

## Workflow Descriptions –

### Soil Nail Wall

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### Workflow 1A: Geometric Modeling – Concrete Structure

1. Import Soil Nail Wall Alignment including the Top of Wall Profile and Bottom of Wall Profile from LandXML file.
2. Specify the total length of the Soil Nail Wall and the length of each individual wall segment considering changes in Design Height, location of Expansion Joints, and other design details or requirements.
3. Define Cross-Sections for the following objects, as applicable:
  - a. Facing - Shoring Layer (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. Type 60D
    - v. Custom Cross-Section
  - d. Surface – Gutter, crest
  - e. Concrete Surface Textures (if required)
1. Extrude Cross-Sections along the Soil Nail Wall Alignment that are bound by the Top of Wall and Bottom of Wall Profiles.
2. Place Expansion Joints at specified locations for wall facing, Barrier Slabs, Barriers, or Soundwalls, as applicable.
3. Place Utility openings given shape, size, location, and elevation of openings.

4. Provide Architectural Treatment/Concrete Surface Textures to Facing - Structural Layer (final layer).
  - a. Surface Textures may be modeled as 2D Surfaces or 3D Objects with constant thickness.
5. Assign "Object ID" attribute to each component (See E-01\_CT\_Object-ID\_Reqs.pdf).

## **Workflow 1B: Geometric Modeling – Soil Nails**

1. Define Soil Nail Assembly with the following components and respective parameters:
  - a. Bearing Plate
    - i. Thickness
    - ii. Width
    - iii. Length
    - iv. Hole Diameter
    - v. Steel Grade or material property
    - vi. Headed Studs, including diameter, length, quantity, spacing or pattern, and material property, as applicable
  - b. Test Soil Nail
    - i. Length
    - ii. Drilled Hole Diameter (min)
    - iii. Bonded Length
    - iv. Unbonded Length
    - v. Inclination
  - c. Production Soil Nail
    - i. Length
    - ii. Drilled Hole Diameter (min)
    - iii. Bar Number
    - iv. Inclination
    - v. Coating and Steel Grade
2. Import Soil Nail Wall Alignment from LandXML file.
3. Define the stationing, offset, elevation, vertical and horizontal angles of each Test Soil Nail and Production Soil Nail.
4. Orient the Test Soil Nail and Production Soil Nail objects along the wall with option to vary the parameters listed above per Design Height or wall segment.
5. Place Bearing Plates at the nail head locations.
6. Assign "Object ID" attribute to each Soil Nail and Bearing Plate component (See E-01\_CT\_Object-ID\_Reqs.pdf).

## **Workflow 1C: Geometric Modeling – Drainage and Accessories (If required)**

1. Define drainage elements with geometry and locations shown in the project plans, as applicable:
  - a. Surface -Retaining Wall, Gutter Outlet
  - b. Subsurface- geocomposite
  - c. Subsurface - perm (permeable material)
  - d. Subsurface- drain pipe weephole
2. Place drainage elements using station, offset, elevation, length, width, diameter, and outlet location, as applicable.
3. Define miscellaneous accessories, as applicable, including Fence, Tubular Railing, Safety Cable Rail, and Soundwall.
4. Assign "Object ID" attribute to each drainage or accessory component (See E-01\_CT\_Object-ID\_Reqs.pdf).

## **Workflow 2: Earthwork Modeling – Structure Excavation and Structure Backfill**

1. See Workflow 1A 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 spec 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
    - 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.