/nozzle
- 64.49 Prepare and apply various types of spray paint using pressure fed paint spraying equipment.
Apply: vertical, overhead
Paint: water based, multi-colour
- 64.50 Select, assemble, dismantle for cleaning, clean, maintain and store gravity fed paint spraying equipment.
Assemble: compressor, leads, cup, gun
- 64.51 Select the correct gravity fed spray gun set up.
Set up: fluid tip, needle, air cap/nozzle
- 64.52 Prepare and apply spray paint using gravity fed paint spraying equipment.
Apply: small decorative panel work (eg stencils)
Paint: water based, oil based
- 64.53 Select, assemble, dismantle for cleaning, clean, maintain and store syphon/suction fed paint spraying equipment.
Assemble: compressor, leads, cup, gun
- 64.54 Select the correct syphon/suction fed spray gun set up.
Set up: fluid tip, needle, air cap/nozzle
- 64.55 Prepare and apply spray paint using syphon/suction fed paint spraying equipment.
Apply: vertical
Paint: eg water based, oil based
- 64.56 Store specialist wall hangings.
Specialist hangings: eg cloth backed vinyl, paper backed hessian, paper backed felt, lincrusta, metallic foils, flock, cork
Store: manufacturers instructions
- 64.57 Prepare cloth backed vinyl wall hanging material ready for application.
Cloth backed vinyl: 1.3 m width
Preparation: shade, measure, cut to length, paste (ready mixed, apply to back of hanging material), fold
- 64.58 Apply cloth backed vinyl wall hanging material.
Application: tools (spatular, trimming knife, straight edge), hanging, setting out, plumbing, centring, jointing, trimming techniques
- 64.59 Prepare metallic foil wall hanging material ready for application.
Preparation: shade, measure, cut to length, paste (ready mixed, apply to wall), fold
- 64.60 Apply metallic foil wall hanging material.
Application: tools (felt/rubber roller, trimming knife, straight edge), hanging, setting out, plumbing, centring, jointing, trimming techniques
- 64.61 Prepare lincrusta wall hanging material ready for application to a moulded edged panel.
Panel: 1 m width, 1.5 m high
Preparation: soak to soften (hot water), measure, cut to exact size, paste (lincrusta glue, apply to back of hanging material)
- 64.62 Apply lincrusta wall hanging material.
Application: tools (rubber roller), hanging, setting out, plumbing, centring, jointing, filling techniques
- 64.63 Select, clean, maintain and store specialist wall hanging equipment.
Equipment: tools (trimming knife, straight edge), applicator (rubber roller, felt roller)
Clean/store: wipe clean/dry, secure storage

Knowledge requirements

The instructor must ensure the candidate is able to:

- 64.64 Describe the techniques for applying various types of glazes and stains to obtain specialist marbling decorative effects.
Techniques: ragging, softening, splattering, sign writing pencil, pencils, feathers (negative veining, positive veining)
Application: even distribution of material, even distribution of technique
Glaze/stains: water based, oil based
Marbling: sienna, vert de mare, fantasy
- 64.65 Describe the various processes available for manufacturing a stencil template.
Process: knife/oil paper, hot pen/mylar (acetate), knife/transparent self adhesive film
- 64.66 Describe the various types of decorative effects obtained by stencil template, lining fitches, tape and sign writing pencils.
Decorative effect: motifs, stencils, painted lines/borders, free brush work
- 64.67 Describe the techniques for applying various types of scumbles to obtain simulated wood grain decorative effects.
Techniques: rags, rubbers, combs, horns, sign writing pencils
Application: even distribution of material, even distribution of technique
Scumbles: oil based
Wood grain: mahogany, figured oak
- 64.68 Describe the correct method for dismantling and cleaning paint spraying equipment.
Method: flushing with correct solvent (pipe lines, container, gun), brush/wooden pick (set up)
Equipment: containers, hoses, guns
- 64.69 Describe the method for selecting the correct spray gun set up.
Set up: fluid tip, needle, air cap/nozzle
- 64.70 Identify the component parts of a conventional paint spray gun.
Components: air cap/nozzle, fluid tip/nozzle, fluid needle, spreader adjustment valve, fluid adjustment valve, air valve, trigger, material inlet, air inlet
- 64.71 State the applications for pressure fed paint spraying equipment.
Applications: positions (any angle), fast rate of application
Paint: water based, oil based, multi-colour
- 64.72 State the applications for gravity fed paint spraying equipment.
Applications: position (upright only), small decorative panel work
Paint: water based, oil based
- 64.73 State the applications for syphon/suction fed paint spraying equipment.
Applications: position (upright only), small applications, frequent changes of colour
Paint: water based, oil based
- 64.74 Describe the operating principle of airless paint spray equipment.
Principle: use of extremely high pressure, paint atomising without air
- 64.75 Identify the component parts of airless paint spray equipment.
Components: paint container, filter, paint pump, fluid line, gun, fluid tip
- 64.76 State the applications for airless paint spraying equipment.
Applications: position (any angle), very large areas, fast, clean
- 64.77 Identify specialist wall hanging tools and equipment.
Tools/equipment: tools (trimming knife, straight edge), applicator (spatular, rubber roller, felt roller)
- 64.78 Explain the techniques for applying metallic foil wall hanging material.
Techniques: determine starting point, matching/planning (drop, straight across, random, reversing alternate lengths, aesthetics), paste applied to wall, tools (felt/rubber roller, trimming knife, straight edge), jointing, trimming
- 64.79 Describe the procedure for preparing lincrusta wall hanging material.
Preparation: soak to soften (hot water), measure, cut to exact size, paste (lincrusta glue, apply to back of hanging material)
- 64.80 Explain the techniques for applying lincrusta wall hanging material.
Techniques: determine starting point, matching/planning (drop, straight across, random, reversing alternate lengths, aesthetics), specialist paste applied to hanging material, tools (rubber roller, trimming knife, straight edge), jointing, trimming, filling techniques
- 64.81 State the technical properties, characteristics and storage requirements of metallic leaf decorative materials.
Properties: non-corrosive, malleable
Characteristics: decorative finish, colour, protection
Storage: cool, dry

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 64.82 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 64.83 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 64.84 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 64.85 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 64.86 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 64.87 Access a database applications software package.
- 64.88 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 64.89 Enter data into a database file.
- 64.90 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 64.91 Edit data in an existing database file.
Edit: add, delete, amend

- 64.92 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after

- 64.93 Modify a database structure.
Modify: fields (add, delete), change data type, change field length

- 64.94 Print selected forms from a database.
Selected forms: from 64.92 above

- 64.95 Define and execute sort criteria for numeric, character and date fields.

- 64.96 Print a summary report of selected data from a database file.

- 64.97 Exit database software.

Spreadsheet

- 64.98 Access a spreadsheet applications software package.
- 64.99 Create a new spreadsheet file for a given application.
- 64.100 Set single and global column widths.
- 64.101 Create and insert appropriate spreadsheet column and row titles.
- 64.102 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars
- 64.103 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 64.104 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete
- 64.105 Insert and delete columns and rows in a spreadsheet.
- 64.106 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 64.107 Use absolute and relative cell addresses.
- 64.108 Replicate formula in a row or column.
- 64.109 Use the sum and average functions in a spreadsheet for rows and columns.

- 64.110 Print a spreadsheet.
- 64.111 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 64.112 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 64.113 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 64.114 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 64.115 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 64.116 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 64.117 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 64.118 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 64.119 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 64.120 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 64.121 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 64.122 Describe the method for creating a new spreadsheet file for a given application.
- 64.123 Describe the method for setting single and global column widths.
- 64.124 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 64.125 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 64.126 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 64.127 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 64.128 Explain the terms 'absolute' and 'relative' cell addresses.
- 64.129 Describe the method for replicating formula in a row or column.
- 64.130 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Repair, Restoration and Interior Decorative Techniques

Practical competences

The candidate must be able to do the following:

- 64.131 Carry out the restoration of an area of damaged interior decorated hardwood.
Restoration: remove existing coating, make good damaged areas, bleach/stain, apply new finish
- 64.132 Carry out the restoration of an area of damaged interior specialist wall hanging.
Restoration: remove damaged area, select suitable material to match existing finish, apply new material, trim new/existing material to a disguised finish
Specialist wall hangings: eg metallic foil, cloth backed vinyl, paper backed hessian, paper backed felt
- 64.133 Carry out the restoration of an area of damaged interior textured finish.
Restoration: remove damaged area back to a suitable edge, apply new material to match existing finish
- 64.134 Carry out the restoration of an area of damaged lincrusta wall hanging.
Restoration: cut out damaged area, select suitable material to match existing finish, apply new material, trim new/existing material to a disguised finish, fill edges/small damaged areas to match existing pattern
- 64.135 Produce domestic colour schemes and schedules to given specifications.
Production: Colour wheel, colour swatches
Specifications: analogous/harmonious, complementary/contrast, monochrome
- 64.136 Support the colour schemes produced in 64.135 above with perspective drawings.
Perspective drawings: one vanishing point, two vanishing points
- 64.137 Apply verdigris decorative effects to a small artifact.
Verdigris: traditional (water based colours), wax stain
- 64.138 Apply crazed decorative effects to a small artifact.
Crazed effect: eg cracklure, crackle glaze, crackling

Knowledge requirements

The instructor must ensure the candidate is able to:

- 64.139 Describe the procedure for carrying out the restoration of an area of damaged interior decorated hardwood.
Procedure: remove existing coating, make good damaged areas, bleach/stain, apply new finish
- 64.140 Describe the procedure for carrying out the restoration of an area of damaged interior specialist wall hanging.
Procedure: remove damaged area, select suitable material to match existing finish, apply new material, trim new/existing material to a disguised finish
Specialist wall hangings: metallic foil, cloth backed vinyl, paper backed hessian, paper backed felt
- 64.141 Describe the procedure for carrying out the restoration of an area of damaged interior textured finish.
Procedure: remove damaged area back to a suitable edge, apply new material to match existing finish
- 64.142 Describe the procedure for carrying out the restoration of an area of damaged lincrusta wall hanging.
Procedure: cut out damaged area, select suitable material to match existing finish, apply new material, trim new/existing material to a disguised finish, fill edges/small damaged areas to match existing pattern
- 64.143 Describe various types of colour schemes.
Types: analogous/harmonious, complementary/contrast, monochrome
- 64.144 Describe the use of the colour wheel for producing various colour schemes.
Use: analogous/harmonious, complementary/contrast
- 64.145 Describe the procedure for applying verdigris decorative effects.
Procedure: traditional (water based colours), wax stain
- 64.146 Describe the procedure for applying crazed decorative effects.
Procedure: cracklure, crackle glaze, crackling

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 64.146 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 64.147 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 64.148 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 64.149 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 64.150 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 64.151 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 64.152 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 64.153 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 64.154 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 64.155 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 64.156 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination,

communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)

- 64.157 Make recommendations to improve the performance of a team.
- 64.158 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 64.159 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non critical
- 64.160 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 64.161 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 64.162 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 64.163 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network
- 64.164 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople

- 64.165 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 64.166 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 64.167 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 64.168 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 64.169 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 64.170 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 64.171 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessments

Test specification for written paper Painting and Decorating 3 Principles (6161-24-064)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	35
Communications and information technology	10
Repair, restoration and interior decorative techniques	10
Supervision, planning and administration	15

64 Painting and Decorating 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- 64.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
- 64.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
- 64.3 Carry out a risk assessment and prepare a report identifying the potential hazards.
- 64.4 Complete an accident report for a simulated accident resulting in injury.
- 64.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
- 64.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
- 64.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
- 64.8 Carry out safe working practices using various paint spray equipments.
- 64.9 Instruct a new team member in site safety procedures/rules and issue appropriate safety 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 _____

64 Painting and Decorating 3: Materials

Practical competences

The candidate must be able to do the following:

- 64.16 Identify and select glazes, stains and scumbles suitable for interior decorative effects based on their technical properties.
- 64.17 Identify and select oil based surface coating materials for paint spray applications based on their technical properties.
- 64.18 Identify and select water based surface coating materials for paint spray applications based on their technical properties.
- 64.19 Identify and select cellulose based surface coating materials for paint spray applications based on their technical properties.
- 64.20 Identify and select multi-colour paints for spray applications based on their technical properties.
- 64.21 Identify and select specialist wall hanging materials in various widths for specific applications based on their technical properties.
- 64.22 Identify and select specialist wall hanging pastes and adhesives for specific applications based on their technical properties.
- 64.23 Identify and select metallic leaf decorative materials for specific applications based on their technical properties.

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 _____

64 Painting and Decorating 3: Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

- 64.33 Calculate the standard unit costs for various work from given data.
- 64.34 Calculate the total costs of a contract from given specifications and standard unit costs values.
- 64.35 Use tools and equipment to enlarge and set out motifs.
- 64.36 Use tools and equipment to set out a stencil template.
- 64.37 Produce plan and elevation drawings to scale of proposed interior schemes.

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

64 Painting and Decorating 3: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

64.43	Prepare and apply various types of glazes and stains to obtain specialist marbling decorative effects.	<input type="checkbox"/>	64.56	Store specialist wall hangings.	<input type="checkbox"/>
64.44	Design and produce a stencil template.	<input type="checkbox"/>	64.57	Prepare cloth backed vinyl wall hanging material ready for application.	<input type="checkbox"/>
64.45	Apply decorative effects by stencil templates, lining fitches, tapes and sign writing pencils.	<input type="checkbox"/>	64.58	Apply cloth backed vinyl wall hanging material.	<input type="checkbox"/>
64.46	Prepare and apply various types of scumbles to obtain simulated wood grain decorative effects.	<input type="checkbox"/>	64.59	Prepare metallic foil wall hanging material ready for application.	<input type="checkbox"/>
64.47	Select, assemble, dismantle for cleaning, clean, maintain and store pressure fed paint spraying equipment.	<input type="checkbox"/>	64.60	Apply metallic foil wall hanging material.	<input type="checkbox"/>
64.48	Select the correct pressure fed spray gun set up.	<input type="checkbox"/>	64.61	Prepare lincrusta wall hanging material ready for application to a moulded edged panel.	<input type="checkbox"/>
64.49	Prepare and apply various types of spray paint using pressure fed paint spraying equipment.	<input type="checkbox"/>	64.62	Apply lincrusta wall hanging material.	<input type="checkbox"/>
64.50	Select, assemble, dismantle for cleaning, clean, maintain and store gravity fed paint spraying equipment.	<input type="checkbox"/>	64.63	Select, clean, maintain and store specialist wall hanging equipment.	<input type="checkbox"/>
64.51	Select the correct gravity fed spray gun set up.	<input type="checkbox"/>			
64.52	Prepare and apply spray paint using gravity fed paint spraying equipment.	<input type="checkbox"/>			
64.53	Select, assemble, dismantle for cleaning, clean, maintain and store syphon/suction fed paint spraying equipment.	<input type="checkbox"/>			
64.54	Select the correct syphon/suction fed spray gun set up.	<input type="checkbox"/>			
64.55	Prepare and apply spray paint using syphon/suction fed paint spraying equipment.	<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

64 Painting and Decorating 3: Communications and Information Technology

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|-------|--|--------------------------|--------------------|--|--------------------------|
| 64.82 | Draw an organisational chart showing the structure of a multi-trade construction company. | <input type="checkbox"/> | 64.96 | Print a summary report of selected data from a database file. | <input type="checkbox"/> |
| 64.83 | Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy. | <input type="checkbox"/> | 64.97 | Exit database software. | <input type="checkbox"/> |
| 64.84 | Prepare a report describing the administration systems of a multi-trade construction company. | <input type="checkbox"/> | Spreadsheet | | |
| 64.85 | Prepare a report on the key issues of customer service/care in a construction company. | <input type="checkbox"/> | 64.98 | Access a spreadsheet applications software package. | <input type="checkbox"/> |
| 64.86 | Use information technology systems for communication. | <input type="checkbox"/> | 64.99 | Create a new spreadsheet file for a given application. | <input type="checkbox"/> |
| 64.87 | Access a database applications software package. | <input type="checkbox"/> | 64.100 | Set single and global column widths. | <input type="checkbox"/> |
| 64.88 | Define and create a database structure to store a given set of data. | <input type="checkbox"/> | 64.101 | Create and insert appropriate spreadsheet column and row titles. | <input type="checkbox"/> |
| 64.89 | Enter data into a database file. | <input type="checkbox"/> | 64.102 | Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse controls. | <input type="checkbox"/> |
| 64.90 | Save a database file to disk with an appropriate filename in a given location. | <input type="checkbox"/> | 64.103 | Insert and format character and numeric data. | <input type="checkbox"/> |
| 64.91 | Edit data in an existing database file. | <input type="checkbox"/> | 64.104 | Edit the contents of a cell in a spreadsheet file. | <input type="checkbox"/> |
| 64.92 | Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators. | <input type="checkbox"/> | 64.105 | Insert and delete columns and rows in a spreadsheet. | <input type="checkbox"/> |
| 64.93 | Modify a database structure. | <input type="checkbox"/> | 64.106 | Insert formula containing cell addresses and numbers to carry out calculations. | <input type="checkbox"/> |
| 64.94 | Print selected forms from a database. | <input type="checkbox"/> | 64.107 | Use absolute and relative cell addresses. | <input type="checkbox"/> |
| 64.95 | Define and execute sort criteria for numeric, character and date fields. | <input type="checkbox"/> | 64.108 | Replicate formula in a row or column. | <input type="checkbox"/> |
| | | | 64.109 | Use the sum and average functions in a spreadsheet for rows and columns. | <input type="checkbox"/> |
| | | | 64.110 | Print a spreadsheet. | <input type="checkbox"/> |
| | | | 64.111 | Present and print data in a graphical format. | <input type="checkbox"/> |
| | | | 64.112 | Save a spreadsheet file to disk with an appropriate filename in a given location. | <input type="checkbox"/> |
| | | | 64.113 | Exit spreadsheet software. | <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

64 Painting and Decorating 3: Repair, Restoration and Interior Decorative Techniques

Practical competences

The candidate must be able to do the following:

- | | | |
|--------|---|--------------------------|
| 64.131 | Carry out the restoration of an area of damaged interior decorated hardwood. | <input type="checkbox"/> |
| 64.132 | Carry out the restoration of an area of damaged interior specialist wall hanging. | <input type="checkbox"/> |
| 64.133 | Carry out the restoration of an area of damaged interior textured finish. | <input type="checkbox"/> |
| 64.134 | Carry out the restoration of an area of damaged lincrusta wall hanging. | <input type="checkbox"/> |
| 64.135 | Produce domestic colour schemes and schedules to given specifications. | <input type="checkbox"/> |
| 64.136 | Support the colour schemes produced in 64.135 above with perspective drawings. | <input type="checkbox"/> |
| 64.137 | Apply verdigris decorative effects to a small artifact. | <input type="checkbox"/> |
| 64.138 | Apply crazed decorative effects to a small artifact. | <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

64 Painting and Decorating 3: Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 64.146 Identify various elements of a construction project and arrange in a logical sequence of events.
- 64.147 Calculate the time required for each element of a construction project from given data.
- 64.148 Calculate the resources required for each element of the project to complete them within the time allowed.
- 64.149 Analyse data produced on each element of the project to determine their individual effect on the programme.
- 64.150 Produce planning programmes for a domestic construction project.
- 64.151 Write a method statement to carry out a craft operation.
- 64.152 Prepare material orders with deliveries planned to support the programmed sequence of events.
- 64.153 Record daily and weekly progress and compare with the project programme.
- 64.154 Provide feedback to individuals and teams on daily and weekly progress.
- 64.155 Use effective leadership methods to supervise individuals/teams working in the construction industry.
- 64.156 Use communication skills within a team environment to achieve agreement with individuals/teams.
- 64.157 Make recommendations to improve the performance of a team.

