Cave Builder User Guide

Thank you for using **Stylized Nature - Cave Builder** by **Arkerion Studios**.

Cave Builder is an editor tool for building walkable caves directly in the Scene view. You click a few points, and the tool builds a continuous cave around them: passages that bend, climb and descend, rooms where passages meet, entrances to the outside world, colliders on every floor and wall, optional lights and decorations. When the cave is finished, you bake it into an ordinary prefab that needs no Cave Builder code in your game.

Main Features

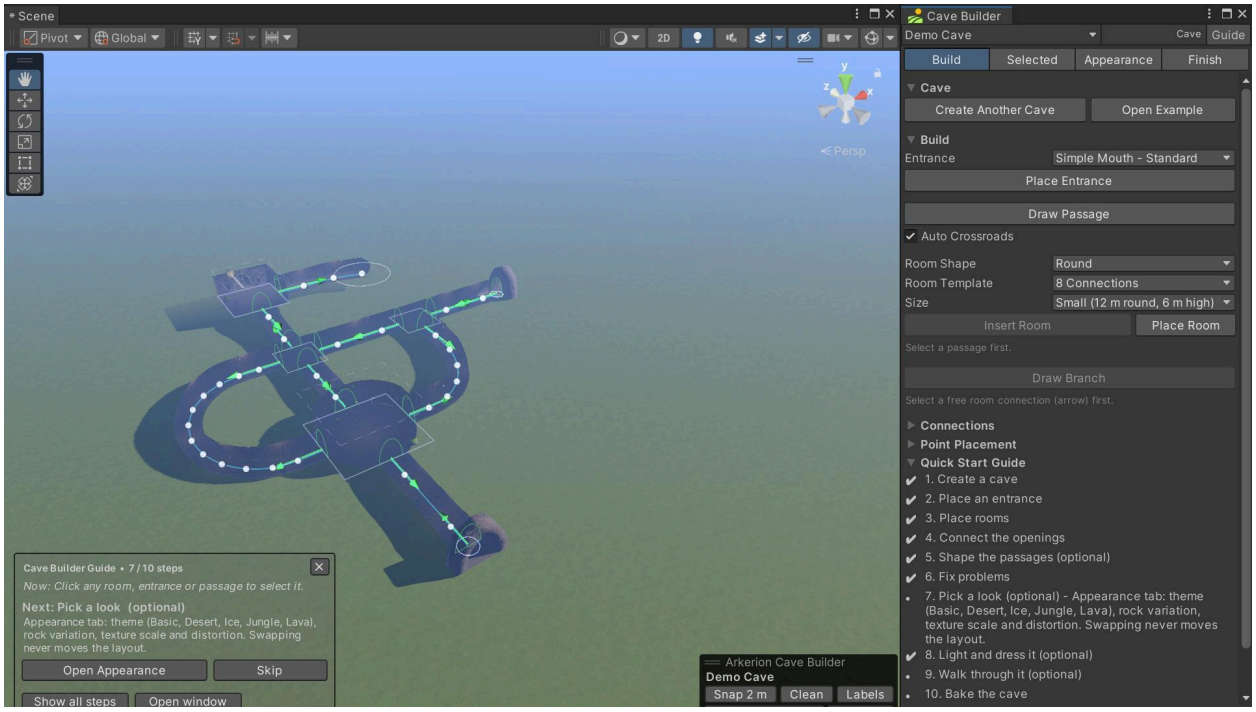
- Draw passages by clicking floor points in the Scene view; the cave follows instantly
- Passages that turn, climb, descend and become vertical shafts
- Square rooms with 2, 3 or 4 connections and round chambers with 2 to 8 connections in three sizes, entrances, closed passage ends and branches
- Crossroads and branches: crossing passages join automatically; branch off any point - ideal for labyrinths
- Seamless openings: passages and rooms always join without gaps
- Colliders on every floor and wall, ready for your character controller

- Distortion: bends the whole cave so it never looks machine-made, still without gaps
- Rock material mix (Rock A / B / C and Floor) painted automatically
- Optional point lights and decorations (rocks, boulders, stalagmites, stalactites) textured to match every theme, with LODs and colliders
- Validation that points out problems and offers one-click fixes
- Play Test: walk through the cave in first person with one click
- Bake to a prefab with LODs, colliders, lightmap UVs and static flags
- Export tools: waypoint path for AI, minimap image, layout files, terrain openings
- Manual kit of ordinary prefabs for building by hand
- Full Undo for every action

Requirements

- **Unity** 2022.3 LTS or Unity 6
- Any render pipeline: **URP** 14 or newer, **HDRP** 14 or newer, or the **Built-in Render Pipeline** (Built-in needs the free Shader Graph package from the Package Manager)
- The Physics module (for colliders, Play Test and terrain tools)
- Input System package or the old Input Manager – Play Test works with either

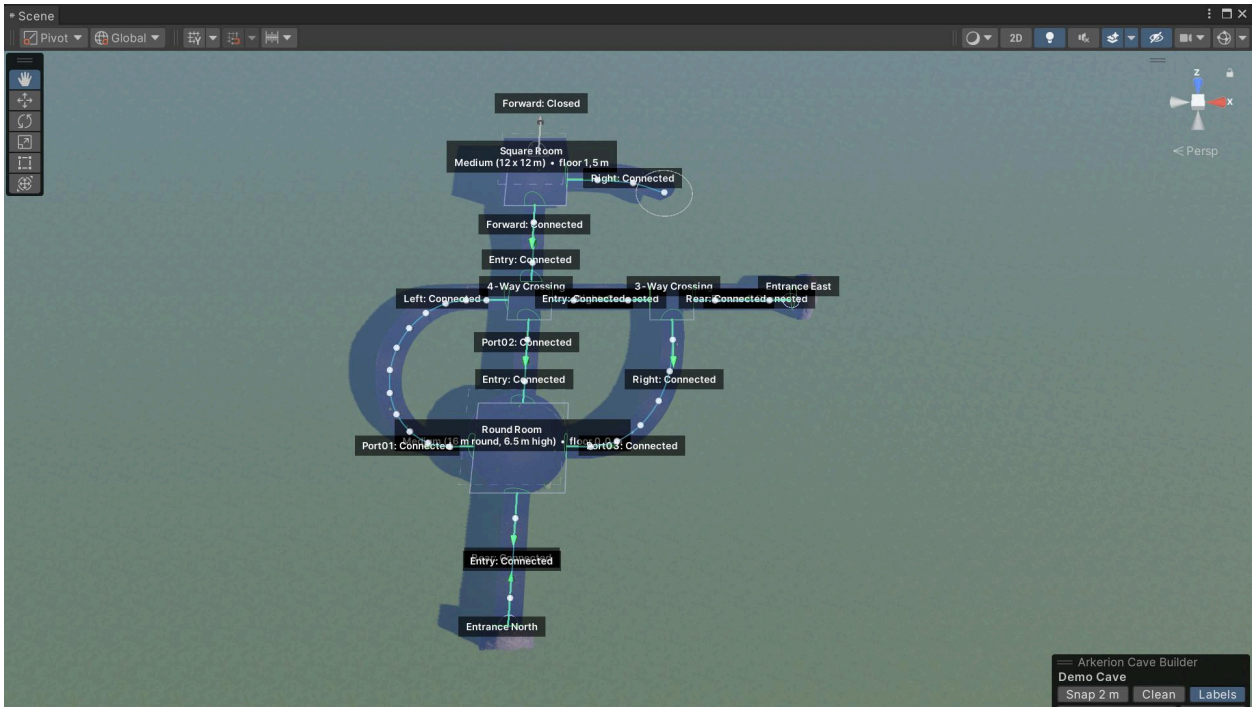
Quick Start (10 minutes)



1. Open **Tools > Arkerion > Cave Builder**. Dock the window next to the Inspector.
2. On the **Build** tab, click **Create Cave**. An empty cave object appears at the centre of the Scene view.
3. Click **Place Entrance**. In the Scene view, click the spot where the cave should start, then move the mouse to aim the direction the cave goes and click again.
4. Drawing starts by itself. Click floor points one after another to lay out the passage. Press **Enter** to finish.
5. Select a point and drag it up or down to make the passage climb or descend.
6. Select the passage, click **Insert Room** and click on the passage where the room should be.
7. Click one of the room's orange connection arrows, then **Draw Branch** to start a side passage.
8. On the **Appearance** tab, pick a theme and try **Distortion**.
9. On the **Finish** tab, click **Play Test** and walk through your cave.
10. Click **Bake Cave** to save it as a prefab.

Tip: the **Quick Start Guide** at the bottom of the Build tab ticks off these steps as you go. **Build Example Cave Here** creates a complete example cave you can study and edit.

Words Used in the Tool



- **Cave** – the object holding one cave. Everything you build belongs to it.
- **Passage** – a tunnel through a row of points.
- **Point** – a spot on the walking floor in the middle of a passage. Points carry the passage size.
- **Room** – a chamber with a level floor: square (2, 3 or 4 connections) or round (2 to 8 connections).
- **Crossing** – a passage-sized junction (3-way or 4-way) where passages meet, cross or branch.
- **Entrance** – the opening where the cave meets the outside world.
- **Connection** – an opening in a room or entrance. A passage attaches to it. Free connections are closed by a plug, so there is never a hole.
- **Open end** / **Closed end** – a passage end that stops (open) or is sealed with a rounded cap (closed).
- **Profile** – the shape of a passage cross-section (Default, Broad, Irregular).
- **Theme** – the set of materials and decorations.
- **Preview** – the cave you see while editing. It is rebuilt automatically after every change.

- **Bake** – saving the cave as a normal prefab for your game.

Step Guide

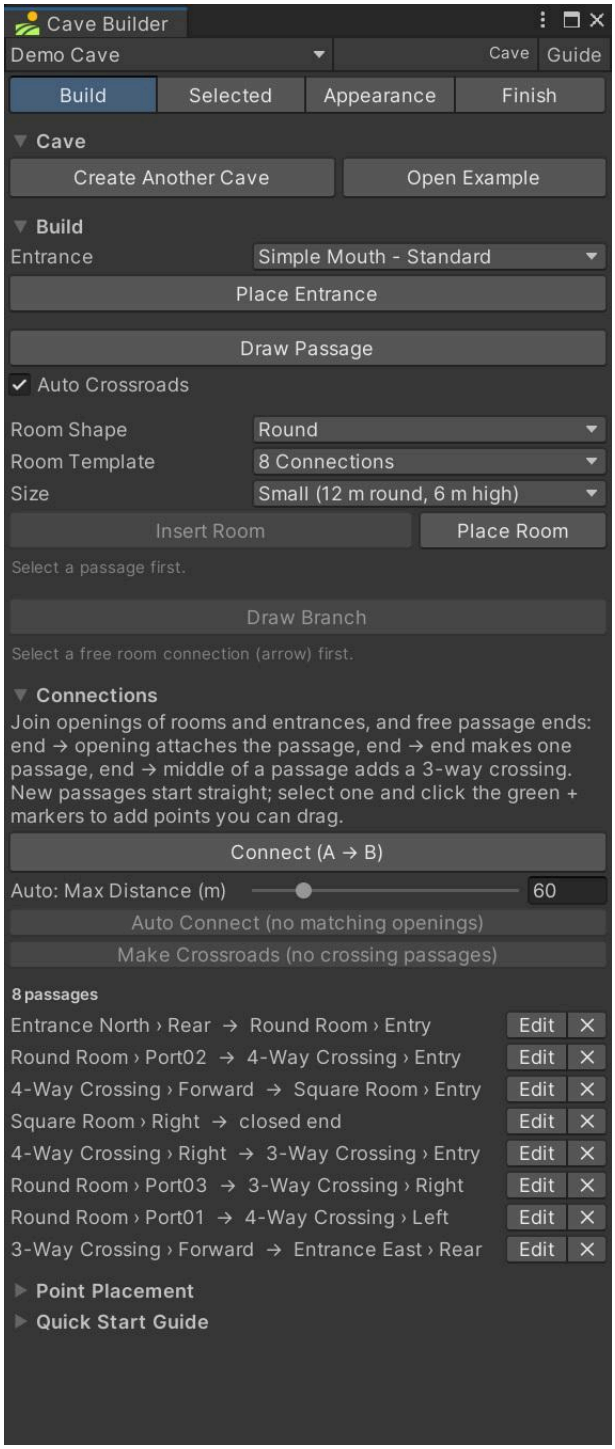
The Scene view Step Guide shows the current action and the next step.

New to the tool? The **Step Guide** panel (bottom left of the Scene view) always shows:

- **Now** – a tip for the tool you are using or what you selected (for example *"Now click opening B"* in Connect mode).
- **Next** – the next step of the pipeline with a button that starts it: Create a cave › Place an entrance › Place rooms › Connect the openings › Shape the passages › Fix problems › Pick a look › Light and dress it › Walk through it › Bake. Steps tick themselves off from your cave; optional steps have **Skip**.
- **Show all steps** – the whole checklist.

When you know the pipeline, hide it with ✕, the **Guide** button in the window toolbar, or **Tools > Arkerion > Cave Builder Utilities > Show Step Guide**. The same steps are listed in **Build > Quick Start Guide** (with **Reset Skipped**).

The Cave Builder Window



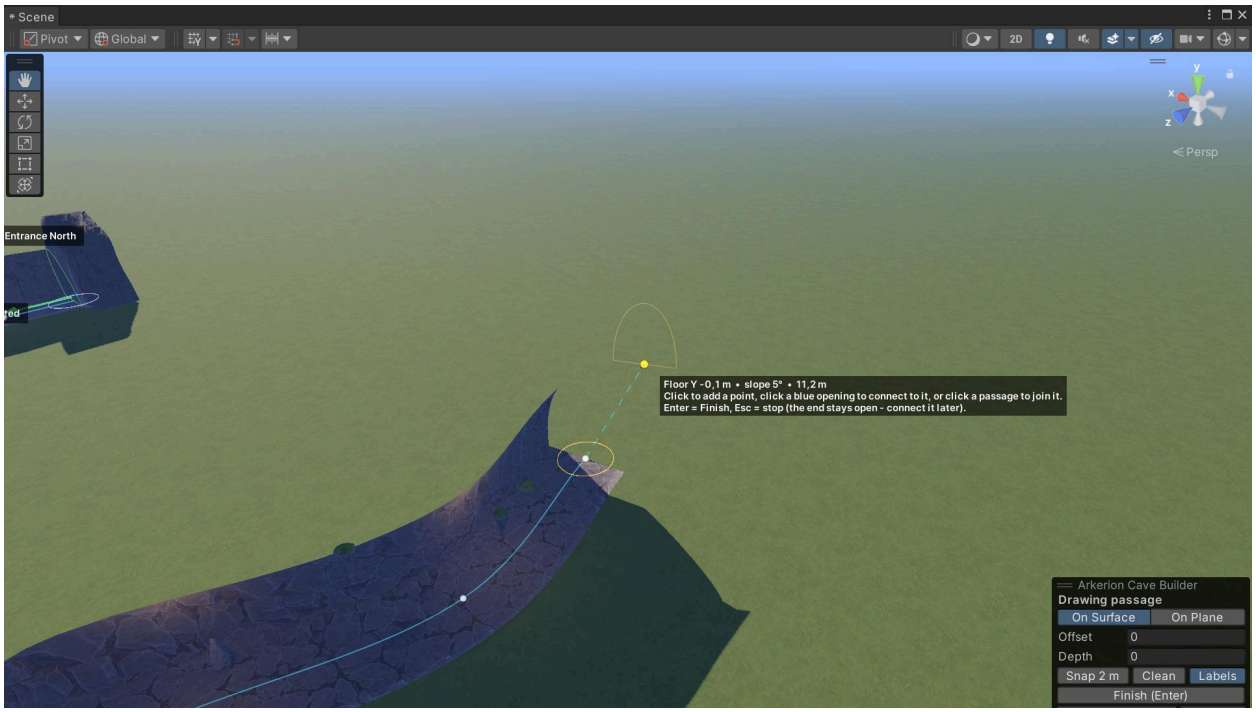
The window has four tabs. Most of the building happens in the Scene view; the window holds the settings.

