RHS

Including examiner comments

R3113

UNDERSTANDING THE SETTING OUT & CONSTRUCTION OF LANDSCAPING ELEMENTS IN THE GARDEN

Level 3

Thursday 9 February 2023

13:30 – 14:55

Written Examination

Candidate Number: .....

Candidate Name: .....

Centre Name: .....

IMPORTANT – Please read carefully before commencing:

i) The duration of this paper is **85** minutes;
ii) **ALL** questions should be attempted;
iii) **EACH** question carries **10 marks**;
iv) Write your answers legibly in the spaces provided. It is **NOT** necessary that all lined space is used in answering the questions;
v) Use **METRIC** measurements only;
vi) Use black or blue ink only. Pencil can be used for drawing purposes only. Ensure that all diagrams are labelled accurately with the line touching the named object;
vii) Where plant names are required, they should include genus, species and where appropriate, cultivar;
viii) Where a question requires a specific number of answers; only the first answers given that meet the question requirement will be accepted, regardless of the number of answers offered;
ix) Please note, when the word **'distinct'** is used within a question, it means that the items have different characteristics or features.

ANSWER ALL QUESTIONS

MARKS

Q1 a) State **TWO** methods of producing a right angle when setting out. **2**

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b) Describe **ONE** of the methods listed in a). 4

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Please see over/…..

MARKS

c) State **FOUR** problems which could be encountered when transferring features from the setting out plan to the ground. **4**

Total Mark

Q2 a) Describe the construction of a piped drainage system for a poorly drained lawn under the following headings:

(Excluding backfill)

i) specification of materials
ii) layout
iii) fall

MARKS

3
2
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i) .....

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ii) .....

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iii) .....

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Please see over/…..

b) Give **TWO** reasons why a silt trap may be required in a drainage system. **2**

c) Describe the features of a silt trap. **2**

Total Mark

Please turn over/…..

MARKS

Q3 a) State **SIX** elements expected to be found on a construction drawing of a garden feature. **6**

Please see over/…..

MARKS

b) Describe how to establish a site datum. 4

Total Mark

Please turn over/…..

MARKS

Q4 a) State **FOUR** hazards associated with excavating a trench. **4**

b) State **TWO** reasons why sub soiling could be required. **2**

Please see over/…..

MARKS

c) Describe the process of sub-soiling. **4**

Total Mark

Please turn over/…..

MARKS

Q5 a) State **TWO** purposes of foundations. **2**

b) Give the foundation dimensions for a 1m high garden wall, constructed from bricks. **3**

Please see over/…..

MARKS

c) List the quantities and ingredients of an ideal concrete mix for the foundation in b). **3**

d) Name **TWO** additional materials added to concrete to enhance its performance. **2**

Total Mark

Please turn over/…..

MARKS

Q6 Describe the laying of a concrete slab patio (excluding the edge details under the following headings:

i) site preparation **2**
ii) sub base **4**
iii) laying of concrete slabs **4**

i)

ii)

Please see over/…..

MARKS

iii) .....

Total Mark

Please turn over/…..

MARKS

Q7 Give specifications for **ONE** type of modular trellis panel suitable as a screen. **4**

b) State the sequence of construction of the trellis panels in a) to form a screen 5 panels long on a level site. **6**

Please see over/…..

MARKS

Total Mark

Please turn over/…..

MARKS

Q8 a) Describe suitable stone for the uprights of a garden arch. **4**

b) For the arch in a)

i) give the specification for a horizontal timber beam **2**
ii) state **TWO** methods for attaching it to the uprights **4**

i)

Please see over/…..