- 64.158 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.

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

65 Plumbing 3 – Summary of syllabus sections

Page 111 Safety at Work

(Objectives 65.1 to 65.16)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 112 Materials

(Objectives 65.17 to 65.33)

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

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

Page 114 Calculations, Setting Out and Drawing

(Objectives 65.34 to 65.55)

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

- a apply calculations to problems associated with practical operations and planning
- b set out branch connections and heat bend offsets
- c set out drainage systems
- d produce working drawings of commercial pipework systems

Page 116 Advanced Practical Skills

(Objectives 65.56 to 65.92)

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

- a apply advanced tools skills
- b install and test a mains fed fire sprinkler system
- c install and test a boosted cold water system
- d install and test a hot water supply system with a secondary return
- e describe the layout and operation of hot water systems and heating systems
- f describe the layout and operation of sanitary and rainwater systems
- g sterilise hot and cold water systems

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

Page 118 Communications and Information Technology

(Objectives 65.93 to 65.141)

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 120 Alteration, Repair and Planned Maintenance

(Objectives 65.142 to 65.157)

The aim of this unit is to enable the candidate to apply advanced tool skills to:

carry out the alteration, repair and planned maintenance of existing systems

- a service hot water/heating system
- b install a solar heating panel to an existing system
- c install an additional heat panel to an existing hot water heating system
- d chemically clean systems
- e produce maintenance schedules

Page 121 Supervision, Planning and Administration

(Objectives 65.158 to 65.183)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

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:

- 65.1 Inspect and keep records on the condition of excavations.
Record: subsoil condition (drying, freezing, effects of rainfall)
- 65.2 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 65.3 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 65.4 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 65.5 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 65.6 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 65.7 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 65.8 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: power tools (eg electric drill, pipe threading machine, lighting), hydraulic bender, hand tools (eg hand bender, hammers, spanners, reamer)

- 65.9 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 65.10 State possible faults and potential hazards when working in deep excavations.
Faults: deterioration of subsoil, change in type of subsoil
Hazards: change in condition of subsoil condition (drying, freezing, effects of rainfall), lights (defective, removal), interference with trench supports, interference with barriers
- 65.11 State the possible faults or potential defects in trench support systems.
Faults/defects: metal components (corrosion, distortion), timber components (displacement, splits, cracks)
- 65.12 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 65.13 Explain the need for communication systems to ensure safe use of lifting or excavating machines.
Communication systems: hand signals, bell systems, two way radio
- 65.14 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 65.15 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 65.16 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity

Materials

Practical competences

The candidate must be able to do the following:

- 65.17 Identify and select fittings suitable for brazing based on their technical properties.
Fittings: material (copper, brass), bends, elbows, tees, branches, connectors
- 65.18 Identify and select fittings suitable for bronze welding based on their technical properties.
Fittings: material (steel), bends, elbows, tees, branches, connectors
- 65.19 Identify and select consumable materials suitable for brazing and bronze welding.
Consumables: brazing rods, bronze welding rods, fluxes
- 65.20 Identify and select water heaters for specific applications based on their technical properties.
Water heaters: fuel (gas, electric, oil, solid), flue (eg balanced, open, fan), operation (condenser, combination, instantaneous)
Applications: hot water, heating
- 65.21 Identify and select control equipment for specific applications based on their technical properties.
Controls: programmer, time clock, energy management systems, thermostats, programmable room thermostat, control valves
Applications: fire sprinkler, boosted cold water, hot water services, heating
- 65.22 Identify and select pumps for specific applications based on their technical properties.
Applications: fire sprinkler, boosted cold water, hot water services, heating, shower (single outlet, multiple outlets)
- 65.23 Identify and select sterilizing material suitable for water pipework systems based on their technical properties.
Material: chlorine
- 65.24 Identify and select chemical cleaning materials for specific applications based on their technical properties.
Applications: descaling, sludge removal (heating systems), degreasing, neutralising, inhibiting
- 65.25 Identify and select petrol/oil interceptor chambers and septic tanks for specific applications based on their technical properties.

Knowledge requirements

The instructor must ensure the candidate is able to:

- 65.26 State the technical properties of fittings suitable for brazing.
Fittings: material (copper, brass), bends, elbows, tees, branches, connectors
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 65.27 State the technical properties of fittings suitable for bronze welding.
Fittings: material (steel), bends, elbows, tees, branches, connectors
Properties: corrosion resistance, pressure, expansion, contraction, mechanical strength, compressive strength
- 65.28 State the technical properties of consumable materials suitable for brazing and bronze welding.
Consumables: brazing rods, bronze welding rods, fluxes
Properties: corrosion resistance, mechanical strength, compatibility
- 65.29 State the technical properties of water heaters.
Water heaters: condenser, combination, instantaneous
Properties: capacity, mounting (wall, floor), fuel (gas, electric, oil, solid), flue (balanced, open, fan)
- 65.30 State the technical properties of control equipment.
Controls: programmer, time clock, energy management systems (optimizing, compensating), thermostats (room, hot water), programmable room thermostat, control valves (electronic, thermostatic radiator)
Properties: electrical supply (alternating current/AC, direct current/DC), programmers (24 hour, 7 day, number of time bands, overrides, battery back up), energy management systems (efficiency, battery back up), thermostats (operating range, sensitivity), programmable room thermostats (24 hour, 7 day, time bands, overrides, battery back up, operating range, sensitivity, mains, cordless), electronic control valves (flow rate), thermostatic radiator control valves (operating range, sensitivity)
- 65.31 State the technical properties of pumps suitable for various applications.
Properties: flow rate, material, temperature operating range, construction
Applications: fire sprinkler, boosted cold water, hot water services, heating, shower (single outlet, multiple outlets)

- 65.32 State the technical properties of chemical cleaning materials for various applications.
Properties: system compatibility, safety, environmental effects (disposal), efficiency, durability
Applications: descaling, sludge removal (heating systems), degreasing, neutralising, inhibiting
- 65.33 State the technical properties of petrol/oil interceptor chambers and septic tanks.
Properties: capacity, environmental effects, compatibility with national/local regulations

Calculations, Setting Out and Drawing

Practical competences

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

The candidate must be able to do the following:

Calculations

- 65.34 Calculate the volume of various shapes of excavations and trenches.
Shapes: varying depth, sides (plumb, battering), plan (rectangular, trapezoidal)
- 65.35 Calculate the costs for removing subsoil from excavations and trenches from given data.
Costs: labour, machine
Data: machine (output, cost), labour (output, cost)
- 65.36 Calculate the increase in subsoil volume when excavated from given data.
Data: subsoil type, bulking factor chart, excavation dimensions
- 65.37 Calculate the costs for transporting excavated material from given data.
Data: costs per m³ per kilometre, distance from site to waste tip
- 65.38 Calculate the quantity and cost of labour required for the installation of pipework systems from given data.
Quantity: total hours, number of tradesmen
Pipework: water (mains, hot/cold services), drainage, sanitation, gas, rainwater
Data: labour (output, cost), duration of contract
- 65.39 Calculate pipe sizes for specified commercial services.
Calculations: using flow rate charts
Services: water (mains, hot/cold services), fire (sprinkler, hose reel, dry riser), drainage, sanitary, gas, rainwater
- 65.40 Calculate pipe sizes for specified commercial services.
Calculations: using flow rate charts, manufacturers' data sheets
Services: water (heating, boosted hot/cold services), fire (sprinkler, hose reel, dry riser), gas, rainwater (gutters, down pipes)

Setting out

- 65.41 Measure and set out a branch connection in 54mm copper pipe suitable for bronze welding.
Branch: 28mm copper pipe, 45° branch
- 65.42 Measure and set out a branch connection in 100mm steel pipe suitable for bronze welding.
Branch: 50mm steel pipe, 45° branch
- 65.43 Measure and set out an offset in 50mm steel pipe.
Offset: minimum 1 diameter, heat bending technique

Drawings

- 65.44 Produce working drawings from plans and details of commercial pipework systems.
Drawings: dimensions, detail (pipe, fittings, valves, pumps, tanks, sprinkler heads, meters, water heaters, controls, sensors, wiring), exploded views
Plans/Details: engineering drawings, computer-aided design (CAD) generated drawings, manufacturers data sheets/brochures
Systems: water (heating, boosted hot/cold services), fire (sprinkler, hose reel, dry riser), gas, rainwater (gutters, down pipes)

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 65.45 Identify calculations involving the volume of various shapes of excavations and trenches.
Shapes: varying depth, sides (plumb, battering), plan (rectangular, trapezoidal)
- 65.46 Identify calculations involving the costs for removing subsoil from excavations and trenches from given data.
Costs: labour, machine
Data: machine (output, cost), labour (output, cost)
- 65.47 Identify calculations involving the increase in subsoil volume when excavated from given data.
Data: subsoil type, bulking factor chart, excavation dimensions
- 65.48 Identify calculations involving the costs for transporting excavated material from given data.
Data: costs per m³ per kilometer, distance from site to waste tip
- 65.49 Identify calculations involving the quantity and cost of labour required for the installation of pipework systems from given data.
Quantity: total hours, number of tradesmen
Pipework: water (mains, hot/cold services), drainage, sanitation, gas, rainwater
Data: labour (output, cost), duration of contract
- 65.50 Identify calculations involving pipe sizes for specified commercial services.
Calculations: using flow rate charts
Services: water (mains, hot/cold services), fire (sprinkler, hose reel, dry riser), drainage, sanitary, gas, rainwater

65.51 Identify calculations involving pipe sizes for specified commercial services.

Calculations: using flow rate charts, manufacturers data sheets

Services: water (heating, boosted hot/cold services), fire (sprinkler, hose reel, dry riser), gas, rainwater (gutters, down pipes)

Setting out

65.52 Describe, with the aid of a sketch, the method of measuring and setting out a branch connection in 54mm copper pipe suitable for bronze welding.

Branch: 28mm copper pipe, 45° branch

65.53 Describe, with the aid of a sketch, the method of measuring and setting out a branch connection in 100mm steel pipe suitable for bronze welding.

Branch: 50mm steel pipe, 45° branch

65.54 Describe, with the aid of a sketch, the method of measuring and setting out an offset in 50mm steel pipe.

Offset: minimum 1 diameter, heat bending technique

Drawings

65.55 Identify scale working drawings from plans and details of commercial pipework systems.

Drawings: dimensions, detail (pipe, fittings, valves, pumps, tanks, sprinkler heads, meters, water heaters, controls, sensors, wiring), exploded views

Plans/Details: engineering drawings, computer-aided design (CAD) generated drawings, manufacturers data sheets/brochures

Systems: water (heating, boosted hot/cold services), fire (sprinkler, hose reel, dry riser), gas, rainwater (gutters, down pipes)

Practical competences

The candidate must be able to do the following:

Advanced tools skills

- 65.56 Fabricate and braze or bronze weld a branch connection in 54mm copper pipe.
Fabricate: from a straight length of tube, 28mm branch
- 65.57 Fabricate, assemble and pressure test a short section of 54mm copper pipework.
Pipework: minimum (1 x connector, 1 x 90° elbow, 1 x 28mm fabricated branch)
Pressure test: hydraulic (4 bar), pneumatic (4 bar)
- 65.58 Fabricate and bronze weld a branch connection in 100mm steel pipe.
Fabricate: from a straight length of tube, 50mm branch
- 65.59 Apply heat bending techniques to form an offset in 50mm steel pipework.
Offset: minimum 1mm diameter
- 65.60 Fabricate, assemble and pressure test a short section of 100mm threaded steel pipework.
Pipework: minimum (1 x flange, 1 x tee, 1 x 90° elbow, 1 x 50mm fabricated branch, 1 heat formed offset in 50mm)
Pressure test: hydraulic (4 bar), pneumatic (4 bar)
- 65.61 Fabricate, assemble and pressure test a short section of 50mm plastic pipework suitable for an underground mains cold water supply.
Fabricate: pipework material (medium density polyethylene/MDPE), fittings (compression, push fit), minimum (1 x tee, 1 x elbow, 1 x stop valve)
Pressure test: hydraulic (4 bar)
- 65.62 Fabricate, assemble and pressure test a short section of 50mm plastic pipework suitable for an above ground mains cold water supply.
Fabricate: pipework material (chemically modified unplasticised polyvinyl chloride/ MuPVC), fittings (push fit), minimum (1 x tee, 1 x elbow, 1 x stop valve)
Pressure test: hydraulic (4 bar)
- 65.63 Fabricate, assemble and pressure test a short section of 110mm plastic pipework suitable for a sanitary pipework or drainage system.
Fabricate: pipework material (eg polyvinyl chloride/PVC, unplasticised polyvinyl chloride/uPVC, acrylonitrile butadiene styrene/ABS), fittings (push fit, solvent), minimum (1 x connector, 1 x branch, 1 x elbow)
Pressure test: pneumatic
- 65.64 Fabricate, assemble and pressure test a short section of 100mm cast iron pipework suitable for an underground mains cold water supply.
Fabricate: fittings (caulked, clamped, compression), minimum (1 x connector, 1 x branch, 1 x elbow)
Pressure test: hydraulic (4 bar), pneumatic (4 bar)
- 65.65 Connect and test an electrical appliance to a suitable supply point.
Appliance: eg boiler, pump, water heater
Test: continuity, function
- 65.66 Connect and test electronic control units.
Control units: thermostat, time clock/programmer
Test: continuity, function
- 65.67 Identify various types of subsoil.
Types: eg soft sand, peat, compact gravel, clays, shale, rock, made up ground, re-used demolition sites, filled ground
- 65.68 Carry out tests to determine the characteristics of various types of subsoil.
Tests: probes, trial holes, boreholes, penetrometer test, shrinkage/expansion tests (clay soil samples), effects of frost action on soils
Characteristics: condition, bearing capacity
- 65.69 Install supports to an excavation.
Supports: materials (eg steel sheeting, close boarding, open spaced supports), protection of workforce from machinery/vehicles)
Excavation: greater than 2m deep

Pipework installations

- 65.70 Set out, fabricate, install and test a mains fed fire sprinkler and hose reel system.
System: material (steel), pipe sizes (25mm, 50mm, 100mm), fittings (bends, elbows, tee, connectors, valves, sprinkler heads, minimum (3 outlets), hose reel
Test: hydraulic (4 bar), pneumatic (4 bar)
- 65.71 Set out, fabricate, install and test a boosted cold water system.
System: material (steel), pipe size (50mm), fittings (screwed), tanks (low level, high level), single pump, pressure switches (high, low), electronic level switch
Tests: hydraulic (4 bar), controls (level, pressure)
- 65.72 Set out, fabricate, install and test a hot water supply system with a secondary return.
System: material (eg steel, copper), pump, tank
Test: hydraulic (4 bar)
- 65.73 Carry out the chlorination of a commissioned cold/hot water system.
Chlorination: fill system, purge, hold time, drain, flush, refill, purge

Knowledge requirements

The instructor must ensure the candidate is able to:

Advanced tool skills

- 65.74 State the technical properties of fluxes used for brazing and bronze welding.
Fluxes: paste, powder
Properties: corrosive effect, material compatibility, toxic effect, water contamination, mechanical strength
- 65.75 Describe, with the aid of a sketch, the technique for brazing a fabricated branch in copper pipework.
Technique: joint preparation, application of flux, type of flame
- 65.76 Describe, with the aid of a sketch, the technique for bronze welding a fabricated branch in steel pipework.
Technique: joint preparation, application of flux, type of flame, angle of flame, direction of travel
- 65.77 Describe, with the aid of a sketch, the technique for bronze welding a fabricated branch in copper pipework.
Technique: joint preparation, application of flux, type of flame, angle of flame, direction of travel
- 65.78 Describe, with the aid of a sketch, the technique for heat bending steel pipework to form an offset.
Technique: marking out, sand fill, application of heat, cooling
- 65.79 State the differences between AC and DC electrical supplies and list their applications.
Applications: AC (power, heating, lighting), DC (control, emergency lighting)
- 65.80 Identify the various types of single and three phase circuits.
Circuits: ring, radial
Installations: lighting, socket, fixed appliance
- 65.81 Identify single and three phase distribution boards with a double pole isolating switch.
Distribution board: fused (cartridge, re-wireable), miniature circuit breaker, rating, residual current device (RCD)
- 65.82 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 30mA for supplementary shock protection

Pipework installations

- 65.83 Describe, with the aid of a sketch, the layout and operation of a mains fed fire sprinkler, hose reel and dry riser system.

