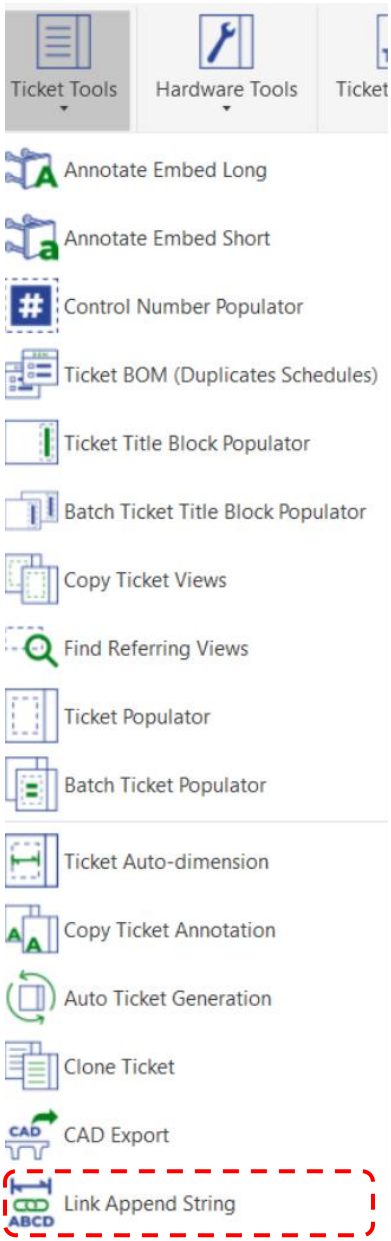
Geometry Tools: Auto Panelization



Programmed Result of Tool:

Auto Panelization converts a standard Revit wall span into precast wall panels. The tool divides a wall into panels based on your selected family/type, spacing rules, minimum/maximum dimensions, joint and grout behavior, and optional level splits.

The tool replaces manual wall-panel modeling with a controlled, rules-based workflow.

Steps to Perform tool Operation:

1. **Select the wall element**, then run **Auto Panelization** *(or launch the tool first, then select the wall as prompted).*
2. **Choose whether to isolate the wall** for easier visibility.
3. **Select the exterior face** of the wall.
4. **Configure panelization options** in the Auto Panelization window:
   - Family/type
   - Min/max width & height
   - Joint and grout settings
   - Scrap placement rules
   - Optional level splitting
   - Insulated panel options
   - Solid zone settings
5. Click **Continue** to generate panels.

Panels are created automatically based on your defined rules.

Input Requirement:

- Element must be a wall category.
- Wall cannot be a finish. The IS_FINISH parameter cannot have a Yes value.
- MIN_PANEL_HEIGHT parameter on the wall element auto populates the minimum height settings for the generated wall panel.
- MIN_PANEL_WIDTH parameter on the wall element auto populates the minimum width settings for the generated wall panel.

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Wall Panel Structural Framing Elements:

- To use the Auto Panelization tool the user must have eligible wall panel families to place.
- These families must meet the following criteria -
  - Structural framing family
  - Have a CONSTRUCTION_PRODUCT parameter value that contains wall.
- The CONSTRUCTION_PRODUCT of the wall panel family is also used to determine what parameters to use when reading information and editing new instances. These are set using the Auto Panelization Settings tool.
- Types that do not have a *Construction Product* set up in the **Auto Panelization Settings** are invalid for use with the tool.

Orientation Information:

- When referring to left and right Auto Panelization is describing the left and right side of the selected wall when viewing the face selected.
- Start and end are determined by the wall element's location line which describes the walls direction and span. When placing a wall element, the user draws this line. The start of the wall is where the user clicks first and then drags is its end point. That end point would be at the end of the wall.

Insulation Wall Panels:

- Auto Panelization has additional options to edit insulated wall panels.
- To be considered an insulated wall panel by the Auto Panelization tool the family type must have a CONSTRUCTION_PRODUCT parameter that contains "INSULATED".