MARKS

ii)

Total Mark

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DO NOT USE THIS PAGE

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R3113
UNDERSTANDING THE SETTING OUT & CONSTRUCTION OF LANDSCAPING ELEMENTS IN THE GARDEN

Level 3

Thursday 9 February 2023

Candidates Registered	**TBC**		**Total Candidates Passed**	TBC	84%
Candidates Entered	62	TBC%	Passed with Commendation	14	23%
Candidates Absent/Withdrawn	TBC	TBC%	Passed	38	61%
Candidates Deferred	TBC	TBC%	Failed	10	16%

General comments

Questions - It is essential to read the question carefully and to note the **key words** before starting to write to ensure answers are relevant. Candidates should take account of the command statements in the question e.g. 'list', 'describe', 'explain', together with the mark allocation, to judge the depth of the answer required. Extra information, even if it is accurate, does not gain extra marks.
Where a number of answers were specified in the question and a candidate gave a list with more than that number, **only the first answers** in the list were marked, e.g. where the question stated 'Name **TWO** locations' or 'State **TWO** ways' only the first **TWO** answers were marked even if the correct answers were given further down. It is helpful (but not essential) if the answers are numbered in the text or separate paragraphs or bullet points are used.

Plant names - Where named plant examples were asked for, **full botanical names are required** to achieve full marks: genus, species and where appropriate variety, cultivar etc. needed to be written and spelt correctly. Where genus alone was given, all species in that genus need to show the characteristic asked for to gain any credit. **Common names were NOT accepted** and misspellings were penalised. Candidates needed to use unambiguous plant examples from sources such as the RHS Plant Finder and/or the RHS A-Z Encyclopaedia of Plants together with examples given in the syllabus and avoid obscure or difficult to verify plant examples, which risked being not credited.

Labels on diagrams must be carefully and correctly positioned to avoid ambiguity. Marks can be easily lost if this is not followed. Labels must actually touch the appropriate part of the diagram and must not be left hanging in mid air. Annotations on diagrams can be accepted as an alternative to description in the text as long as these are clear and answer the question. No marks were awarded for artistic merit or for unlabelled diagrams.

Continuation sheets - Where these have been included, it is vital that the relevant question number is included in the left hand margin if information written here is to be considered. These should also be attached to the answer booklet in the appropriate place and candidates should indicate in their answer booklet that they have written part of their answer on the attached sheet/s.

MARKS

Q1 a) State **TWO** methods of producing a right angle when setting out. **2**

b) Describe **ONE** of the methods listed in a). **4**

c) State **FOUR** problems which could be encountered when transferring features from the setting out plan to the ground. **4**

Q1 a) Most candidates gained high marks, the most common methods stated by candidates were using a 3:4:5 ratio triangle and using a builder's square; some candidates stated the bisection method, a few mentioned the use of optical squares.

b) Most candidates accurately described their chosen method of producing a right angle, despite some candidates not indicating the position of the base line or the point along the line where the right angle was to be constructed.

Trilateration (triangulation accepted as a term) using a 3:4:5 ratio triangle included positioning a pin/peg on a base line, measuring the 3 along a base line and positioning a pin/peg at this point. Either with one tape held on each pin, one tape set at 4 and the other set at 5 pull the two tapes taut, where they cross position another pin/peg, OR with one tape held at the two pins at 0 and 4+5 = 9 position, the pin at 4 forms the right angle.

Those describing using a builder's square included the following points:

Establish a base line and mark the corner point with a metal pin. Place the square right angle of the builder's square along the base line touching the pin. Extend a line/tape measure beside the square and at a convenient distance place another pin.

Some candidates described the rope and geometry method of bisecting the base line and using arcs to determine the right angle, but some failed to make reference to the point where the tapes crossed.

A few mentioned the use of optical squares, with ranging poles/markers set out along the base line and the prism set on a tripod; an assistant is required to move a ranging pole until the pole images seen through the prism line up. A line running from the point below the optical square to the assistant's pole indicates the right angle.

c) Candidates who gained marks were able to state problems with setting out a plan on the ground. Some candidates however described problems encountered when drawing the plan, not setting out, and lost marks.

Good answers included:

Issues with the plan such as poor photocopying quality can change the scale and dimensions, or the plan may become wet/muddy when marking out in poor weather resulting in misreading of the scale of the plan, or unable to easily distinguish features.

Also issues with the site such as undulating ground preventing the ability to stretch out tapes in a straight line. Topography may also cause inaccuracies due to the slope of the site versus the flat plane of the plan. Obstructions on the ground such as existing structures or trees and shrubs also prevent line of sight and interfere with the taking of measurements.