- 65.84 Describe, with the aid of a sketch, the construction and operation of a glass phial fire sprinkler head.
- 65.85 Describe, with the aid of a sketch, the layout and operation of a boosted cold water system.
Layout: pipework, tanks (low level, high level), single pump, pressure switches (high, low), electronic level switch
- 65.86 Describe, with the aid of a sketch, the layout and operation of a hot water supply system with a secondary return.
Layout: water heater, pipework, hot water tank, single pump, time clock/programmer, thermostat
- 65.87 State the differences between pumps used in 65.85 and 65.86 above.
Differences: function, materials (body, impeller, seals), working temperature, stages (single, multiple)
- 65.88 Describe, with the aid of a sketch, the layout and operation of a hot water heating system.
Layout: water heater, pipework, tanks, pumps, time clock/programmer, thermostats
Systems: open vented, sealed
- 65.89 Describe, with the aid of a sketch, the layout and operation of combined hot water supply and heating systems.
Layout: water heater, pipework, tanks, pumps, time clock/programmer, control valves, thermostats
Systems: open vented, sealed
- 65.90 Describe, with the aid of a sketch, the layout and operation of commercial sanitary pipework systems.
Layout: pipework (up to 150mm), fittings (traps, bends, tees, clips expansion joints, air admittance valves), appliances (basins, sinks, showers, water closets, urinals), gradients, over 4 floors
Systems: single stack, ventilated stack, fully ventilated stack
- 65.91 Describe, with the aid of a sketch, the layout and operation of a commercial rainwater system.
Layout: gutters (stop end, coupling, outlet, clips, bend, gradient), downpipe (coupling, shoe/outlet, clips, bends), minimum 1000m² roof area, up to 150mm downpipe
- 65.92 Describe the procedure for chlorinating a commissioned cold/hot water system.
Procedure: chemical strength, fill system, purge, hold time, drain, flush, refill

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 65.93 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 65.94 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 65.95 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 65.96 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 65.97 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 65.98 Access a database applications software package.
- 65.99 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 65.100 Enter data into a database file.
- 65.101 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 65.102 Edit data in an existing database file.
Edit: add, delete, amend

- 65.103 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 65.104 Modify a database structure.
Modify: fields (add, delete), change data type, change field length
- 65.105 Print selected forms from a database.
Selected forms: from 65.103 above
- 65.106 Define and execute sort criteria for numeric, character and date fields.
- 65.107 Print a summary report of selected data from a database file.
- 65.108 Exit database software.

Spreadsheet

- 65.109 Access a spreadsheet applications software package.
- 65.110 Create a new spreadsheet file for a given application.
- 65.111 Set single and global column widths.
- 65.112 Create and insert appropriate spreadsheet column and row titles.
- 65.113 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars
- 65.114 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 65.115 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete
- 65.116 Insert and delete columns and rows in a spreadsheet.
- 65.117 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 65.118 Use absolute and relative cell addresses.
- 65.119 Replicate formula in a row or column.
- 65.120 Use the sum and average functions in a spreadsheet for rows and columns.

- 65.121 Print a spreadsheet.
- 65.122 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 65.123 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 65.124 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 65.125 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 65.126 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 65.127 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 65.128 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 65.129 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 65.130 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 65.131 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 65.132 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 65.133 Describe the method for creating a new spreadsheet file for a given application.
- 65.134 Describe the method for setting single and global column widths.
- 65.135 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 65.136 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 65.137 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 65.138 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 65.139 Explain the terms 'absolute' and 'relative' cell addresses.
- 65.140 Describe the method for replicating formula in a row or column.
- 65.141 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Alteration, Repair and Planned Maintenance

Practical competences

The candidate must be able to do the following:

- 65.142 Carry out the service, maintenance and repair of hot water supply systems.
Service/maintenance: water heater, tanks, pumps, time clock/programmer, thermostats
Systems: open vented, sealed
- 65.143 Carry out the service, maintenance and repair of combined hot water supply and heating systems.
Service/maintenance: water heater, tanks, pumps, time clock/programmer, control valves, thermostats
Systems: open vented, sealed
- 65.144 Install and commission a solar heating panel to an existing hot water supply/heating system.
Installation: isolate/drain existing system, pipework, pump, control valve, controls
Commission: fill, purge, function test
- 65.145 Install and commission an additional heating panel to an existing hot water heating system.
Installation: isolate/drain existing system, pipework, valves, controls
Commission: fill, purge, function test
- 65.146 Replace and commission an electric heater element in a hot water tank.
Replace: isolate/drain existing system, isolate electrical supply, remove/replace element, refill system, reconnect electrical supply, test (continuity, function)
- 65.147 Carry out the chemical cleaning of a hot water heating system.
Chemical cleaning: drain/flush system, chemical fill, purge, operate system, drain, flush, refill, purge, inspect
- 65.148 Produce a maintenance schedule for a combined hot/cold water supply and heating systems.
Schedule: water heater, pipework, tanks, pumps, time clock/programmer, control valves, thermostats
Systems: open vented, sealed
- 65.149 Produce a maintenance schedule for sanitation and drainage pipework systems.
Schedule: pipework, traps, inspection chambers, manholes, rodding points

Knowledge requirements

The instructor must ensure the candidate is able to:

- 65.150 Describe the procedure for servicing and maintaining hot water supply and heating systems.
Service/maintenance: water heater, tanks, pumps, time clock/programmer, control valves, thermostats
Systems: open vented, sealed
- 65.151 Describe the procedure for servicing and maintaining sanitation and drainage pipework systems.
Service/maintenance: pipework, traps, inspection chambers, manholes, rodding points
- 65.152 Describe, with the aid of a sketch, the layout required to install a solar heating panel to an existing hot water supply/heating system.
Layout: pipework, pump, control valve, controls
Commission: fill, purge, function test
- 65.153 Describe the procedure for commissioning a solar heating panel connected to an existing hot water supply/heating system.
Commission: fill, purge, function test
- 65.154 Describe the procedure for replacing and commission an electric heater element in a hot water tank.
Procedure: isolate/drain existing system, isolate electrical supply, remove/replace element, refill system, reconnect electrical supply, test (continuity, function)
- 65.155 Describe the procedure for chemically cleaning a hot water heating system.
Procedure: drain/flush system, chemical types (cleaners, inhibitors), chemical strength, chemical fill, purge, operate system, drain, flush, refill, purge, inspect
- 65.156 State the items to be included in a maintenance schedule for domestic, commercial and light industrial services.
Items: heaters, pipework, tanks, pumps, time clock/programmer, control valves, thermostats, meters, traps, inspection chamber/manhole, rodding points
Services: water (mains, hot/cold services), sanitation, drainage, gas
- 65.157 Describe, with the aid of a sketch, the electrical layout of a hot water heating system.
Layout: time clock/programmer, pump, control valves, thermostats, water heater, supply point

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 65.158 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 65.159 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 65.160 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 65.161 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 65.162 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 65.163 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 65.164 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 65.165 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 65.166 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 65.167 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 65.168 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 65.169 Make recommendations to improve the performance of a team.
- 65.170 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 65.171 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non-critical
- 65.172 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 65.173 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 65.174 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 65.175 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 65.176 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 65.177 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 65.178 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 65.179 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 65.180 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 65.181 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 65.182 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 65.183 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessments

Test specification for written paper Plumbing 3 Principles (6161-25-065)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	40
Communications and information technology	10
Alteration, repair and planned maintenance	10
Supervision, planning and administration	10

65 Plumbing 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- | | | |
|------|---|--------------------------|
| 65.1 | Inspect and keep records on the condition of excavations. | <input type="checkbox"/> |
| 65.2 | Inspect and keep records on the condition of scaffold platforms over 2m high. | <input type="checkbox"/> |
| 65.3 | Demonstrate methods of ensuring safe working practices. | <input type="checkbox"/> |
| 65.4 | Carry out a risk assessment and prepare a report identifying the potential hazards. | <input type="checkbox"/> |
| 65.5 | Complete an accident report for a simulated accident resulting in injury. | <input type="checkbox"/> |
| 65.6 | Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions. | <input type="checkbox"/> |
| 65.7 | Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations. | <input type="checkbox"/> |
| 65.8 | Check equipment and inspection records to ensure tools are to standard prior to issue. | <input type="checkbox"/> |
| 65.9 | Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment. | <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

65 Plumbing 3: Materials

Practical competences

The candidate must be able to do the following:

- 65.17 Identify and select fittings suitable for brazing based on their technical properties.
- 65.18 Identify and select fittings suitable for bronze welding based on their technical properties.
- 65.19 Identify and select consumable materials suitable for brazing and bronze welding.
- 65.20 Identify and select water heaters for specific applications based on their technical properties.
- 65.21 Identify and select control equipment for specific applications based on their technical properties.
- 65.22 Identify and select pumps for specific applications based on their technical properties.
- 65.23 Identify and select sterilizing material suitable for water pipework systems based on their technical properties.
- 65.24 Identify and select chemical cleaning materials for specific applications based on their technical properties.
- 65.25 Identify and select petrol/oil interceptor chambers and septic tanks for specific applications based on their technical properties.

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

65 Plumbing 3: Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

- | | | |
|-------|--|--------------------------|
| 65.34 | Calculate the volume of various shapes of excavations and trenches. | <input type="checkbox"/> |
| 65.35 | Calculate the costs for removing subsoil from excavations and trenches from given data. | <input type="checkbox"/> |
| 65.36 | Calculate the increase in subsoil volume when excavated from given data. | <input type="checkbox"/> |
| 65.37 | Calculate the costs for transporting excavated material from given data. | <input type="checkbox"/> |
| 65.38 | Calculate the quantity and cost of labour required for the installation of pipework systems from given data. | <input type="checkbox"/> |
| 65.39 | Calculate pipe sizes for specified commercial services. | <input type="checkbox"/> |
| 65.40 | Calculate pipe sizes for specified commercial services. | <input type="checkbox"/> |
| 65.41 | Measure and set out a branch connection in 54mm copper pipe suitable for bronze welding. | <input type="checkbox"/> |
| 65.42 | Measure and set out a branch connection in 100mm steel pipe suitable for bronze welding. | <input type="checkbox"/> |
| 65.43 | Measure and set out an offset in 50mm steel pipe. | <input type="checkbox"/> |
| 65.44 | Produce working drawings from plans and details of commercial pipework systems. | <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

65 Plumbing 3: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

65.56	Fabricate and braze or bronze weld a branch connection in 54mm copper pipe.	<input type="checkbox"/>	65.69	Install supports to an excavation.	<input type="checkbox"/>
65.57	Fabricate, assemble and pressure test a short section of 54mm copper pipework.	<input type="checkbox"/>	65.70	Set out, fabricate, install and test a mains fed fire sprinkler and hose reel system.	<input type="checkbox"/>
65.58	Fabricate and bronze weld a branch connection in 100mm steel pipe.	<input type="checkbox"/>	65.71	Set out, fabricate, install and test a boosted cold water system.	<input type="checkbox"/>
65.59	Apply heat bending techniques to form an offset in 50mm steel pipework.	<input type="checkbox"/>	65.72	Set out, fabricate, install and test a hot water supply system with a secondary return.	<input type="checkbox"/>
65.60	Fabricate, assemble and pressure test a short section of 100mm threaded steel pipework.	<input type="checkbox"/>	65.73	Carry out the chlorination of a commissioned cold/hot water system.	<input type="checkbox"/>
65.61	Fabricate, assemble and pressure test a short section of 50mm plastic pipework suitable for an underground mains cold water supply.	<input type="checkbox"/>			
65.62	Fabricate, assemble and pressure test a short section of 50mm plastic pipework suitable for an above ground mains cold water supply.	<input type="checkbox"/>			
65.63	Fabricate, assemble and pressure test a short section of 110mm plastic pipework suitable for a sanitary pipework or drainage system.	<input type="checkbox"/>			
65.64	Fabricate, assemble and pressure test a short section of 100mm cast iron pipework suitable for an underground mains cold water supply.	<input type="checkbox"/>			
65.65	Connect and test an electrical appliance to a suitable supply point.	<input type="checkbox"/>			
65.66	Connect and test electronic control units.	<input type="checkbox"/>			
65.67	Identify various types of subsoil.	<input type="checkbox"/>			
65.68	Carry out tests to determine the characteristics of various types of subsoil.	<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

65 Plumbing 3: Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 65.93 Draw an organisational chart showing the structure of a multi-trade construction company.
- 65.94 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 65.95 Prepare a report describing the administration systems of a multi-trade construction company.
- 65.96 Prepare a report on the key issues of customer service/care in a construction company.
- 65.97 Use information technology systems for communication.

Information Technology

Database

- 65.98 Access a database applications software package.
- 65.99 Define and create a database structure to store a given set of data.
- 65.100 Enter data into a database file.
- 65.101 Save a database file to disk with an appropriate filename in a given location.
- 65.102 Edit data in an existing database file.
- 65.103 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 65.104 Modify a database structure.
- 65.105 Print selected forms from a database.
- 65.106 Define and execute sort criteria for numeric, character and date fields.

65.107 Print a summary report of selected data from a database file.

65.108 Exit database software.

Spreadsheet

- 65.109 Access a spreadsheet applications software package.
- 65.110 Create a new spreadsheet file for a given application.
- 65.111 Set single and global column widths.
- 65.112 Create and insert appropriate spreadsheet column and row titles.
- 65.113 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 65.114 Insert and format character and numeric data.
- 65.115 Edit the contents of a cell in a spreadsheet file.
- 65.116 Insert and delete columns and rows in a spreadsheet.
- 65.117 Insert formula containing cell addresses and numbers to carry out calculations.
- 65.118 Use absolute and relative cell addresses.
- 65.119 Replicate formula in a row or column.
- 65.120 Use the sum and average functions in a spreadsheet for rows and columns.
- 65.121 Print a spreadsheet.
- 65.122 Present and print data in graphical format.
- 65.123 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 65.124 Exit spreadsheet software.

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 _____

65 Plumbing 3: Alteration, Repair and Planned Maintenance

Practical competences

The candidate must be able to do the following:

- 65.142 Carry out the service, maintenance and repair of hot water supply systems.
- 65.143 Carry out the service, maintenance and repair of combined hot water supply and heating systems.
- 65.144 Install and commission a solar heating panel to an existing hot water supply/heating system.
- 65.145 Install and commission an additional heating panel to an existing hot water heating system.
- 65.146 Replace and commission an electric heater element in a hot water tank.
- 65.147 Carry out the chemical cleaning of a hot water heating system.
- 65.148 Produce a maintenance schedule for a combined hot/cold water supply and heating systems.
- 65.149 Produce a maintenance schedule for sanitation and drainage pipework systems.

