



NQF BTEC Level 3 National in
Construction and the Built Environment
Unit 1: Construction Principles

Mark Scheme
June 2019

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

Specific marking guidance for levels-based mark schemes*

Levels-based mark schemes (LBMS) have been designed to assess learners' work holistically. They consist of two parts: indicative content and levels-based descriptors. Indicative content reflects specific content-related points that learners might make. Levels-based descriptors articulate the skills that learners are likely to demonstrate in relation to the assessment outcomes being targeted by the question. Different rows in the levels represent the progression of these skills.

When using a levels-based mark scheme, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches learners' response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/objective and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

Specific marking guidance

This mark scheme uses the following types of marks:

- M marks: method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
- A marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
- B marks are unconditional accuracy marks (independent of M marks)
- Marks should not be subdivided.

Abbreviations:

- ft – follow through
- cao – correct answer only
- cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- isw – ignore subsequent working
- awrt – answers which round to
- SC - special case
- oe – or equivalent (and appropriate)
- dp - decimal places
- sf - significant figures
- dep - mark is awarded dependent on the previous mark
- indep - mark is awarded independent of the previous mark

BTEC Next Generation Mark Scheme Template

Construction and the Built Environment Level 3, Unit 1 - 1906

Question Number	Answer	Mark
1(a)	B - Embedded energy	1

Question Number	Answer	Mark
1(b)	<p>Award one mark for any of the following up to a maximum of two marks.</p> <ul style="list-style-type: none"> • The time taken for sound to decay (die away) (1) • Sound is absorbed by interactions with the surfaces of a room (1) • Sound drops to a level 60 decibels below its original level (1) <p>Accept any other appropriate response</p>	2

Question number	Working	Answer	Notes	Mark
1(c)	<p>'Addition' method</p> <p>Volume of cuboid section $V_c = b \times w \times h$ $V_c = 10 \times 8 \times 4$ $V_c = 320 \text{ (m}^3\text{)}$</p> <p>Volume of triangular section $h = 6 - 4 = 2$ $V_t = b \times w \times h/2$ $V_t = 10 \times 8 \times 2/2$ $V_t = 80 \text{ (m}^3\text{)}$</p> <p>Volume = $V_c + V_t$ Volume = $320 + 80$ Volume = $400 \text{ (m}^3\text{)}$</p>	<u>$V = 400 \text{ (m}^3\text{)}$</u>	<p>M1 for correct population of formula A1 for correct answer for V_c (ft)</p> <p>M1 for height of triangle section M1 for correct population of formula A1 for correct answer for V_t (ft)</p> <p>A1 for correct total volume (ft)</p>	(6)

	<p>'Subtraction' method</p> <p>Volume of cuboid section</p> $V_c = b \times w \times h$ $V_c = 10 \times 8 \times 6$ $V_c = 480 \text{ (m}^3\text{)}$ <p>Volume of triangular section</p> $h = 6 - 4 = 2$ $V_t = b \times w \times h/2$ $V_t = 10 \times 8 \times 2/2$ $V_t = 80 \text{ (m}^3\text{)}$ <p>Volume = $V_c - V_t$</p> <p>Volume = $480 - 80$</p> <p>Volume = $400 \text{ (m}^3\text{)}$</p>			
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Question Number	Answer	Mark
1(d)	<p>Award one mark for identification and one additional mark for appropriate expansion.</p> <ul style="list-style-type: none"> • The thermostat measures the temperature of the air (1) therefore interprets the information to turn on/off heating systems (1) • Thermostats can contain a bimetallic/heat activated switch (1) which opens and closes a circuit to control the heat (1) • Thermostats have electronic circuits that contain thermistors (1) which change resistance depending on temperature (1) <p>Accept any other appropriate response</p>	2

Question Number	Answer	Mark
1(e)	<p>Award one mark for identification and one additional mark for appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> • Noise criteria indices are specific for a type of use of a room (1) and are linked to the maximum recommended noise level for a specific use (1) • Comfortable levels of noise differ for different types of use (1) meaning that 	4

