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, expansionand 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 	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
 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 	 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

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

Level 3

- 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 Prepare (wetting, brushing, cleaning), cut, shape elements 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: Arches: frames, masonry Connection to foundation Timber frame infill Connection to other walls Anchoring of structural and non structural elements Openings: Beams and lintels are correctly fixed on even support, their length and strength is appropriate 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: Trimming/cutting/paring tools Compacting and beating tools Selective use of movable formwork for cob Drying process: Differential shrinkage 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 plasticityThe 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 Traditional: layers of lime, etc. Contemporary: mesh frames, geotextiles, etc. 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.