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 _____

65 Plumbing 3: Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|--------|---|--------------------------|--------|--|--------------------------|
| 65.158 | Identify various elements of a construction project and arrange in a logical sequence of events. | <input type="checkbox"/> | 65.170 | Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance. | <input type="checkbox"/> |
| 65.159 | Calculate the time required for each element of a construction project from given data. | <input type="checkbox"/> | | | |
| 65.160 | Calculate the resources required for each element of the project to complete them within the time allowed. | <input type="checkbox"/> | | | |
| 65.161 | Analyse data produced on each element of the project to determine their individual effect on the programme. | <input type="checkbox"/> | | | |
| 65.162 | Produce planning programmes for a domestic construction project. | <input type="checkbox"/> | | | |
| 65.163 | Write a method statement to carry out a craft operation. | <input type="checkbox"/> | | | |
| 65.164 | Prepare material orders with deliveries planned to support the programmed sequence of events. | <input type="checkbox"/> | | | |
| 65.165 | Record daily and weekly progress and compare with the project programme. | <input type="checkbox"/> | | | |
| 65.166 | Provide feedback to individuals and teams on daily and weekly progress. | <input type="checkbox"/> | | | |
| 65.167 | Use effective leadership methods to supervise individuals/teams working in the construction industry. | <input type="checkbox"/> | | | |
| 65.168 | Use communication skills within a team environment to achieve agreement with individuals/teams. | <input type="checkbox"/> | | | |
| 65.169 | Make recommendations to improve the performance of a team. | <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

66 Refrigeration and Air Conditioning 3 – Summary of syllabus sections

Page 132 Safety at Work

(Objectives 66.1 to 66.19)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 134 Materials (Plant and Refrigerants)

(Objectives 66.20 to 66.47)

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

Page 136 Calculations, Science and Drawing

(Objectives 66.48 to 66.88)

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

- a carry out calculations associated with the system performance of 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 139 Advanced Practical Skills

(Objectives 66.89 to 66.139)

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

- a apply advanced tools skills
- b install, test and adjust system accessories
- c install and test air distribution systems
- d install and test electrical switchgear and motors
- e commission systems
- f describe the layout and operation of refrigeration systems

Page 142 Communications and Information Technology

(Objectives 66.140 to 66.188)

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 144 Alteration and Repair

(Objectives 66.189 to 66.228)

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

- a modify (retrofit) systems as part of a maintenance or repair requirement
- b carry out fault diagnosis
- c repair defective systems or components of systems

Page 146 Supervision, Planning and Administration

(Objectives 66.229 to 66.254)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

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:

- 66.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 66.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
Methods: warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 66.3 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: movement of site plant (eg generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 66.4 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 66.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 66.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 66.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: electric power tools (eg hammer drills, jig saw, disc cutter, lighting), hand tools (eg hammer, chisel, bolster, scribers, hacksaw, files)
- 66.8 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (excavation, electrical, height)

- 66.9 Inspect and keep records of refrigerant retrofits.
Record: plant data, type of refrigerant added, disposal of old refrigerant, labels
- 66.10 Produce an audit trail for new and reclaimed refrigerant.
- 66.11 Check system refrigerants and ensure that all leak detection facilities are safe for use.
Refrigerants: hydrochlorofluoro carbon (HCFC), hydrofluoro carbon HFC, hydrochloro carbon (HC)
Facilities: intrinsically safe electronic detectors, soap solutions

Knowledge requirements

The instructor must ensure the candidate is able to:

- 66.12 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 66.13 Explain the need for communication systems to ensure the safe use of lifting or excavating machines.
Communication systems: hand signals, bell systems, two way radio
- 66.14 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 66.15 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 66.16 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 66.17 Explain the need to keep records of refrigerant retrofits.
Need: future identification
Record: plant data, type of refrigerant added, disposal of old refrigerant, labels

66.18 Explain the need to produce an audit trail for new and reclaimed refrigerant.

Need: environmental protection, requirement of Montreal protocol (as amended)

66.19 Explain the need to check system refrigerants and ensure that all leak detection facilities are safe for use.

Need: flammable nature of hydrocarbons

Refrigerants: HCFC, HFC, HC

Facilities: intrinsically safe electronic detectors, soap solutions

Materials (Plant and Refrigerants)

Practical competences

The candidate must be able to do the following:

- 66.20 Identify and select thermostatic expansion valves for specific applications based on their technical properties.
Valves: internally equalised, externally equalised
Applications: compatible with system refrigerant, slow start, rapid pull down, temperature (high, medium, low), industrial, commercial
- 66.21 Identify and select discharge line oil separators for specific applications based on their technical properties.
Separators: impingement, spiral
Applications: temperature (high, low), industrial, commercial
- 66.22 Identify and select suction line/liquid line heat exchangers for specific applications based on their technical properties.
Applications: temperature (high, low), industrial, commercial
- 66.23 Identify and select components of a hot gas defrost system for specific applications based on their technical properties.
Components: reversing valve, check valves, solenoid valves
Applications: low temperature cylinder defrost, industrial, commercial
- 66.24 Identify and select defrost timers for specific applications based on their technical properties.
Timers: mechanical, electronic
Applications: time, duration, industrial, commercial
- 66.25 Identify and select evaporator pressure regulators for specific applications based on their technical properties.
Regulators: pilot operated, non-pilot operated
Applications: multi-evaporator systems, temperature (high, low), industrial, commercial
- 66.26 Identify and select crankcase pressure regulators for specific applications based on their technical properties.
Regulators: pilot operated, non-pilot operated
Applications: frequent start systems, high pull down loads, industrial, commercial
- 66.27 Identify and select suitable replacement refrigerants for specific applications based on their technical properties.
Refrigerants: replaced (CFCs, HCFCs), replacements (zeotropic blends)
Applications: temperature (high, medium, low), industrial, commercial
- 66.28 Identify and select oils compatible with system refrigerants for specific applications based on their technical properties.
Oils: synthetic
Applications: temperature (high, medium, low), industrial, commercial
- 66.29 Identify and select seal materials for specific applications based on their technical properties.
Applications: compatible with system refrigerants, temperature (high, medium, low), industrial, commercial
- 66.30 Identify and select chemicals suitable for use as secondary refrigerants for specific applications based on their technical properties.
Chemicals: glycols, salts (eg calcium chloride)
Applications: eg ice rinks, major cold stores, liquid cooling
- 66.31 Identify and select fans for specific applications based on their technical properties.
Fans: centrifugal, axial flow
Applications: evaporators, condensers, ducting, temperature (high, medium, low), industrial, commercial
- 66.32 Identify and select air filters for specific applications based on their technical properties.
Filters: viscous, dry, roller, absolute
Applications: fresh air intake, mixed air, industrial, commercial
- 66.33 Identify and select drive couplings for specific applications based on their technical properties.
Drive couplings: flexible
Applications: direct drive motor compressor sets

Knowledge requirements

The instructor must ensure the candidate is able to:

- 66.34 State the technical properties of thermostatic expansion valves.
Properties: phial charge
Valves: internally equalised, externally equalised
- 66.35 State the technical properties of discharge line oil separators.
Properties: separation method
Separators: impingement, spiral
- 66.36 State the technical properties of suction line/liquid line heat exchangers.
Properties: superheating suction vapour, subcooling of liquid, static pressure loss compensation

- 66.37 State the technical properties of components for a hot gas defrost system.
Properties: flow control
Components: reversing valve, check valves, solenoid valves
- 66.38 State the technical properties of defrost timers.
Properties: operational frequency, duration, circuit switching
Timers: mechanical, electronic
- 66.39 State the technical properties of evaporator pressure regulators.
Properties: maintain minimum evaporator pressure
Regulators: pilot operated, non-pilot operated
- 66.40 State the technical properties of crankcase pressure regulators.
Properties: control of maximum crankcase pressure
Regulators: pilot operated, non-pilot operated
- 66.41 State the technical properties of suitable replacement refrigerants.
Properties: similar pressure/temperature characteristics, latent heats
Refrigerants: zeotropic blends
- 66.42 State the technical properties of oils compatible with system refrigerants.
Properties: compatible with system refrigerant/materials
Oils: synthetic
- 66.43 State the technical properties of seal materials.
Properties: not soluble in system oil/refrigerant
- 66.44 State the technical properties of chemicals suitable for use as secondary refrigerants.
Properties: solubility, freezing point
Chemicals: glycols, salts (eg calcium chloride)
- 66.45 State the technical properties of fans for specific applications.
Properties: volume, static head
Fans: centrifugal, axial flow
- 66.46 State the technical properties of air filters.
Properties: filter efficiency, dust holding capacity, pressure drop
Filters: viscous, dry, roller, absolute
- 66.47 State the technical properties of drive couplings.
Properties: rating (power, speed), shaft diameters
Drive couplings: flexible

Practical competences

The candidate must be able to do the following:

- 66.48 Use pressure enthalpy (pH) charts or refrigerant data tables to determine the energy transfers occurring during a refrigeration process.
Energy transfers: refrigeration effect (RE), compressor work done (WD), heat rejected at condenser (QR)
- 66.49 Plot refrigeration cycles on pH charts, or use data from tables, to determine the state points during a vapour compression cycle.
State points: discharge temperature, expansion valve inlet temperature, dryness fraction (quality) at evaporator inlet
- 66.50 Use values obtained from pH charts or data tables to calculate general system capacities for given parameters.
System capacities: cooling duty (kW, kJ/kg), condenser duty, shaft input power, mass flow rate, compressor displacement, coefficient of performance (COP)
Parameters: eg evaporator pressure, condenser pressure, suction temperature, flow rate, capacity
- 66.51 Carry out calculations with defined parameters to determine compressor volumetric efficiency.
Parameters: volume induced, volume swept, zero clearance volume, actual clearance volume
- 66.52 Use pH charts or data tables to carry out simple flow calculations on compound refrigeration systems.
Calculations: mass balance, energy balance, flow through intercooler
- 66.53 Calculate the theoretical interstage pressure for a compound refrigeration system using geometrical progression.
- 66.54 Using mass/energy balance calculations on compound refrigeration systems, determine the value of the intermediate temperature refrigeration duty.
- 66.55 Use information obtained from psychrometric charts to calculate duties, condition and state points for air conditioning processes.
Duties/conditions/state points: cooling duty, volume flow rate, mixed air temperature, room ratio line, apparatus dew point (mean coil surface temperature), preheat/reheat loads
- 66.56 Calculate the sizes of ducts required for various air flow systems.
Calculations: duct size charts, equal pressure method
- 66.57 Calculate the pressure drop through various duct systems.
Pressure drop: bends, grilles, diffusers, dampers
- 66.58 Calculate the size of pipes needed for refrigeration/air conditioning systems using the relationship between volume flow, standard flow velocity, cross sectional area.
Pipe sizes: suction line, discharge line, liquid line
Velocities: suction 8-10 m/s, discharge 10-12 m/s, liquid 1-1.5 m/s
- 66.59 Sketch a skeleton pressure enthalpy (pH) chart showing the property lines.
Property lines: pressure, enthalpy, specific volume, entropy, temperature, quality (dryness fraction)
- 66.60 Use a skeleton pH chart to show simple vapour compression cycles.
Cycles: saturated cycle, superheated cycle, cycle with subcooling
- 66.61 Use cycle drawings of skeleton pH charts, to identify the various processes which occur in a refrigeration system.
Processes: compression, desuperheating, condensation, subcooling, expansion, evaporation, suction line superheating
- 66.62 Sketch a skeleton psychrometric chart showing the various property lines.
Property lines: dry bulb temperature, wet bulb temperature, moisture content, specific volume, enthalpy, % saturation
- 66.63 Use a psychrometric chart to identify the parts of various air conditioning processes.
Processes: sensible heating, sensible cooling, cooling and dehumidification, cooling and humidification
- 66.64 Use a psychrometric chart to illustrate the components of an air conditioning process.
Process: air mixing, air cooling, apparatus dew point, room ratio line, supply air condition, pre heating, after heating
- 66.65 Draw simple line diagrams to show the layout and components of compound refrigeration systems.
Components: low stage compressor, high stage compressor, intercooler (open flush, closed flush, liquid subcooler)
- 66.66 Draw simple line diagrams to show the layout and components of a cascade refrigeration system.
Components: low temperature system, high temperature system, cascade condenser, expansion vessel, pressure relief valves, safety cut outs

Knowledge requirements

The instructor must ensure the candidate is able to:

- 66.67 Identify the use of pressure enthalpy (pH) charts or refrigerant data tables to determine the energy transfers occurring during a refrigeration process.
Energy transfers: refrigeration effect (RE), compressor work done (WD), heat ejected at condenser (QR)
- 66.68 Identify refrigeration cycles on pH charts, and the use data from tables, to determine the state points during a vapour compression cycle.
State points: discharge temperature, expansion valve inlet temperature, dryness fraction (quality) at evaporator inlet
- 66.69 Identify the use of values obtained from pH charts and data tables to calculate general system capacities for given parameters.
System capacities: cooling duty (kW, kJ/kg), condenser duty, shaft input power, mass flow rate, compressor displacement, coefficient of performance (COP)
Parameters: eg evaporator pressure, condenser pressure, suction temperature, flow rate, capacity
- 66.70 Identify calculations with defined parameters to determine compressor volumetric efficiency.
Parameters: volume induced, volume swept, zero clearance volume, actual clearance volume
- 66.71 Identify the use of pH charts and data tables to carry out simple flow calculations on compound refrigeration systems.
Calculations: mass balance, energy balance, flow through intercooler
- 66.72 Identify calculations involving the theoretical interstage pressure for a compound refrigeration system using geometrical progression.
- 66.73 Identify the use of mass/energy balance calculations on compound refrigeration systems to determine the value of the intermediate temperature refrigeration duty.
- 66.74 Identify the use of information obtained from psychrometric charts to calculate duties, condition and state points for air conditioning processes.
Duties/conditions/state points: cooling duty, volume flow rate, mixed air temperature, room ratio line, apparatus dew point (mean coil surface temperature), preheat/reheat loads
- 66.75 Identify calculations involving the sizes of ducts required for various air flow systems.
Calculations: duct size charts, equal pressure method
- 66.76 Identify calculations involving the pressure drop through various duct systems.
Pressure drop: bends, grilles, diffusers, dampers
- 66.77 Identify calculations involving the size of pipes needed for refrigeration/air conditioning systems using the relationship between volume flow, standard flow velocity, cross sectional area.
Pipe sizes: suction line, discharge line, liquid line
Velocities: suction 8-10 m/s, discharge 10-12 m/s, liquid 1-1.5 m/s
- 66.78 Identify sketches of skeleton pressure enthalpy (pH) charts showing the property lines.
Property lines: pressure, enthalpy, specific volume, entropy, temperature, quality (dryness fraction)
- 66.79 Identify the use of skeleton pH charts showing simple vapour compression cycles.
Cycles: saturated cycle, superheated cycle, cycle with subcooling
- 66.80 Identify the use of cycle drawings of skeleton pH charts, to identify the various processes which occur in a refrigeration system.
Processes: compression, desuperheating, condensation, subcooling, expansion, evaporation, suction line superheating
- 66.81 Identify sketches of skeleton psychrometric charts showing the various property lines.
Property lines: dry bulb temperature, wet bulb temperature, moisture content, specific volume, enthalpy, % saturation
- 66.82 Identify the use of psychrometric charts to identify the parts of various air conditioning processes.
Processes: sensible heating, sensible cooling, cooling and dehumidification, cooling and humidification
- 66.83 Identify the use of psychrometric chart to illustrate the components of an air conditioning process.
Process: air mixing, air cooling, apparatus dew point, room ratio line, supply air condition, pre heating, after heating
- 66.84 Identify simple line diagrams showing the layout and components of compound refrigeration systems.
Components: low stage compressor, high stage compressor, intercooler (open flush, closed flush, liquid subcooler)

- 66.85 Identify simple line diagrams showing the layout and components of a cascade refrigeration system.
Components: low temperature system, high temperature system, cascade condenser, expansion vessel, pressure relief valves, safety cut outs
- 66.86 Identify the general methods for preserving food.
Methods: chilling, freezing, drying, smoking, canning, salting, pickling
- 66.87 Identify the effects food spoilage agents have upon stored products.
Spoilage agents: bacteria, enzymes, mould, yeast
- 66.88 State the effect on chilled/frozen food products of various storage conditions.
Storage conditions: humidity, air movement, air velocity, air temperature, product packaging

Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

Advanced tool skills

66.89 Fabricate, assemble and pressure test a short section of 54 mm copper pipework.

Pipework: minimum (1 x connector, 1 x 54mm equal tee, 1 x 90° elbow, 1 x 28 mm branch, 1 x 54mm flange), joints silver soldered

Pressure test: oxygen free nitrogen (17 bar)

66.90 Apply machine bending techniques to form an offset in 22 mm extra thick walled copper pipe.

Offset: minimum 1 diameter

Installation and testing of system accessories

66.91 Install, test and adjust thermostatic expansion valves.

Test/adjustment: superheat settings

66.92 Install, test and adjust a discharge line oil separator.

Test/adjustment: leak free, ensure free oil drainage

66.93 Install and test a suction line accumulator.

Test: leak free

66.94 Install and test a suction line/liquid line heat exchanger.

Test: leak free

66.95 Install and test suction and discharge line vibration eliminators.

Test: leak free

66.96 Install and test a hot gas defrost system.

Test: leak free, function

66.97 Install and test an electric defrost system.

Test: electrical (continuity, safety), function

66.98 Install, test and set a defrost timer.

Test: electrical (continuity, safety), function

Set: defrosts (number, duration)

66.99 Install, test and adjust an evaporator pressure regulator.

Test: leak free, function

Adjustment: set point value

Pressure regulator: pilot valve operated, non-pilot valve operated

66.100 Install, test and adjust a crankcase pressure regulator.

Test: leak free, function

Adjustment: set point value

Pressure regulator: pilot valve operated, non-pilot valve operated

66.101 Install and test a simple hot gas bypass for capacity control.

66.102 Install insulation to system pipework.

Install: fully sealed to prevent water vapour penetration, insulated clamps

Insulation: preformed

Installation and testing of air distribution systems

66.103 Assemble and install air distribution ductwork.

Ductwork: circular cross section, minimum (1 x 90° bend, 1 x reducing tee piece), support brackets

66.104 Install, test and adjust ductwork dampers.

Test: function

Adjust: degree of opening

66.105 Install and adjust diffusers, grills and registers.

Adjust: diffusers (design airflow)

66.106 Install air filters and monitoring equipment.

Air filters: fresh, return

Monitoring equipment: manometers

66.107 Install and test humidifiers.

Test: function

Humidifiers: spinning disc, steam injection

Installation and testing of electrical switchgear and motors

66.108 Install and test electrical switchgear and motors.

Switchgear: single/three phase starters

Motors: single phase, three phase

Testing: conductor continuity (live, protective conductors), insulation resistance, earth loop impedance, functional, approved test equipment

System commissioning

66.109 Carry out a visual inspection of an installed system.

Visual inspection: correct installation, system to specification

66.110 Carry out an electrical inspection of an installed system.

Electrical inspection: continuity, earthing

66.111 Carry out a system strength (pressure) test of an installed system.

Strength/Pressure test: 1.3 x system working pressure

66.112 Evacuate a tested system to a pressure of 25 Torr.

66.113 Carry out a system pressure test using oxygen free nitrogen.

Pressure test: 1.1 x system working pressure, soap solution

66.114 Evacuate oxygen free nitrogen from a tested system and charge with refrigerant.

66.115 Run system and check for dynamic performance.
Dynamic performance: evaporator air on/air off temperatures, condenser air on/air off temperatures, suction pressure, discharge pressure, compressor body temperature, liquid line temperature, cold space temperature, power demand, function of system accessories

Knowledge requirements

The instructor must ensure the candidate is able to:

Advanced tool skills

66.116 Describe, with the aid of a sketch, the technique for silver soldering copper pipe and fittings.
Technique: joint preparation, application of flux, type of flame, angle of flame, nozzle size, gas pressures, direction of travel

Installation and testing of system accessories

- 66.117 Describe, with the aid of a sketch, the method of installing, testing and adjusting thermostatic expansion valves.
Testing/adjustment: superheat settings
- 66.118 Describe, with the aid of a sketch, the method of installing, testing and adjusting a discharge line oil separator.
Testing/adjustment: leak free, ensure free oil drainage
- 66.119 Describe, with the aid of a sketch, the method of installing and testing a suction line accumulator.
Testing: leak free
- 66.120 Describe, with the aid of a sketch, the method of installing and testing a suction line/liquid line heat exchanger.
Testing: leak free
- 66.121 Describe, with the aid of a sketch, the method of installing and testing suction and discharge line vibration eliminators.
Testing: leak free
- 66.122 Describe, with the aid of a sketch, the method of installing and testing a hot gas defrost system.
Testing: leak free, function
- 66.123 Describe, with the aid of a sketch, the method of installing and testing an electric defrost system.
Testing: electrical (continuity, safety), function
- 66.124 Describe, with the aid of a sketch, the method of installing, testing and setting a defrost timer.
Testing: electrical (continuity, safety), function
Set: defrosts (number, duration)

66.125 Describe, with the aid of a sketch, the method of installing, testing and adjusting an evaporator pressure regulator.
Testing: leak free, function
Adjustment: set point value
Pressure regulator: pilot valve operated, non-pilot valve operated

66.126 Describe, with the aid of a sketch, the method of installing, testing and adjusting a crankcase pressure regulator.
Testing: leak free, function
Adjustment: set point value
Pressure regulator: pilot valve operated, non-pilot valve operated

66.127 Describe, with the aid of a sketch, the method of installing and testing a simple hot gas bypass for capacity control.