	<p>materials must be chosen that can control noise levels (1)</p> <ul style="list-style-type: none"> • Buildings regulations set performance standards for noise levels (1) which can be met by specifying appropriate materials (1) <p>Accept any other appropriate response</p>	
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Question Number	Answer	Mark
2(a)	<p>Award one mark for any of the following:</p> <ul style="list-style-type: none"> • Water (1) • Cement (1) • Fine aggregate/sand (1) • Course aggregate/rock/gravel (1) • Admixtures/air entrainment agents/retarders/accelerators/plasticisers (1) 	1

Question number	Working	Answer	Notes	Mark
2(b)	<p>(1) $y = 2x - 8$ (2) $y = x + 3$ $x = y - 3$</p> <p>$y = 2(y-3) - 8$ $y = 2y - 6 - 8$ $y = 2y - 14$ $y = 14$</p> <p>Substituting into (2) $14 = x + 3$ $x = 11$</p> <p>Alternative approach</p> <p>$2x - 8 = x + 3$ $x - 8 = 3$ (1) any first correct step to rearrange the equation $x = 11$ (1) $y = x + 3$ $y = 11 + 3 = 14$ (1) Coordinates (11, 14) (1)</p>	<p><u>$x = 11$</u> <u>$y = 14$</u> <u>Or (11,14)</u> Allow ft if second variable is correct in relation to the first incorrect answer.</p>	<p>M1 for rearranging equation 2 o.e</p> <p>M1 for substituting eqn 2 in to eqn 1</p> <p>A1 for correct value of y</p> <p>A1 for correct value of x</p>	(4)

Question Number	Answer	Mark
2(c)	<p>Award one mark for identification and one additional mark for appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> • Frost attack/damage (1) which causes spalling/brickwork crumbling (1) • Sulphate attack (1) resulting in mortar cracking/crumbling (1) • Wall tie failure (1) causing walls to buckle/bulge (1) • Stepped cracking of the mortar joints (1) resulting from settlement/differential settlement/heave (1) • Compression/tensile failure (1) which could result in failure paths through mortar (1) • Overturning (1) due to excessive lateral pressure (1) • Acid rain/corrosive elements (1) causes degradation of mortar joints (1) • Inadequate drainage/weephole design (1) allows build-up of water pressure, which could cause the wall to fail (1) <p>Accept any other appropriate response</p>	(4)

Question Number	Answer	Mark
3(a)	<p>Award one mark for identification and one additional mark for appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> • Light in weight (1) making them easy to handle/use on site/faster construction (1) • Easy to cut and shape (1) reducing the time needed to size blocks as required (1) • Accept nails (1) allowing fixtures to be directly attached (1) • Good fire resistance (1) as the material does not burn or give off toxic fumes/fire protection for long period (1) • High levels of sound insulation (1) reducing noise from other rooms (1) • Appropriate flat surface (1) which will accept an internal finish. (1) • Durable material (1) will withstand everyday wear and tear and damage (1) <p>Accept any other appropriate response</p>	(4)

Question number	Working	Answer	Notes	Mark
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3(b)	<p>Moments around B</p> $2.5 \times 2 \times 1.25 = RA \times 2.5$ $2.5RA = 6.25$ $RA = 6.25/2.5$ $RA = 2.5\text{kN}$ <p><i>Could be answered by resolving forces and identifying RA and RB are equal</i></p>		<p>M1 for correct substitution of values on LHS of equation</p> <p>M1 for correct substitution of values on RHS of equation</p> <p>M1 for rearranging in terms of RA</p> <p>A1 for correct value of RA</p>	(4)
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Question Number	Answer	Mark
3(c)	<p>Award one mark for identification and one additional mark for appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> ○ Allows light to pass through (1) while providing a level of privacy for individual rooms (1) ○ Provides decorative effects (1) because it is available in a wide range of styles /types/colours/finishes (1) ○ Can have 'one-way' properties (1) allowing people to look out but not in to rooms (1) <p>Accept any other appropriate response.</p>	(4)