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Panelization Behavior:

- The Auto Panelization tool generates wall panels that fully occupy the same height and horizontal span as the selected Revit wall.
- The tool places as many *maximum-size* panels as possible based on the selected family and type. When full-size panels cannot completely fill the remaining space, the tool inserts **scrap panels**, which have dimensions:
  - **Less than the maximum**, but
  - **Greater than the minimum allowed size**
  - *Maximum sizes* come from the default family/type settings.
  - *Minimum sizes* are defined by parameters on the selected wall. If those parameters do not exist, the minimum defaults to **1'-0"**.
- The user can choose whether scrap panels appear on the **left** or **right** end of the generated panel span.
- The tool can optionally split wall panels at project levels. When enabled:
  - Panels are broken at each selected level based on a user-defined **offset**.
  - The user may choose **specific levels** to split at rather than all levels.
  - At each split, the tool applies the **same vertical scrap logic** used in standard panelization to generate correctly sized scrap panels at the break.

Voids and Slopes:

- Auto Panelization supports sloped walls that have a uniform slope across its entire span.
  - Tool does not support walls with non-uniform slopes. Using the tool on these walls may result in unexpected results.
- If needed, the tool will place a triangular void to cut wall panels to achieve the slope.
  - The “TRIANGULAR_VOID” family provided by EDGE^R must be present in the project to use this functionality.
    - The “TRIANGULAR_VOID” family can be obtained from the EDGE^R Browser.
  - If a triangular void is currently cutting the selected wall and is in the correct location to achieve desired slope, it will be used instead of placing a new void element.
- If the wall is already cut by voids, Auto Panelization will attempt to cut all new wall panels with the existing voids.
- If cutting placed wall panels results in the following situations, the tool will not place that panel:
  - Void cuts the wall panel in half.
  - The void cut results in a panel with a height below minimum allowed.
  - The void cut results in a panel with a width below minimum allowed.
- The wall panels cut by only the triangular void used to achieve desired slope will still be placed even if it results in a height below minimum allowed.

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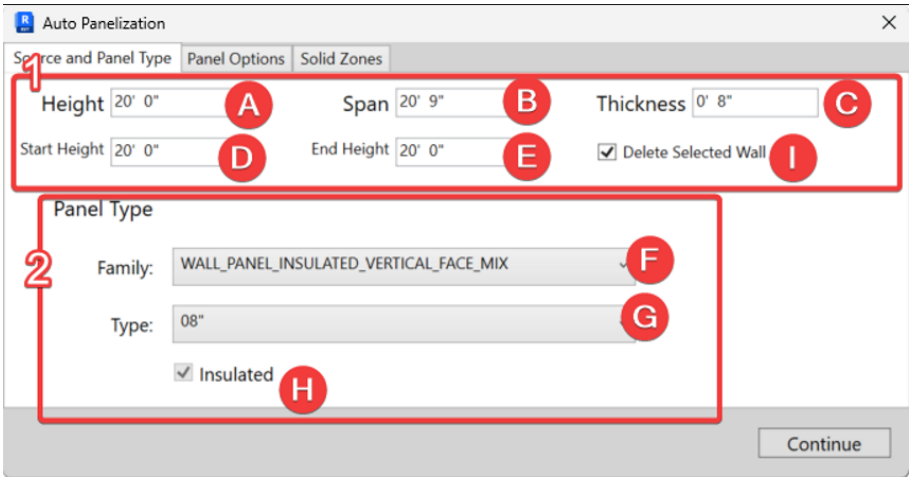
Source and Panel Type Tab



- 1: Wall Span Information
  - Information is read only except for sloping details
  - Describes behavior of full wall span before panelization
  - Slope definitions set based on start and end of panel as created
  - A: Height of initial wall span
    - This height will not be exceeded by panelized result, defines bounds
    - Reads out highest point if wall is sloped
  - B: Width/Horizontal component of initial wall span
    - This width will not be exceeded by panelized result, defines bounds
  - C: Thickness of initial wall span
    - Always reflects full thickness of *generated* wall panels, regardless of wythes/composition
    - Used to select the defaults for panel types. (Ex: If your Revit wall is 8” thick, the tool will default to an 8” type in the Type selector)
    - If this box is highlighted in **red**, the Revit wall thickness does not match the thickness of the selected panel types.
  - D/E: Start/End height of slopes
    - Can reflect either profile-based slope from wall sketch or result of sloped void on initial wall
    - Start/End are defined in sketch order
- 2: Panel Type
  - User defines which wall panel family/type to use
  - F: Family Selection
    - Default family set in AUTO_PANELIZATION_DEFAULT_FAMILY parameter on Project Info
    - If blank or above parameter doesn't exist, default is selected arbitrarily (first in the list)
    - Green options represent insulated families.