66.128 Describe, with the aid of a sketch, the method of installing insulation to system pipework.
Installation: fully sealed to prevent water vapour penetration, insulated clamps
Insulation: preformed

Installation and testing of air distribution systems

- 66.129 Describe, with the aid of a sketch, the method of assembling and installing air distribution ductwork.
Ductwork: circular cross section, minimum (1 x 90° bend, 1 x reducing tee piece) , support brackets
- 66.130 Describe, with the aid of a sketch, the method of installing, testing and adjusting ductwork dampers.
Testing: function
Adjusting: degree of opening
- 66.131 Describe, with the aid of a sketch, the method of installing and adjusting diffusers, grills and registers.
Adjusting: diffusers (design airflow)
- 66.132 Describe, with the aid of a sketch, the method of installing air filters and monitoring equipment.
Air filters: fresh, return
Monitoring equipment: manometers
- 66.133 Describe, with the aid of a sketch, the method of installing and testing humidifiers.
Testing: function
Humidifiers: spinning disc, steam injection
- 66.134 Describe the process of water treatment to remove the risk of transmitting legionella bacteria.

Installation and testing of electrical switchgear and motors

- 66.135 Describe, with the aid of a sketch, the method of installing and testing electrical switchgear and motors.
Switchgear: single/three phase starters
Motors: single phase, three phase
Testing: conductor continuity (live, protective conductors), insulation resistance, earth loop impedance, functional, approved test equipment

Refrigeration systems

- 66.136 Describe, with the aid of a sketch, the layout and operation of compound refrigeration systems.
Layout: eg intercoolers (open flash, closed flash, direct injection), direct injection sub cooler, compressor, condenser, pressure relief valve, pressure controls, temperature sensors, pipework
Systems: internally compounded, externally compounded
- 66.137 Describe, with the aid of a sketch, the layout and operation of a cascade refrigeration system.
Layout: eg cascade condenser, low stage expansion tank, refrigerant combinations, compressor, condenser, pressure relief valve, pressure controls, temperature sensors, pipework
Systems: eg two stage, three stage
- 66.138 Describe, with the aid of a sketch, the layout and operation of a secondary refrigerant system.
Layout: eg primary refrigerant circuit (compressor, condenser, pressure relief valve, pressure controls, temperature sensors, pipework), liquid chilling evaporator (no flow switches, chilled liquid temperature control), secondary refrigerant pumps, mixing tanks, agitators
- 66.139 Describe, with the aid of a sketch, the layout and operation of air cycle refrigeration systems.
Layout: eg first stage compressor, heat exchangers, fans, turbines, temperature sensors, ductwork
Systems: eg simple air cycle, bootstrap, three wheel bootstrap

Practical competences

The candidate must be able to do the following:

Communications

- 66.140 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 66.141 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 66.142 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 66.143 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 66.144 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 66.145 Access a database applications software package.
- 66.146 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 66.147 Enter data into a database file.
- 66.148 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 66.149 Edit data in an existing database file.
Edit: add, delete, amend

- 66.150 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 66.151 Modify a database structure.
Modify: fields (add, delete), change data type, change field length
- 66.152 Print selected forms from a database.
Selected forms: from 66.150 above
- 66.153 Define and execute sort criteria for numeric, character and date fields.
- 66.154 Print a summary report of selected data from a database file.
- 66.155 Exit database software.

Spreadsheet

- 66.156 Access a spreadsheet applications software package.
- 66.157 Create a new spreadsheet file for a given application.
- 66.158 Set single and global column widths.
- 66.159 Create and insert appropriate spreadsheet column and row titles.
- 66.160 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
Cursor keys: up, down, left, right
Mouse control: point and click, use of scroll bars
- 66.161 Insert and format character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 66.162 Edit the contents of a cell in a spreadsheet file.
Edit: add, amend, replace, delete
- 66.163 Insert and delete columns and rows in a spreadsheet.
- 66.164 Insert formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 66.165 Use absolute and relative cell addresses.
- 66.166 Replicate formula in a row or column.
- 66.167 Use the sum and average functions in a spreadsheet for rows and columns.

- 66.168 Print a spreadsheet.
- 66.169 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 66.170 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 66.171 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 66.172 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 66.173 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 66.174 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 66.175 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 66.176 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 66.177 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 66.178 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 66.179 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 66.180 Describe the method for creating a new spreadsheet file for a given application.
- 66.181 Describe the method for setting single and global column widths.
- 66.182 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 66.183 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 66.184 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 66.185 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 66.186 Explain the terms 'absolute' and 'relative' cell addresses.
- 66.187 Describe the method for replicating formula in a row or column.
- 66.188 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Alteration and Repair

Practical competences

The candidate must be able to do the following:

Alteration (Retrofit)

- 66.189 Change crankcase oil with a suitable replacement during a refrigerant retrofit.
Oil: compatible with new refrigerant
- 66.190 Replace an expansion valve as part of a refrigerant retrofit.
Expansion valve: suitability (for new refrigerant, system duty)
- 66.191 Adjust the superheat setting or thermostatic expansion valve to suit new refrigerant.
Superheat setting: refrigerant data, temperature glide
- 66.192 Replace seal material, where required, during a refrigerant retrofit.
Seal material: compatible with new refrigerant
- 66.193 Adjust the pressure cut out settings for retrofitted refrigerants.
Settings: pressure, temperature, refrigerant data
- 66.194 Reset the operating values for evaporator pressure regulator to suit new refrigerant.
Operating values: pressure, temperature, refrigerant data
- 66.195 Reset the operating values for crankcase pressure regulator to suit new refrigerant.
Operating values: pressure, temperature, refrigerant data
- 66.196 Replace existing CFC/HCFC refrigerant with new generation material.
- 66.197 Fit replacement labels to system components to provide evidence of refrigerant retrofit.
Labels: refrigerant (type, number, quantity)
Components: liquid receiver, condensing unit case

Repair and Planned Maintenance

- 66.198 Replace a defective compressor.
Compressor: hermetic, semi hermetic
- 66.199 Replace a damaged evaporator within a vapour compression system.
Evaporator: forced convection, defrost (eg electric, hot gas)
- 66.200 Use an acid test kit to check the quality of the compressor oil.
Test kit: propriety kit

- 66.201 Use appropriate instruments to identify a burnt out compressor.
Instruments: continuity tester
Compressors: hermetic, semi hermetic
- 66.202 Diagnose and repair or replace a defective evaporator fan.
Diagnosis: system operation, use of instruments
- 66.203 Diagnose and repair or replace a defective condenser fan.
Diagnosis: system operation, use of instruments
- 66.204 Use appropriate equipment to clear contaminants from a system after a burn out.
Equipment: burn out dryer
Contaminants: acids, carbon
- 66.205 Inspect and refit a drive coupling for a direct drive motor compressor set.
Inspect/refit: manufacturers' data
- 66.206 Replace defective crankcase heaters.
Crankcase heaters: internal, external
- 66.207 Diagnose and replace a defective defrost heater.
Diagnose: appropriate instruments
- 66.208 Diagnose and replace a defective reversing/hot gas defrost valve.
Diagnose: appropriate instruments

Knowledge requirements

The instructor must ensure the candidate is able to:

Alteration (Retrofit)

- 66.209 Describe, with the aid of a sketch, the procedure for changing crankcase oil with a suitable replacement during a refrigerant retrofit.
Oil: compatible with new refrigerant
- 66.210 Describe, with the aid of a sketch, the procedure for replacing an expansion valve as part of a refrigerant retrofit.
Expansion valve: suitability (for new refrigerant, system duty)
- 66.211 Explain the procedure for adjusting the superheat setting or thermostatic expansion valve to suit new refrigerant.
Superheat setting: refrigerant data, temperature guide
- 66.212 Identify, with the aid of data sheets, the refrigerants that would require system seals to be replaced during a refrigerant retrofit.

- 66.213 Explain the method for determining new set points, and the procedure for adjusting the pressure cut out settings for retrofitted refrigerants.
Settings: pressure, temperature, refrigerant data
- 66.214 Describe, with the aid of a sketch, the procedure for resetting the operating values for evaporator pressure regulator to suit new refrigerant.
Operating values: pressure, temperature, refrigerant data
- 66.215 Describe, with the aid of a sketch, the procedure for resetting the operating values for crankcase pressure regulator to suit new refrigerant.
Operating values: pressure, temperature, refrigerant data
- 66.216 Describe the procedure for replacing existing CFC/HCFC refrigerant with new generation material.
- 66.217 Explain the importance of fitting replacement labels to system components to provide evidence of refrigerant retrofit.
Labels: refrigerant (type, number, quantity)
Components: liquid receiver, condensing unit case
- 66.224 Describe, with the aid of a sketch, the process used to clear contaminants from a system after a burn out.
Process: burn out dryer
Contaminants: acids, carbon
- 66.225 Describe, with the aid of a sketch, the procedure for inspecting and refitting a drive coupling for a direct drive motor compressor set.
Inspect/refit: manufacturers' data
- 66.226 Describe the procedure for diagnosing and replacing a defective crankcase heater.
Diagnosis: appropriate instruments
Crankcase heaters: internal, external
- 66.227 Describe, with the aid of a sketch, the procedure for diagnosing and replacing a defective defrost heater.
Diagnose: appropriate instruments
- 66.228 Describe, with the aid of a sketch, the procedure for diagnosing and replacing a defective reversing/hot gas defrost valve.
Diagnose: appropriate instruments

Repair and Planned Maintenance

- 66.218 Describe the procedure for replacing a defective compressor.
Compressor: hermetic, semi hermetic
- 66.219 Describe, with the aid of a sketch, the procedure for replacing a damaged evaporator within a vapour compression system.
Evaporator: forced convection, defrost (eg electric, hot gas)
- 66.220 Explain the procedure for using an acid test kit to check the quality of the compressor oil.
Test kit: propriety kit
- 66.221 Describe how instruments are used to identify a burnt out compressor.
Instruments: continuity tester
Compressors: hermetic, semi hermetic
- 66.222 Describe, with the aid of a sketch, the procedure for diagnosing and repairing or replacing a defective evaporator fan.
Diagnosis: system operation, use of instruments
- 66.223 Describe, with the aid of a sketch, the procedure for diagnosing and repairing or replacing a defective condenser fan.
Diagnosis: system operation, use of instruments

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 66.229 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 66.230 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 66.231 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 66.232 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 66.233 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 66.234 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 66.235 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 66.236 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 66.237 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 66.238 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making

- 66.239 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 66.240 Make recommendations to improve the performance of a team.
- 66.241 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 66.242 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non-critical
- 66.243 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 66.244 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 66.245 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 66.246 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 66.247 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 66.248 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 66.249 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 66.250 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 66.251 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 66.252 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 66.253 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 66.254 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessments

Test specification for written paper Refrigeration and Air Conditioning 3 Principles (6161-26-066)

This is a structured answer examination paper lasting three hours comprising 12 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 (plant and refrigerants)	10
Calculations, science and drawing	15
Advanced practical skills	25
Communications and information technology	10
Alteration and repair	15
Supervision, planning and administration	15

66 Refrigeration and Air Conditioning 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- 66.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
- 66.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery or alongside road traffic.
- 66.3 Carry out a risk assessment and prepare a report identifying the potential hazards.
- 66.4 Complete an accident report for a simulated accident resulting in injury.
- 66.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
- 66.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
- 66.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
- 66.8 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
- 66.9 Inspect and keep records of refrigerant retrofits.
- 66.10 Produce an audit trail for new and reclaimed refrigerant.
- 66.11 Check system refrigerants and ensure that all leak detection facilities are safe for use.

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

Refrigeration and Air Conditioning 3: Materials (Plant and Refrigerants)

Practical competences

The candidate must be able to do the following:

66.20	Identify and select thermostatic expansion valves for specific applications based on their technical properties.	<input type="checkbox"/>	66.30	Identify and select chemicals suitable for use as secondary refrigerants for specific applications based on their technical properties.	<input type="checkbox"/>
66.21	Identify and select discharge line oil separators for specific applications based on their technical properties.	<input type="checkbox"/>	66.31	Identify and select fans for specific applications based on their technical properties.	<input type="checkbox"/>
66.22	Identify and select suction line/liquid line heat exchangers for specific applications based on their technical properties.	<input type="checkbox"/>	66.32	Identify and select air filters for specific applications based on their technical properties.	<input type="checkbox"/>
66.23	Identify and select components of a hot gas defrost system for specific applications based on their technical properties.	<input type="checkbox"/>	66.33	Identify and select drive couplings for specific applications based on their technical properties.	<input type="checkbox"/>
66.24	Identify and select defrost timers for specific applications based on their technical properties.	<input type="checkbox"/>			
66.25	Identify and select evaporator pressure regulators for specific applications based on their technical properties.	<input type="checkbox"/>			
66.26	Identify and select crankcase pressure regulators for specific applications based on their technical properties.	<input type="checkbox"/>			
66.27	Identify and select suitable replacement refrigerants for specific applications based on their technical properties.	<input type="checkbox"/>			
66.28	Identify and select oils compatible with system refrigerants for specific applications based on their technical properties.	<input type="checkbox"/>			
66.29	Identify and select seal materials for specific applications based on their technical properties.	<input type="checkbox"/>			

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

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Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

Refrigeration and Air Conditioning 3: Calculations, Science and Drawing

Practical competences

The candidate must be able to do the following:

- | | | | | | |
|-------|---|--------------------------|-------|--|--------------------------|
| 66.48 | Use pressure enthalpy (pH) charts or refrigerant data tables to determine the energy transfers occurring during a refrigeration process. | <input type="checkbox"/> | 66.59 | Sketch a skeleton pressure enthalpy (pH) chart showing the property lines. | <input type="checkbox"/> |
| 66.49 | Plot refrigeration cycles on pH charts, or use data from tables, to determine the state points during a vapour compression cycle. | <input type="checkbox"/> | 66.60 | Use a skeleton pH chart to show simple vapour compression cycles. | <input type="checkbox"/> |
| 66.50 | Use values obtained from pH charts or data tables to calculate general system capacities for given parameters. | <input type="checkbox"/> | 66.61 | Use cycle drawings of skeleton pH charts, to identify the various processes which occur in a refrigeration system. | <input type="checkbox"/> |
| 66.51 | Carry out calculations with defined parameters to determine compressor volumetric efficiency. | <input type="checkbox"/> | 66.62 | Sketch a skeleton psychrometric chart showing the various property lines. | <input type="checkbox"/> |
| 66.52 | Use pH charts or data tables to carry out simple flow calculations on compound refrigeration systems. | <input type="checkbox"/> | 66.63 | Use a psychrometric chart to identify the parts of various air conditioning processes. | <input type="checkbox"/> |
| 66.53 | Calculate the theoretical interstage pressure for a compound refrigeration system using geometrical progression. | <input type="checkbox"/> | 66.64 | Use a psychrometric chart to illustrate the components of an air conditioning process. | <input type="checkbox"/> |
| 66.54 | Using mass/energy balance calculations on compound refrigeration systems, determine the value of the intermediate temperature refrigeration duty. | <input type="checkbox"/> | 66.65 | Draw simple line diagrams to show the layout and components of compound refrigeration systems. | <input type="checkbox"/> |
| 66.55 | Use information obtained from psychrometric charts to calculate duties, condition and state points for air conditioning processes. | <input type="checkbox"/> | 66.66 | Draw simple line diagrams to show the layout and components of a cascade refrigeration system. | <input type="checkbox"/> |
| 66.56 | Calculate the sizes of ducts required for various air flow systems. | <input type="checkbox"/> | | | |
| 66.57 | Calculate the pressure drop through various duct systems. | <input type="checkbox"/> | | | |
| 66.58 | Calculate the size of pipes needed for refrigeration/air conditioning systems using the relationship between volume flow, standard flow velocity, cross sectional area. | <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

Refrigeration and Air Conditioning 3: Advanced Practical Skills

Practical competences

The candidate must be able to do the following:

66.89 Fabricate, assemble and pressure test a short section of 54 mm copper pipework.

66.90 Apply machine bending techniques to form an offset in 22 mm extra thick walled copper pipe.

Installation and testing of system accessories

66.91 Install, test and adjust thermostatic expansion valves.

66.92 Install, test and adjust a discharge line oil separator.

66.93 Install and test a suction line accumulator.

66.94 Install and test a suction line/liquid line heat exchanger.

66.95 Install and test suction and discharge line vibration eliminators.

66.96 Install and test a hot gas defrost system.

66.97 Install and test an electric defrost system.

66.98 Install, test and set a defrost timer.

66.99 Install, test and adjust an evaporator pressure regulator.

66.100 Install, test and adjust a crankcase pressure regulator.

66.101 Install and test a simple hot gas bypass for capacity control.

66.102 Install insulation to system pipework.

Installation and testing of air distribution systems

66.103 Assemble and install air distribution ductwork.

66.104 Install, test and adjust ductwork dampers.

66.105 Install and adjust diffusers, grills and registers.

66.106 Install air filters and monitoring equipment.

66.107 Install and test humidifiers.

Installation and testing of electrical switchgear and motors

66.108 Install and test electrical switchgear and motors.

System commissioning

66.109 Carry out a visual inspection of an installed system.

66.110 Carry out an electrical inspection of an installed system.

66.111 Carry out a system strength (pressure) test of an installed system.

66.112 Evacuate a tested system to a pressure of 25 Torr.

66.113 Carry out a system pressure test using oxygen free nitrogen.

66.114 Evacuate oxygen free nitrogen from a tested system and charge with refrigerant.

66.115 Run system and check for dynamic performance.

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

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Candidate name (please print)

Instructor signature

Instructor name (please print)

Completion date

Refrigeration and Air Conditioning 3: Communications and Information Technology

Practical competences

The candidate must be able to do the following:

- 66.140 Draw an organisational chart showing the structure of a multi-trade construction company.
- 66.141 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 66.142 Prepare a report describing the administration systems of a multi-trade construction company.
- 66.143 Prepare a report on the key issues of customer service/care in a construction company.
- 66.144 Use information technology systems for communication.