MARKS

Q2 a) Describe the construction of a piped drainage system for a poorly drained lawn under the following headings:

(Excluding backfill)

i) specification of materials **3**
ii) layout **2**
iii) fall **1**

b) Give **TWO** reasons why a silt trap may be required in a drainage system **2**

c) Describe the features of a silt trap. **2**

a)

i) Specification of materials

Generally, well answered with most candidates describing a perforated plastic pipe (colour was not required), 100mm diameter; very few went on to describe this as flexible.

Candidates gaining full marks also described a geotextile membrane used to surround the pipe, or placed between the soil and backfill aggregates surrounding the pipe, used to prevent fines entering the drainage system.

Although the question specifically excluded backfill some candidates chose to describe the aggregates surrounding the pipe and gained no marks.

ii) Many candidates answered poorly, often describing the method of excavating a trench and laying the pipes.

Those gaining marks described the pattern of layout as herringbone with a central pipe, or a grid system, with optimum spacings between pipes of 5m, but up to 10m depending on the site and costs.

iii) Fall

The majority of candidates correctly stated a fall between 1:80 and 1:200, answers above or below these gained no marks. Surprisingly quite a few thought that 1:40 was an ideal fall but this is suitable for sewage or foul water drainage only.

b)

Most candidates answered this section well with reasons for including a silt trap as being:

- to catch particles and sediment to prevent it entering the rest of the drainage system
- to prevent or reduce the likelihood blockages in drainage systems, particularly at junctions and bends
- catching sediments to ensure they do not enter the water system or water storage tanks

Candidates describing two of these reasons gained full marks.

c) A number of candidates incorrectly described the inclusion of filters or sieves to remove silt from drainage water.

The majority described a structure underground within a drainage system, with a solid and removable inspection lid to provide easy access to clean out the silt and inspect the chamber. Those who described the location of the inlet pipe as above the outlet pipe and the chamber having a solid, flat base to collect the silt gained good marks.

MARKS

Q3 a) State **SIX** elements expected to be found on a construction drawing of a garden feature. **6**

b) Describe how to establish a site datum. **4**

Q3 a)

Many candidates did not relate their answers specifically to construction drawings, naming elements expected to be found on site layout plans only, e.g., North Point.

Those gaining marks specified elements including;

1. The scale of the drawing
2. The specification of materials used, e.g., colour, dimensions
3. Details of the site and/or client
4. The name of the architect creating the drawings and date drawn
5. Specifications of construction methods including foundations
6. The location of the feature within the layout plan

Other accepted answers included

- dimensions of features
- references to other drawings and plans
- 'version number' due to changes which might be made to the drawing

b)

Candidates who gained high marks referred to the establishment of a temporary bench mark. A description should include the following:

Select a suitable horizontal surface near to the construction site which is unlikely to be accidentally moved/changed such as the corner of a step or inspection cover. Ensure the datum point selected would be visible within the area, positioned on a feature which would be easy to interpret and use during the construction of the feature.

MARKS

Q4 a) State **FOUR** hazards associated with excavating a trench. **4**

b) State **TWO** reasons why sub soiling could be required. **2**

c) Describe the process of sub-soiling. **4**

Q4 a) Candidates need to distinguish between hazards (source of potential harm) and risks (the likelihood and severity of harm). Those who gave risks without the hazard could not be awarded full marks.

The majority of candidates stated four relevant hazards which included:

- Collision with heavy machinery.
- Manual digging the soil from the trench and handling heavy quantities of soil leading to harm, both from lifting weight and the use of hand tools
- While excavating underground services (gas/electrical cables) could be hit and damaged.
- Wet slippery and uneven ground by the side of the trench could lead to people falling into the trench.
- The sides of the trench could collapse in on themselves resulting in crush injuries.
- Marker string lines and pegs, beside the trench can lead to trips.

b) Some good answers were given here, with most candidates able to state two distinct reasons for relieving sub-surface compaction.

