

Content Area 2: Science

Students must be able to apply an understanding of the range of materials used by the construction sector in a range of design, surveying and planning contexts. They must explore how materials behave whilst they are under load, and perform calculations related to structural members under various loading conditions. Students also need to understand the principles of human comfort and apply theories to contextualised problems. Students will also gain an understanding of Earth Sciences and their impact on the construction industry, specifically in a range of design, surveying and planning contexts.

| What students need to learn | | |
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| 2.1 Students must understand material properties, chemical composition, degradation, failure and effects of environmental conditions | | |
| 2.1.1 | <p>Students need to understand how different materials behave, material properties, composition and causes of failure and degradation in order to discriminate between materials and select appropriately.</p> <ul style="list-style-type: none">• Material properties: mass, density, compressive strength, tensile strength, shear strength, hardness, toughness, stiffness, workability, resistance to moisture/vapour penetration, resistance to degradation/oxidization.• Chemical composition (structure) of materials: timber, concrete, plastics, metals.• Degradation: natural agents, timber infestation, timber decay, chemical degradation.• Modes of failure: fatigue, creep, buckling, bending, shear.• Effects of environmental conditions: moisture movement, exposure conditions, freeze-thaw, thermal ageing.• Remedial measures to prevent and reduce degradation: special paints, preservatives, special coatings. | |
| 2.1.2 | <p>Key properties of construction materials, how they work together to provide composite performance and properties, how they impact on performance in use and on the specification of materials for different scenarios and levels of exposure to the elements.</p> <ul style="list-style-type: none">• Bricks – facings, Class A engineering, Class B engineering, commons.• Concrete – prescribed mixes, design mixes.• Reinforced concrete – pre-stressed concrete, types of reinforcement, pre-cast, cast in situ.• Concrete blocks – aerated, high density, insulated.• Mortar mixes – cement mortar, cement lime mortar, coloured mortar.• Plasterboard.• Glass and glass finishes – smart glass (thermochromic, electrochromic, photochromic), laminated, tempered, float, clear, obscured. | |

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| | <ul style="list-style-type: none"> • Insulation materials – fibreglass, expanded polystyrene, Celotex, mineral wool, cellulose, straw, polyurethane. • Plastics used for polythene damp-proof membranes (DPM), damp-proof courses (DPC), doors and window frames, soffits, bargeboards, fascia, guttering. • Polyvinylchloride (PVC), un-plasticised Polyvinylchloride (uPVC). • Timber and manufactured boards – hardwoods, softwoods, plywood, chipboard, particle board, medium-density fiberboard (MDF). • Roofing materials – slate, concrete, pantile, roofing felt, thatch, ridge, lead flashing. • Engineered timber – glulam beams, engineered joists. engineered beams, eco joist. • Metals: steel (mild, stainless, high strength), aluminium alloys, copper, brass. | |
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