- **Cave selector** (top bar) – lists the caves in the open scene. Selecting one frames it.
- **Build** – create caves, place entrances, draw passages, add rooms and branches.

- **Selected** – settings of whatever you clicked in the Scene view: a point, a passage, a room or a connection. With nothing selected, it shows the settings of the whole cave.
- **Appearance** – theme, rock look, distortion, lights and decorations.
- **Finish** – preview quality, Play Test, validation, baking and export tools.
- **Status bar** (bottom) – the result of the last update, and the number of errors and warnings. Click the counter to jump to the list.

All sections can be folded. The window remembers which ones are open.

The Scene View



When a cave is selected, the Scene view shows the cave's layout on top of the geometry, and a small toolbar (**Arkerion Cave Builder** overlay) appears.

The overlay toolbar

- **Mode label** – what the current tool expects, for example "Entrance: aim direction".
- **On Surface** / **On Plane** – where clicked points land (see Placing Points).
- **Snap 2 m** – snaps points to a 2 m grid horizontally. Height always stays free.
- **Clean** – hides all editing lines and labels to judge the look, without losing the selection.

- **Labels** – shows or hides measurements and names.
- **Finish (Enter)** / **Cancel (Esc)** – ends the current tool.
- **Open Cave Builder** and **Play Test** – shortcuts.

Colours

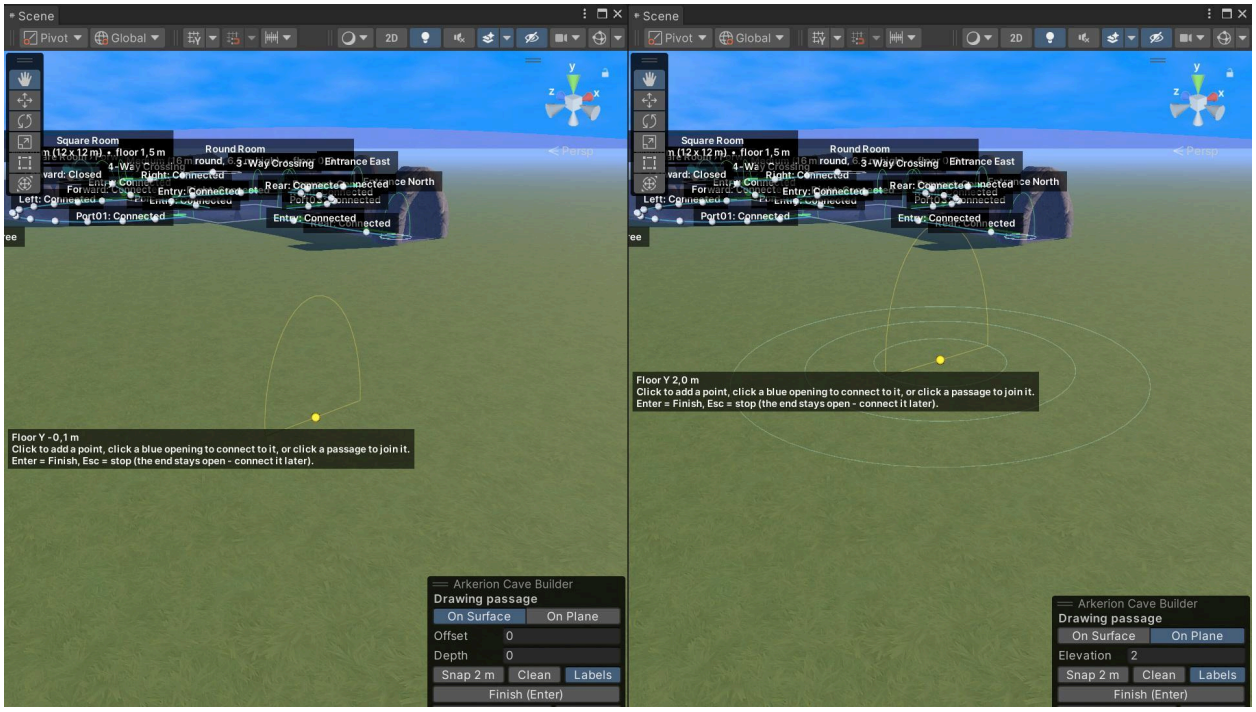
- **Blue line** – the walking floor centre of a passage
- **Yellow** – the selected passage, point or room
- **White spheres** – points
- **Orange arrow** – a free connection
- **Green arrow** – a connected connection
- **Grey arrow** – a connection you marked as closed, or a closed passage end
- **Orange / red marks** – warnings / errors from validation, drawn where the problem is

Keys and mouse

- **Click** – select a point, passage, room or connection arrow
- **Enter** – finish drawing a passage

- **Esc** – finish drawing, or cancel the current tool
- **Delete** – delete the selected point, passage or room
- **Ctrl+Z** / **Ctrl+Y** – Undo / Redo; every action is one Undo step
- **Alt + drag** – orbit the camera as usual; it never places points

Placing Points



Every tool needs to know where on the floor you clicked. Choose the method on the Build tab (**Point Placement**) or in the overlay.

- **Draw on Surface** – points land on whatever collider is under the mouse: terrain, a ground plane, other geometry. The cave itself is ignored. **Floor Offset** raises the walking floor above the clicked surface.
- **Depth Below Surface** (with Draw on Surface; saved with each cave) – keeps terrain out of the cave: passage points, rooms and crossings go this far below the surface you click, while entrances stay on it. A passage drawn out of an entrance descends at a comfortable slope until it reaches this depth. About the passage height plus a few metres (e.g. 6 m) works well. Already built a cave too shallow? **Lower Existing Cave** moves passages, rooms and crossings down by the amount you enter (entrances stay, passages ramp down from them, passages that would get too steep are smoothed) – one Undo step.

- **Draw on Plane** – points land on a flat horizontal plane at **Plane Elevation**. Use it in empty scenes and for caves deep underground. Change the elevation between clicks to build on several levels.

- **Snap to 2 m Grid** – snaps X and Z for tidy layouts. Heights stay free.

When the mouse is over nothing usable, a message next to the cursor tells you what to aim at instead. Points are never placed at a random spot.

Building a Cave Step by Step

1. Place an entrance

1. On the Build tab, choose the **Entrance** style and click **Place Entrance**.

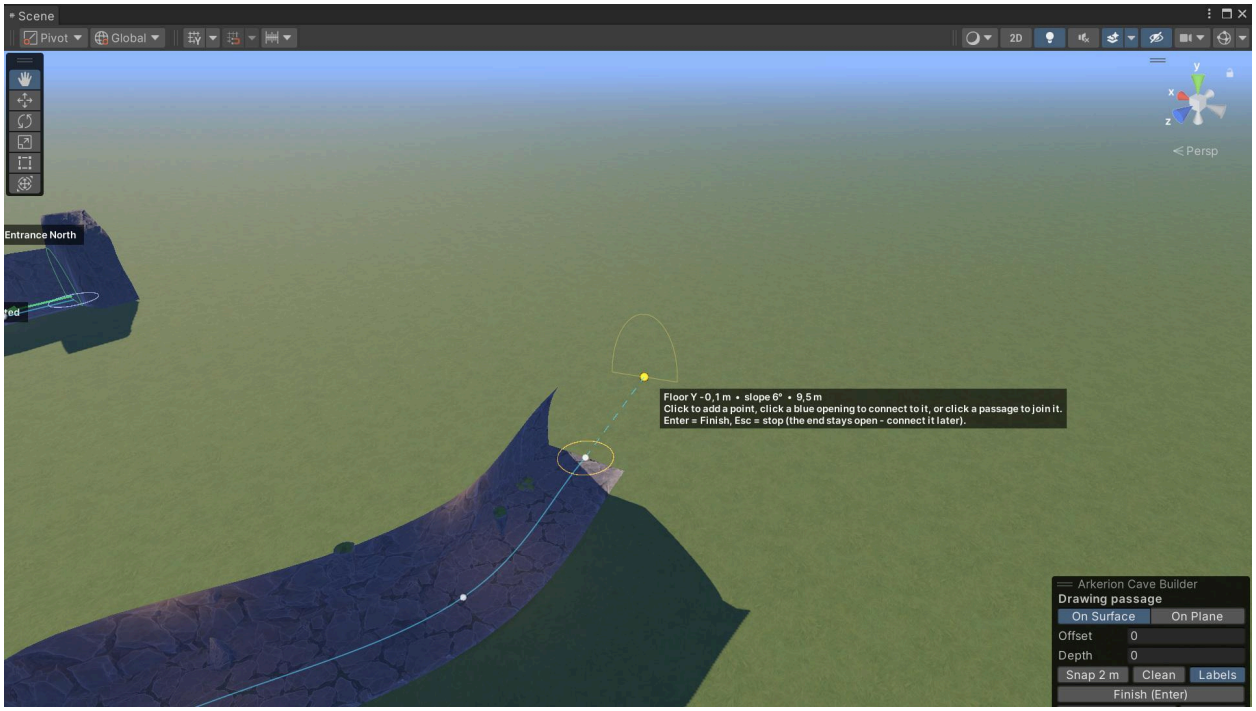
2. Click the floor point where the cave mouth should stand. A ghost shows the entrance.

3. Move the mouse to aim the **green ghost tunnel** (with arrows on its floor): that is where the passage goes into the ground. The blue **Outside** arrow marks the cave mouth. Click again.

4. Drawing of the first passage starts right away from the entrance.

Tip: on a terrain, place the entrance at the foot of a hill or cliff, then use **Cut Terrain Opening** (see Terrain).

2. Draw a passage



1. Click floor points one after another. A dotted line from the last point follows the mouse with the slope and distance, and warns when the next point would be too steep to walk.
2. Press **Enter** (or **Finish** in the overlay) to stop.
3. To continue an existing passage later, select it and click **Continue Passage** on the Build tab. It continues from its free end.

Without an entrance, **Draw Passage** starts a free passage at the first click.

Good spacing: one point every 6–15 m on straight sections, more points in bends.

3. Shape the passage

Click a point to select it:

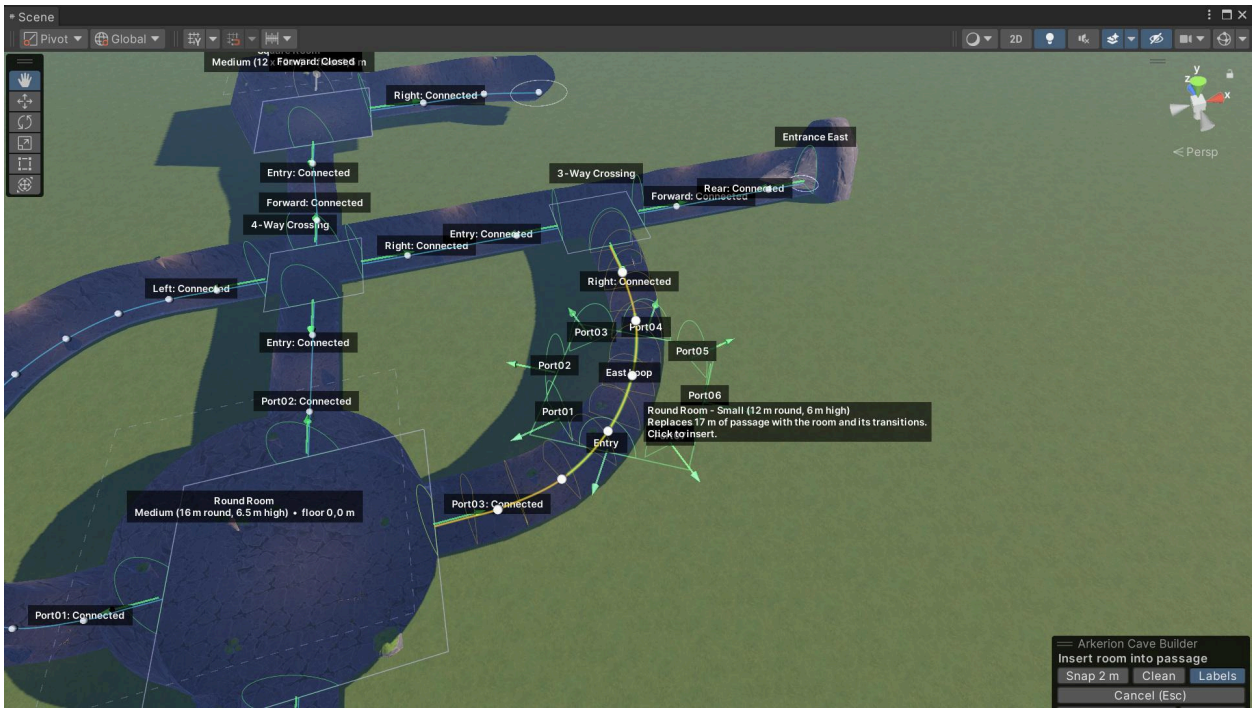
- **Move handle** – drag in any direction. Dragging up or down makes the passage climb or descend.
- **Yellow cubes** – drag sideways to change the width, up to change the height at this point.
- **Yellow outline** – the cross-section at this point.
- **Dotted line** – drops to the ground, to judge height.

On the **Selected** tab you can also type exact values:

- **Position (cave)** / **Floor Elevation (world Y)** – where the point is
- **Width (m)** / **Height (m)** – this point's size. Untick **Use Cave Defaults** to override; sizes between points blend smoothly.
- **Profile** – the cross-section shape at this point
- **Curve** – **Auto Smooth** (the tool rounds the path) or **Manual Curve** (shows a green handle you can drag to shape the bend)
- **Insert Point After** / **Delete Point** – add or remove points

While you drag, a fast draft preview follows the mouse. The full-quality preview returns when you release.

