ECVET Earth Building	**Building with earth - masonry, mass, rammed, light earth**	**Unit B common part**

Learning outcomes — Levels 3+4

KNOWLEDGE

- Geological, geographical and cultural issues affecting traditional and modern earth building techniques
- Schedule plans, specifications and bills of quantities
- Seasonal appropriateness and timing
- Protection before, during and after building: covering choices, and how they aid or impede drying
- Basic knowledge about building physics/structural behaviour
- Characteristics of curved walls / walls with complex geometry
- Height and width ratio (slenderness) in humid and dry state, how high to build according to the technique, weather and site conditions

- Foundations, wall base and DPC (Damp Proof Course)
- Connections with other walls or components, expansion- and structural joints, bonding techniques
- Particular issues with scaffolding: fixing, splash-back
- Fixing structural or non-structural elements, insulation, etc.
- Protection / reinforcement of edge and corner
- Openings: frames, lintels, sills
- Services
- Top of walls, interface with other built elements
- Technical or decorative elements: furniture, stairs, stoves, chimneys…

- Sourcing and use of earth products
- Machinery and tools for mixing, cutting, lifting, laying, placing, compacting
- The schedule of works: reporting of building progress
- Significant defects. Signs of deformation and collapse or slumping. Means of prevention
- The impact of drying on speed of build
- Methods to test and control moisture content (site or lab)
- Drying process, shrinkage
- Quality control on building site
- Site organisation, storage, access, scaffolding
- The ergonomics of the workstation
- Health and safety regulations

SKILLS

Preparatory works and planning
- Read plans and technical specifications
- Check dimensions and quality of foundations and subflooring
- Plan for seasonal appropriateness and timing
- Prepare during-the-work protection
- Regularly control mix moisture and/or fibre content
- Protect adjoining surfaces

Execution
- Create capillary break (e.g. place DPC Damp Proof Course)
- Connect earth walls to other components (earth or not), create expansion/shrinkage and structural joints
- Place/fix structural and non structural elements (wall plates, frames, sills)
- Integrate appropriate insulation systems
- Make chamfered, shaped or reinforced corners
- Key/dampen day work
- Create openings
- Chase/build in services (pipes, boxes, fixing)
- Integrate reinforcing (geo grid, wire mesh)
- Prepare top of wall interface with other built elements
- Execute special elements following instructions
- Produce required surface finish
- Make the necessary surface repairs

Site organisation
- Check scaffolding, avoiding wall damage and splash-back
- Install a small building site with or without on-site production
- Select appropriate tools, machinery, equipment
- Organise the workplace and supply materials
- Manage plant for transport, lifting and handling of prefabricated elements
- Protect the work during and after building (water, damage/abrasion, paint…)

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COMPETENCE	Level **3**

Decision making process
- In the design brief, identify details proper to earth that need particular attention
- Recognise conditions including weather and seasonal issues which may require precautions

Planning and organising for own work
- With the materials provided, plan and organise each step of the building process, according to the specifications and program

Execution, quality control and coordination within the earth building team
- Work in accordance with the schedule of works, adjust to general work process on site, instruct Level 1 + 2 workers of the earth building team
- Check if all the steps involved conform to the specification and program
- Identify problems and report
- Control quality of the own work at each step
- Regularly check the drying process
- Recognise the signs of deformation and collapse
- Ensure your team respects health and safety regulations

Communication beyond the earth building team
- Liaise with non earth building specialists on issues of structure and finish

COMPETENCE	Level **4**

Decision making process
- Advise on details in the design process
- Recognise conditions including weather and seasonal issues which may require precautions

Planning and organising for team work
- Plan and organise all the step of the building process

Execution, quality control and coordination within the earth building team
- Supervise and coordinate the entire work of the earth building team according to the specifications and program
- Report building progress
- Identify significant problems and intervene
- Control quality of the work of the earth building team
- Manage the drying process
- Recognise the signs of deformation and collapse
- Ensure your team respects health and safety regulations

Communication beyond the earth building team
- Liaise with supervision and design team
- Liaise with other trades and professionals, coordinate and sequence earth works within the general schedule
- Liaise with non earth building specialists on issues of structure and finish

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ECVET Earth Building	**Building with Light Earth**	**Unit B sub unit**

Learning outcomes	Level **3+4**

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SPECIFIC KNOWLEDGE	SPECIFIC SKILLS

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MIX
- Different clay minerals and their properties - testing
- Role of the fibres or bio aggregate in earth structure
- Mixing techniques, manual and mechanical
- Methods for making slip, site materials or products

