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

Learning outcomes — Levels **3+4**

KNOWLEDGE	SKILLS
- 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	**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…)

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

ECVET Earth Building	**Building with earth -** masonry with clay mortar	**Unit B sub unit**

Learning outcomes	Level **3+4**
SPECIFIC KNOWLEDGE	SPECIFIC SKILLS

- Masonry basics: setting out, laying, level, verticality
- Compatibility between masonry elements and mortar type
- Features of complex geometry: curved walls, vaults, domes, pillars
	- Execute basic masonry works: setting out, laying, level, verticality
	- Use appropriate mortar, control its moisture content
	- Lay the masonry
	  o Prepare (wetting, brushing, cleaning), cut, shape elements
	  o Lay the masonry using appropriate bonding and coursing

Criteria and Indicators for the Assessment of Skills	Level **3+4**
Criteria	Indicators
Building masonry	- The setting out is done according to plans - The laying starts with corners, using measurement points, building lines and levels - The bonding pattern is correct (rules for thickness of walls and joints, courses) - Settling and drying is managed - Elements are prepared correctly: watered, cut to shape, quantities - The workflow is ergonomic and efficient - The choice of tools and equipment (transport, lift, placing) is correct - The course height stopped before deformation - Quantity of mortar is calculated and the moisture content is controlled - Quantity of bricks or blocs is calculated - Joints are regular (between courses and elements) and filled
Finished built piece	- Built piece respects position, dimensions, shape required - Built piece corresponds to requirements (fair faced masonry or prepared for coatings)

	- Aesthetics requirement are respected (bonding, pointing, local styles, brick faces the right side,…)
Quality of details	- The details are correctly executed following the plans: o Arches: frames, masonry o Connection to foundation o Timber frame infill o Connection to other walls o Anchoring of structural and non structural elements o Openings: Beams and lintels are correctly fixed on even support, their length and strength is appropriate o Services
Protection	- The work has efficient appropriate protection during and after completion - Materials are protected - The adjoining surfaces are protected

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

ECVET Earth Building	**Building with earth -** cob	**Unit B sub unit**

Learning outcomes	Level **3+4**
SPECIFIC KNOWLEDGE	SPECIFIC SKILLS

- Different methods and tools for placing, shaping, compacting, cutting:
  o Trimming/cutting/paring tools
  o Compacting and beating tools
  o Selective use of movable formwork for cob
- Drying process:
  o Differential shrinkage
  o The use of compatible materials and techniques to fill shrinkage gaps
- Remedial measures for wall movement during construction
- Methods of rebuilding, jointing, staggering, propping
	- Lift and place mix: by hand, pitch forks, shuttering, digger, bucket
	- Work to continuous and horizontal lifts
	- Shape and compact cob (top and sides)
	- Use appropriate tools to cut according to the firmness of the wall
	- Recycle the trimmings
	- Assess the maximum height limit of the lift periodically
	- Choose the right moment to continue loading new work
	- Carry out remedial work during the building process

Criteria and Indicators for the Assessment of Skills	Level **3+4**
Criteria	Indicators
Building in lifts	- The choice of equipment is appropriate - The plasticity of the mix is even and controlled - The “fibre” surface has a uniform appearance - The lift height stopped before deformation - There aren’t any observable weak points due to lack of density - The cob is placed correctly and well bonded - The surface is correctly compacted - Overhang is appropriate to the wall conditions - The quantity of bob mix is calculated
Dressing	- The choice of equipment is appropriate according to the plasticity - The trimmings are recycled
Quality of details	- Structural elements (reinforcements, lintels, ring beams, frames) are set out and laid correctly - Services, fixing points, block outs are laid correctly - Joints with other walls are right, filled and regular
Finishing works	- The tools used are appropriate. - Remedial work is done after paring, as long as the plasticity still allows it. - Shrinkage gaps in contact with other materials are well filled - Aesthetic requirements are respected
Protection	- The work has efficient appropriate protection during and after completion - Materials are protected - The adjoining surfaces are protected

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

ECVET Earth Building	**Building with earth -** rammed earth	**Unit B sub unit**

Learning outcomes	Level **3+4**
SPECIFIC KNOWLEDGE	SPECIFIC SKILLS

- Equipment for compacting
- Protection against movement or shrinkage cracks
  o Traditional: layers of lime, etc.
  o Contemporary: mesh frames, geotextiles, etc.
  o Spacing of construction joints
- Factors influencing the final rammed wall surface quality
- Prefabrication
- Formwork
- Specific safety works at height; pneumatic equipment
- Stripping: close holes, faults correction, finishing
	- Lift and place mix inside the formwork avoiding disaggregation
	- Check and manage the depth of fill before compacting
	- Manage the number of passes with the rammer
	- Identify the right time to stop the ramming process (touch, visual and auditory control)
	- Periodically check the position and stability of the formwork (no lifting, plumb, alignment, tightness)
	- Compact the earth using pneumatic or manual rammers
	- Carry out remedial work after stripping
	- Build demonstration wall on site

Criteria and Indicators for the Assessment of Skills	Level **3+4**
Criteria	Indicators
Infill	- The choice of equipment (transport, lift, placing) is appropriate - The moisture content is regularly checked and maintained to optimum - Infill thickness allows sufficient compaction of each layer - The infill agrees with requirements of the surface design - The quantity of rammed earth mix is calculated
Compacting	- Mechanical and manual rammer are appropriate - Rammer is well used - Each layer is sufficiently rammed by regular successive passes, from the exterior to the interior - The right time to stop the ramming process is clearly identified
Quality of details	- Structural elements (reinforcements, lintels, ring beams, frames) are set up 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
Finishing works after stripping	- 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	- Propping ensures stability before wall dries or bracing is fixed - The work has efficient appropriate protection during and after completion - Materials are protected - The adjoining surfaces are protected

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