ECVET Earth Building	**Building with earth - masonry, cob, rammed, Cobbauge**	**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…)

PIRATE project n°528117-LLP-1-2012-1-FR-LEONARDO-LMP

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

CobBauge
Interreg France (Channel Manche) England
Fonds européen de développement régional
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ECVET Earth Building	**Building with CobBauge -** Cob and Light Earth in Formwork	**Unit B sub unit**

Learning outcomes — Level 3+4

SPECIFIC KNOWLEDGE	SPECIFIC SKILLS
CobBauge – Using structural cob and light earth together in formwork for thermal optimisation PLACING/COMPACTING/SHAPING ○ Placing and compacting tools and methods ○ Use of movable formwork (see F) Protection against movement or shrinkage cracks ○ Use of mesh frames, geo-textiles etc ○ Spacing of construction joints - Factors influencing the final wall surface quality - Prefabrication - Setting services, electrical - Drying process: ○ Differential shrinkage of cob and light earth ○ Managing the drying process of cob and light earth in the same wall ○ The use of compatible materials and techniques to fill shrinkage gaps ○ Use of fans for drying - Stripping: close holes, faults correction, finishing - Remedial measures for wall movement during construction - Methods of rebuilding, jointing, staggering, propping - Finishes	COB ELEMENT - Lift and place cob mix inside the formwork: by hand, pitch forks, digger, bucket, avoiding disaggregation - Use temporary braced formwork to create vertical separation and toothing between cob and light earth layers - Work to continuous and horizontal lifts (how high?) - Check and manage the depth of fill before compacting - Manage the compaction process according to the mix requirements - Compact the cob using feet or tampers - Periodically check the position and stability of the formwork (no lifting, plumb, alignment, tightness) - Periodically check that the mix is compacted without voids through the mesh - Assess the maximum height limit of the lift periodically - Choose the right moment to continue loading new work - Make sure the cob surface is clear of light earth before loading new cob - Make sure the cob and light earth surfaces are level before loading new cob - Remove surplus cob at the surface before stripping formwork - Carry out remedial work during the building process LIGHT EARTH ELEMENT - Remove temporary braced formwork - Lift and place light earth mix in formwork adjacent to compacted cob layer, 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

Criteria and Indicators for the Assessment of Skills — Level 3+4

PIRATE project n°528117-LLP-1-2012-1-FR-LEONARDO-LMP

Criteria	Indicators
Building in lifts Infill	- The choice of equipment (transport, lifting, placing) is appropriate to the mix - The plasticity and humidity of the mixes are even and controlled according to the Cobbauge specification (see M unit) - There aren't any observable weak points due to lack of density - The cob and light earth is placed correctly and well bonded - Temporary formwork is used correctly to divide the two mixes during compaction of the cob - The mixes are correctly compacted within the formwork - Infill thickness allows sufficient compaction of each layer - The lift heights are appropriate to the materials and specification - The quantity of cob and light earth mixes are calculated
Compacting	- The choice of equipment is appropriate to the mix - Manual tamper or feet are used correctly to compact the cob mix - Hands or .....? .are used correctly to compact the light earth mix - Each layer and mix is sufficiently compacted by regular successive passes, from the exterior to the interior ? - The right time to stop the compacting 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. - Surplus cob at the surface is removed before the formwork is stripped - 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.

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

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