# Unit 112: Construction operations and civil engineering operations

# Sample scheme of work

This sample scheme of work covers both classroom and workshop-based learning for **Unit 112 Construction operations and civil engineering operations**. It is based on 3–6 hours per session for **Theory** sessions and between 12 and 20 hours for **Practica**l per learning outcome. It is an example only of a possible scheme of work and is based on theory and practical within an FE centre but can be amended to suit all learning facilities with the necessary adjustments to meet individual learners’ needs.

**You can use the sample scheme of work as it is, adjust it or extract content to create a scheme of work to suit your delivery needs. It can also be adjusted by adding theory and practical workshops to support learners who have/need additional learning time.**

Centres should also incorporate the following themes, where appropriate, as strands running through each of the sections within the qualification. Although they are not specifically referred to in the section content section, City & Guilds regards these as essential in the teaching of the qualification:

* health and safety considerations, in particular the need to impress upon learners the fact that they must preserve the health and safety of others as well as themselves
* Essential Skills (Application of Number, Communication, Digital Literacy and Employability)
* extension tasks and differentiation, inclusion, entitlement and equality issues
* spiritual, moral, social and cultural issues
* environmental education and related European issues
* British Values
* use of information learning technology (ILT).

# Unit 112: Construction operations and civil engineering operations

# Sample scheme of work

**Course/qualification:** Foundation in Construction and Building Services Engineering **Tutor’s name:** Enter the tutor’s name here

**Number of sessions**:approx. 45. **Delivery hours**: 140 **Venue**:Enter the venue here **Group**: Enter the group here

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| **Learning outcomes**   1. Know the underlying principles used in construction operations and civil engineering operations 2. Know how to plan and produce a sequence of work 3. Be able to complete common construction operations and civil engineering tasks 4. Understand methods of evaluating performance |