Good answers included:

- the construction activities of hard landscaping can cause sub-surface compaction creating a mechanical pan, which could affect drainage and plant growth.
- If the soil type has poor drainage, subsoiling will provide better growing conditions for plants
- subsoiling is also required to break up pans in the soil horizons that prevent free exchange of water and air, caused by chemical pans or over cultivation.
- Subsoiling can increase the available rooting depth of soil for plants.

c)

Answers very rarely expressed an understanding of the process of using a subsoiler.

Candidates who gained marks described using a subsoiler attached to a tractor or other machine inserted into the soil to a depth below the sub surface pan. Most candidates appreciated the equipment must have the ability to penetrate the sub-soil, so mentioned a vertical bar/beam/arm etc. but failed to consider a horizontal fin which could lift and drop the soil as it was pulled through the sub-soil causing the pan to shatter, causing fissures up to the soil surface.

Many candidates described the use of machinery to rake through both topsoil and subsoil. Other poor answers described stripping off top soil before relieving compaction in sub soil with machinery.

MARKS

Q5 a) State **TWO** purposes of foundations. **2**

b) Give the foundation dimensions for a 1m high garden wall, constructed from bricks. **3**

c) List the quantities and ingredients of an ideal concrete mix for the foundation in b). **3**

d) Name **TWO** additional materials added to concrete to enhance its performance. **2**

Q5 **a)** This was generally well answered by candidates who gave two relevant reasons such as foundations spread the weight/load of the feature preventing settlement, and to provide a level surface for the construction of a feature that is stable and rigid.

b) Diagrams assisted some candidates in answering this question, where labelling with detailed information gained the marks. Correct information included the dimensions of

- Excavations depth – 450mm
- Foundation width – 225mm
- Foundation depth 150 – 200mm

c) A good answer for the concrete mix would include:

1 part ordinary Portland cement to 6 parts mixed ballast (ballast made out of 4 parts coarse aggregate 10mm-40mm stone, and 2 parts sharp sand)

Many candidates made gave inaccurate ratios or did not specify the type of sand or aggregate included in the mix.

Candidates preparing for the examination should consider characteristics of materials, such as shape, round or angular being of relevance as it defines builders' sand compared to sharp sand. The size range of particles/ aggregates is also of relevance to performance of materials.

d) Many candidates named materials used in the construction process to add strength, e.g., metal reinforcement bars, which are not concrete additives.

Good answers included;

- retarder to slow the curing process to prevent the concrete drying too quickly and potential cracking/weakening the foundations
- plasticiser to improve workability to allow it to spread easier and reduce the need for excessive water in the mix
- Corrosion inhibitors to reduce corrosion of steel rebars
- Other additives were also credited including a 'frost inhibitor' which prevents damage to wet concrete screed down to -8^{o}C.

Q6 Describe the laying of a concrete slab patio (excluding the edge details under the following headings: **MARKS**

i) site preparation **2**
ii) sub base **4**
iii) laying of concrete slabs **4**

Q6

A range of answers was given for this question with most candidates describing a process to lay concrete pre-formed slabs, rather than a poured concrete slab, although either process was accepted. Many candidates gave details of the site preparation and sub base in a random order but were still given marks where possible.

i) Details included:

After clearing the site of weeds, debris and top soil:

- excavate the site to formation levels, 125mm plus the depth of the slabs, e.g., 30mm
- ensuring an adequate fall for drainage across the site of 1:60 to 1:80. (Although many candidates stressed the need to level the site and keep it flat which was incorrect)
- followed by consolidation of the formation level and possibly making up of levels on soft ground using DTp1 (MOT1).

ii) Details included:

- Laying of a permeable geotextile membrane as a filtration membrane over the compacted formation level
- DTp1 or MOT1 (a crushed limestone aggregate 63mm - graded down to dust.) is spread out raked to even depth,
- consolidate using a vibrating plate compactor (3-4 passes in different directions).
- after compaction a minimum layer of 100mm of sub-base should be achieved.

iii) There are a range of methods employed within the industry but typically the method below was adopted by many candidates laying pre-cast concrete slabs.