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- G: Type Selection
  - Attempt default based on thickness (C)
    - Note this is total thickness of all wythes
  - If no match, arbitrarily selects first from list
  - Avoids any types with "DO NOT USE" in name as defaults
    - This should not apply in most cases
  - Red options are types with thicknesses that do not match the selected walls thickness
  - Read-Only informational element indicating if selected family is insulated or not
  - Based on whether CONSTRUCTION_PRODUCT contains "INSULATED"
  - **Panel Orientation**: If the panels to be generated are vertical, you must ensure you select the corresponding **Panel Orientation** (Vertical generated panels need to be defined as vertical, and vice versa for the horizontal panels).
- I: "Delete Selected Wall"
  - Toggles deletion of initial Revit wall
  - Useful if you need to preserve architectural model w/ windows, doors, etc.

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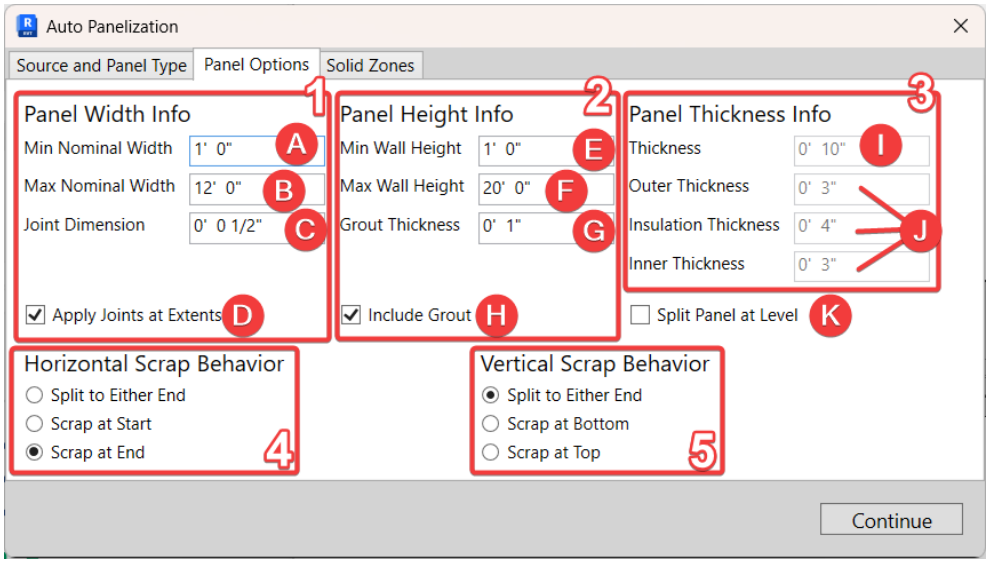
Panel Options Tab



- For any text field sourced/written to panel family instances, greyed out field indicates the parameter is read only or does not exist.
    - Red usually means some invalid condition was created by the pre-saved settings file

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- **1: Panel Width Info**
  - A: Min Nominal Width
    - Minimum possible nominal width panel to generate
    - Defaulted to "MIN_PANEL_WIDTH" on initial Revit Wall
      - (Recommend setting this up on the Wall Type definition rather than doing it per-instance)
    - If above parameter doesn't exist, default is 1' - 0"
  - B: Max Nominal Width
    - Maximum possible nominal width panel to generate
    - Defaulted to default parameter value of "Nominal Width" property set up in Auto Panel Settings
      - This is configured in the family editor (reflects "default" value for bound instance parameter)
  - C: Joint Dimension
    - Reflects total horizontal joint between panels
    - This value is written directly to mapped "Joint Size" property set up in Auto Panel Settings for all panels generated
  - D: Apply Joints at Extents
    - Toggles Joints at start/end sides of span
    - This toggle is written to "Apply Left/Right Joint" properties in settings
    - Which applies to the start/end is determined programmatically
- **2: Panel Height Info**
  - E: Min Nominal Height
    - Minimum possible panel height to generate
    - Does not include grout (i.e. min panel height w/ 1' min + 1" grout would need space for 1' - 1"
    - Defaulted to "MIN_PANEL_HEIGHT" on initial Revit Wall
      - (Recommend setting this up on the Wall Type definition rather than doing it per-instance)
    - If above parameter doesn't exist, default is 1' - 0"
  - F: Max Wall Height
    - Maximum possible panel height to generate
    - Does not include grout
    - Defaulted to default value of "Wall Height" property set up in Auto Panel Settings
      - This is configured in the family editor (reflects "default" value for bound instance parameter)
      - This parameter is also the one that will be written to when generating panels for height