4. Add rooms



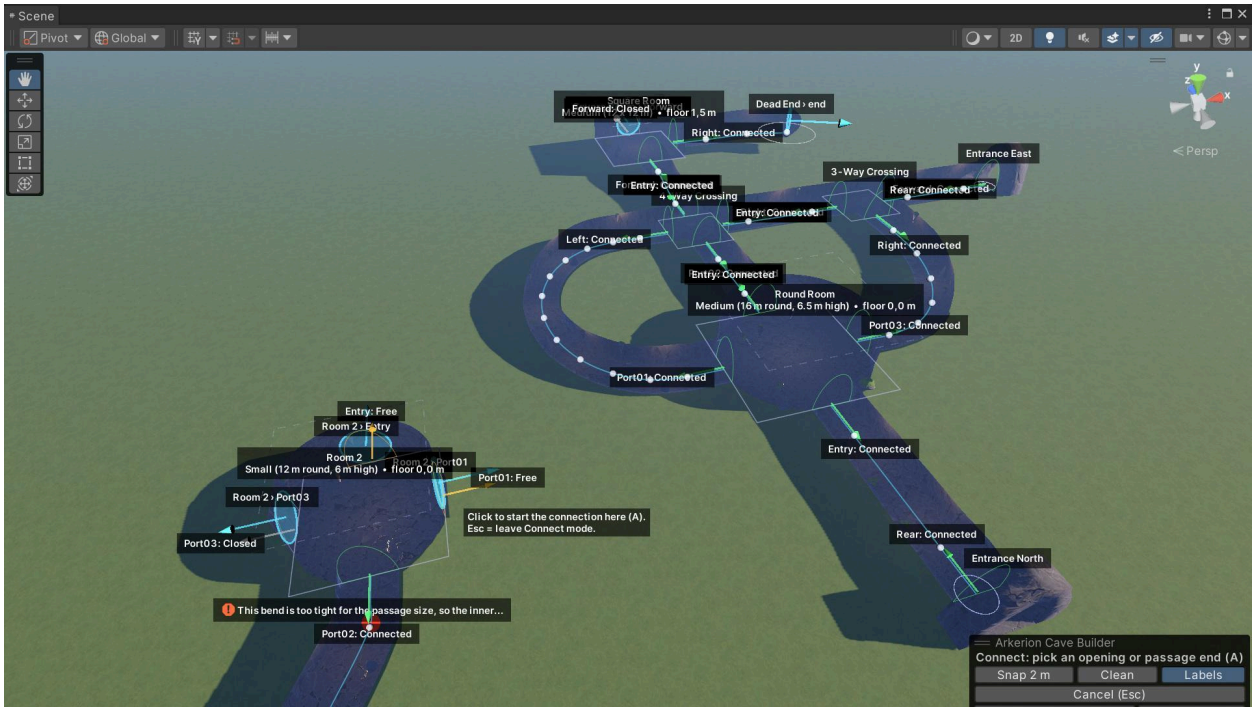
Rooms join passages and give the player space. On the Build tab choose the **Room Shape** (Square or Round), the **Room Template** (number of connections) and the **Size**.

- **Square rooms** – 2, 3 or 4 connections (Straight, Branch, Hub).
- **Round rooms** – 2 to 8 evenly spaced connections, in Small (12 m across, 6 m high), Medium (16 m, 6.5 m) and Large (20 m, 8 m). Their connections are called Entry, Port01, Port02 and so on. With an odd number of connections there is no opening straight opposite Entry, so a room inserted into a straight passage makes the passage turn a little.
- **Insert Room** – select a passage, click Insert Room, hover the passage and click. The room replaces that part of the passage and both halves connect to it. A green ghost shows the room; red means there is not enough passage there, and the message next to the cursor says how much is needed.
- **Place Room** – places a free room: click the centre, then aim its Entry connection and click. Connect passages to it afterwards.

A selected room has a move handle and a blue rotation ring. The handles follow Unity's tool: with **Rotate (E)** only a green rotation ring is shown (drag it to turn the room, Ctrl = 15° steps), **Move (W)** brings back the arrows. Entrances and crossings work the same way. **Smaller** / **Larger** in its action bar switch between the sizes of the same shape and template; connected

passages stay connected. **Square** / **Round** (in the action bar, and as **Shape** in the window's room panel) change the shape of a placed room: it stays in place and every attached passage moves to the new opening that faces its way, so nothing disconnects. The tool picks the preset whose openings line up best with the attached passages (a square 3-way room becomes a round 4-connection chamber, the unused opening is plugged). A shape that has too few openings for the attached passages is greyed out with the reason. Rooms always keep a level floor. Passages take care of height differences.

5. Connect rooms and entrances



Connect mode highlights the openings and passage ends available to join.

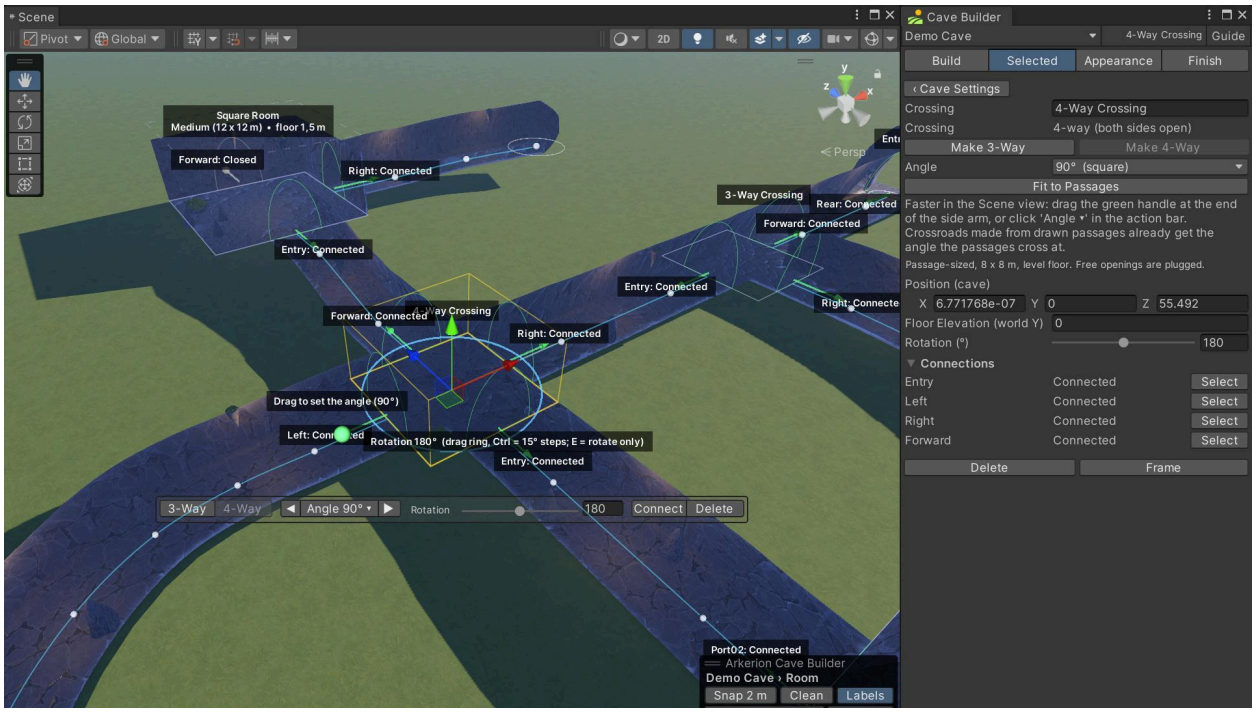
Lay out the key places first (entrances and rooms with **Place Entrance** / **Place Room**), then join them. Build tab > **Connections**:

- **Connect (A → B)** – every free opening and every free passage end becomes a large target in the Scene view. Click **A**, then **B**: two openings get a new straight passage; a passage end and an opening – the passage ends in that opening; two passage ends – the passages become one; a passage end and the middle of another passage – they join with a 3-way crossing. The mode stays on for the next pair; Esc drops A, a second Esc leaves the mode. The label shows the distance and slope, and explains why a pair is refused (already connected, too close).

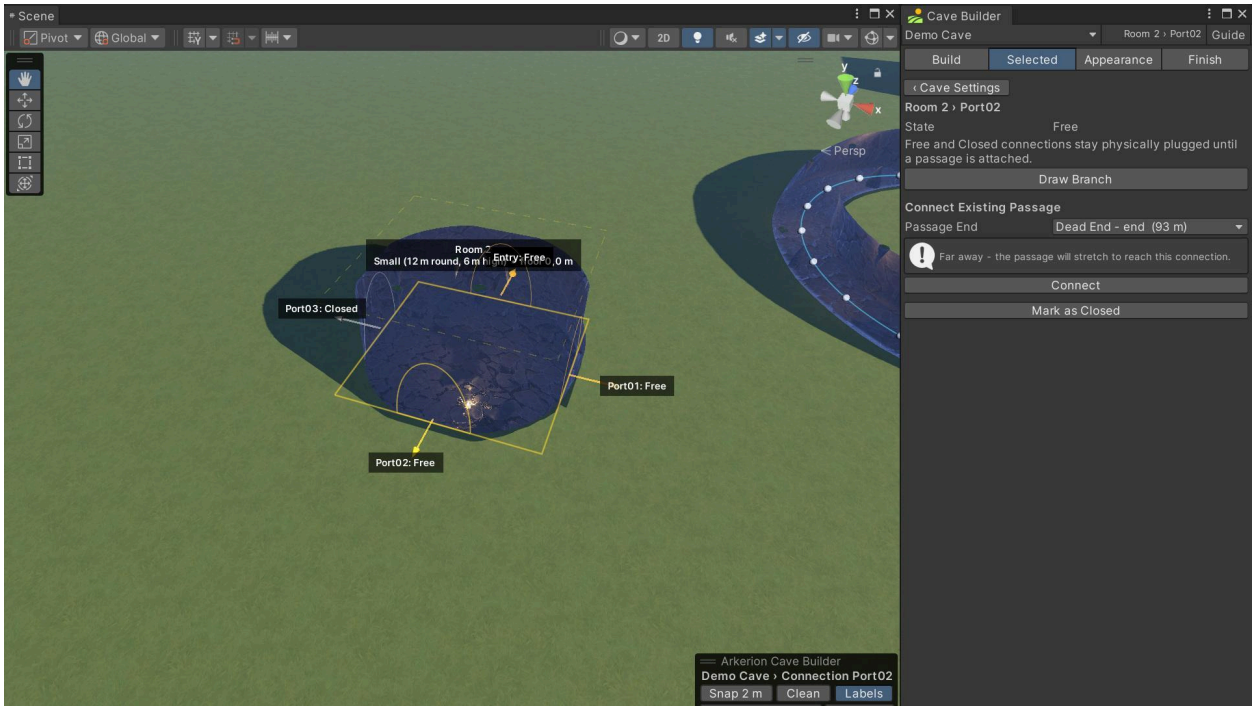
- **Auto Connect** – joins free openings that face each other (within 60°), are within **Max Distance**, stay walkable and do not pass through another room; closest and best aligned pairs first. In Connect mode its suggestions are drawn as dotted lines. One Undo step.

- **The passage list** – every passage as *A → B* with **Edit** (select it) and ✕ (delete, Undo restores it).
- **Edit a connection** – select the passage; on the Selected tab each end has **Reassign** (pick another opening for A or B in the Scene view) and **Disconnect**. Open ends have **Connect** (attach to an opening) and **Draw**.
- **Shape it** – a selected passage shows green **+** markers in the middle of each section. Click one to add a point there; it is selected at once, so drag it to bend, climb or descend the passage.

6. Branches and connections



A selected crossroad exposes its angle handle and action bar.



Click a connection arrow to select it. On the Selected tab:

- **Draw Branch** – starts a new passage from this connection (also on the Build tab).
- **Connect Existing Passage** – attaches the open end of another passage to this connection. The list shows how far away each open end is.
- **Disconnect** – detaches the passage. It keeps its shape and gets an open end.
- **Mark as Closed** / **Mark as Free** – a note for yourself. Unused connections are always plugged, so they never leave a hole.

Crossroads and branches from a passage – no room needed:

- **Crossroads** – draw a passage across another one at about the same height (up to 2 m apart). With **Auto Crossroads** on (Build tab, under Draw Passage) both are joined there by a 4-way crossing when you finish drawing. Crossings made later (e.g. by moving points) show a **Make Crossroad** button in the Scene view; **Make Crossroads** on the Build tab converts all of them at once. The crossing piece is built at the angle the passages actually cross (25°–155°, in 5° steps), so they run straight in; at sharp angles its arms get longer and a rock pillar separates the two tunnels. Pieces for new angles are created automatically in Data/Modules/Crossings.
- **Branch from a point** – select a point in the middle of a passage. The bar under it offers **Branch Left**, **Branch Right** (a 3-way crossing, then you draw the new passage) and **4-Way Crossing** (both sides open; draw from them later). The same buttons are on the Selected tab. A crossing needs about 7 m of passage on each side of the point.