PLACING
- Wet placing vs dry prefab elements
- Different methods and tools for placing, compacting, shaping:
  - Placing and compacting tools and methods
  - Use of movable formwork (see F)

Protection against movement or shrinkage cracks
  - Use of mesh, long fibres or timber frames etc
  - Spacing of construction joints
- Use of fans for drying
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- Factors influencing the final wall surface quality
- Prefabrication
- Setting services, electrical
- Specific safety works at height;
- Stripping: close holes, faults correction, finishing

- Drying process:
  - light earth
  - The use of compatible materials and techniques to fill shrinkage gaps
- Remedial measures for wall movement during construction
- Methods of rebuilding, jointing, staggering, propping
- Finishes

Formwork
- Formwork assembly: formwork key, spacer tubes, wood spacers
- Formwork for curved walls, other shapes

Materials for formwork (different skins, surfaces)
- Factors influencing the final wall surface quality

Analysis of the feasibility of the site
Building environment
Precautions related to exposure to water
Drying conditions after work
Constituents
Clay soil
Preparation of the * clay * slip
Preparation of fibres and aggregates
Mixing of components
Technical filling
Form walls
Blocks and panels
Projected walls
Drying before finishing
Wet installation
Dry installation (blocks and panels)
Sizing and performance
Maximum thickness
Thermal performance
Fire behavior

MIX
- Prepare raw materials (dry, grind, sieve, slip production, store, transport…)
- Order the tasks involved in preparing the earth

Mix to achieve even distribution of all materials

PLACING
- Lift and place light earth mix in formwork, by hand, bucket, shovel ensuring contact to other wooden or earth elements
- Manage the compaction process according to the mix requirements
- Compact the light earth gently by hand or with wooden tampers
- Periodically check that the mix is correctly compacted , lightly but without voids, through the mesh

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Spraying equipment, set up, use and cleaning/maintenance
Spraying onto existing or new build
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Formwork
- Setting formwork and falsework
- Manage the use and rotation of the shutters
- Remove temporary braced formwork
- Clean, maintain and store the shutters and accessories

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Mechanical performance Acoustic performance Sound absorption Acoustic transmission Airtightness Hygroscopicity Service life Technical details Finishes Function Plaster Cladding Joinery Reported insulation Protection against wood-boring and rodents Sanitary facilities, water features Electricity Plumbing Installation of earthenware Charges Floor and wall covering Flues Reinforcement of the periphery of the openings Coordination with other trades Evolution, future adaptation, other mixtures Pathologies, diagnosis and treatment Diagnosis Pathologies of implementation Moisture-related pathologies Faults in foundations and bases Weakening of protections Condensation Checks during the work density Upstream determination Density constancy * during construction Viscosity The tools required for implementation The human resources necessary for the implementation Diagnostic files of the environmental and technical context	

Criteria and Indicators for the Assessment of Skills	Level **3+4**
Criteria	Indicators
Building in lifts using formwork	- The choice of equipment (transport, lifting, placing) is appropriate to the mix - The plasticity and humidity of the mixes are even and controlled - The mix is correctly compacted within the formwork - Infill thickness allows sufficient compaction of each layer - The lift heights are appropriate to the materials and specification - Overhang is appropriate to the wall conditions - The quantity of light earth mixes are calculated

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Spraying	- Machine is set up correctly - Nozzle to work distance is maintained - Thickness is even, regular - Finishing/hand tooling is done in timely manner - Machine is cleaned and maintained
Compacting	- The choice of equipment is appropriate to the mix - Hands or hand tools are used correctly to compact the light earth mix - The right time to stop the compaction process is clearly identified Temporary formwork is used correctly to vertically separate and tooth in the mixes - The compacted mixes are finished clean and level before loading a new layer
Quality of details	- Structural elements (reinforcements, lintels, ring beams, frames) are set out and laid correctly - Services, fixing points, block outs are laid correctly - Corners are well chamfered, shaped or reinforced - Shrinkage joints are executed correctly - Structural joints (between 2 earth walls and different materials) are tight - Joints with other walls are right, filled and regular
Finishing works after stripping	- The tools used are appropriate. - Remedial work is done after the formwork is stripped - Shrinkage gaps in contact with other materials are well filled - Small repair and filling of holes are not visible - Surface treatment is done with appropriate products on the dry wall - Aesthetic requirements are respected
Protection	- The work has efficient appropriate protection during and after completion - Materials are protected - The adjoining surfaces are protected.03.23

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

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