| Session | Objectives/learning outcomes **The learner will:** | Activities and resources | Skills check |
| --- | --- | --- | --- |
| 1  3 hours | 1. **Know the underlying principles used in construction operations and civil engineering operations**   1.1 The main roles and task undertaken  1.2 Materials used  1.3 Tools and equipment | Activities:   * Entrance activities. * Presentation on safety and planning. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 1: Safety and planning** * **Worksheet 1: PPE** * **Worksheet 2: Safe systems of work – risk assessment** * **Worksheet 3: PPE uses** * **Worksheet 4: PPE selection** * **Questions** | Worksheets 1–4  Activity answers  Question and answer (Q&A)  Observation |
| 2  3 hours | 1. **Know how to plan and produce a sequence of work**   2.1 Planning a sequence of work  2.2 Calculating resources required | Activities:   * Entrance activities. * Presentation on linear calculations. * Presentation on area calculations. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 17: Linear calculations** * **PowerPoint 18: Area calculations** * **Worksheet 35: Calculations – linear** * **Worksheet 36: Calculations – area** | Worksheets 35 and 36  Activity answers  Question and answer (Q&A)  Observation |
| 3  3 hours | 1. **Know how to plan and produce a sequence of work**   2.1 Planning a sequence of work  2.2 Calculating resources required | Activities:   * Entrance activities. * Presentation on linear calculations. * Presentation on area calculations. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 19: Volume calculations** * **PowerPoint 20: Tonnage calculations** * **Worksheet 37: Calculations – volume** * **Worksheet 38: Calculations – tonnage** | Worksheets 37 and 38  Activity answers  Question and answer (Q&A)  Observation |
| 4  3 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.1 Erect and remove site protection | Activities:   * Entrance activities. * Introduction to the learning outcome, giving explanations for the need for construction site barriers, health and safety requirements, etc. * Presentation on site protection. * Presentation on site protection boundaries. * Explain the importance of installing construction site barriers to protect work, staff, the public and surrounding environment. * Discuss the types and different features of construction site barriers and typical locations. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 2: Site protection** * **PowerPoint 3: Site protection boundaries** * **Worksheet 5: Site protection 1** * **Worksheet 6: Site protection 2** * **Worksheet 7: Site protection 3** | Worksheets 5–7  Activity answers  Question and answer (Q&A)  Observation |
| 5  3 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.1 Erect and remove site protection | Activities:   * Entrance activities. * Calculations for site protection. * Calculate quantity of construction site barriers used for work operations. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **Worksheet 8: Site protection – perimeter calculations 1** * **Worksheet 9: Site protection – perimeter calculations 2** | Worksheets 8–9  Activity answers  Question and answer (Q&A)  Observation |
| 6–7  6 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.2 Lay drainage | Activities:   * Entrance activities. * Presentation on drainage systems. * Presentation on drainage systems layouts. * Discuss the types of drainage systems – combined, separate, partially separate – and purpose: the removal of surface and foul water. * Discuss the methods of preparing ground for laying domestic drainage: excavating ground, safe digging practices, safe storage of spoil, marking out drainage runs and falls. * Discuss potential natural and environmental hazards encountered when laying domestic drainage: water tables and tree roots, contaminated ground, trench collapse. * Explain the different types and the importance of trench support systems and when they are used, ground types and depths of excavations. * Discuss what services could be in the location and dangers they pose. * Explain how to recognise the different types of services: gas pipes, electric cables, water pipes, communication cables. * Colours, markers, visual clues. * Discuss how to locate services, service plans, cable avoidance tool (CAT Scanner), trial holes, visual inspection. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 4: Drainage systems** * **PowerPoint 5: Drainage preparation and safety** * **Worksheet 10: Drainage systems** * **Worksheet 12: Drainage systems – layouts** * **Worksheet 13: Drainage systems – safe working practices** | Worksheets 10, 12 and 13  Activity answers  Question and answer (Q&A)  Observation |
| 8–9  6 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.2 Lay drainage | Activities:   * Entrance activities. * Presentation on drainage components. * Presentation on drainage laying and testing. * Discuss the reasons for, and methods of, protecting work, resources and surrounding areas from damage arising from installation activities. * Explain the need for testing drainage systems, confirming falls are correct, joints are sealed, and the system is constructed to specification and industrial standards (water and air tests). * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 6: Drainage components** * **PowerPoint 7: Drainage laying and testing** * **Worksheet 11: Drainage components** * **Worksheet 14: Drainage laying** * **Worksheet 15: Drainage calculations 1** * **Worksheet 16: Drainage calculations 2** * **Worksheet 17: Drainage testing** | Worksheets 11, 14, 15, 16 and 17  Activity answers  Question and answer (Q&A)  Observation |
| 10  3 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.3 Lay modular paving | Activities:   * Entrance activities. * Presentation on modular paving materials. * Presentation on modular paving tools. * Discuss the reasons for, and methods of, protecting work, resources and surrounding areas from damage arising from installation activities. Safe working practices are key for safety. * Explain the need for selecting the correct tools and materials, where the materials would be typically used and what tools are used for different activities. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 8: Modular paving materials** * **PowerPoint 9: Modular paving tools** * **Worksheet 18: Modular paving materials** * **Worksheet 19: Modular paving – safe working** * **Worksheet 20: Modular paving – tools and equipment 1** | Worksheets 18–20  Activity answers  Question and answer (Q&A)  Observation |
| 11–12  6 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.3 Lay modular paving | Activities:   * Entrance activities. * Presentation on methods used for preparing and laying areas of block paving. * Presentation on methods used for preparing and laying areas of paving slabs. * Discuss the different methods of construction, the need for edge restraints, compaction and laying methods. * Explain the need for bonding for both block paving and paving slabs and how the paving is finished. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 10: Modular paving construction methods –block paving** * **PowerPoint 11: Modular paving construction methods –paving slabs** * **Worksheet 21: Modular paving – tools and equipment 2** * **Worksheet 22: Modular paving tools for the job** * **Worksheet 23: Modular paving equipment safety** * **Worksheet 24: Modular paving bonds** | Worksheets 21–24  Activity answers  Question and answer (Q&A)  Observation |