Information Technology

Database

- 66.145 Access a database applications software package.
- 66.146 Define and create a database structure to store a given set of data.
- 66.147 Enter data into a database file.
- 66.148 Save a database file to disk with an appropriate filename in a given location.
- 66.149 Edit data in an existing database file.
- 66.150 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 66.151 Modify a database structure.
- 66.152 Print selected forms from a database.
- 66.153 Define and execute sort criteria for numeric, character and date fields.

- 66.154 Print a summary report of selected data from a database file.
- 66.155 Exit database software.

Spreadsheet

- 66.156 Access a spreadsheet applications software package.
- 66.157 Create a new spreadsheet file for a given application.
- 66.158 Set single and global column widths.
- 66.159 Create and insert appropriate spreadsheet column and row titles.
- 66.160 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 66.161 Insert and format character and numeric data.
- 66.162 Edit the contents of a cell in a spreadsheet file.
- 66.163 Insert and delete columns and rows in a spreadsheet.
- 66.164 Insert formula containing cell addresses and numbers to carry out calculations.
- 66.165 Use absolute and relative cell addresses.
- 66.166 Replicate formula in a row or column.
- 66.167 Use the sum and average functions in a spreadsheet for rows and columns.
- 66.168 Print a spreadsheet.
- 66.169 Present and print data in graphical format.
- 66.170 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 66.171 Exit spreadsheet software.

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 _____

Refrigeration and Air Conditioning 3: Alteration and Repair

Practical competences

The candidate must be able to do the following:

- | | | |
|--------|--|--------------------------|
| 66.189 | Change crankcase oil with a suitable replacement during a refrigerant retrofit. | <input type="checkbox"/> |
| 66.190 | Replace an expansion valve as part of a refrigerant retrofit. | <input type="checkbox"/> |
| 66.191 | Adjust the superheat setting or thermostatic expansion valve to suit new refrigerant. | <input type="checkbox"/> |
| 66.192 | Replace seal material, where required, during a refrigerant retrofit. | <input type="checkbox"/> |
| 66.193 | Adjust the pressure cut out settings for retrofitted refrigerants. | <input type="checkbox"/> |
| 66.194 | Reset the operating values for evaporator pressure regulator to suit new refrigerant. | <input type="checkbox"/> |
| 66.195 | Reset the operating values for crankcase pressure regulator to suit new refrigerant. | <input type="checkbox"/> |
| 66.196 | Replace existing CFC/HCFC refrigerant with new generation material. | <input type="checkbox"/> |
| 66.197 | Fit replacement labels to system components to provide evidence of refrigerant retrofit. | <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

Repair and Planned Maintenance

- 66.198 Replace a defective compressor.
- 66.199 Replace a damaged evaporator within a vapour compression system.
- 66.200 Use an acid test kit to check the quality of the compressor oil.
- 66.201 Use appropriate instruments to identify a burnt out compressor.
- 66.202 Diagnose and repair or replace a defective evaporator fan.
- 66.203 Diagnose and repair or replace a defective condenser fan.
- 66.204 Use appropriate equipment to clear contaminants from a system after a burn out.
- 66.205 Inspect and refit a drive coupling for a direct drive motor compressor set.
- 66.206 Replace defective crankcase heaters.
- 66.207 Diagnose and replace a defective defrost heater.
- 66.208 Diagnose and replace a defective reversing/hot gas defrost valve.

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 _____

Refrigeration and Air Conditioning 3: Supervision, Planning and Administration

- 66.229 Identify various elements of a construction project and arrange in a logical sequence of events.
- 66.230 Calculate the time required for each element of a construction project from given data.
- 66.231 Calculate the resources required for each element of the project to complete them within the time allowed.
- 66.232 Analyse data produced on each element of the project to determine their individual effect on the programme.
- 66.233 Produce planning programmes for a domestic construction project.
- 66.234 Write a method statement to carry out a craft operation.
- 66.235 Prepare material orders with deliveries planned to support the programmed sequence of events.
- 66.236 Record daily and weekly progress and compare with the project programme.
- 66.237 Provide feedback to individuals and teams on daily and weekly progress.
- 66.238 Use effective leadership methods to supervise individuals/teams working in the construction industry.
- 66.239 Use communication skills within a team environment to achieve agreement with individuals/teams.
- 66.240 Make recommendations to improve the performance of a team.
- 66.241 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.

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

67 Electrical Installation 3 – Summary of syllabus sections

Page 158 Safety at Work

(Objectives 67.1 to 67.22)

The aim of this unit is to enable the candidate to maintain safe working conditions and to create a safe working environment for working personnel and members of the public.

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

Page 160 Materials

(Objectives 67.23 to 67.47)

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

- a identify and select materials for specific commercial/industrial applications based on their technical properties
- b describe the technical properties of the main types of materials in use for commercial/industrial applications

Page 162 Calculations, Setting Out and Drawing

(Objectives 67.48 to 67.65)

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

- a calculate values and quantities for single phase and three phase circuits
- b set out single phase and three phase circuits
- c produce working drawings of single phase and three phase circuits

Page 163 Advanced Practical Skills

(Objectives 67.66 to 67.98)

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

- a install commercial/industrial three phase switchgear, control, monitoring and protective devices within a low voltage switch room
- b install interconnecting cabling from switch room to sub-mains distribution and final distribution boards
- c install single phase and three phase electric motors and associated starters
- d manually operate power factor correction equipment
- e install dc equipment and circuit cables
- f carry out the inspection and testing of three phase, single phase and DC installations

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

Page 165 Communications and Information Technology

(Objectives 67.99 to 67.147)

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 167 Alteration, Repair and Planned Maintenance

(Objectives 67.148 to 67.169)

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

- a safely reposition, replace and/or upgrade existing three phase switchgear, control, monitoring and protective devices within a low voltage switch room or system
- b diagnose, locate and repair faults on switchgear and associated equipment within a distribution system
- c produce a planned preventative maintenance programme for a commercial/industrial three phase distribution system

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

Page 169 Supervision, Planning and Administration

(Objectives 67.170 to 67.195)

The aim of this unit is to enable candidates to plan, organise and supervise building operations and staff.

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:

- 67.1 Inspect and keep records on the condition of scaffold platforms over 2m high.
Record: movement, metal components (corrosion, distortion), timber components (deterioration, splits, cracks), deterioration of bindings, deterioration of ground (drying, freezing, effects of rainfall)
- 67.2 Demonstrate methods of ensuring safe working practices when in close proximity to site machinery, alongside road traffic and live supplies.
Methods: insulation/enclosures, warning notices, barriers, warning lights, traffic lights, traffic stop/go signs
- 67.3 Carry out a risk assessment and prepare a report identifying the potential hazards.
Risk assessment: movement of site plant (eg excavators, generators), site transport (eg fork lift trucks, delivery vehicles), mobile cranes
- 67.4 Complete an accident report for a simulated accident resulting in injury.
Report: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 67.5 Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Base: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)
- 67.6 Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations.
Base: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 67.7 Check equipment and inspection records to ensure tools are to standard prior to issue.
Tools: electric power tools (eg hammer drill, lighting), hand tools (eg hacksaw, hammer, chisel, bolster, scriber, stocks/dies)
- 67.8 Identify and select distribution assemblies for temporary electrical supplies on site.
Distribution assemblies: main isolator, distribution board, transformer unit with socket outlets, voltages appropriate to work task

- 67.9 Carry out the correct procedure for verifying and securing circuit isolation.
Procedure: identify circuit to be isolated, liaise with site management, effect isolation, lock off, prove voltage indicator is operational, prove circuit is isolated, warning notices, prove voltage indicator is still working
- 67.10 Identify and select various methods of protecting against electric shock caused by direct contact with live parts.
Methods: reduced voltage, insulation, barriers, enclosures, placing out of reach
- 67.11 Identify and select various methods of protecting against electric shock caused by indirect contact with live parts.
Methods: earthed equipotential bonding, automatic disconnection of supply, non-conducting location, double insulation, electrical separation, earth free local equipotential bonding
- 67.12 Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment.
Procedures: eg site evacuation, first aid point, warning signs/notices, safe working practices, protective clothing/equipment, toxic materials, hazards (electrical, height)

Knowledge requirements

The instructor must ensure the candidate is able to:

- 67.13 Describe the main items to be included when carrying out the inspection of scaffolding.
Items: ground movement (base plates, sole plates), vertical/horizontal members, clips, bindings, braces, stabilisers, wall ties, hand rails, toe boards, ladders, platform
- 67.14 Explain the need for communication systems to ensure the safe use of lifting machines.
Communication systems: hand signals, bell systems, two way radio
- 67.15 Describe the elements to be included in an accident report.
Elements: name, date/time of incident, date/time of report, location, weather conditions, lighting conditions, persons involved, sequence of events, injuries sustained, plant/equipment involved, damage sustained, actions taken, witnesses, persons/organisations notified, outcome
- 67.16 Describe, with the aid of a sketch, the methods for establishing a level base for setting up scaffolding on sloping or uneven ground or over obstructions.
Method: adjustable telescopic, levelled sole plates, levelled sub frame (timber, metal)

- 67.17 Describe, with the aid of a sketch, the methods for establishing a firm base on made up ground or soil that has been disturbed by excavations.
Method: large area sole plates, bridging scaffolding supported on firm ground, testing subsoil for load bearing capacity
- 67.18 Explain the need for various voltages for site lighting, tools and equipment.
Voltages: portable hand lamps (maximum 25 – 50V ac, confined locations, damp locations), portable hand held tools/local lighting (110V ac from secondary transformer with centre point earthed), fixed floodlighting (230V ac), fixed/movable equipment (400V ac three phase)
- 67.19 State the correct procedure for verifying and securing circuit isolation.
Procedure: identify circuit to be isolated, liaise with site management, effect isolation, lock off, prove voltage indicator is operational, prove circuit is isolated, provision of warning notices, prove voltage indicator is still working
- 67.20 Describe the human and environmental conditions that may lead to accidents and state the methods of controlling these conditions.
Human conditions: carelessness, improper (behaviour, dress), lack of (training, supervision, experience), fatigue, drug abuse, alcohol abuse, over-enthusiasm
Environmental conditions: machinery/tools (unguarded, faulty), direct contact with live electrical parts, inadequate ventilation, workplace (untidy, dirty, overcrowded, badly-lit)
Control methods: effective site management/supervision, risk assessments, implementing hazard prevention methods, remove/make safe the hazard, personal (protection, equipment), safety (education, publicity)
- 67.21 Describe various methods of protecting against electric shock caused by direct contact with live parts.
Methods: reduced voltage, insulation, barriers, enclosures, placing out of reach
- 67.22 Describe various methods of protecting against electric shock caused by indirect contact with live parts.
Methods: earthed equipotential bonding, automatic disconnection of supply, non-conducting location, double insulation, electrical separation, earth free local equipotential bonding

Practical competences

The candidate must be able to do the following:

- 67.23 Identify and select commercial/industrial three phase switchgear for specific applications based on their technical properties.
Switchgear: type (air break, oil), enclosure (eg dustproof, weatherproof, flameproof), rating above 100A
Applications: switchgear assemblies, switch room, industrial process areas
- 67.24 Identify and select control and monitoring equipment for specific applications based on their technical properties.
Control equipment: earth fault relays, thermostats, power factor correction capacitor units
Monitoring equipment: voltage transformers, current transformers, voltmeter, ammeter, maximum demand meter (kVA), power factor indicator
Applications: commercial/industrial three phase installations
- 67.25 Identify and select single phase/three phase motors and associated starters for specific applications based on their technical properties.
Motors: eg single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
Starters: eg single phase (direct on line/DOL), three phase (direct on line/DOL, star-delta, soft start, auto-transformer, rotor resistor)
Applications: commercial/industrial
- 67.26 Identify and select protective devices for specific applications based on their technical properties.
Protective devices: fuses (cartridge, high breaking capacity/HBC, circuit breakers, moulded case circuit breakers, rating above 100A)
Applications: commercial/industrial three phase installations
- 67.27 Identify and select interconnecting cabling for specific applications based on their technical properties.
Cabling: steel wire armoured, aluminium armoured
Applications: commercial/industrial three phase, switch room, sub mains, final distribution boards
- 67.28 Identify and select dc equipment for specific applications based on their technical properties.
Equipment: switch gear, control gear, rectification units, motors (series, shunt, compound), rating above 10kW
Applications: industrial
- 67.29 Identify and select dc process control equipment specific applications based on their technical properties.
Equipment: timer, thermocouple, thermostat, level gauge, pressure gauge, speed controller
Applications: industrial
- 67.30 Identify and select uninterruptable power supply units and associated equipment for specific applications based on their technical properties.
Associated equipment: protective devices (eg HBC fused), specialist socket outlets
Applications: commercial/industrial, computer system support

Knowledge requirements

The instructor must ensure the candidate is able to:

- 67.31 State the technical properties of commercial/industrial three phase switchgear.
Switchgear: type (air break, oil), enclosure (dustproof, weatherproof, flameproof), rating above 100A
Properties: circuit isolation, rating (current, voltage, single/three phase), short circuit capacity, electrical continuity, arc extinction, safety
- 67.32 Describe, with the aid of a sketch, the construction of air break and oil filled three phase switchgear.
Construction: contacts (shape, materials), enclosure (material, finish)
- 67.33 Describe the operation of air break and oil filled three phase switchgear.
Operation: arc extinction, cooling, contact types (shape, materials)
- 67.34 State the technical properties of commercial/industrial single phase/three phase motors.
Motors: single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
Properties: output power, speed, torque, efficiency, starting characteristics, enclosures, winding insulation, rating (continuous, intermittent)
- 67.35 State the technical properties of starters for commercial/industrial single phase/three phase motors.
Motors: single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
Starters: single phase (direct on line/DOL), three phase (direct on line/DOL, star-delta, soft start, auto-transformer, rotor resistor)
Properties: capacity (starting current, running current), integral overload protection devices, enclosures, provision for remote control

- 67.36 Describe, with the aid of a sketch, the operating principles and characteristics of single phase and three phase motors.
Characteristics: speed, torque, starting
Motors: eg single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
- 67.37 State the technical properties of commercial/industrial control and monitoring equipment.
Control equipment: earth fault relays, thermostats, power factor correction capacitor units
Monitoring equipment: voltage transformers, current transformers, voltmeter, ammeter, maximum demand meter (kVA), power factor indicator
- 67.38 Describe, with the aid of a sketch, the construction and operation of an earth fault relay.
Operation: operating current, time-current characteristics
- 67.39 State the technical properties of commercial/industrial three phase protective devices for specific applications based on their technical properties.
Protective devices: fuses (cartridge, high breaking capacity/HBC, circuit breakers, moulded case circuit breakers, rating above 100A)
- 67.40 State the technical properties of commercial/industrial three phase interconnecting cabling.
Cabling: steel wire armoured, aluminium armoured
- 67.41 State the technical properties of industrial dc equipment.
Equipment: switch gear, control gear, rectification units, motors (series, shunt, compound), rating above 10kW
- 67.42 Describe, with the aid of a sketch, the operating principles of rectification units.
Operating principles: converting ac to dc, smoothing of output voltage
Rectification units: half wave, full wave
- 67.43 Describe, with the aid of a sketch, the operating principles of electroplating equipment.
Operating principles: functions (anode, cathode), solutions
Electroplating: copper, chrome
- 67.44 Describe, with the aid of a sketch, the operating principles and characteristics of dc motors.
Operating principles: magnetic theory, field/armature winding arrangements, commutation processes, brush gear, starting arrangements
Characteristics: speed, torque, starting
Motors: series, shunt, compound
- 67.45 State the technical properties of industrial dc process control equipment.
Equipment: timer, thermocouple, thermostat, level gauge, pressure gauge, speed controller
- 67.46 Describe, with the aid of a sketch, the construction and operation of a switch room thermostat.
Construction: bi-metal strip
Operation: ambient temperature control
- 67.47 State the technical properties of uninterruptable power supply units and associated equipment.
Associated equipment: protective devices (eg HBC fuse), specialist socket outlets
Applications: commercial/industrial, computer system support