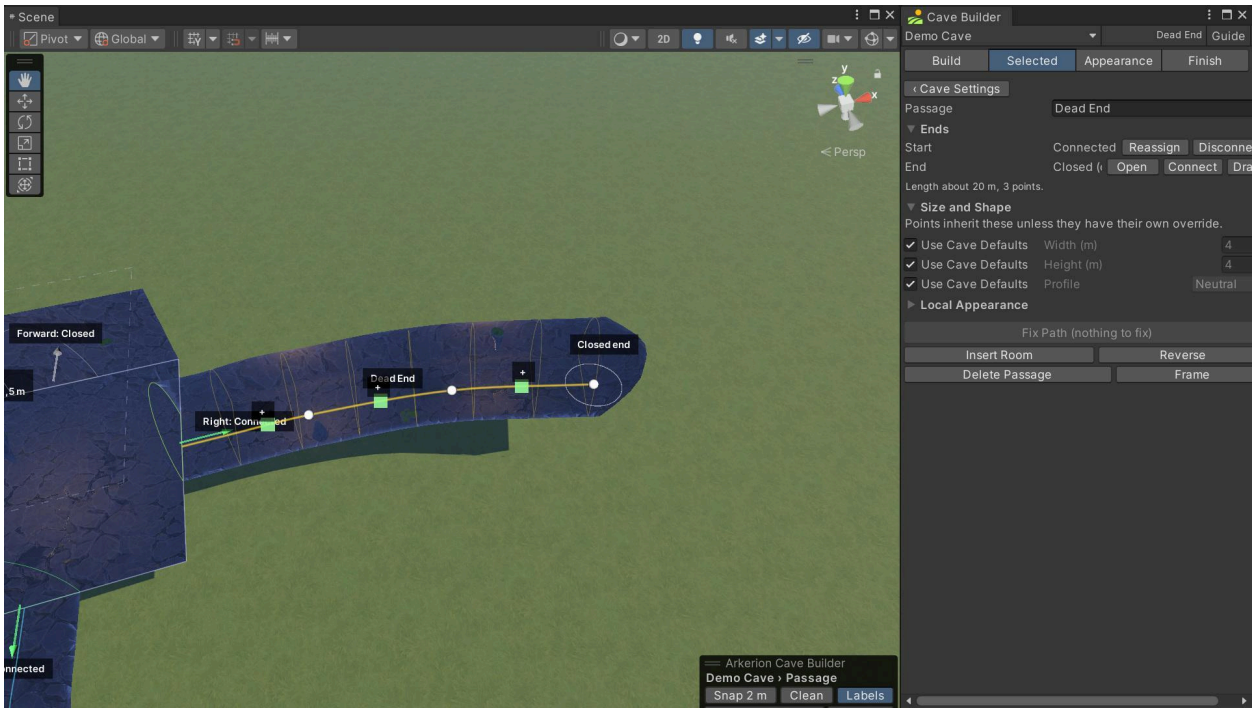
- **Join a passage while drawing** – in Draw Passage, click on another passage (not an opening) to end your passage there with a 3-way crossing. Before the first point, the same click starts a new branch from that passage. Hold **Shift** to place a normal point over a passage instead.

- **Angle** – select a crossing, then either drag the **green handle** at the end of its side arm (a ghost shows the angle, release to apply), click **Angle** ▾ in its action bar to pick any value, or use ◄ ► (5° per click). Range 25°–155°: for a 4-way the angle between the two passages, for a 3-way the angle of the branch. Connected passages stay attached; if one now bends too tightly you are told which.

- **Fit to Passages** (in the Angle ▾ menu and on the Selected tab) – the smart option: turns the crossing and sets its angle so its openings point where the connected passages actually go. Draw the passages roughly where you want them, then click it.

- **3-Way / 4-Way** – select a crossing to switch it. A 3-way crossing has a wall where the 4-way has its Left opening, so that opening must be free.

7. Passage ends



Select a passage. Under **Ends**:

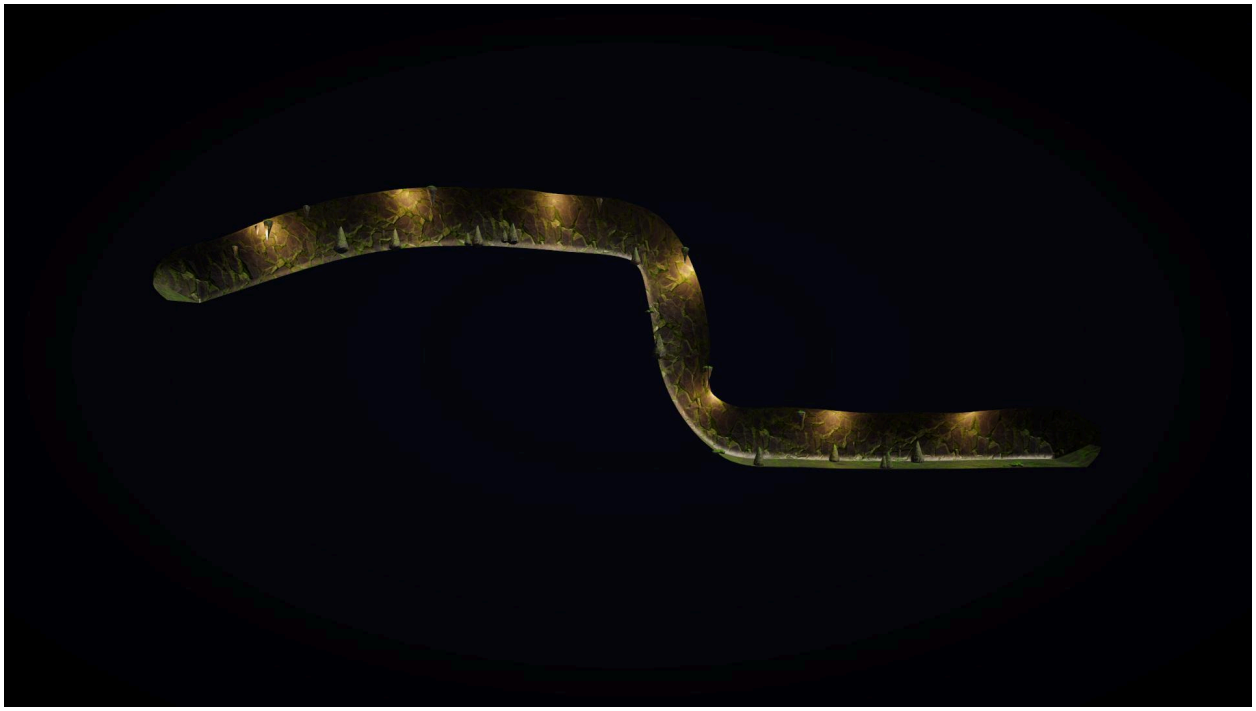
- **Open** – the passage simply stops. Use it while building, or where the passage continues in other geometry.

- **Close** – seals the end with a rounded cap.

- **Draw** – continues the passage from that end.

- **Disconnect** – frees an end that is attached to a room.

8. Climbs and shafts

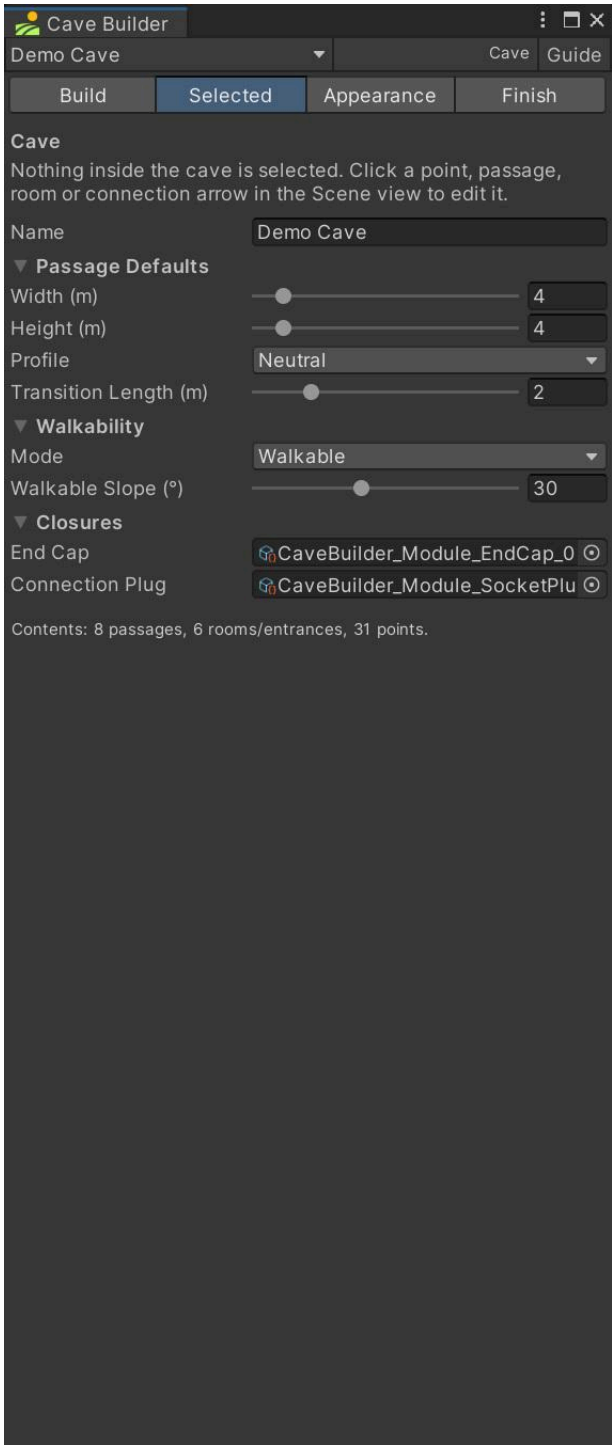


Drag points up or down to climb. The tool keeps the floor level across the passage on walkable slopes and turns the passage into a vertical shaft when it gets very steep.

- **Walkable** mode (default) warns about slopes steeper than **Walkable Slope** (default 30°). Set it to match your character controller.
- **Freeform** mode accepts steep sections and shafts – for caves the player climbs, falls or flies through.

Both settings are on the Selected tab with nothing selected (**Walkability**). A shaft needs room to bend: give it about its own height to curve from horizontal to vertical. **Fix Path** helps when it does not fit.

9. Whole-cave settings

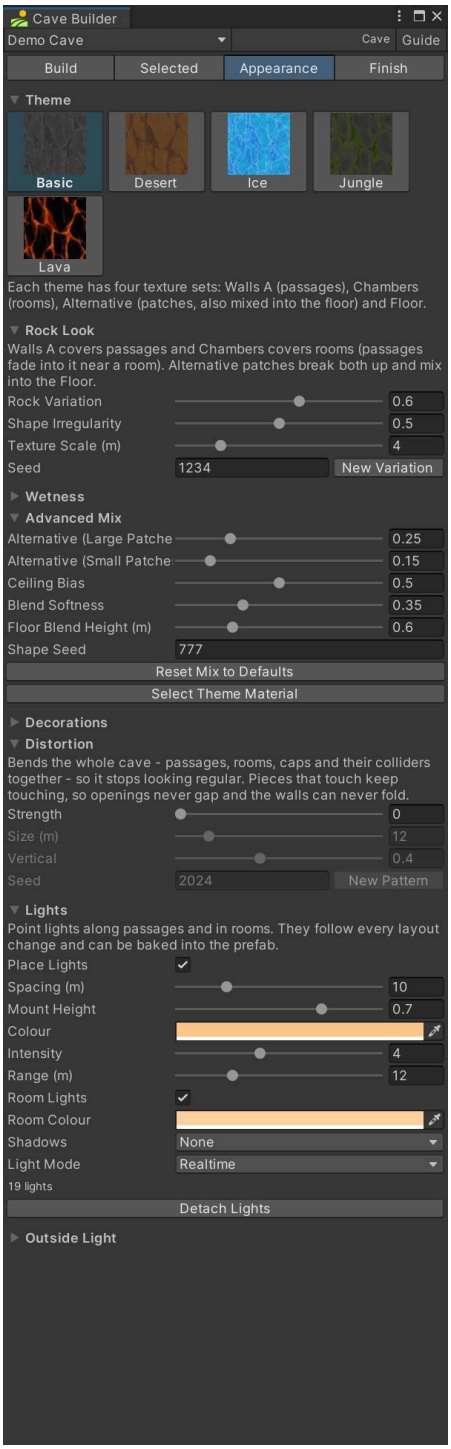


Select the cave object in the Hierarchy. If a point, passage or room is still selected, click **‹ Cave Settings** at the top of the Selected tab. With nothing inside the cave selected, the Selected tab shows:

- **Name** – the cave object's name

- **Passage Defaults** – **Width**, **Height** and **Profile** for every point without its own values, and **Transition Length**, the straight section in front of every opening
- **Walkability** – **Mode** and **Walkable Slope**
- **Closures** – the **End Cap** and **Connection Plug** pieces used for closed ends and free connections

A selected passage can also override width, height and profile for all its points (**Size and Shape**), and use its own Alternative patch amounts (**Local Appearance**).



Appearance

Appearance changes never move the layout. Theme changes are instant.

Theme

Click a theme button to swap all materials: **Basic**, **Desert**, **Ice**, **Jungle** or **Lava**. Only themes installed in your project are listed.

Every theme has four texture sets:

- **Walls A** – passage walls and ceilings
- **Chambers** – rooms; a passage fades into it over its last 4 m before a room
- **Alternative** – patches that break up the walls and chambers, also mixed into the floor
- **Floor** – walking surfaces

Lava is its own system. Its texture sets are temperature bands instead of cave roles (see **Lava > Heat Zones**): the hottest liquid lava in the **Floor** set, warm lava streams in **Alternative** and cold rock in **Walls A** and **Chambers**. A lava cave is never wet, so the Wetness section is hidden for it, and the Alternative patch settings in Rock Look and Advanced Mix are hidden too.

Outside Light

Cave walls are single-sided, so on their own they would let the sun shine into the cave. **Block Outside Light** (on by default) adds an invisible, low-poly **shadow shell** around every passage, room, entrance, cap and plug. It only casts shadows: no colliders, no extra material, not visible in the game. **Shell Offset (m)** sets how far outside the cave it sits (raise it if you see shadow acne inside). The shell has its own triangle count in **Statistics** and is included in baked prefabs.

Cave material options

Select the theme material (**Advanced Mix > Select Theme Material**). Its inspector is grouped:

- **Walls A / Chambers / Alternative / Floor** – colour, normal, tint, **Scale** and **Rotation** per texture set (different scales and rotations hide tiling)
- **Blending** – **Height Blend** (sets meet along the stone cracks), **Macro Variation** (large brightness changes), **Crack Occlusion**
- **Top Cover** – moss, snow, sand or ash on upward-facing surfaces; it settles in the cracks first
- **Wetness** (Cave Surface shader: every theme except Lava) – damp walls, **Puddles** in the floor cracks, **Drip Streaks** on walls
- **Emission** – strength and a travelling **Pulse** (Lava)
- **Heat Zones** and **Lava** (Cave Lava shader only) – the theme-wide defaults of the Appearance **Lava** section
- **Color Adjust** – hue, saturation, brightness for quick re-colours
- **Quality & Debug** – **Low Quality (Mobile / VR)** and **Debug View** (texture sets, height, wet/cover masks, mesh channels, projections)

Rock Look

- **Rock Variation** – how many Alternative patches break up Walls A, Chambers and the Floor
- **Shape Irregularity** – smooth bulges in passage walls (not near openings)
- **Texture Scale (m)** – metres of surface per texture repeat (default 4)
- **Seed** / **New Variation** – reshuffles material patches and decorations, never the layout

Lava

The Lava section controls the heat zones and molten effects of a lava cave.

Shown when the theme uses the Cave Lava shader (the **Lava** theme). Sets how much of the rock glows, and adds lava pools, leaks and heat to this cave without changing other caves that use the same theme. Everything is procedural in cave space, so it also breaks up the texture repetition.