| 12–13  6 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.4 Concreting work | Activities:   * Entrance activities. * Presentation on concrete materials. * Presentation on concrete formwork and reinforcement. * Discuss the materials used in concrete operations: cement, fine aggregate, coarse aggregate, water and additives. * Discuss the uses of concrete as a material where is it typically used: advantages/disadvantages. * Explain how to establish the correct height levels for concrete works, the different types of setting out and levelling equipment. * Explain the reasons for reinforcement, e.g. to increase tensile strength, reduce slab thickness, prevent cracking, increase life span. * Discussion and questioning. * Completion of activities and worksheets.   Resources:   * **PowerPoint 12: Concrete materials** * **PowerPoint 13: Concrete formwork and reinforcement** * **Worksheet 25: Concrete material 1** * **Worksheet 26: Concrete material 2** * **Worksheet 27: Concrete safe working** * **Worksheet 28: Concrete tools and equipment** | Worksheets 25–28  Activity answers  Question and answer (Q&A)  Observation |
| 14–15  6 hours | 1. **Be able to complete common construction operations and civil engineering tasks**   3.4 Concreting work | Activities:   * Entrance activities. * Presentation on concrete place and compact. * Presentation on concrete finishing. * Presentation on concrete curing. * Explain the methods used for mixing concrete by hand, mixer, and advantages of using ready mixed concrete. * Explain the methods used for placing concrete. Discuss the reason for compacting concrete. * Explain the types and methods used for finishing concrete to the required specification. * Explain the methods of protecting concrete during curing. Explain the types of curing and typical uses, advantages, etc. * Discussion and questioning * Completion of activities and worksheets   Resources:   * **PowerPoint 14: Concrete place and compact** * **PowerPoint 15: Concrete curing** * **PowerPoint 16: Concrete finishing** * **Worksheet 29: Concrete mixing 1** * **Worksheet 30: Concrete mixing 2** * **Worksheet 31: Concrete placing** * **Worksheet 32: Concrete finishes** * **Worksheet 33: Concrete curing** * **Worksheet 34: Concrete calculations** | Worksheets 29–34  Activity answers  Question and answer (Q&A)  Observation |
| 16–18  Practical activities  12 hours | 1. **Understand methods of evaluating performance**   4.1 Evaluation against standards  4.2 Performance analysis   1. **Be able to complete common construction operations and civil engineering tasks**   3.1 Erect and remove site protection  3.5 Working safely | Activities:   * Carry out risk assessment for installation of construction site barriers for given work scenarios. * Select type and calculate quantity of construction site barriers. * Select tools required to install barriers, set out and install site barriers, and check and maintain the construction site barriers during work operations.   Resources:   * Tools, barriers, fencing, signs, etc. (this should be repeated for the different types of site protection). | Observation  Outcome of practical task  Complete activities until learners show competency |
| 19–25  Practical activities  20 hours | 1. **Understand methods of evaluating performance**   4.1 Evaluation against set standards  4.2 Performance analysis   1. **Be able to complete common construction operations and civil engineering tasks**   3.2 Lay drainage  3.5 Working safely | Activities:   * Calculate quantity of resources required for laying domestic drainage to given specifications. Select resources required for laying domestic drainage. * Lay new drainage pipes to line and level to tutor given specification. * Install new drainage units and components to line and level and test completed run. * Follow risk assessment for installing drainage systems. * Maintain a clean and safe working area. * Clean all tools and equipment ready for re-use.   **Resources:**   * Plastic and clay foul and surface water drainage pipes; plastic, concrete, brick inspection chambers; fittings/connections and bedding materials. * Shovels, laying/bedding tools, hand-operated and * powered pipe cutting equipment, levels (optical, laser), boning rods. | Observation  Outcome of practical task  Complete activities until learners show competency |
| 26–31  Practical activities  20 hours | 1. **Understand methods of evaluating performance**   4.1 Evaluation against standards  4.2 Performance analysis   1. **Be able to complete common construction operations and civil engineering tasks**   3.3 Lay modular paving  3.5 Working safely | Activities:   * Select the correct PPE, tools and materials to construct a short length of footpath with block paving to tutor-given specification. * Set up the work area safely. * Use PPE appropriate to preparing and laying areas for block paving. * Select tools and equipment required and appropriate for preparing and laying areas for block paving. * Maintain a clean and safe working area. * Clean all tools and equipment ready for re-use.   Resources:   * PPE: Safety boots, hard hat, high visibility jackets, goggles, gloves. * Materials:Types of block paviour, types of paviour edging, sub base, sharp sand for bedding paviours, kiln dried sand as space filler. * Tools and equipment: Shovel, wheelbarrow, pegs, trowel, straight edge, mallet, level, tape measure, building line vibrating plate*.* | Observation  Outcome of practical task  Complete activities until learners show competency |
| 32–38  Practical activities  20 hours | 1. **Understand methods of evaluating performance**   4.1 Evaluation against set standards  4.2 Performance analysis   1. **Be able to complete common construction operations and civil engineering tasks**   3.3 Lay modular paving  3.5 Working safely | Activities:   * Select the correct PPE, tools and materials to construct a short length of footpath with paving slabs to tutor-given specification. * Use PPE appropriate for preparing and laying areas for paving slabs. * Select tools and equipment appropriate for preparing and laying areas for block paving. * Maintain a clean and safe working area. * Clean all tools and equipment ready for re-use.   Resources:   * PPE: Safety boots, hard hat, high visibility jackets, goggles, gloves. * Materials: Basic types of flagstones, sub base, sand, cement. * Tools and equipment: Shovel, wheelbarrow, trowel, straight edge, mallet, level, tape measure. | Observation  Outcome of practical task  Complete activities until learners show competency |
| 39–45  Practical activities  20 hours | 1. **Understand methods of evaluating performance**   4.1 Evaluation against set standards  4.2 Performance analysis   1. **Be able to complete common construction operations and civil engineering tasks**   3.4 Concreting work  3.5 Working safely | Activities:   * Select the correct PPE, tools and materials to mix and place concrete to tutor-given specifications. * Set up the work area safely. * Use PPE appropriate for mixing concrete. * Select materials required to prepare formwork and compact and finish concrete by hand. * Select tools and equipment required to prepare formwork and compact and finish concrete by hand. * Maintain a clean and safe working area. * Clean all tools and equipment ready for re-use.   Resources:   * PPE: Safety boots, hard hat, high visibility jackets, goggles, gloves. * Materials: Timber moulds, concreting sand, gravel, cement, mould release oil. * Tools and equipment: Shovel, wheelbarrow, trowel, straight edge, mallet, level, tape measure*.* | Observation  Outcome of practical task  Complete activities until learners show competency |