

Workflow Descriptions –

Mechanically Stabilized Earth (MSE) Retaining Wall

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Workflow 1A: Geometric Modelling – Concrete Structure

1. Import Retaining Wall Alignment including the Top of Wall Profile from LandXML file.
2. Specify the total length of the Retaining Wall and the length of each individual wall segment considering changes in Design Height and other design details or requirements.
3. Specify Retaining Wall Geometric Parameters for each wall segment:
 - a. Facing Panel
 - i. Facing panel size
 - b. Design Height
 - i. The soil reinforcement detail is specified according to the design height.
 - c. Leveling Pad
 - i. General geometry
 - ii. Top Elevation
 - d. Coping / Barrier Slab / Barrier / Gutter
 - i. Per Standard Details or Per Design
4. Extrude Leveling Pad given the geometric parameters above along the Wall Alignment at specified elevation.
5. Place Wall Panel along the top of Wall Profile at the specified spacing. The bottom of the wall elevation is specified by the top of Leveling Pad elevation.
6. Extrude Coping / Barrier Slab / Barrier / Gutter along top of wall profile with specified distance requirements.
7. Place Utility openings given shape, size, location, and elevation of openings (if applicable)

8. Assign "Object ID" attribute to each wall segment, leveling pad, coping, gutter, and barrier or barrier slab. (See *E-01_CT_Object-ID_Reqs.pdf*)

Workflow 1B: Geometric Modelling – Barrier Slab Piles

1. Import Retaining Wall Alignment from LandXML file.
2. Define Pile Type, including Material and Installation Method
3. Define the Pile Row along each Barrier Slab. The Pile Row is an offset in the transverse direction of the wall, parallel to the Retaining Wall Alignment.
4. Define Pile Spacing along each Pile Row definition
 - a. Allow option to define unique Pile Spacing per Pile Row
5. Define the Pile Cutoff Elevation and Tip Elevation

Workflow 2: Rebar and Soil Reinforcement Modelling

1. See Workflow 1 above:
 - a. Note that Retaining Wall objects are already modeled.
2. Specify Rebar Parameters from the plan.
3. Specify Soil Reinforcement Parameters based on the Design Height from the plan. The following parameters vary given the wall's Design Height 'H' value.
 - Length 'L'
 - Number and size of welded wire mats
 - Welded wire mat spacing
4. Based on soil reinforcement parameters, each soil reinforcement assembly can be created automatically.
5. Based on the Soil Reinforcement Table, automatically place soil reinforcement for the entire MSE wall.
6. Assign additional user defined attributes to each bar as applicable using the Object ID (See *E-01_CT_Object-ID_Reqs.pdf*)
7. Also, see Attribute Workflow described in a separate document (see *G-06_CT_Workflow_General.pdf / Workflow 2*)

Workflow 3: Earthwork Modelling – Structure Excavation and Structure Backfill

1. See Workflow 1 above
 - a. Note that alignment is already imported and the bridge objects are already modeled.
2. Import Existing Ground and Finished Grade Surfaces from LandXML file.
3. Specify the total length of earthwork operations and the length of each individual earthwork segment considering changes in structural geometry, and any plan or specification driven requirements.
4. Specify Earthwork Geometric Requirements for each segment using project plans and Standard Plans (and any structure specific notes):
 - a. Structural Excavation Requirements
 - i. Offset limits from structure faces (example: 1'-0" offset from footing side faces)
 - ii. Bottom definition (bottom elevation, bottom profile, over excavation if required)
 - iii. Side limits definition (vertical cut or slope, benches or shoring limits if applicable)
 - iv. Any special geometric constraints at steps or transitions (segment breaks at step locations)
 - b. Structural Backfill Requirements
 - i. Backfill zone limits relative to the structure (example: within a specified offset behind the wall and around the footing)
 - ii. Top of backfill definition (trim to Finished Grade surface, or to a specified cap elevation if required)
5. Create earthwork solids that represent the plan and spec requirements:
 - a. Create Structural Excavation Solid
 - i. Create a solid representing the structural excavation envelope for the segment.
 - ii. The solid limitation follows the shape of the retaining wall (extrude or loft along the wall alignment or wall path), using the modeled wall geometry as the controlling reference.
 - iii. Trim or cut the excavation solid by the Existing Ground surface so excavation is limited to material below existing ground.
 - b. Create Structural Backfill Solid

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- i. Create a solid representing the structural backfill envelope for the segment (bounded by structure limits and excavation limits).
- ii. Trim or cut the backfill solid by the Finished Grade surface so backfill is limited to the finished condition.

Note: If steps or changing requirements exist along the wall length, generate multiple solids (one per segment) to match the geometric requirements and keep quantities clean per segment.

6. Assign tracking attributes. Assign "Object ID" (see *E-01_CT_Object-ID_Reqs.pdf*) to each excavation solid and each backfill solid for reporting and takeoff grouping.
7. Extract quantities
 - a. Extract the volume of each excavation and backfill solid (by Object ID and by segment) as the earthwork quantity.
 - b. Sum segment quantities for total structural excavation and total structural backfill.