Calculations, Setting Out and Drawing

Practical competences

The candidate must be able to do the following:

Calculations

- 67.48 Produce phasor diagrams for single phase circuits having resistive, inductive and capacitive components in series, parallel and combined circuits.
- 67.49 Calculate by formula and phasor diagram the kVAr of a capacitor to improve a given power factor.
- 67.50 Calculate by phasor diagram the current in the neutral conductor for a three phase unbalanced load.
- 67.51 Calculate disconnection times of protective devices for given circuit single phase and three phase circuit parameters.
Parameters: circuit type (fixed equipment, socket outlet), type of protective device, use of published data sheets, national/local regulations
- 67.52 Calculate cable sizes for single phase and three phase circuits for given parameters.
Parameters: load current, voltage drop, grouping of conductors, ambient temperatures, contact with thermal insulation, use of published data sheets, national/local regulations
- 67.53 Calculate the prospective fault current for given single phase circuit parameters.
Parameters: system impedance, resistive values (live conductors, protective conductors), supply voltage, impedance of external supply network, use of published data sheets
- 67.54 Calculate cable sizes for dc circuits for given parameters.
Parameters: load current, voltage drop, use of published data sheets, national/local regulations

Setting out

- 67.55 Measure and set out three phase commercial/industrial circuits from drawings.
Circuits: process control, motor drives

Drawings

- 67.56 Produce a block diagram for a switch room assembly.
Diagram: incoming supply terminations, metering, main isolator, bus-bar chamber, switch fuses (single phase, three phase), fused switches (single phase, three phase), moulded case circuit breakers, distribution boards, main earthing terminal

Knowledge requirements

The instructor must ensure the candidate is able to:

Calculations

- 67.57 Identify phasor diagrams for single phase circuits having resistive, inductive and capacitive components in series, parallel and combined circuits.
- 67.58 Identify calculations involving the kVAr of a capacitor to improve a given power factor.
Calculations: formula, phasor diagram
- 67.59 Identify calculations involving the current in the neutral conductor for a three phase unbalanced load.
Calculations: phasor diagram
- 67.60 Identify calculations involving the disconnection times of protective devices for given circuit single phase and three phase circuit parameters.
Parameters: circuit type (fixed equipment, socket outlet), type of protective device, use of published data sheets, national/local regulations
- 67.61 Identify calculations involving cable sizes for single phase and three phase circuits for given parameters.
Parameters: load current, voltage drop, grouping of conductors, ambient temperatures, contact with thermal insulation, use of published data sheets, national/local regulations
- 67.62 Identify calculations involving the prospective fault current for given single phase circuit parameters.
Parameters: system impedance, resistive values (live conductors, protective conductors), supply voltage, impedance of external supply network, use of published data sheets
- 67.63 Identify calculations involving cable sizes for dc circuits for given parameters.
Parameters: load current, voltage drop, use of published data sheets, national/local regulations

Setting out

- 67.64 Explain the correct procedure for measuring and setting out three phase commercial/industrial circuits from drawings.
Circuits: process control, motor drives

Drawings

- 67.65 Identify block diagrams for a switch room assembly.
Diagram: incoming supply terminations, metering, main isolator, bus-bar chamber, switch fuses (single phase, three phase), fused switches (single phase, three phase), moulded case circuit breakers, distribution boards, main earthing terminal

Practical competences

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

The candidate must be able to do the following:

- 67.66 Install and connect commercial/industrial three phase switchgear.
Switchgear: type (air break, oil filled), rating above 100A
- 67.67 Install and connect control and monitoring equipment to commercial/industrial three phase installations.
Control: earth fault relays, thermostats, power factor correction capacitor unit
Monitoring: eg voltage transformers, current transformers, voltmeter, ammeter, maximum demand meter ((kVA), power factor indicator
- 67.68 Install and connect protective devices to commercial/industrial three phase installations.
Protective devices: fuses (cartridge, high breaking capacity/HBC, circuit breakers, moulded case circuit breakers, rating above 100A
- 67.69 Install interconnecting cabling from switch room to sub-mains distribution and final distribution boards for a commercial/industrial three phase installation.
Installation: cable supports, cable (steel wire armoured, aluminium armoured)
- 67.70 Install single phase and three phase commercial/industrial motors and associated starters.
Installation: motors, cable, starters, emergency switching, drives (direct coupling, vee-belt)
Motors: eg single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
Starters: eg single phase (direct on line/DOL), three phase (direct on line/DOL, star-delta, soft start, auto-transformer, rotor resistor)
- 67.71 Carry out the safe inspection and testing procedures of commercial/industrial three phase installations in accordance with national/local standards.
Installations: cable, switchgear, equipment (control, monitoring), protective devices
- 67.72 Manually adjust power factor correction equipment to maintain optimum economical operation of three phase commercial/industrial equipment.
Adjustment: power factor meter, maximum demand meter (kVA), ammeter, power factor correction capacitor unit
- 67.73 Install industrial dc equipment.
Installation: cable, switch gear, control gear, rectification unit
Equipment: eg electro-plating, motors (series, shunt, compound), rating above 10 kW
- 67.74 Carry out the safe inspection and testing procedures of industrial dc installations in accordance with national/local standards.
Installations: cable, switchgear, control equipment, monitoring equipment, protective devices
- 67.75 Install dc process control equipment.
Installation: cable, protective devices, control gear, dc power supply
Equipment: eg timers, thermocouples, thermostats, level gauges, pressure gauges, speed controller
- 67.76 Install an uninterruptable power supply to support a computer system.
Installation: ac supply, cable, protective devices, specialist socket outlet
- 67.77 Carry out the safe inspection and testing procedures of industrial dc process control equipment in accordance with national/local standards.
Installations: cable, control equipment, protective devices, control gear, dc power supply

Knowledge requirements

The instructor must ensure the candidate is able to:

- 67.78 State the need for a soakaway/gravel pit when using oil filled three phase switch gear.
- 67.79 Describe, with the aid of a sketch, the location of a thermostat installed to control ambient temperature in a switch room.
Location: draughts, mechanical damage, heat sources, maintenance
- 67.80 Describe, with the aid of a sketch, the method for connecting power factor correction capacitors to a single phase and three phase circuits, installations or equipment.
- 67.81 Describe, with the aid of a sketch, the layout of cabling from a switch room to sub-mains distribution boards and final distribution boards.

- 67.82 Describe, with the aid of a diagram, the wiring circuits for single phase and three phase commercial/industrial motors and associated starters.
Installation: motors, cable, starters, emergency switching, drives (direct coupling, vee-belt)
Motors: eg single phase (capacitor start, split phase start, synchronous), three phase (cage rotor, wound rotor)
Starters: eg single phase (direct on line/DOL), three phase (direct on line/DOL, star-delta, soft start, auto-transformer, rotor resistor)
- 67.83 State the reason for installing separable links to facilitate earth testing.
Reason: disconnect armouring from metallic enclosure of switchgear
- 67.84 State the data required prior to carrying out the inspection and testing of a three phase commercial/industrial installation.
Data: installation diagrams, charts, tables, schedules, drawings
- 67.85 Describe the method for carrying out the safe inspection and testing of a three phase commercial/industrial installations.
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 (phases, neutral, protective conductors), insulation resistance, phase sequence, functional, approved test equipment
- 67.86 State the details required in a test report for a three phase commercial/industrial installation.
Details: type of supply to installation, means of earthing, results of listed tests, prospective short circuit current
- 67.87 Describe the method for manually adjusting power factor correction equipment to maintain optimum economical operation of three phase commercial/industrial equipment.
Adjustment: power factor meter, maximum demand meter (kVA), ammeter, power factor correction capacitor unit
- 67.88 Describe the method of measuring the power factor in a three phase circuit.
Circuits: balanced, unbalanced
- 67.89 Describe, with the aid of a diagram, the wiring circuits for dc industrial equipment installations.
Installation: cable, equipment, switch gear, control gear, rectification unit
Equipment: electro-plating, motors (series, shunt, compound), rating above 10 kW
- 67.90 State the reason for using heat sinks with rectification units.
- 67.91 State the data required prior to carrying out the inspection and testing of an industrial dc installation.
Data: installation diagrams, charts, tables, schedules, drawings
- 67.92 Describe the method for carrying out the safe inspection and testing of an industrial dc installation.
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 (positive, negative, protective conductors), insulation resistance, functional, approved test equipment
- 67.93 State the details required in a test report for an industrial dc installation.
Details: type of supply to installation, means of earthing, results of listed tests, prospective fault current
- 67.94 Describe, with the aid of a diagram, the wiring circuits for dc process control equipment installations.
Installation: cable, equipment, protective devices, control gear, DC power supply
Equipment: timers, thermocouples, thermostats, level gauges, pressure gauges, speed controller
- 67.95 Describe, with the aid of a sketch, the installation of an uninterruptable power supply to support a computer system.
Installation: uninterruptable power supply, ac supply, cable, protective devices, specialist socket outlet
- 67.96 State the data required prior to carrying out the inspection and testing of a dc process control equipment installation.
Data: installation diagrams, charts, tables, schedules, drawings
- 67.97 Describe the method for carrying out the safe inspection and testing of a dc process control equipment installation.
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 (positive, negative, protective conductors), insulation resistance, functional, approved test equipment
- 67.98 State the details required in a test report for a dc process control equipment installation.
Details: type of supply to installation, means of earthing, results of listed tests, prospective fault current

Communications and Information Technology

Practical competences

The candidate must be able to do the following:

Communications

- 67.99 Draw an organisational chart showing the structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 67.100 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
Specification: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 67.101 Prepare a report describing the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 67.102 Prepare a report on the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)
- 67.103 Use information technology systems for communication.
Systems: E-mail, Internet

Information Technology

Database

- 67.104 Access a database applications software package.
- 67.105 Define and create a database structure to store a given set of data.
Data: numeric, date, character
- 67.106 Enter data into a database file.
- 67.107 Save a database file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 67.108 Edit data in an existing database file.
Edit: add, delete, amend

- 67.109 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after

- 67.110 Modify a database structure.
Modify: fields (add, delete), change data type, change field length

- 67.111 Print selected forms from a database.
Selected forms: from 67.109 above

- 67.112 Define and execute sort criteria for numeric, character and date fields.

- 67.113 Print a summary report of selected data from a database file.

- 67.114 Exit database software.

Spreadsheet

- 67.115 Access a spreadsheet applications software package.

- 67.116 Create a new spreadsheet file for a given application.

- 67.117 Set single and global column widths.

- 67.118 Create and insert appropriate spreadsheet column and row titles.

- 67.119 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.

Cursor keys: up, down, left, right

Mouse control: point and click, use of scroll bars

- 67.120 Insert and format character and numeric data.

Character format: left, centre, right justified

Numeric format: integer, decimal, scientific, percentage, currency, date

- 67.121 Edit the contents of a cell in a spreadsheet file.

Edit: add, amend, replace, delete

- 67.122 Insert and delete columns and rows in a spreadsheet.

- 67.123 Insert formula containing cell addresses and numbers to carry out calculations.

Formula: add, subtract, multiply, divide, percentages

- 67.124 Use absolute and relative cell addresses.

- 67.125 Replicate formula in a row or column.

- 67.126 Use the sum and average functions in a spreadsheet for rows and columns.

- 67.127 Print a spreadsheet.
- 67.128 Present and print data in graphical format.
Graphical format: bar chart, pie chart
- 67.129 Save a spreadsheet file to disk with an appropriate filename in a given location.
Location: eg hard disc, floppy disc, sub-directory, network user area
- 67.130 Exit spreadsheet software.

Knowledge requirements

The instructor must ensure the candidate is able to:

Communications

- 67.131 Describe the organisational structure of a multi-trade construction company.
Organisational chart: departments, personnel (management, administration, skilled trades, unskilled labour, levels of responsibility), relationships within the organisation
- 67.132 State the various elements that should be considered when preparing a job/person specification for a specified site vacancy.
Elements: formal qualifications, employment history, experience, selection criteria, equality of opportunity, legal requirements
- 67.133 Describe the administration systems of a multi-trade construction company.
Administration systems: purchase orders (plant, materials, equipment), recruitment, time sheets, labour (rates, bonus, incentive schemes), wage roll, charge-out rate, invoicing, project (planning, monitoring), accident (reports, investigations)
- 67.134 Describe the key issues of customer service/care in a construction company.
Key issues: customers (internal, external), assessing customer needs, customer impressions, standards of service, creating a service that meets/exceeds customer expectations, provision of information (effectiveness, accuracy), maintaining (safety, security), staff (motivation, training)

Information Technology

Database

- 67.135 State the various types of data that can be stored in a database.
Data: numeric, date, character
- 67.136 Describe the method for defining and executing a single condition search for values on numeric string and date logical fields using appropriate operators.
Operators: less than (<), greater than (>), equal to (=), less than or equal to (<=), greater than or equal to (>=), not equal to (<>), is the same as, is not the same as, contains the string, comes before, comes after
- 67.137 Describe the method for modifying a database structure.
Modify: fields (add, delete), change data type, change field length
- 67.138 Describe the method for defining and executing sort criteria for numeric, character and date fields.

Spreadsheet

- 67.139 Describe the method for creating a new spreadsheet file for a given application.
- 67.140 Describe the method for setting single and global column widths.
- 67.141 Describe the method for creating and inserting appropriate spreadsheet column and row titles.
- 67.142 State the various formats for character and numeric data.
Character format: left, centre, right justified
Numeric format: integer, decimal, scientific, percentage, currency, date
- 67.143 Describe the method for inserting and deleting columns and rows in a spreadsheet.
- 67.144 Describe the method for inserting formula containing cell addresses and numbers to carry out calculations.
Formula: add, subtract, multiply, divide, percentages
- 67.145 Explain the terms 'absolute' and 'relative' cell addresses.
- 67.146 Describe the method for replicating formula in a row or column.
- 67.147 Describe the method for using the sum and average functions in a spreadsheet for rows and columns.

Alteration, Repair and Planned Maintenance

Practical competences

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

The candidate must be able to do the following:

- 67.148 Disconnect and reposition an existing three phase switchgear assembly together with associated equipment.
Switchgear: eg three phase fused switch, circuit breaker (air break, oil filled), moulded case circuit breaker
Equipment: eg transformers (voltage, current), voltmeters, ammeters, power factor meter
- 67.149 Disconnect and replace an existing three phase switchgear assembly with an upgraded unit.
Switchgear: eg three phase fused switch, circuit breaker (air break, oil filled), moulded case circuit breaker
Upgraded unit: eg increased current rating, prospective fault level/short circuit rating
- 67.150 Replace the interconnecting cables between an upgraded three phase switchgear assembly and the distribution boards/panels.
Distribution boards/panels: sub mains, final circuit
- 67.151 Disconnect and replace an existing dc rectification unit with an upgraded system.
Upgraded system: eg increased (output current, output voltage)
- 67.152 Disconnect and reposition existing dc process control equipment.
Control equipment: eg dc power supply, timer, thermocouple, thermostat, level gauge, pressure gauge, speed controller
- 67.153 Diagnose faults in three phase commercial/industrial switchgear and carry out repairs.
Faults: contacts (burning, pitting, arcing, pressure, material, shape), mechanisms (springs, insulation, bearings), housings (mechanical damage, corrosion)
- 67.154 Diagnose faults in three phase control and monitoring equipment.
Faults: connections (voltage transformer, current transformer), transformer windings (short, open circuit), instrument failure, defective gauges (pressure, level)

- 67.155 Produce a planned preventative maintenance programme for a commercial/industrial three phase distribution system.
Maintenance programme: frequency of maintenance, component identification numbers, activity dates, procedures
System: switchgear, control equipment, monitoring equipment, protective devices, transformers (voltage, current), instruments, power factor correction units, cable, trays/trunking
- 67.156 Complete a maintenance report for a commercial/industrial three phase distribution system.
Report: current ratings, voltages, condition (switchgear, circuit breakers, distribution boards, monitoring equipment, protective devices, power factor correction equipment, cable, trays/trunking), switchgear (operation, lock-off facility), enclosures (unused entries blanked off)
System: switchgear, control equipment, monitoring equipment, protective devices, transformers (voltage, current), instruments, power factor correction units, cable, trays/trunking
- 67.157 Carry out the safe inspection and testing of an upgraded commercial/industrial three phase switchgear system in accordance with national/local standards.
Tests: continuity of protective conductors, insulation resistance, earth electrode resistance, earth loop impedance

Knowledge requirements

The instructor must ensure the candidate is able to:

- 67.158 State the factors that should be taken into account when deciding whether faulty three phase equipment should be repaired or replaced.
Factors: suitability of existing equipment for purpose, cost of replacement, availability of replacement, down time under fault condition, availability of resources/staff, levels of responsibility
- 67.159 State the need to liaise with building management before isolating three phase switchgear and associated equipment.
Need: safe working procedures, permit to work procedures
Switchgear: three phase fused switch, circuit breaker (air break, oil filled), moulded case circuit breaker
Equipment: transformers (voltage, current), voltmeters, ammeters, power factor meter