Question number	Indicative content
3(d)	<p>Answers will be credited according to learners' demonstration of knowledge and understanding of the use of source-path-receiver approach, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but should be rewarded for other relevant answers.</p> <ul style="list-style-type: none"> • The equipment in the plant room will generate considerable noise • The plant room is likely to contain heating/ventilation equipment, boilers, pumps, extraction equipment • The source of noise should be dealt with first • More modern, efficient quieter plant could be used • Silencers could be fitted • The paths of the noise will need to be identified • These will be analysed to see which is the most dominant • Suitable barriers can then be identified to interrupt the noise path • Barriers will divert the noise away from the receiver • Barriers could include walls, enclosures, cowls, screens etc. • Residual noise can be reduced using high mass materials • Limiting exposure to the receiver by modifying work patterns • Provide and use PPE

Level	Mark	Descriptor
Level 0	0	No rewardable material
Level 1	1 - 3	<ul style="list-style-type: none"> ● Demonstrates isolated knowledge and understanding of relevant information; there may be major gaps or omissions. ● Provides little evidence of weighing up competing arguments/pros and cons in context; discussion likely to consist of basic description of information. ● Meaning may be conveyed but in a non-specialist way; response lacks clarity and provides a basic answer to the question. ● The learner demonstrates a basic understanding of the application of the source-path-receiver approach.

Level 2	4 - 6	<ul style="list-style-type: none"> ● Demonstrates accurate knowledge and understanding of relevant information with a few gaps or omissions. ● Discussion is partially developed, but will be imbalanced; evidences the weighing up of competing arguments/pros and cons in context. ● Demonstrates the use of logical reasoning, clarity, and appropriate specialist technical language. ● The learner demonstrates a good understanding of the application of the source-path-receiver approach.
Level 3 7-9		<ul style="list-style-type: none"> ● Demonstrates accurate and thorough knowledge and understanding of relevant information; any gaps or omissions are minor. ● Displays a well-developed and balanced discussion, demonstrating a thorough grasp of competing arguments/pros and cons in context. ● Logical reasoning evidenced throughout response that is clear and uses specialist technical language. ● The learner demonstrates a developed understanding of the application of the source-path-receiver approach.

Question number	Working	Answer	Notes	Mark
4(a)	Strain = $\Delta L/L$ Strain = $5/1500$ Strain = $0.003(3\dots)$	Strain = $0.003(3\dots)$	M1 for correct substitution of values. A1 for correct value of strain	(2)

Question Number	Answer	Mark
4(b)	<p data-bbox="491 293 1070 353">Award one mark for identification and one additional mark for appropriate expansion.</p> <ul data-bbox="539 394 1171 846" style="list-style-type: none"><li data-bbox="539 394 1098 454">• Contains hazardous materials (1) and requires specialist disposal (1)<li data-bbox="539 456 1110 517">• Not dimmable (1) reduce the ability to control light levels (1)<li data-bbox="539 519 1145 618">• Requires a uniform pattern of installation (1) which restricts layout and ability to highlight (1)<li data-bbox="539 620 1158 680">• Fluorescent tubes buzz and flicker (1) and can be uncomfortable (1)<li data-bbox="539 683 1171 743">• Not as energy efficient (1) LED lamps offer greater efficiency (1)<li data-bbox="539 745 1129 846">• Tubes take some time to become fully effective (1) as they need to reach their operating temperature/brightness (1) <p data-bbox="491 882 1171 913">Accept any other relevant phrasing/wording.</p>	2

Question Number	Answer	Mark
4(c)	<p>Award one mark for the identification and one additional mark for the appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> • Colour/absorbency of the external surface (1) produces heat gains caused by radiant heat as the sun warms the surface of the building (1) • Large buildings contain many occupants/people (1) as internal heat gain will be influenced by the activities in the sports hall (1) • The larger the external surface area (1) the greater the solar heat gain (1) • The greater the difference between internal and external temperature (1) the greater the heat gain (1) • Electrical lighting/electrical equipment (1) which generates heat (1) <p>Consider orientation/location/degree of exposure</p> <p>Accept any other relevant phrasing/wording.</p>	(4)

Question Number	Answer	Mark
5(a)	<p>Award one mark for the identification and one additional mark for the appropriate expansion up to a maximum of four marks.</p> <ul style="list-style-type: none"> • Thatch is a weatherproof coating (1) making it suitable for a location with low rainfall (1) • Thatch provides good insulation (1) keeping the homes cool in summer (1) • Thatch has some soundproofing qualities (1) reducing noise transmission in the property (1) • Good aesthetic properties (1) in keeping with the local built environment (1) <p>Do not accept responses relating to sustainable materials/natural resources.</p> <p>Accept any other valid response.</p>	4