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- G: Grout Thickness
  - Determines fixed grout joint thickness for all panels to be generated
  - The default for this will be determined by the default value of the "Grout Size" parameter it was bound to in Auto Panel Settings
    - The Grout Size value is configured in the family editor. Reflects "default" value for bound instance parameter.
    - This parameter is also the one that will be written to when generating panels for the grout joint dimension
- H: Include Grout
  - Toggles visibility and presence of nested grout joint component assuming family is configured properly
  - Spacing will not adjust if grout is disabled, set Grout Thickness (G) to 0" if this behavior is desired
  - Grout toggle parameter is turned on and off with the "Include Grout" checkbox in the settings window

- **3: Panel Thickness Info**
  - These are read-only fields that are reflecting wall panel thickness information
  - Outer, Insulation, and Inner only apply to insulated panels
    - I: Thickness
      - Represents total thickness including insulation
      - Maps to "Thickness" property from settings
    - J: Wythe thicknesses
      - Reflect matched properties configured in settings
    - K: Split Panel At Level
      - Allows for intelligent division of walls at levels defined in model
      - See "Split Level Settings Tab" for details

❖ **Scrap**
- Scrap is defined as less-than-max panels required by a spacing that does not divide evenly
- If scrap would generate a sub-minimum panel, we instead remove a maximum and divide the new remaining space in half, creating two equal panels
- Scrap behaviors defined below dictate placement of scrap panels

- **4: Horizontal Scrap Behavior**
  - Split to Either End
    - Places scrap alternating between end and start
  - Scrap at Start
    - All panels less than maximum panel width will be moved to start of span
  - Scrap at End
    - All panels less than maximum panel width will be moved to end of span

Solid Zones Tab

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- **5: Vertical Scrap Behavior**
  - Split to Either End
    - Places scrap alternating between top and bottom
  - Scrap at Bottom
    - All panels less than maximum panel height will be moved to bottom of span
  - Scrap at Top
    - All panels less than maximum panel height will be moved to top of span

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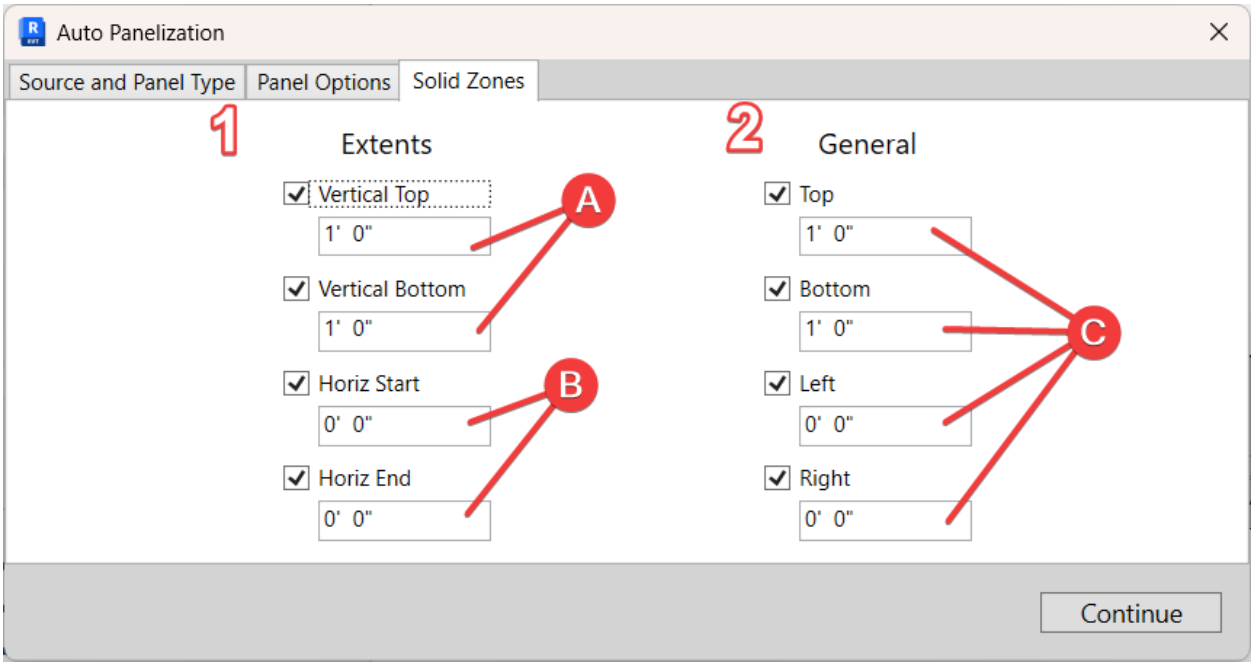
Solid Zones Settings Tab



