ENVIROCON
CAPTURING CONCRETE EXCESS

ENVIROCALC

ENVIROCALC USER GUIDE

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A CLOUD-BASED ENGINEERING TOOL FOR THE ANALYSIS AND DESIGN VERIFICATION OF GRAVITY RETAINING WALLS

www.envirocon.co.nz

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1. INTRODUCTION & DESIGN BASIS

1.1 OVERVIEW

Envirocalc is a cloud-based engineering tool for the analysis and design verification of gravity retaining walls using Envirocon's Interbloc and Stonebloc modular block systems.
The software performs limit state design checks in accordance with the following New Zealand standards and guidelines:

- New Zealand Building Code (NZBC) Clause B1, Verification Method 4 (B1/VM4).
- AS/NZS 1170.0, AS/NZS 1170.1.
- NZS 1170.5, NZGS Module 1, and NZGS Module 6.

This guide outlines the input parameters, the calculation workflow, and the interpretation of the results.

1.2 PROFESSIONAL RESPONSIBILITY

Envirocalc is a design verification tool that automates the calculation procedures outlined in the standards above. The accuracy of the output is entirely dependent on the accuracy of the user-provided input parameters. All inputs for a final design must be derived from a site-specific geotechnical investigation report. Designs intended for regulatory consent must be reviewed and signed off by a Chartered Professional Engineer (CPEng).

2. STEP 1: ACCOUNT REGISTRATION & ACCESS

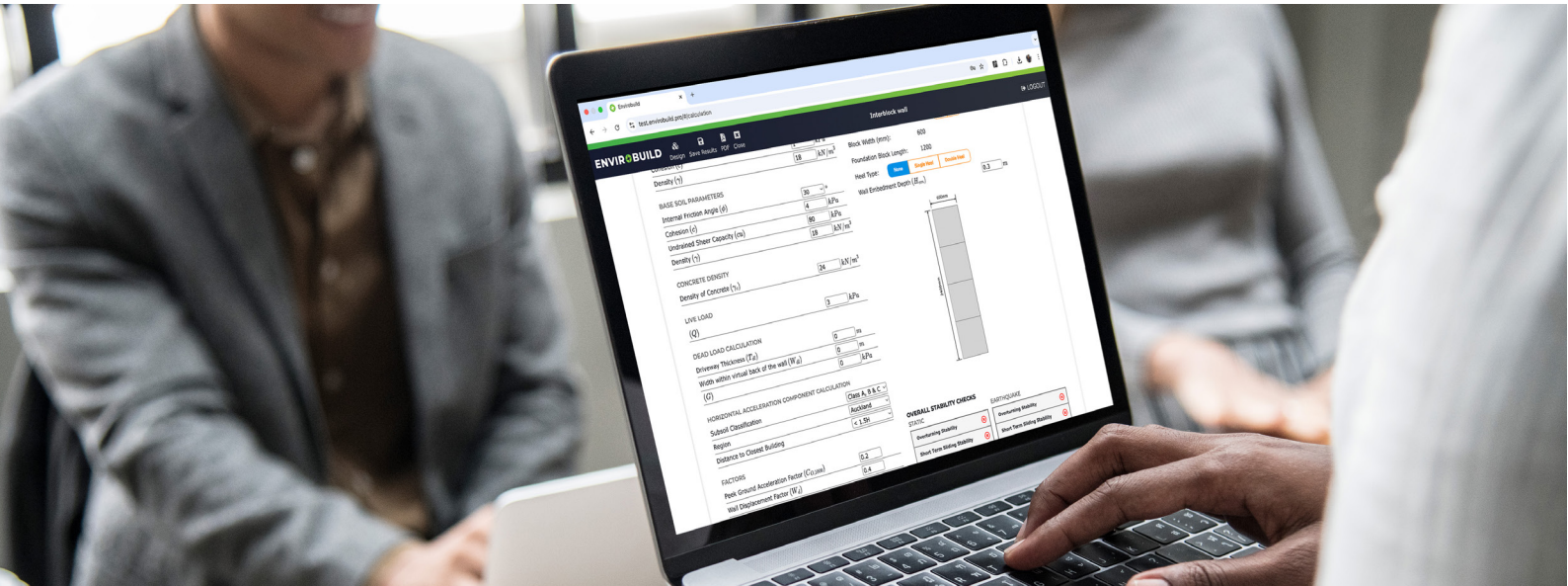
Access to Envirocalc is provided exclusively to verified engineering professionals. The process involves two stages: registering in Envirobuild and having Envirocalc access enabled by our team.