Start at firm edge/corner with plank/shuttering or string

Lay a 30mm - 50mm level continuous bedding mix of mortar mix – 6 parts sharp sand : 1 part ordinary Portland cement for one course of slabs

Laying should begin at one corner of the patio, wetting slabs first

Lay two slabs and ensure levels are correct, then tap into place using a rubber mallet

Continue laying ensuring a 6-10 mm gap or butt joint is left between slabs

Tamp down each slab with rubber mallet as laid

Keep checking levels/ even fall with spirit level and straight edge to ensure each is level and the fall is maintained.

After laying, leave mortar to dry/go off before pointing.

Point either by brushing a dry mortar mix into gaps once all slabs have been laid or using a wet mix.

MARKS

Q7 a) Give specifications for **ONE** type of modular trellis panel suitable as a screen. **4**

b) State the sequence of construction of the trellis panels in a) to form a screen 5 panels long on a level site. **6**

Q7 **a)** Most candidates gained full marks for their trellis specification which included dimensions1800mm wide and 1800mm high; some included thickness of the materials.

Good examples also included some of the following:

- Shape - flat or arched top.
- Type of wood, e.g., softwood or pine or FSC certified timber
- Timber finish such as sawn
- Treatment given such as pressure treated or stained/ painted.
- Pattern such as Diamond grid or Square with 150mm centres
- Place the 100 x 100mm post into the hole. Check that the post is plumb on both sides and that it is touching the straight string line (without moving the line).
- Backfill the base of hole with rubble, postcrete and water, or a concrete mix of 1 OPC:6 ballast (and water) Brace the post to prevent it moving. Some candidates suggested completely filling the around the post with rubble, which has the advantage of re-cycling materials and not having to wait for cement products to set, before attaching the trellis panels to the posts.
- Many candidates used the panel to position the remaining posts positions when the gravel boards would be an easier process.
- Attach the first trellis panel to the post with a timber gravel board underneath, using
- frame battens and capping rail of 40 x 40mm timber

b) Candidates gaining maximum marks were able to accurately describe the whole process of construction of the screen, beginning with marking out, erecting posts, and attaching panels.

Good answers would include:

Mark out the length of the fence with measurements from the setting out plan.

Place the string line stretching beyond the fence length of the structure and secure to pins.

Mark the position of the first post and dig out a hole 600mm deep and 300mm wide for the first post 75mm external wood screws at the top, middle and bottom of the panel or fencing brackets. Alternatively use a slotted post which gravel board and panels can be fed into.

Once the trellis is secure, repeat the above for all additional posts (6 posts) until all 5 panels are fixed.

Top each post with a post cap.

MARKS

Q8 a) Describe suitable stone for the uprights of a garden arch. **4**

b) For the arch in a)

i) give the specification for a horizontal timber beam **2**
ii) state **TWO** methods for attaching it to the uprights **4**

Q8 **a)** Many candidates incorrectly described excessively small blocks or pieces of stone to form the uprights, e.g., 25mm x 100mm

Good answers included both the dimensions of the stone, the provenance or type of a specific stone, many included the colour or finish

For example;

- York sandstone, with a buff/yellow colour, and smooth finish blocks, 325mm x 100mm x 65mm

Indian Sandstone, Hand Cut Blocks, 215mm x 100mm x 65mm, rough finish.

b) **i)** This was well answered by candidates who were able to describe the dimensions, source and type of specific timber, finish, shape and size.

Good examples included

- Oak hardwood, from FSC source, square-edged beam, 150mm x 100mm x 1800mm, planed finish
- Soft wood, *Pinus* species, round 100mm, tanalised, rough sawn finish.

Candidates should check that their metric measurements are correct. some variation in candidates' answers included 30cm X 30 cm beams while others were 50mm X 50mm

ii) This part of the question was generally poorly answered, with some candidates describing notched timber upright and post. Others suggesting drilling into the stone, putting in raw-plugs and screwing the post to the pillar.

The most frequently given methods for attachment given were

- Drilling through the stone to attach with nuts and bolts
- Attaching hanging brackets to the stone with raw-plugs and screws which the beams are then secured to with screws.
- Constructing stone pillars with a slot for the beam to fit into, a better answer then included a method of securing the beam by various methods such as screws into raw-plugs or brackets.
- Galvanised steel pins included in the construction of the pillar to sit the beam on.

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