## Learning outcomes

<table>
<thead>
<tr>
<th>KNOWLEDGE</th>
<th>SKILLS</th>
</tr>
</thead>
</table>
| - Geological data applied to earth construction for sourcing of different clay and soils (read reports, maps, collect data):  
  - look for quarries  
  - identify soils appropriate for construction (open extraction sites)  
- Properties and use of clay as a binder in building materials  
- Advantages and disadvantages of different kinds of stabilisation  
- Tests to identify suitability of soil for construction purposes  
- Methods for determining appropriate mix (constituent proportions)  
- Selection criteria for earth extraction and preparation equipment: cost, efficiency, consumption, maintenance, dimensions, handiness, security, providers,...  
- Hygro-thermal, bioclimatic and mechanical properties of earth building materials: thermal bridges and airproofness, thermal mass, impacts on air conditioning (heating and cooling), indoor air quality and comfort, mould  
- Innovation and development related to earth construction and testing procedures  
- Environmental impacts of earth material: existing Life Cycle Analysis data, carbon assessment  | Planning  
- Program all the studies and and controls for earth materials at different steps, from sourcing to production of the mix  
- Identify sources (deposits, providers...) of earthen materials and other mix components  
- Carry out various soil tests to determine its suitability for construction  
- Make samples: test walls, cubes, cylinders ...  
- Carry out or order various tests on samples to determine physical and mechanical properties of mix  
- Choose appropriate additives: organic/mineral  
- Modify the composition of the mix, according to a required task, weather conditions and equipment  
- Calculate the quantities of materials and check the availability of the sources  
- Select and if necessary adapt equipment for extraction, transport, preparation and mixing  

### Coordination  
- Organise the workforce and coordinate the team for optimum workflow in production, from extraction to earth mix preparation  
- Liaise with and control various professions and trades linked to raw earth extraction, testing, processing and mixing  
- Modify program against earth related incidents  

### Controls  
- Prevent disaggregation during transport and mixing  
- Check if the moisture content of the mix is well controlled  
- Check the correct application of the site health & safety plan  

## COMPETENCE

<table>
<thead>
<tr>
<th>KNOWLEDGE</th>
<th>SKILLS</th>
</tr>
</thead>
</table>
| - Create confidence on site and underline the particular issues relating to earthen materials through site inductions and training where necessary  
- Assess and report site soil, used earth and alternative sources of earthen materials for use as building material (possible building techniques)  
- Characterise earth mix on site and/or in lab relating to earth building standards or regulations and give input to preliminary design studies: specific technical requirements (composition of the mix, equipment, processes)  
- Manage the efficient procurement of the earth materials, raw and mixed  
- Liaise with architects and engineers (level 7), give input to preliminary design studies about sourcing, tests, processing, equipment, mixing |
## Criteria and Indicators for the Assessment of Skills

### Level 5

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
</tr>
</thead>
</table>
| **Planning** | - Test methods have been discussed and test results are documented  
- Possible applications for local soil are defined  
- Quantities of materials are accurately estimated  
- Choice of equipment for extraction, transport, preparation of earth and mixing is appropriate  
- Planning of production is adapted to the type of equipment and number of workers |
| **Coordination** | - The earth building competence of the team is assessed and training needs identified  
- The workers are aware of the behaviour of clay and evolution of the earth mix with time  
- Distance travelled with earthen material to/on construction site is optimised  
- Equipment are used correctly and efficiently  
- The work plan and cost plan are up-dated in light of events  
- Mix is available when needed |
| **Controls** | - Properties of the extraction soil are regularly checked  
- Quantity of extraction soil and other components is correct and storage appropriate  
- Mix is homogenous (grain size, fibres and humidity) and in line with the specification  
- The site is managed safely:  
  o Personal protection equipment is adapted to risks and is used according to safety instructions  
  o Equipment is used according to safety instructions.  
  o All protective safeguards are in place  
  o Erection of ladders and scaffolding according to regulations |

Ensure that standards of work and materials comply with relevant codes of practice and to current standards.