- **Black Rock / Cooling / Balanced / Molten** – one-click looks: cold basalt with no lava; mostly dark rock with dim red cracks and crusted pools; a glowing crack network broken into hot and cold zones; mostly lava with a few rocks.
- **Custom Lava** – off: the cave uses the theme material's lava settings. On: the values below apply to this cave only (it gets its own copy of the theme material, saved with the scene and with the baked prefab). Turn it on as well when the cave's **Floor Blend Height** is not 0.6 m, so the heights below are in real metres.

- **Heat Zones** – where the three lava texture bands go. The hottest lava (**Floor** set) lies mostly on the floor, warm lava (**Alternative**) always surrounds it, and cold rock (**Walls A** / **Chambers**) fills everything else, so hot lava never touches cold rock directly. Lava runs along the cracks of the colder rock instead of meeting it in straight lines.

- **Hot Floor** / **Hot Pool Size** – how much of the floor is the hottest lava, and the size of its pools.

- **Hot Leaks** with **Leak Spacing**, **Leak Width** and **Leak Source Height** – hottest lava running down the walls.

- **Hot Spots** – occasional hot patches on walls and ceilings.

- **Warm Spread** – how far the warm lava reaches out from the hot areas (about 1.5–2 m up the walls above a hot pool at the default 0.35).

- **Warm Patches** / **Warm Patch Size** – loose warm lava streams in otherwise cold walls and ceilings.

- **Glowing Cracks** – **Crack Glow** (how much of the textures' crack network glows; 0 = cold cracks turn to dark basalt), **Crack Width** (hot cracks widen into molten lava that floods the rock), **Hot / Cold Zones** and **Zone Size** (break the glow up so the pattern never repeats).

- **Floor Lava** – procedural molten pools on top of the textures: **Floor Lava** (pools that fill cracks and low spots first; 1 = almost the whole floor), **Pool Size**, **Crust** (cooled plates drifting on the lava, their seams stay molten) and **Flow Speed**. Visual only: the floor collider stays. With Heat Zones the Floor set already is the floor lava, so the Lava theme starts at 0 here.

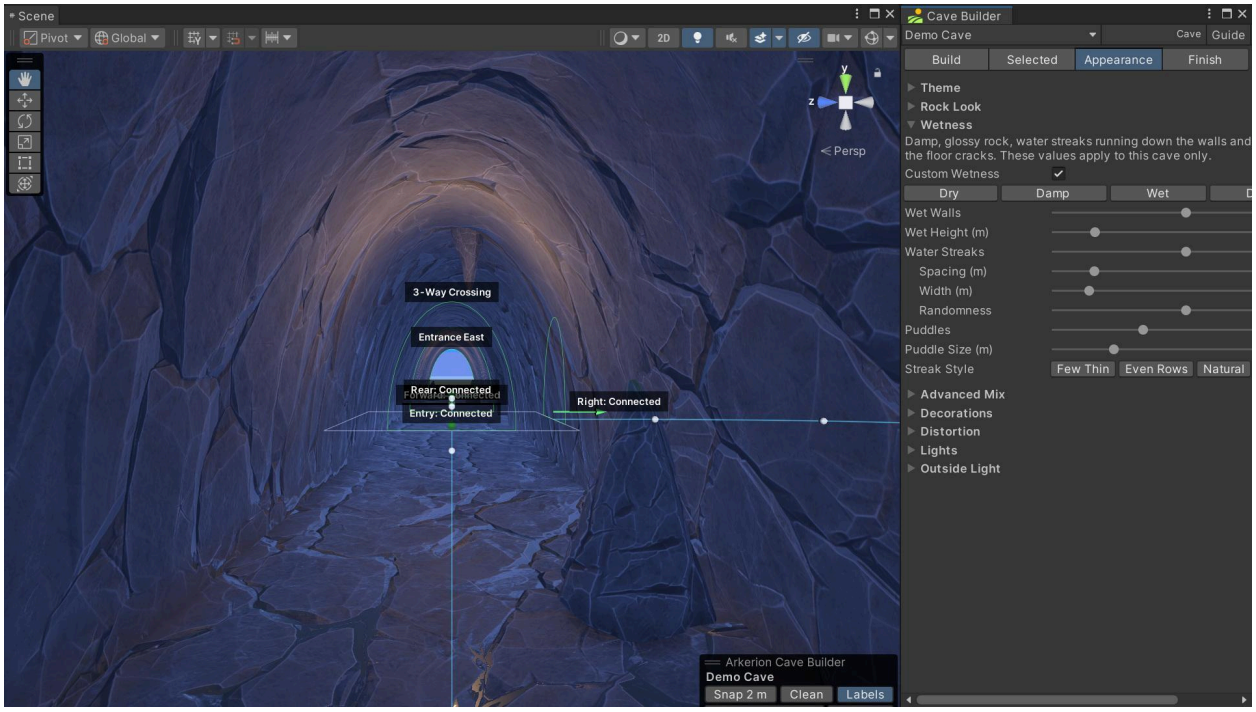
- **Lava Leaks** – glowing, flowing lava coming out of the walls and running down to the floor: **Leaks** (how many), **Spacing**, **Width** and **Source Height** (highest point a leak starts from).

- **Heat Gradient** – **Heat From Floor** (cracks near the floor glow even in cold zones) with **Heat Height**, and **Rock Glow** (red heat on the rock itself near the floor and around pools).

- **Colour & Glow** – **Lava Colour** (HDR) and **Glow Intensity**.

Changes show instantly; no rebuild is needed. Flowing lava animates in Play Mode (or in the Scene view with **Always Refresh** on). Warm orange cave lights (**Lights > Colour**) match the glow best. **Debug View > Lava** on the material shows heat (red), molten lava (yellow) and cold cracks (blue).

Wetness



Wetness controls adjust water streaks and puddles for the selected cave.

Makes this cave wet without changing other caves that use the same theme.

- **Dry / Damp / Wet / Dripping** – one-click looks.
- **Custom Wetness** – off: the cave uses the theme material's wetness. On: the values below apply to this cave only (it gets its own copy of the theme material, saved with the scene and with the baked prefab).
- **Wet Walls** – darker, glossier rock, strongest near the floor. **Wet Height** – how far up from the floor the walls are wettest.
- **Water Streaks** – how strong the water running down the walls is. Under it: **Spacing** (distance between streaks – smaller means more), **Width** and **Randomness** (0 = even rows of identical streaks; higher = uneven placement and widths, dry gaps, streaks that start, stop and wander). **Streak Style** buttons: Few Thin, Even Rows, Natural, Many Wide.
- **Puddles** / **Puddle Size** – still water that fills floor cracks and low spots first.

Changes show instantly; no rebuild is needed. Requires the Cave Surface shader (every shipped theme except Lava; lava caves are never wet).

Advanced Mix

- **Alternative (Large Patches)** / **Alternative (Small Patches)** – rough share of the surface covered by Alternative patches
- **Ceiling Bias** – extra small patches on ceilings
- **Blend Softness** – how soft the borders between materials are
- **Floor Blend Height (m)** – how far the Floor material creeps up the walls
- **Shape Seed** – pattern of the wall bulges
- **Reset Mix to Defaults** / **Select Theme Material**

Distortion

Distortion bends the whole finished cave – passages, rooms, entrances, caps, plugs, decorations, lights and all colliders together – so it stops looking regular.

- **Strength** – 0 is off. 1 is the strongest distortion that is still guaranteed to be safe for the chosen Size.
- **Size (m)** – the distance over which the cave swings one way and back. Larger sizes allow larger offsets. Below the sliders, the window shows how far walls and floors move.
- **Vertical** – 0 keeps floors at their height (only the walls bend). 1 makes floors and ceilings as uneven as the walls.
- **Seed** / **New Pattern** – a different pattern with the same settings.

Why it is safe: every point of the cave moves by an amount that depends only on where it is. Pieces that touch before (a passage and a room, two parts of a passage, a cap) still touch exactly afterwards, so there are never gaps to fall through, and colliders always match what you see. The strength is limited so walls can never fold through each other.

Good starting values: **Strength** 1, **Size** 12–20 m, **Vertical** 0.3. For big, slow bends raise Size; for small lumps add Shape Irregularity.

Lights

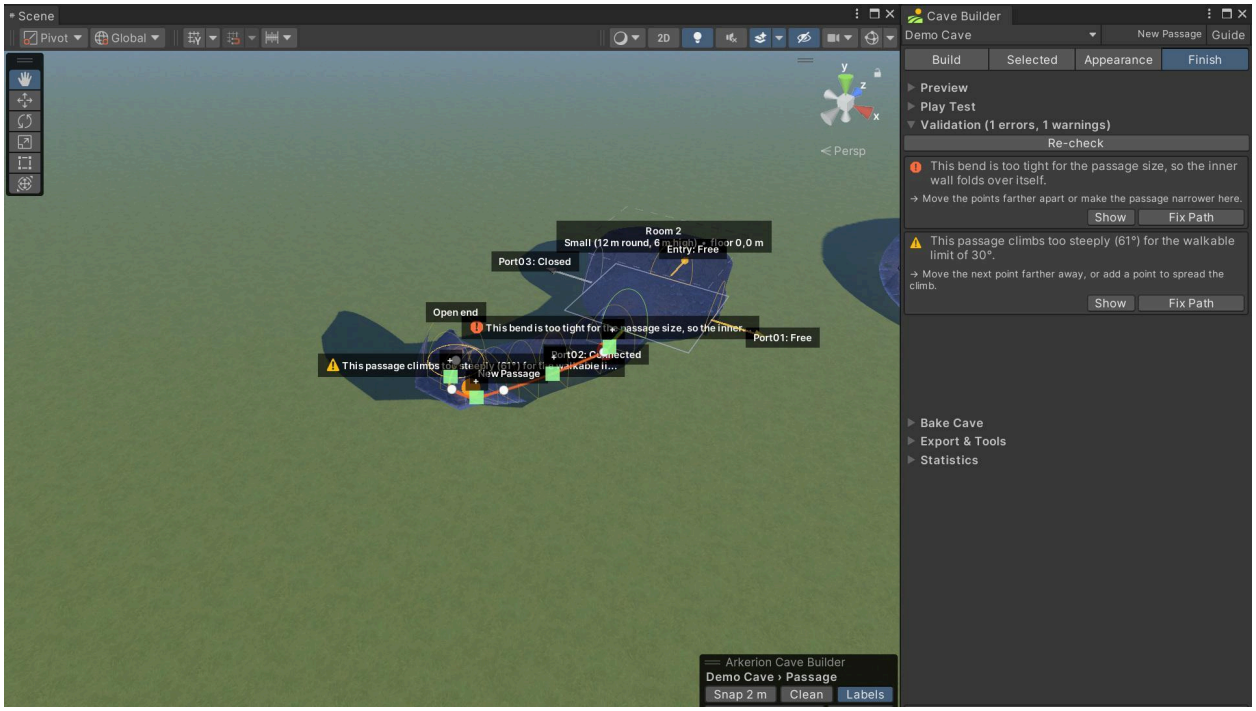
- **Place Lights** – point lights along passages and one per room. They follow every change.
- **Spacing (m)** – distance between passage lights
- **Mount Height** – height as a part of the passage height; lights always stay inside the cave, also in shafts
- **Colour**, **Intensity**, **Range** – light look. Room lights grow to fill the room.
- **Room Lights** / **Room Colour** – the extra light in every room
- **Shadows** – **None** suits most caves; shadow-casting point lights are expensive
- **Light Mode** – **Realtime**, **Mixed** or **Baked** for lightmapped scenes
- **Detach Lights** – copies the lights into a normal object you can edit one by one, and turns automatic lights off (Undo brings them back)

Decorations

- **Generate Decorations** – rocks, boulders, stalagmites and stalactites from the cave's theme. Every theme has its own textured set (three LODs, colliders: convex on the solid pieces, the rock cluster keeps its real shape)
- **Density** – how many. Low values place a few pieces here and there; the full value is really dense (a piece about every 0.8 m along a passage and up to 21 floor + 18 ceiling pieces in a room).
- **Size** – size of every piece (1 = as modelled)
- **Size Variation** – how different the pieces are in size: 0 = all the same, 0.5 = from half to one and a half times the Size
- **Turn Variation** – how differently the pieces are turned: 0 = all face the same way, 1 = any direction
- **Tilt (°)** – random lean, so pieces don't all stand perfectly upright; the base (or the top of a stalactite) stays in place
- **Clusters** – groups pieces naturally: smaller stalagmites, stalactites and rocks next to the big ones, rocks scattered around boulders. It only adds pieces; the ones already placed stay where they are.
- **Reset Look to Defaults** – back to Size 1, Size Variation 0.2, Turn Variation 1, Tilt 0, Clusters 0

Decorations always come from the cave's own theme and switch with it. A theme without its own decoration pieces uses the Basic ones; the section then names the borrowed pieces. Decorations stay out of the walking strip and away from openings. **Seed** / **New Variation** reshuffle them.

Validation and Fixes



The cave is checked after every change. Problems are listed on the Finish tab under **Validation**, counted in the status bar and marked in the Scene view where they are.

- **Error** – the result would be broken. Errors block baking.
- **Warning** – probably not what you want, but it can be baked.
- **Show** – frames the problem and selects the passage or point.
- **Fix button** – a one-click repair when one exists. Every fix can be undone.