- 1. Extent fields
  - **A: Vertical Top/Bottom**
    - Defines solid zone behavior at bottom/top respectively of span
    - Mapped to "Bottom Solid Zone" and "Top Solid Zone" properties in settings
    - **Unchecked** fields are set to **zero**
  - **B: Horizontal Start/End**
    - Defines solid zone behavior at horizontal start/end respectively of span
    - Mapped to "Left Solid Zone" and "Right Solid Zone" properties in settings
      - Start/End is programmatically matched to appropriate left/right based on wall panel orientation, etc. much like joints
  - **Unchecked** fields are set to **zero**
  - **Note that extent behavior trumps general in situations where either could apply*
- 2. General Fields
  - **C: Top/Bottom/Left/Right Solid Zone**
    - Maps to matched properties in settings
    - Distinct from extents in that horizontal side solid zones are explicitly left or right
  - **Unchecked** fields are set to **zero**

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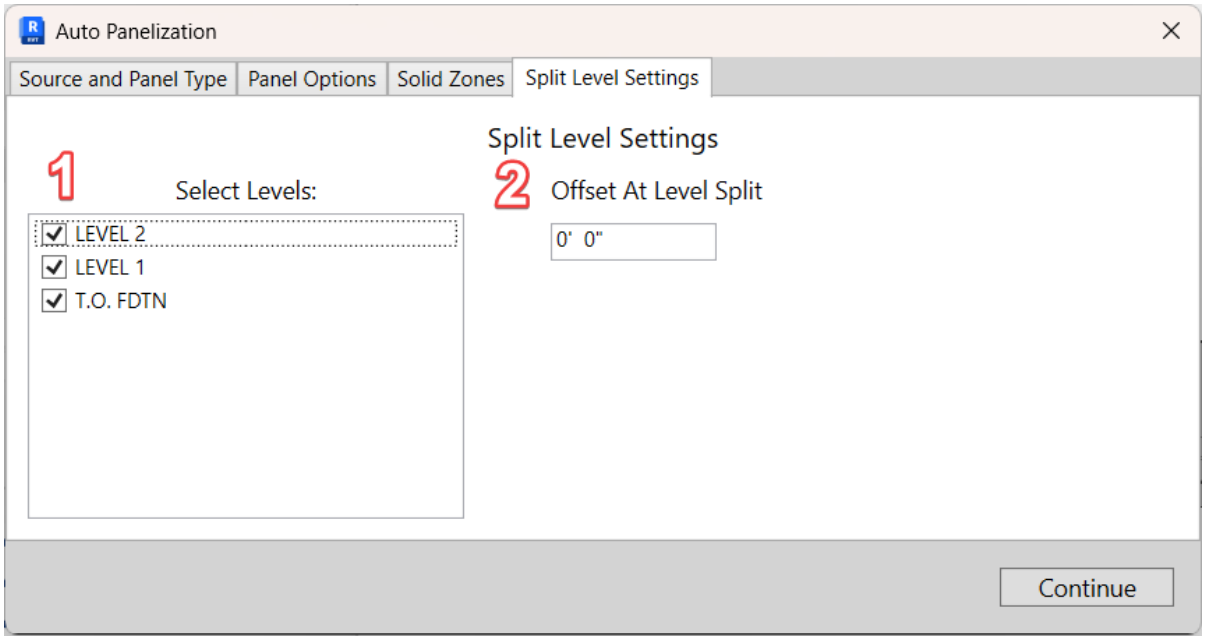
Split Level Settings Tab



- The Split Level Settings tab only appears if the user checks the **Split Panel At Level** check box in the **Panel Options** tab**.**
  1. Select Levels List:
     - Allows the user to select at which levels to split the panel
  2. **Offset At Level Split**
     - Defines offset from level to split panels
       - Negative values will split at offset *below* level
       - Positive values will split at offset *above* level