- 67.160 Select and specify appropriate upgraded switchgear.
Select/specify: manufacturers' (catalogues, database)
Upgraded switchgear: increased current rating, prospective fault level capacity, appropriate enclosure for the environment (eg dustproof, weatherproof, flameproof)
- 67.161 Determine the appropriate type and size of replacement interconnecting cables.
Determine: calculate conductor size, data from manufacturers' (catalogues, database), voltage drop constraints
Replacement cables: types (eg steel wired armoured/swa, thermosetting, polyvinyl chloride/PVC, mineral insulated/MI), conductor sizes
- 67.162 Explain the requirements and operating principles of upgraded dc rectification units.
Requirements: heat dissipation, ventilation, load carrying capacity, voltage rating
Operating principles: rectification methods (eg semi-conductors, high frequency switchmode)
- 67.163 Select and specify dc process control equipment.
Select/specify: operating characteristics, manufacturers' (catalogues, database)
Control equipment: dc power supply, timer, thermocouple, thermostat, level gauge, pressure gauge, speed controller
- 67.164 Describe the faults that may occur in three phase commercial/industrial switchgear.
Faults: contacts (burning, pitting, arcing, pressure, material, shape), mechanisms (springs, insulation, bearings), housings (mechanical damage, corrosion)
- 67.165 Describe the faults that may occur in three phase control and monitoring equipment.
Faults: connections (voltage transformer, current transformer), transformer windings (short, open circuit), instrument failure, defective gauges (pressure, level)
- 67.166 Interpret the operating characteristics and circuitry of three phase control and monitoring equipment to diagnose and locate faults.
Faults: circuitry (open circuit, short circuit, high resistance connections), equipment component failure
- 67.167 State the items and factors to be included in a planned preventative maintenance programme for a commercial/industrial three phase distribution system.
Items/Factors: switchgear, control equipment, monitoring equipment, protective devices, transformers (voltage, current), instruments, power factor correction units, cable, frequency of maintenance, component identification numbers, activity dates, procedures
- 67.168 State the items and factors to be included in a maintenance report for a commercial/industrial three phase distribution system.
Items/Factors: current ratings, voltages, condition (switchgear, circuit breakers, distribution boards, monitoring equipment, protective devices, power factor correction equipment, cable, trays/trunking), switchgear (operation, lock-off facility), enclosures (unused entries blanked off)
System: switchgear, control equipment, monitoring equipment, protective devices, transformers (voltage, current), instruments, power factor correction units, cable, trays/trunking
- 67.169 Describe the procedure for carrying out the safe inspection and testing of an upgraded commercial/industrial three phase switchgear system in accordance with national/local standards.
Tests: continuity of protective conductors, insulation resistance, earth electrode resistance, earth loop impedance

Supervision, Planning and Administration

Practical competences

The candidate must be able to do the following:

- 67.170 Identify various elements of a construction project and arrange in a logical sequence of events.
Elements: taken from (plans, specifications, bills of quantities, schedules)
- 67.171 Calculate the time required for each element of a construction project from given data.
Data: labour output, machine output
Time: labour, plant, supervision
- 67.172 Calculate the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 67.173 Analyse data produced on each element of the project to determine their individual effect on the programme.
Elements: overlapping, parallel, isolated, critical, non-critical
- 67.174 Produce planning programmes for a domestic construction project.
Programmes: bar chart, critical path analysis network, elements (overlapping, parallel, isolated, critical, non-critical, potential delays)
- 67.175 Write a method statement to carry out a craft operation.
Statement: resources (labour, materials, equipment, plant), sequence of events, safety
- 67.176 Prepare material orders with deliveries planned to support the programmed sequence of events.
Order: details (eg quantity, description, quality, delivery date, phased delivery, delivery address, site location references)
- 67.177 Record daily and weekly progress and compare with the project programme.
Progress: time sheets, site measurement
- 67.178 Provide feedback to individuals and teams on daily and weekly progress.
Feedback: programme time, costs, areas for improvement
- 67.179 Use effective leadership methods to supervise individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making

- 67.180 Use communication skills within a team environment to achieve agreement with individuals/ teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 67.181 Make recommendations to improve the performance of a team.
- 67.182 Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Knowledge requirements

The instructor must ensure the candidate is able to:

- 67.183 State the main reasons why operations must be arranged in a logical sequence of events.
Reasons: continuity of work, completion to programme, cost control, deliveries (plant, materials, labour)
Sequence: overlapping, parallel, isolated, critical, non critical
- 67.184 Identify calculations involving the time required for each element of a construction project from given data.
Data: labour output, plant output
Time: labour, plant, supervision
- 67.185 Identify calculations involving the resources required for each element of the project to complete them within the time allowed.
Resources: labour, materials, plant, supervision
- 67.186 State the factors which determine if an operation is critical to the completion of the project on time.
Factors: operations which must be complete before others are started
- 67.187 Describe various methods of planning work operations.
Methods: bar charts, critical path analysis network

- 67.188 State various delaying factors that should be taken into consideration when planning a project and describe, with the aid of a sketch, how these factors can be included in a critical path analysis network.
Factors: weather conditions, late deliveries, breakdown of plant, absence of key craft personnel, illness, accident, overall shortage of trained craftspeople
- 67.189 Explain the function and content of a method statement for a craft operation.
Function: method of work, resources required
Content: resources (labour, materials, equipment, plant), sequence of events, safety
- 67.190 State the factors and details that should be taken into account when preparing an order for materials to be delivered to site.
Factors: unloading facilities, site storage, project programme.
Details: quantity, description, quality, delivery date, phased delivery, delivery address, site location references
- 67.191 Describe the measurement and recording of progress on site.
Recording: job sheets, time sheets, comparison with planned programme
- 67.192 State the information that may be included when providing feedback to individuals and teams.
Information: programme time, costs, areas for improvement
- 67.193 Describe effective leadership methods for supervising individuals/teams working in the construction industry.
Methods: interpersonal skills, communication, styles of leadership, function, focus, delegation, evaluating/decision making
- 67.194 State the communication skills required to achieve agreement with individuals/teams.
Skills: interpersonal (negotiation, controlled discussion, identify cause of conflict), strategy for dealing with conflict (common objectives, coordination, communication, removal of territorial/ role conflict, arbitration, negotiation, liaison, confrontation, understanding negative factors)
- 67.195 Describe methods of setting and reviewing work targets/objectives for an individual or team.
Objectives: number, nature (subjective, objective), time limits, SMART (specific, measurable, achievable, realistic, timescale)
Review: formal/informal, type, structure, process, self-appraisal, performance measurement, rating scales, frequency, assessing strengths/weaknesses, training/development programme

Assessments

Test specification for written paper Electrical Installation 3 Principles (6161-27-067)

This is a structured answer examination paper lasting three hours comprising 12 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	10
Calculations, setting out and drawing	10
Advanced practical skills	30
Communications and information technology	10
Alteration, repair and planned maintenance	15
Supervision, planning and administration	15

67 Electrical Installation 3: Safety at Work

Practical competences

The candidate must be able to do the following:

- | | | |
|-------|---|--------------------------|
| 67.1 | Inspect and keep records on the condition of scaffold platforms over 2m high. | <input type="checkbox"/> |
| 67.2 | Demonstrate methods of ensuring safe working practices when in close proximity to site machinery, alongside road traffic and live supplies. | <input type="checkbox"/> |
| 67.3 | Carry out a risk assessment and prepare a report identifying the potential hazards. | <input type="checkbox"/> |
| 67.4 | Complete an accident report for a simulated accident resulting in injury. | <input type="checkbox"/> |
| 67.5 | Establish a level base for setting up scaffolding on sloping or uneven ground or over obstructions. | <input type="checkbox"/> |
| 67.6 | Establish a firm base for scaffolding on made up ground or soil that has been disturbed by excavations. | <input type="checkbox"/> |
| 67.7 | Check equipment and inspection records to ensure tools are to standard prior to issue. | <input type="checkbox"/> |
| 67.8 | Identify and select distribution assemblies for temporary electrical supplies on site. | <input type="checkbox"/> |
| 67.9 | Carry out the correct procedure for verifying and securing circuit isolation. | <input type="checkbox"/> |
| 67.10 | Identify and select various methods of protecting against electric shock caused by direct contact with live parts. | <input type="checkbox"/> |
| 67.11 | Identify and select various methods of protecting against electric shock caused by indirect contact with live parts. | <input type="checkbox"/> |
| 67.12 | Instruct a new team member in site safety procedures/rules and issue appropriate safety equipment. | <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

67 Electrical Installation 3: Materials

Practical competences

The candidate must be able to do the following:

- 67.23 Identify and select commercial/industrial three phase switchgear for specific applications based on their technical properties.
- 67.24 Identify and select control and monitoring equipment for specific applications based on their technical properties.
- 67.25 Identify and select single phase/three phase motors and associated starters for specific applications based on their technical properties.
- 67.26 Identify and select protective devices for specific applications based on their technical properties.
- 67.27 Identify and select interconnecting cabling for specific applications based on their technical properties.
- 67.28 Identify and select dc equipment for specific applications based on their technical properties.
- 67.29 Identify and select dc process control equipment specific applications based on their technical properties.
- 67.30 Identify and select uninterruptable power supply units and associated equipment for specific applications based on their technical properties.

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 _____

67 Electrical Installation 3: Calculations, Setting Out and Drawing

Practical competences

- 67.48 Produce phasor diagrams for single phase circuits having resistive, inductive and capacitive components in series, parallel and combined circuits.
- 67.49 Calculate by formula and phasor diagram the kVAR of a capacitor to improve a given power factor.
- 67.50 Calculate by phasor diagram the current in the neutral conductor for a three phase unbalanced load.
- 67.51 Calculate disconnection times of protective devices for given circuit single phase and three phase circuit parameters.
- 67.52 Calculate cable sizes for single phase and three phase circuits for given parameters.
- 67.53 Calculate the prospective fault current for given single phase circuit parameters.
- 67.54 Calculate cable sizes for dc circuits for given parameters.

Setting out

- 67.55 Measure and set out three phase commercial/industrial circuits from drawings.

Drawings

- 67.56 Produce a block diagram for a switch room assembly.

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

67 Electrical Installation 3: Advanced Practical Skills

Practical competences

- 67.66 Install and connect commercial/industrial three phase switchgear.
- 67.67 Install and connect control and monitoring equipment to commercial/industrial three phase installations.
- 67.68 Install and connect protective devices to commercial/industrial three phase installations.
- 67.69 Install interconnecting cabling from switch room to sub-mains distribution and final distribution boards for a commercial/industrial three phase installation.
- 67.70 Install single phase and three phase commercial/industrial motors and associated starters.
- 67.71 Carry out the safe inspection and testing procedures of commercial/industrial three phase installations in accordance with national/local standards.
- 67.72 Manually adjust power factor correction equipment to maintain optimum economical operation of three phase commercial/industrial equipment.
- 67.73 Install industrial dc equipment.
- 67.74 Carry out the safe inspection and testing procedures of industrial dc installations in accordance with national/local standards.
- 67.75 Install dc process control equipment.
- 67.76 Install an uninterruptable power supply to support a computer system.
- 67.77 Carry out the safe inspection and testing procedures of industrial dc process control equipment 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

67 Electrical Installation 3: Communications and Information Technology

Practical competences

- 67.99 Draw an organisational chart showing the structure of a multi-trade construction company.
- 67.100 Prepare a job/person specification describing the knowledge and skills required for a specified site vacancy.
- 67.101 Prepare a report describing the administration systems of a multi-trade construction company.
- 67.102 Prepare a report on the key issues of customer service/care in a construction company.
- 67.103 Use information technology systems for communication.

Information Technology

Database

- 67.104 Access a database applications software package.
- 67.105 Define and create a database structure to store a given set of data.
- 67.106 Enter data into a database file.
- 67.107 Save a database file to disk with an appropriate filename in a given location.
- 67.108 Edit data in an existing database file.
- 67.109 Define and execute a single condition search for values on numeric string and date logical fields using appropriate operators.
- 67.110 Modify a database structure.
- 67.111 Print selected forms from a database.
- 67.112 Define and execute sort criteria for numeric, character and date fields.

- 67.113 Print a summary report of selected data from a database file.
- 67.114 Exit database software.

Spreadsheets

- 67.115 Access a spreadsheet applications software package.
- 67.116 Create a new spreadsheet file for a given application.
- 67.117 Set single and global column widths.
- 67.118 Create and insert appropriate spreadsheet column and row titles.
- 67.119 Identify and move the cell pointer to rows, columns and cells within a spreadsheet using cursor keys and mouse control.
- 67.120 Insert and format character and numeric data.
- 67.121 Edit the contents of a cell in a spreadsheet file.
- 67.122 Insert and delete columns and rows in a spreadsheet.
- 67.123 Insert formula containing cell addresses and numbers to carry out calculations.
- 67.124 Use absolute and relative cell addresses.
- 67.125 Replicate formula in a row or column.
- 67.126 Use the sum and average functions in a spreadsheet for rows and columns.
- 67.127 Print a spreadsheet.
- 67.128 Present and print data in graphical format.
- 67.129 Save a spreadsheet file to disk with an appropriate filename in a given location.
- 67.130 Exit spreadsheet software.

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

67 Electrical Installation 3: Alteration, Repair and Planned Maintenance

Practical competences

- | | | |
|--------|---|--------------------------|
| 67.148 | Disconnect and reposition an existing three phase switchgear assembly together with associated equipment. | <input type="checkbox"/> |
| 67.149 | Disconnect and replace an existing three phase switchgear assembly with an upgraded unit. | <input type="checkbox"/> |
| 67.150 | Replace the interconnecting cables between an upgraded three phase switchgear assembly and the distribution boards/panels. | <input type="checkbox"/> |
| 67.151 | Disconnect and replace an existing dc rectification unit with an upgraded system. | <input type="checkbox"/> |
| 67.152 | Disconnect and reposition existing dc process control equipment. | <input type="checkbox"/> |
| 67.153 | Diagnose faults in three phase commercial/industrial switchgear and carry out repairs. | <input type="checkbox"/> |
| 67.154 | Diagnose faults in three phase control and monitoring equipment. | <input type="checkbox"/> |
| 67.155 | Produce a planned preventative maintenance programme for a commercial/industrial three phase distribution system. | <input type="checkbox"/> |
| 67.156 | Complete a maintenance report for a commercial/industrial three phase distribution system. | <input type="checkbox"/> |
| 67.157 | Carry out the safe inspection and testing of an upgraded commercial/industrial three phase switchgear system in accordance with national/local standards. | <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

67 Electrical Installation 3: Supervision, Planning and Administration

Practical competences

67.170	Identify various elements of a construction project and arrange in a logical sequence of events.	<input type="checkbox"/>	67.182	Set work targets/objectives for an individual, review completion of work and set new targets/objectives for improvements in performance.	<input type="checkbox"/>
67.171	Calculate the time required for each element of a construction project from given data.	<input type="checkbox"/>			
67.172	Calculate the resources required for each element of the project to complete them within the time allowed.	<input type="checkbox"/>			
67.173	Analyse data produced on each element of the project to determine their individual effect on the programme.	<input type="checkbox"/>			
67.174	Produce planning programmes for a domestic construction project.	<input type="checkbox"/>			
67.175	Write a method statement to carry out a craft operation.	<input type="checkbox"/>			
67.176	Prepare material orders with deliveries planned to support the programmed sequence of events.	<input type="checkbox"/>			
67.177	Record daily and weekly progress and compare with the project programme.	<input type="checkbox"/>			
67.178	Provide feedback to individuals and teams on daily and weekly progress.	<input type="checkbox"/>			
67.179	Use effective leadership methods to supervise individuals/teams working in the construction industry.	<input type="checkbox"/>			
67.180	Use communication skills within a team environment to achieve agreement with individuals/teams.	<input type="checkbox"/>			
67.181	Make recommendations to improve the performance of a team.	<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 – set examinations by question paper and practical assessments.

Practical assessment

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 the 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.

General information

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.

6161-22 Advanced Diploma in Timber Vocations Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
161 Site Carpentry 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Alteration, Repair and Renovation			
Supervision, Planning and Administration			

6161-22 Advanced Diploma in Timber Vocations Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
162 Bench Joinery 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Planned Machine Maintenance			
Supervision, Planning and Administration			

6161-23 Advanced Diploma in Trowel Vocations Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
163 Trowel Vocations 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Alteration, Repair and Renovation			
Supervision, Planning and Administration			

6161-24 Advanced Diploma in Painting and Decorating Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
164 Painting and Decorating 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Repair, Restoration and Interior Decorative Techniques			
Supervision, Planning and Administration			

6161-25 Advanced Diploma in Plumbing Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
165 Plumbing 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Alteration, Repair and Planned Maintenance			
Supervision, Planning and Administration			

6161-26 Advanced Diploma in Refrigeration and Air Conditioning Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
166 Refrigeration and Air Conditioning 3			
Safety at Work			
Materials (Plant and Refrigerants)			
Calculations, Science and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Alteration and Repair			
Supervision, Planning and Administration			

6161-27 Advanced Diploma in Electrical Installation Practical competence assessment record

Candidate's name (and City & Guilds enrolment number, if applicable)

Centre name

Centre number

Assessment reference	Date completed	Instructor signature	Instructor name
167 Electrical Installation 3			
Safety at Work			
Materials			
Calculations, Setting Out and Drawing			
Advanced Practical Skills			
Communications and Information Technology			
Alteration, Repair and Planned Maintenance			
Supervision, Planning and Administration			

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