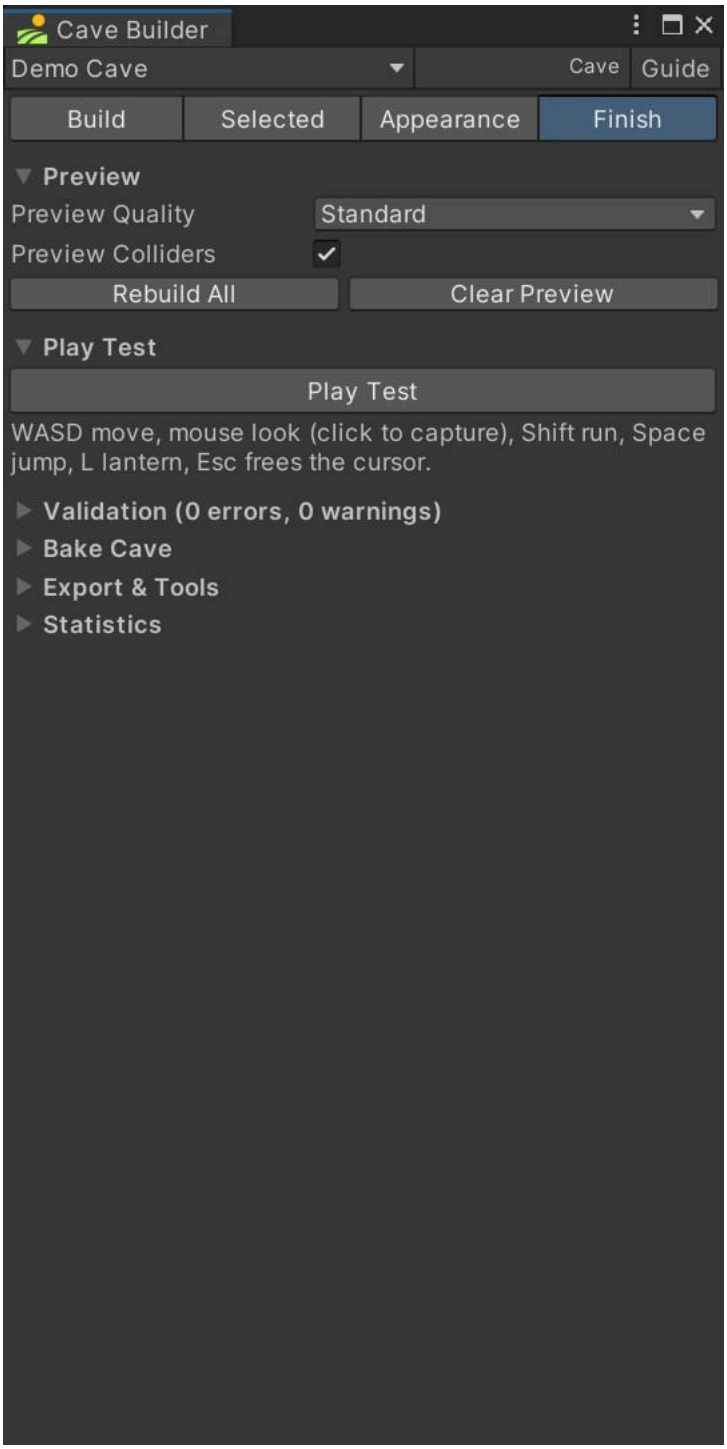
Common messages:

- **Passage needs at least one more point** – add points, or delete the passage.
- **Two consecutive points are almost on top of each other** – **Remove Point**.
- **Connection needs more space for its transition** – move the nearest point further out in front of the opening (about 3 m).
- **Climbs too steeply** – **Fix Path** spreads the climb over the points, or use Freeform.

- **Near-vertical shaft** – **Use Freeform**, or spread the height change over a longer distance.
- **Walls fold over themselves** – the bend is too tight for the passage size. **Fix Path** rounds the corner; otherwise move points apart or make the passage smaller.
- **Tight bend** – the inner wall may pinch. Spread the turn.
- **Closed end on a steep section** – caps need a gentle end; add a flatter last point.
- **Clearance can drop below 2 m** – raise the height or lower Shape Irregularity.
- **Distortion lowers the clearance** / **makes the floor steep** – lower Distortion Strength or Vertical, or raise Size.
- **Passage runs through a room** – connect it to a free connection, or route it around.
- **These passages cross without a crossroad** – **Make Crossroad** joins them with a 4-way crossing.
- **These passages cross at a shallow angle** – move one passage so they cross at 25° or more.
- **These passages overlap** – they run too close side by side or at different heights; move one away.
- **Two rooms overlap** – move or rotate one.
- **Point size is outside the supported range** – widths and heights must be 2–24 m.
- **Cave object is scaled** – **Reset Scale**; set sizes on points instead.
- **No theme assigned** – **Assign Theme**.

Fix Path

Select a passage and click **Fix Path**. It rounds corners that make the walls fold and spreads too-steep climbs over the existing points, keeping the ends and connections in place. A message tells you what changed; when the layout simply has too little room, it tells you how much more is needed.



Preview

On the Finish tab under **Preview**:

- **Preview Quality** – **Draft**, **Standard** or **Final**. Draft is used automatically while dragging. Final matches the bake.
- **Preview Colliders** – keep it on: Play Test, terrain tools and your own testing need it.
- **Rebuild All** – regenerates everything (with a progress bar you can cancel).

- **Clear Preview** – removes the generated geometry. The layout is kept; any change brings it back.

Only the parts you changed are rebuilt, so editing stays fast even in large caves.

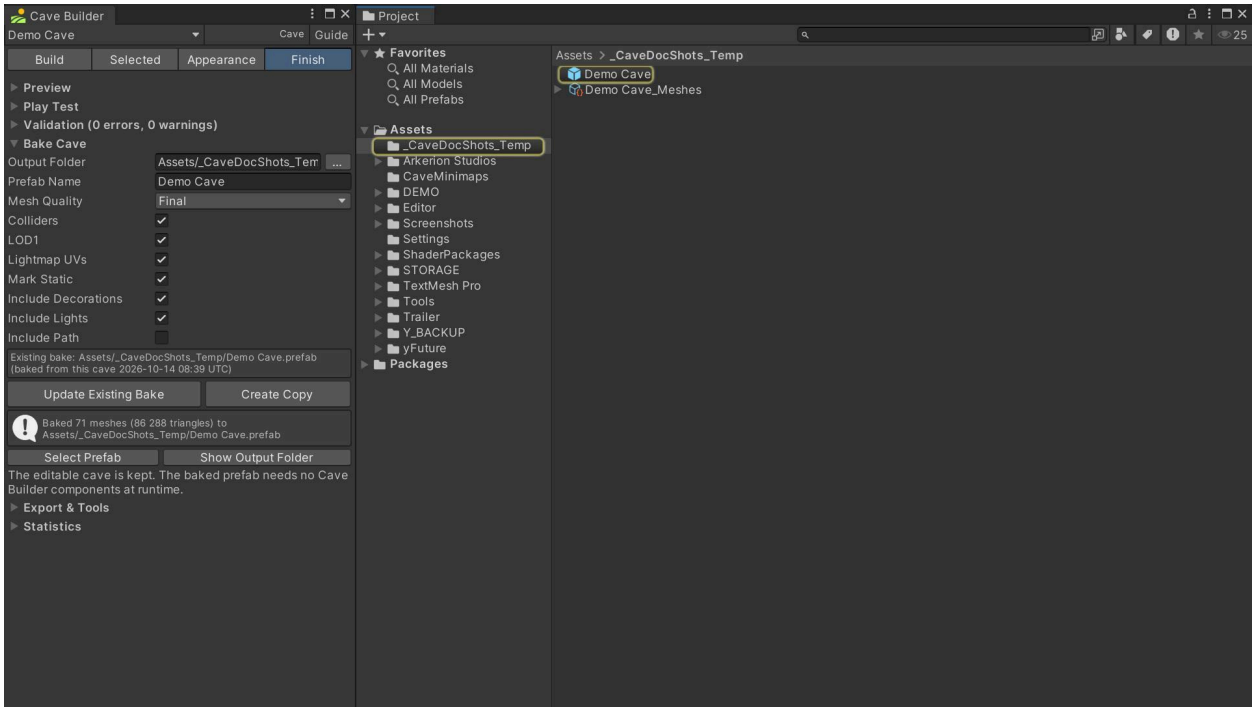
Play Test

Click **Play Test** (Finish tab or overlay). Unity enters Play mode with a first-person walker just inside the entrance (or at the start of the first passage).

- **WASD** / arrows – move
- **Mouse** – look (click into the Game view to capture the mouse)
- **Shift** – run, **Space** – jump
- **L** – lantern on/off
- **Esc** – free the mouse

Everything the walker creates disappears when you leave Play mode. Colliders are built automatically if the preview has none.

Baking



Baking saves the cave as ordinary assets: a prefab plus one mesh asset. The baked prefab has no Cave Builder components and works in any build. The editable cave stays in your scene, so you can change it and bake again.

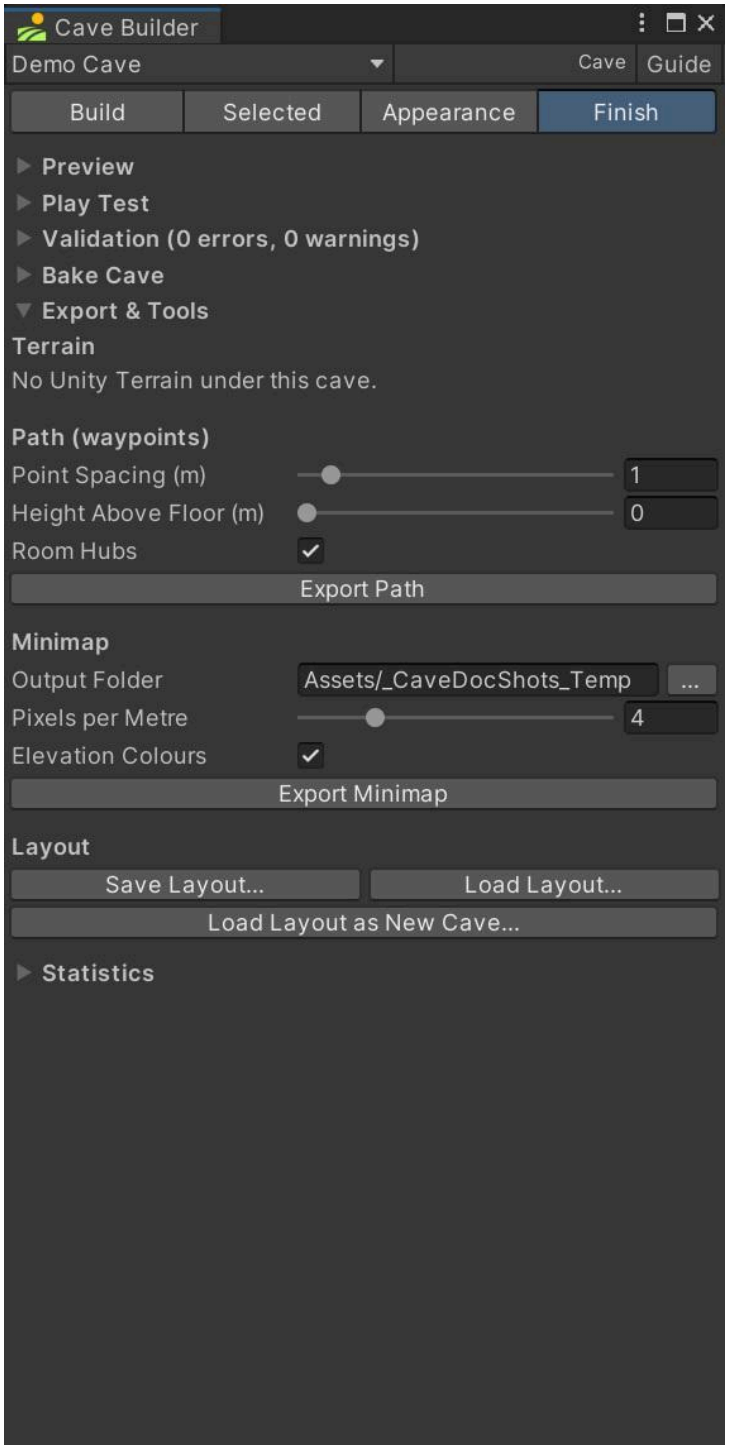
- **Output Folder** / **Prefab Name** – where the prefab (**Name.prefab**) and its meshes (**Name_Meshes.asset**) go
- **Mesh Quality** – Final is recommended
- **Colliders** – static mesh colliders on every floor and wall. Leave this on unless you add your own collision; without it the player falls through.
- **LOD1** – a lighter version for distance. Openings keep full detail, so neighbours never crack.
- **Lightmap UVs** – needed for baked lighting
- **Mark Static** – static flags for batching, occlusion culling and lightmapping
- **Include Decorations** / **Include Lights** / **Include Path** – optional extras

Buttons:

- **Bake Cave** – first bake
- **Update Existing Bake** – overwrites the earlier bake of this cave in place. Every copy of the prefab in your scenes updates.

- **Create Copy** – bakes to a new name and keeps the old one
- **Select Prefab** / **Show Output Folder**

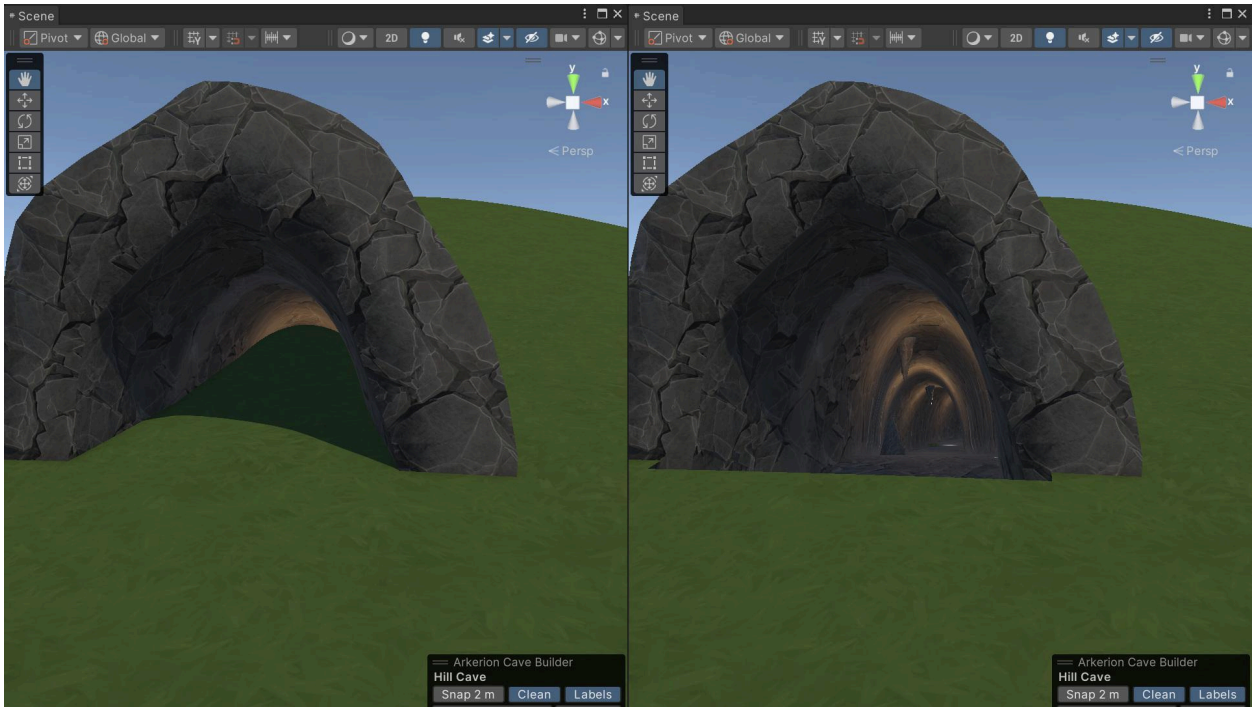
The tool never overwrites a prefab that belongs to another cave. Baking is blocked while there are errors.



Export and Tools

All on the Finish tab under **Export & Tools**.