Question Number	Answer	Mark
5(b)	<p>Award one mark for the identification and one additional mark for the appropriate expansion up to a maximum of six marks.</p> <ul style="list-style-type: none"> • Locate windows where they will receive the most daylight (1) so they are not in the shade of other buildings (1) • Increase the size/number of windows/glazed doors (1) to increase the sky component (1) • Include sky lights (1) to allow more light to enter rooms (1) • Use pale colours for the outside of the holiday homes (1) to allow light to be reflected into the holiday homes (1) • Use light colours for internal walls and ceilings (1) improving the internally reflected component (1) • Building is located in a position free from any obstructions (1) so that light into the building is not obstructed (1) <p>Do not accept responses relating to building orientation, sunlight or open plan layout.</p> <p>Accept any other valid response.</p>	6

Question number	Indicative content
5(c)	<p>Answers will be credited according to learners' demonstration of knowledge and understanding of the context, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive.</p> <p>Answers may cover some or all of the indicative content but should be rewarded for other relevant answers.</p> <p>An analysis of the use of the same designs, materials and construction methods, the appropriateness for the locations, or not, supported by relevant points, which may include:</p> <ul style="list-style-type: none"> • Consideration of the climate at the given location, including temperature, rainfall, wind speed, and days of air frost. • The appropriateness of the materials with regards to the type of construction proposed and how they meet legislative requirements. • Consideration of materials to be used: <ul style="list-style-type: none"> ○ timber cladding is able to withstand the effects of rain, wind and frost in the location

- timber cladding is generally durable and will protect the homes effectively
- timber cladding will allow the holiday homes to have low embedded energy
- timber cladding may expand/contract as moisture levels change
- timber cladding will need to be installed in such a way as to allow rain to run off
- timber cladding will need to be treated to reduce the effects of frost
- timber cladding will need to be maintained in order to retain the integrity of the building
- particle board framing can allow for modular designs of the holiday homes.
- particle board frames can be vulnerable to insect attack/animal infestation.
- particle board will not twist/warp as it is a stable material
- straw insulation will provide adequate insulation in the location of the holiday homes
- straw insulated walls will help to keep the homes cool in the summer
- straw has low embedded energy
- straw insulation is largely unaffected by air frost
- straw insulation can be installed in pre-fabricated units
- Consideration of location and climate:
 - the location is relatively dry and warm, meaning materials do all year round with all averages above freezing.
 - windspeeds in the location are relatively low meaning lighter weight construction may be appropriate
 - the location has a low average annual rainfall
 - monthly rainfall levels are similar throughout the year, and are relatively low
 - the location does not encounter much air frost in the winter
 - the location is warm in summer.
- Consideration of design/construction methods:
 - the design could be appropriate for holiday homes as an alternative to brick/stone construction
 - construction methods, such as thatching, are likely to be familiar to local workforces
 - use of pre-fabricated modules allows the holiday homes to be constructed quickly
 - gives the appearance of a traditional rural building
 - ensures the holiday homes have low embedded energy.

Level	Descriptor
0 0 marks	No rewardable material
1 1-4 marks	Basic arguments on both sides identified, or only one side considered. The answer is likely to be in the form of a list. Points made will be superficial/generic and not applied/directly linked to the situation in the question. No conclusion produced or the conclusion a consequence of only one side of the argument being considered.
2 5-8 marks	Arguments for and against are described, but there will be more emphasis on one side than the other. The answer will be unbalanced. A conclusion may be present, but this is either implicit or as a result of unbalanced consideration of the arguments. There is little or unfocused justification of the conclusion. Most points made will be relevant to the situation in the question, but the link will not always be clear.
3 9-12 marks	Balanced explanation of both sides for and against. A conclusion may be produced which is justified clearly linked to the consideration of arguments for and against, and their relative importance to the situation. The majority of points made will be relevant and there will be a clear link to the situation in the question.

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