

Workflow Descriptions –

Anchored Wall

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Workflow 1A: Geometric Modeling – Concrete Structure

1. Import Anchored Wall Alignment including the Top of Wall Profile and Bottom of Wall Profile from LandXML file.
2. Specify the total length of the Anchored Wall and the length of each individual wall segment considering changes in Design Height and Steps in the diaphragm wall or wall facing
3. Define Cross-Sections for the following objects, as applicable:
 - a. Facing - Shoring Layer (structural shotcrete or initial layer)
 - b. Facing - Structural Layer (final layer)
 - c. Barrier or Barrier Slab
 - i. Type 836 Barrier per Standard Plan B11-79 & B11-80
 - ii. Type 842 Barrier per Standard Plan B11-81 & B11-82
 - iii. Type 732SW Barrier Slab per Standard Plan B11-58 & B11-59
 - iv. Custom Cross-Section
 - d. Surface – Gutter, crest
4. Extrude Cross-Sections along the Anchored Wall Alignment that are bound by the Top of Wall and Bottom of Wall Profiles.
5. Add a haunch detail to the top of wall to properly support the base of the barrier or barrier slab (if applicable)
6. Place Expansion Joints at specified locations for components of the anchored wall, such as Barriers or Barrier Slabs (if specified)
7. Place Utility openings given shape, size, location, and elevation of openings
8. Provide Concrete Surface Textures to Facing - Structural Layer (final layer).
 - a. Surface Textures may be modeled as 2D Surfaces or 3D Objects with constant thickness.
9. Update to alignment and/or profile will automatically update the modeled wall.

10. Assign additional user defined attributes to each component using the Object ID
(See *E-01_CT_Object-ID_Reqs.pdf*)

Workflow 1B: Geometric Modeling – Ground Anchors

1. Define Ground Anchor Assembly with the following components and respective parameters:
 - a. Bearing Plate
 - i. Thickness
 - ii. Width
 - iii. Length
 - iv. Material Properties
 - b. Ground Anchor Assembly
 - i. Anchor Diameter
 - ii. Drilled Hole Diameter
 - iii. Unbonded Length
 - iv. Bonded Length
 - v. Clear Distance from Limit of Bonded Length to End of Drilled Hole
 - vi. Anchor vertical and horizontal Angles (horizontal angle is measured with respect to the normal of the wall at anchor location)
 - vii. Material Properties for the anchor and grout
2. Import Anchored Wall Alignment from LandXML file.
3. Define the stationing and elevation of the Ground Anchor Assembly
4. Automatically place the Ground Anchor Assemblies along the wall based on the station and elevations, with option to vary the parameters listed above per Design Height. Update to the parameters will automatically update the modeled anchors.
5. Assign additional user defined attributes to each anchor assembly using the Object ID (See *E-01_CT_Object-ID_Reqs.pdf*)

Workflow 1C: Geometric Modeling – Micro Piles

1. Import Retaining Wall Alignment from LandXML file.
2. Define Pile Type and material property
3. Define Pile position by providing the stationing, spacing, or combination thereof, and pile offsets from alignment along the anchored wall
4. Specify the Pile Cutoff Elevation and Tip Elevation
5. Place Micro Piles along the anchored wall per the parameters defined in the previous steps. Update to the parameters will automatically update the modeled piles.

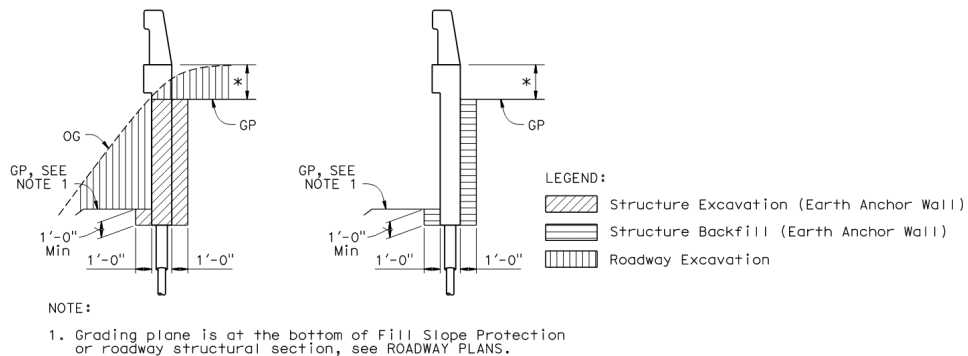
6. Assign additional user defined attributes to each component using the Object ID
(See *E-01_CT_Object-ID_Reqs.pdf*)

Workflow 2: Earthwork Modeling – Structure Excavation and Structure Backfill

1. Import the Existing Ground, Finished Grade, and Grading Plane surfaces, as applicable
2. Specify the total length of earthwork operations and the length of each individual earthwork segment considering changes in structural geometry, steps, and any plan or specification driven requirements.
3. 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 wall facing)
 - ii. Bottom limit definition (bottom elevation or bottom profile)
 - iii. Side limits definition (vertical cut or slope, benches or shoring limits if applicable)
 - iv. Any special geometric constraints at steps or transitions
 - b. Structural Backfill Requirements
 - i. Backfill zone limits relative to the structure (example: within a specified offset behind wall facing)
 - ii. Top of backfill definition (trim to Finished Grade surface or Grading Plane Surface, as applicable)
4. Create earthwork solids that represent the plan and specification 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 bound by Existing Ground surface or Grading Plane surface, as applicable
 - 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 bound by the Finished Grade surface or Grading Plane surface, as applicable
- c. The following figure shows an example of the limits described in this section and the previous section. Note that this is only for reference, the required limits for Structure Excavation and Structure Backfill may vary per project. Limits will be defined in each project.



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.

5. 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 quantities takeoff grouping.
6. 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.