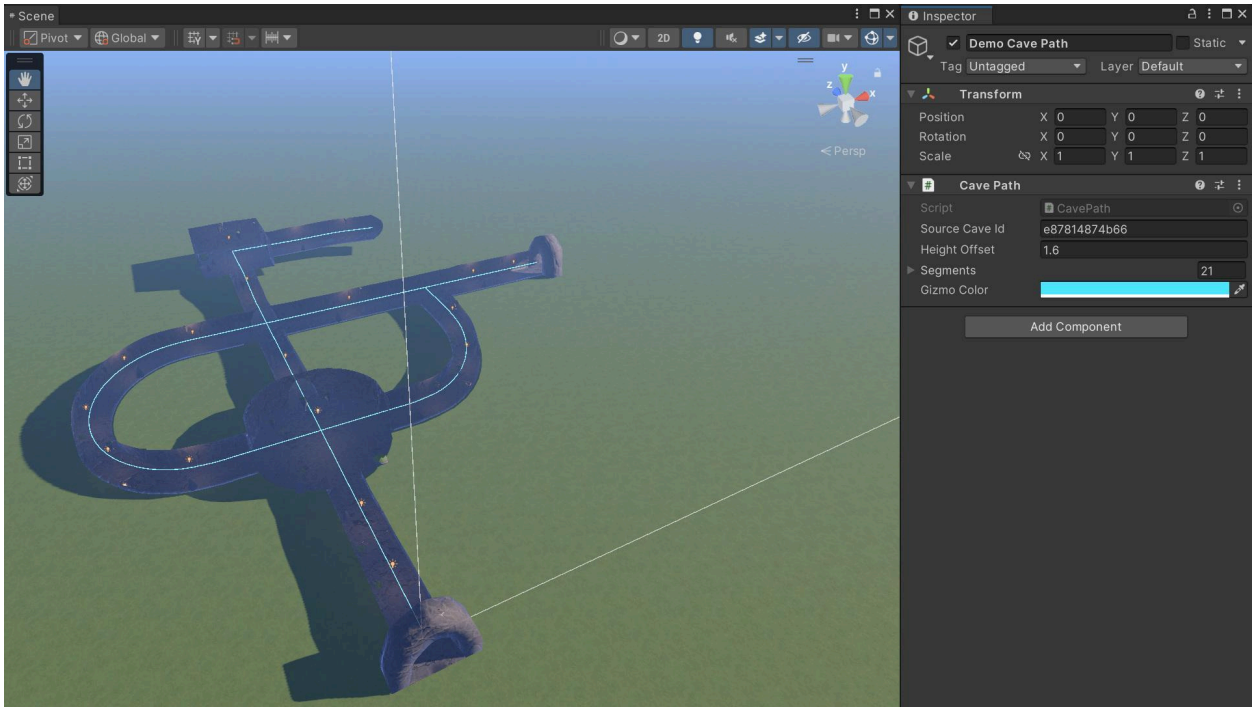
Terrain



- **Cut Terrain Opening** – cuts holes into a Unity Terrain wherever the terrain surface lies inside the cave, so the entrance opens into the landscape. Needs the cave colliders (on by default).
- **Restore Terrain** – fills the holes under this cave again.

Both can be undone. The entrance's Selected tab has the same button.

Path (waypoints)

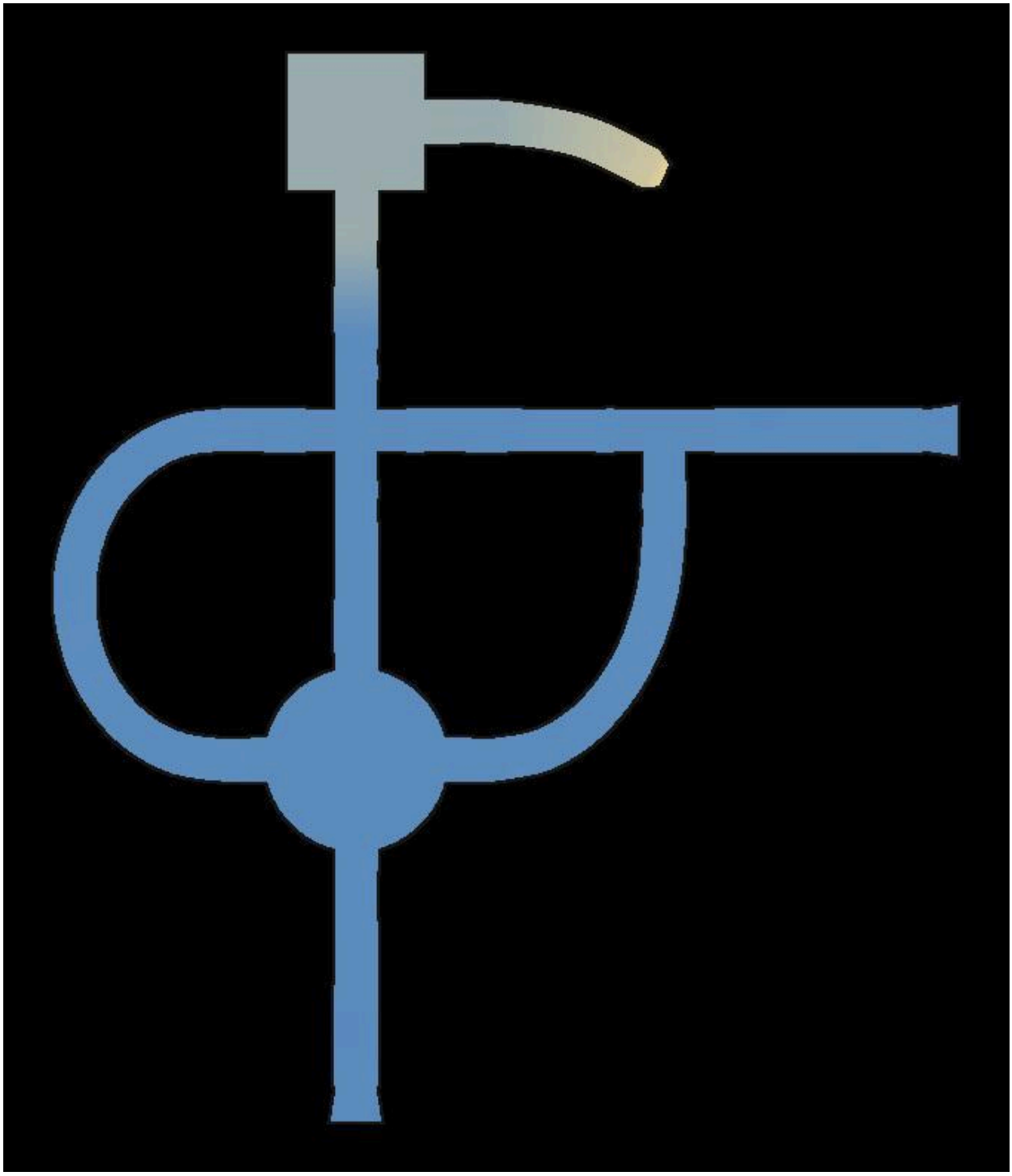


Export Path creates a **Cave Path** object next to the cave: the walking-floor centre-lines of all passages as waypoints, with room hubs connecting each room centre to its openings.

- **Point Spacing (m)** – distance between waypoints
- **Height Above Floor (m)** – 0 for the floor, about 1.6 for a camera rail
- **Room Hubs** – adds the room connections

Use it for AI patrol routes, camera rails, spawn points or guides. Programmers can ask it for a point at a distance (GetPoint), the closest point to a position (FindNearest) and the paths meeting at a junction (SegmentsAt). Exporting again updates the same object.

Minimap



Export Minimap writes a top-down PNG of the cave floors (as a Sprite) and a data asset that converts world positions to positions on the image. **Pixels per Metre** sets the resolution; **Elevation Colours** shades lower floors blue and higher floors warm.

Layouts

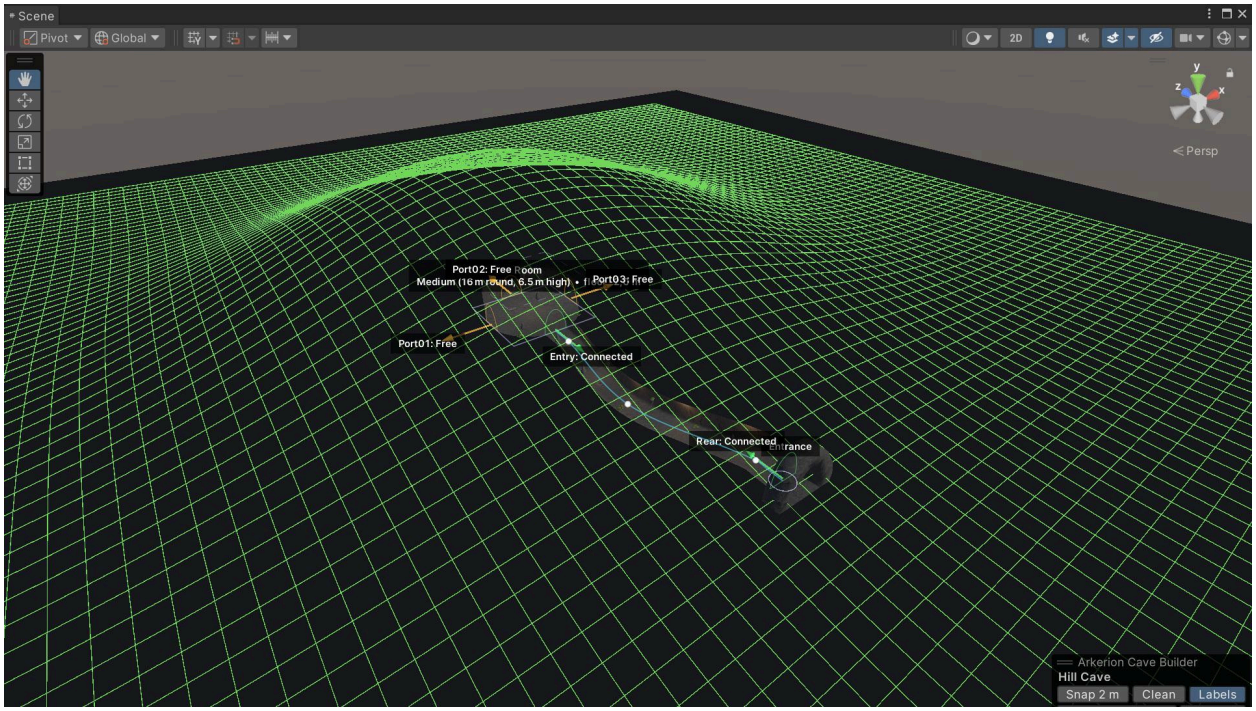
- **Save Layout** – saves the cave design as a JSON file
- **Load Layout** – replaces this cave's design with a saved one (can be undone)
- **Load Layout as New Cave** – creates a new cave from a file

Use layouts to back up a design before big experiments, or to move caves between projects with the same Cave Builder assets.

Statistics

Counts passages, length, rooms, points, meshes, triangles, colliders, lights, decorations and mesh memory, plus the triangle count the shell would have at each quality.

Working With Terrain and Levels

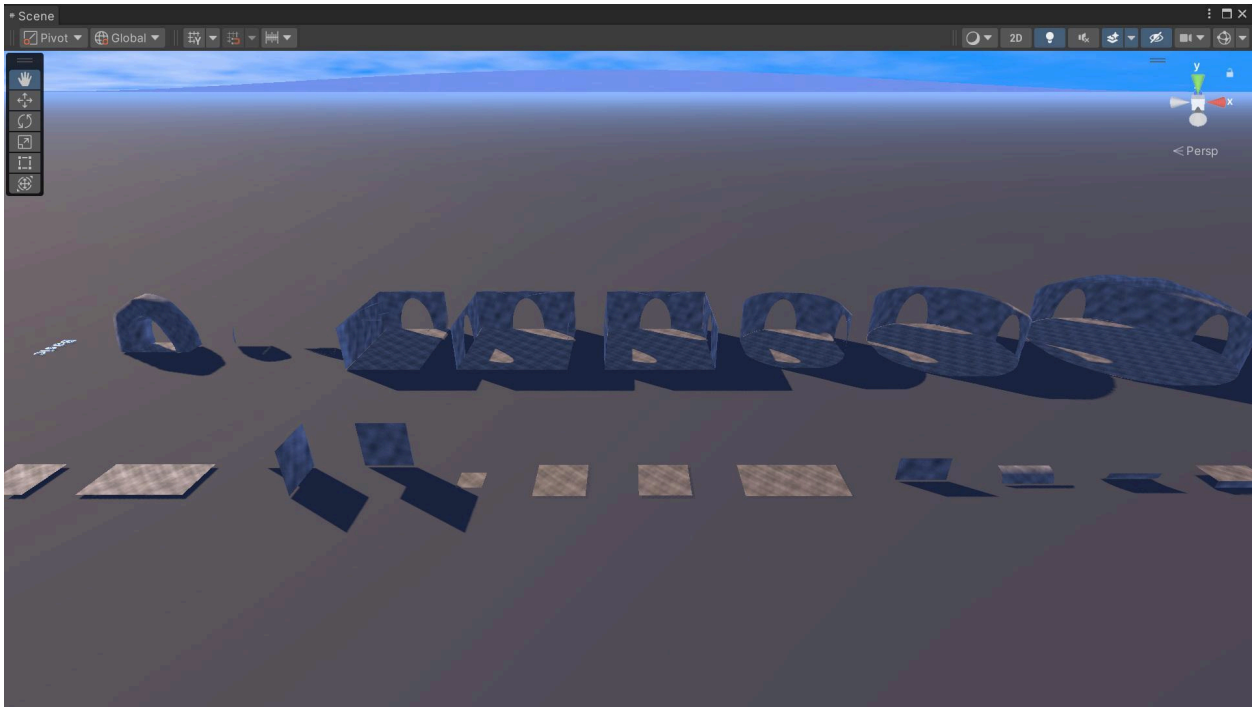


1. Place the entrance at the foot of a slope with **Draw on Surface**, so it sits on the terrain.
2. Switch to **Draw on Plane** for the underground part and set the elevation a few metres below the surface.
3. Draw passages and rooms underground.

4. Click **Cut Terrain Opening**, then check the mouth from outside. Add rocks or the manual kit pieces around the entrance to hide the terrain edge.

5. For a cave inside a mountain mesh, check that the passages stay inside the mesh. The cave is single-sided and only visible from inside.

Manual Kit



The folder **Prefabs/CaveBuilder Basic** also contains the cave pieces as ordinary prefabs: walls, corners, floors, ceilings, junction strips, a ramp, a ledge, an arch, a floor skirt, an opening wall, the rooms, the entrance, the cap, the plug and the four Basic decorations (every theme has its own decoration prefabs in its Prefabs folder). The kit pieces snap together on the 2 m grid and use world-space materials, so neighbouring pieces line up. Use them to dress the outside of an entrance, or to build small hand-made caves without the tool.

Your Own Content

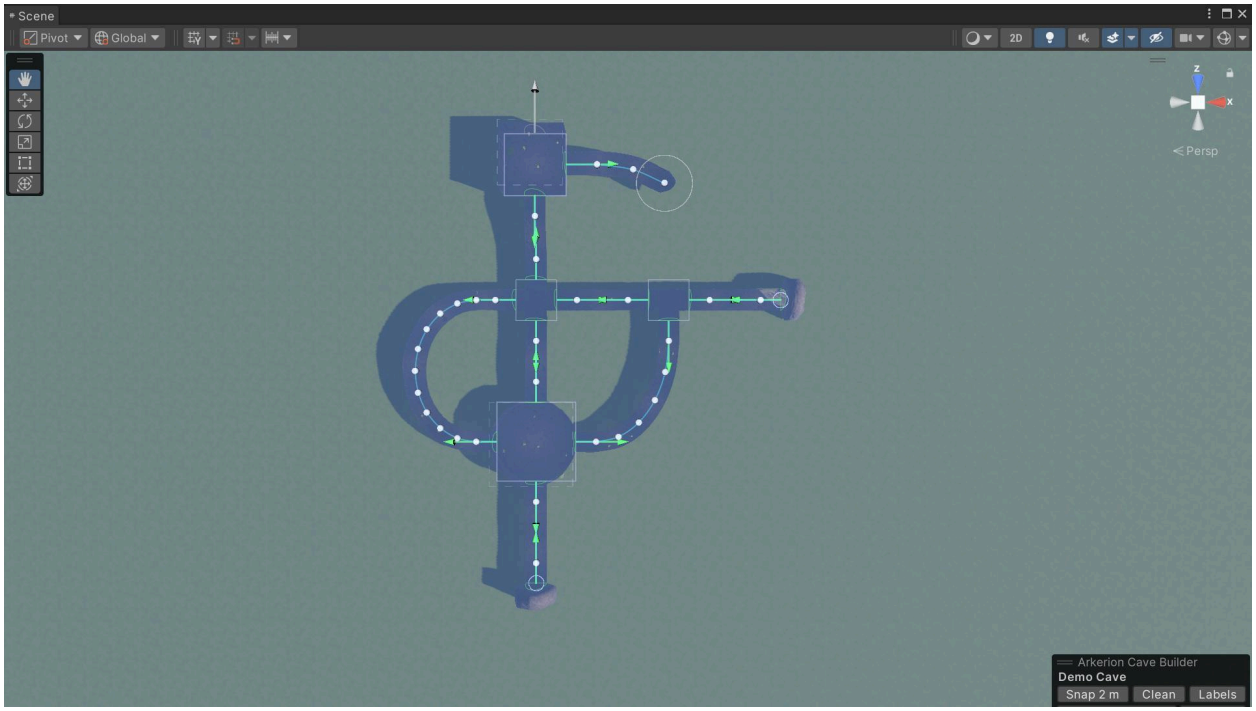
- **Themes** – **Assets > Create > Arkerion > Cave Builder > Theme**. Assign a cave material made with the **ArkerionCaveSurface** shader (fill its Walls A, Chambers, Alternative and Floor textures; use **ArkerionCaveLava** for a lava-style theme), the role materials and optional decoration prefabs. The theme's four decoration slots are what its caves scatter, so a theme gets its own look by pointing them at prefabs with its own material (for example a copy of the Basic decoration prefabs with your material).

- **Profiles** – **Assets > Create > Arkerion > Cave Builder > Profile**: a custom cross-section shape.

- **Rooms and entrances** – model the opening to the standard 4 x 4 m shape (coordinates in **Documentation/CB1_Contour_Unity.json**), add empty objects named Model_Socket_Id at each opening's floor centre, select the model and use **Assets > Create > Arkerion > Cave Builder > Module From Selected Model**. The module's Inspector reports whether every opening fits.

Programmers can add their own generated content, settings and checks. See **CaveBuilder_Extending.md** in the Documentation folder.

Best Practices



Planning

- Start with the entrance and the main route, then add rooms and branches.

- Think in spaces: tight passages lead to open rooms; a room is a good place for a choice, a fight or a view.

- Keep the main route readable; hide side branches behind bends.

- Use **Save Layout** before big changes.

Layout

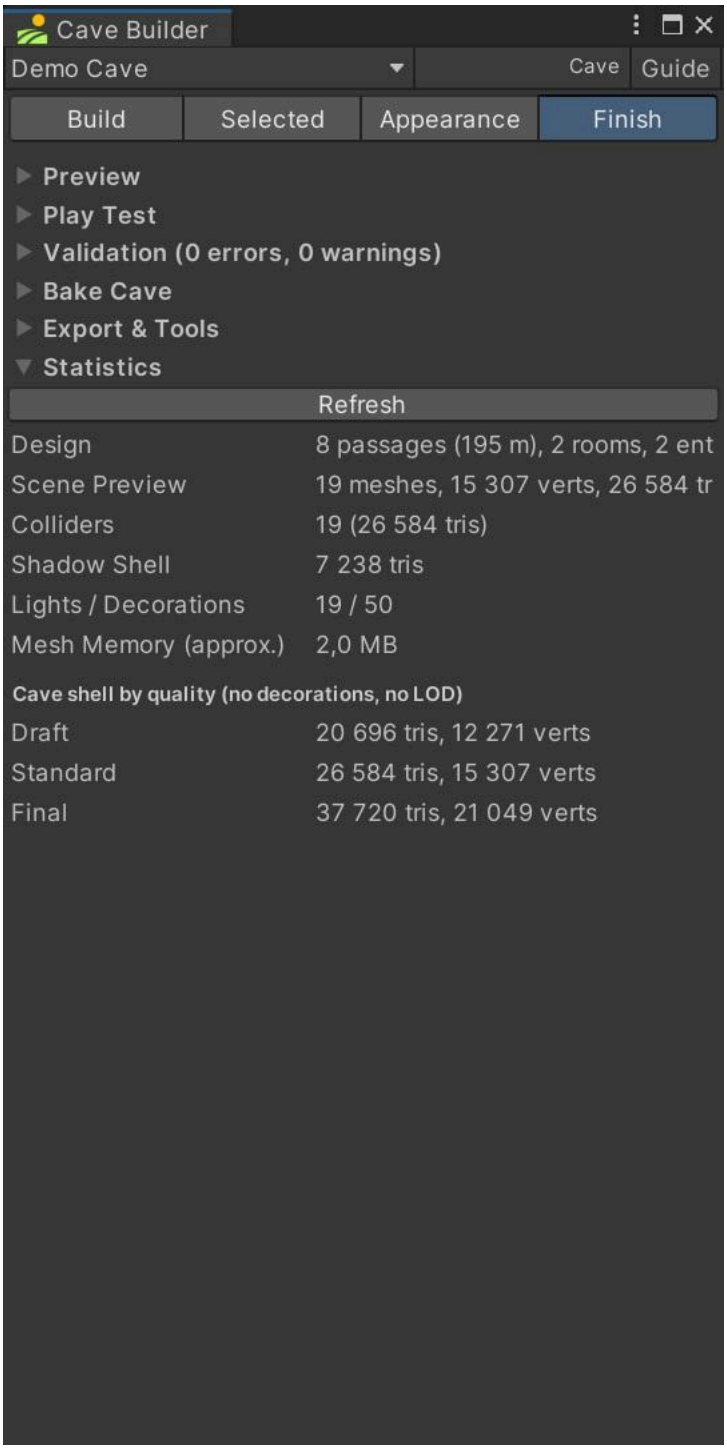
- One point every 6–15 m on straight sections; more points in bends.
- Leave about 3 m of straight passage in front of every opening.
- Spread big height changes over distance: about 30° and below stays walkable.
- Keep bends wider than the passage is wide.
- Let passages cross at about the same height and at a clear angle; they become crossroads.
- Keep the cave object at scale 1. Change sizes on points or in the Passage Defaults.
- Rotate or move the whole cave with its object; the layout follows.

Look

- Mix sizes: a 4 m passage opening into a 6–8 m section feels natural.
- Use a different profile on a few points (Broad, Irregular) for variety.
- Add Distortion last; check clearance warnings afterwards.
- Use light colour and spacing to guide the player: warmer and brighter on the main route.

Workflow

- Leave preview quality on Standard while building; Final for the last checks.
- Use **Clean** in the overlay to judge the look without editing lines.
- Play Test often; it takes seconds.
- Bake for your game scenes. Keep the editable cave in a separate work scene, or next to the baked prefab with its object disabled.
- Never edit the objects under **Generated** by hand – they are rebuilt from the design at any time. Detach lights or bake first if you want to edit the result.



Performance

- Bake caves for your game; the preview is for editing.
- Passages are split into chunks of about 24 m, so the parts behind the camera are skipped automatically.
- LOD1 and the LOD group hide distant parts of the cave.

- Caves are ideal for **Occlusion Culling** (Window > Rendering > Occlusion Culling): rock hides almost everything around the next bend. Baked caves are already marked static for it.
- Lights cost more than polygons: keep shadows off for most cave lights, use Baked or Mixed light mode, and keep spacing generous. URP Forward lights at most 8 lights per object; Forward+ has no such limit.
- **Statistics** shows triangles and memory before you bake.

Troubleshooting

Nothing happens when I click in the Scene view

- The cave must be selected (the overlay toolbar is visible).
- With **Draw on Surface**, there must be a collider under the mouse. Add a ground plane or terrain, or switch to **Draw on Plane**. The message next to the cursor says what is missing.
- **Alt** is held – Alt is reserved for orbiting the camera.

Points land too high or too low

- Check **Floor Offset** (surface) or **Plane Elevation** (plane).

- Use the Selected tab to type the exact **Floor Elevation**.

The cave does not update

- Look at the status bar: if generation failed, the last valid preview stays visible and the message says why.
- Click **Rebuild All** on the Finish tab.
- Check the Validation list – an invalid passage keeps an empty preview until it is fixed.

The walls fold, pinch or look twisted

- The bend is too tight for the passage size. Use **Fix Path**, move points apart or make the passage smaller there.
- For shafts, give the bend room – about the passage height.

There is a hole in the cave

- Free connections are always plugged and openings are always sealed, so a hole usually means a passage has an **Open** end. Select it and click **Close**.
- Two passages that cross without a crossroad overlap. Click **Make Crossroad** where they cross.

The player falls through the floor

- In the editor: turn on **Preview Colliders**.
- In a baked prefab: bake with **Colliders** on.
- Your character controller must collide with the default layer the cave uses, and its step offset and slope limit must fit the cave (see Walkable Slope).

The player cannot walk up a slope

- The slope is steeper than your controller allows. Lower the climb, set **Walkable Slope** to your controller's limit and fix the warnings, or lower Distortion **Vertical**.

The cave is black

- No theme or material: pick a theme on the Appearance tab.

- No light inside: turn on **Place Lights**, or add lights. Light from the sky does not reach inside – that is intended.
- Light leaks through the walls from outside: caves are single-sided. Avoid strong directional light on underground caves, or cover the outside with terrain or rock.

The entrance is buried in the terrain

- Click **Cut Terrain Opening** on the Finish tab or the entrance's Selected tab.

Textures look stretched or blurry

- Adjust **Texture Scale**. Strong Distortion stretches textures slightly with the rock – that is intended and helps the look.

Decorations float or sit in the way

- Click **Rebuild All**. Decorations are placed on the generated floor and never in the walking strip; if you moved objects under **Generated** by hand, they are replaced.

"Preview out of date" in the overlay

- Generation of a part failed. The status bar shows the reason. Fix the reported problem or click **Rebuild All**.

Baking is blocked

- Errors in the Validation list block baking. Use **Show** and the fix buttons.
- The prefab name exists and belongs to another cave: change the name or use **Create Copy**.

I duplicated a cave and both changed

- They do not: a duplicated cave gets its own identity automatically. Bake the copy under a new name.

The cave is part of a prefab and behaves strangely

- Editable caves keep their geometry in the scene. To reuse a cave, bake it and use the baked prefab.

Play Test does not start

- Draw a passage or place an entrance first.
- Leave Play mode first if it is already running.

Limits of This Version

- Rooms come in fixed size presets; there is no free room resizing.
- Every room has one level floor.
- Crossroads are level and passage-sized (4 x 4 m openings); passages crossing more than 2 m apart in height or below 25° are not joined. Crossing angles come in 5° steps.
- No holes in arbitrary places of a wall; use rooms and entrances for openings.
- Caves are built in the editor and baked; there is no generation at runtime.
- Crossing and clearance checks are approximate warnings, not guarantees.
- Editing handles stay on the undistorted design line; the distorted walls can be up to the distortion amount away.

Folder Overview

Main package folder:

Assets/Arkerion Studios/Stylized Nature/Cave_Builder

- **Data** – the library, themes, profiles and room/entrance definitions
- **Documentation** – this guide, the extension guide and the opening shape data
- **Materials/CaveBuilder Basic, Desert, Ice, Jungle, Lava** – per theme: the cave material ({Theme}_Cave_Surface) and one material per texture set ({Theme}_Cave_Wall_A to D); **Materials/Demo** – the example scene's ground
- **Models/CaveBuilder** – rooms, entrance, cap, plug, kit pieces and decorations
- **Prefabs/CaveBuilder Basic** – manual kit prefabs and the Basic decorations; **Prefabs/CaveBuilder Desert, Ice, Jungle, Lava** – the decorations of the other themes ({Theme}_Cave_Deco_Rocks, _Boulder, _Stalagmite, _Stalactite)
- **Scenes** – a demo scene per theme (**DemoScene_CaveBuilder_Basic**, **_Desert**, **_Ice**, **_Jungle**, **_Lava**) with the same finished example cave,

AssetPreviewScene_CaveBuilder (a small cave and the decorations of every theme) and **PartsReference_CaveBuilder** (every module, crossing and kit piece)

- **Scripts** – the tool (Runtime and Editor)
- **Shaders** – the Cave Surface Shader Graph (theme materials), the Cave Lava Shader Graph (Lava theme: Heat Zones, glowing cracks, leaks) and the Cave Rock Shader Graph (kit pieces)
- **Textures/Basic, Desert, Ice, Jungle, Lava** – the four cave texture sets of each theme (colour, normal, emission for Lava; Lava also has hot Maximum and cold Minimum sets)
- **Textures/CaveBuilder Basic** – textures of the kit pieces
- **Textures/Cover** – Top Cover textures (snow, sand, ash); **Textures/Demo** – the example scene's ground

Support

For questions, feedback, or support, please contact us here:

Email: arkerion.studios@gmail.com

Discord: https://discord.com/invite/gTHbWn94v2

Instagram: https://www.instagram.com/arkerion.studios/