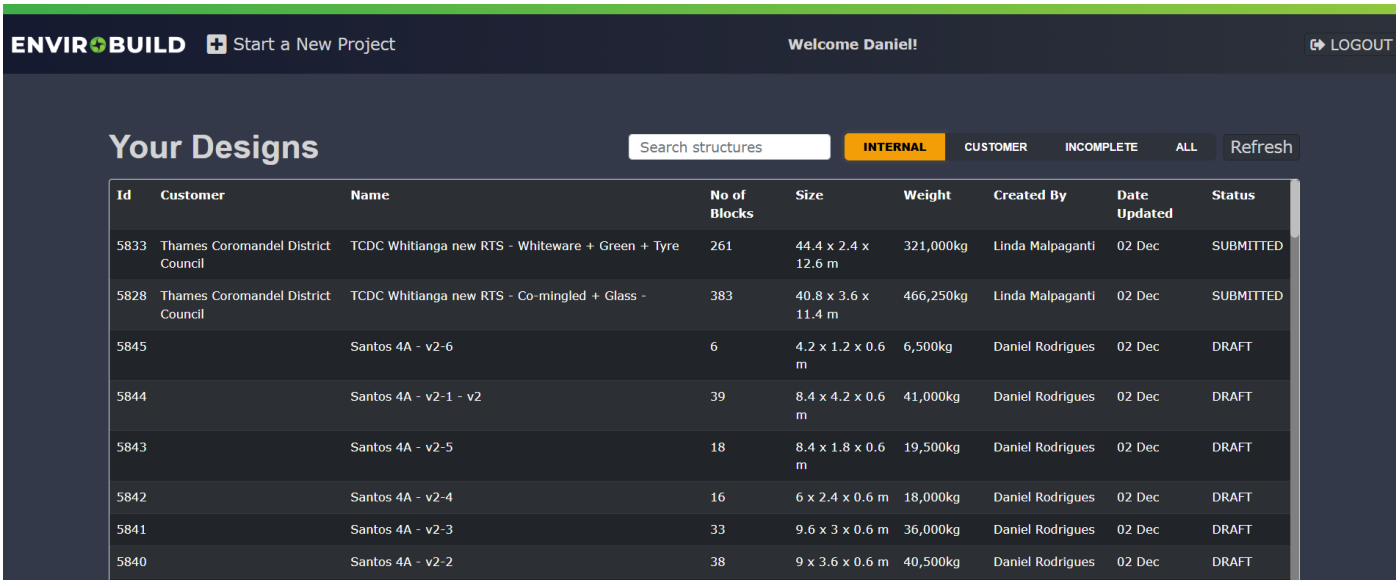
2.1 CREATING YOUR ENVIROBUILD ACCOUNT

1. Navigate to envirobuild.co.nz.
2. Click on 'Sign Up' to create a new account.
3. Complete the registration form and accept the terms and conditions.

2.2 ENABLING ENVIROCALC ACCESS

1. After registering, please notify your Envirocon representative or respond to your training follow-up email to confirm you have registered.
2. Our team will then enable full Envirocalc functionality for your specific email address.



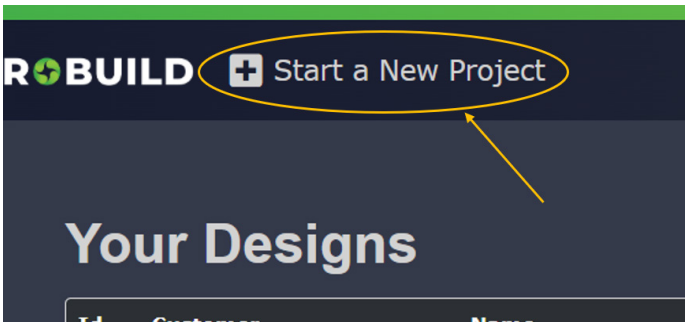


Id	Customer	Name	No of Blocks	Size	Weight	Created By	Date Updated	Status
5833	Thames Coromandel District Council	TCDC Whitianga new RTS - Whiteware + Green + Tyre	261	44.4 x 2.4 x 12.6 m	321,000kg	Linda Malpaganti	02 Dec	SUBMITTED
5828	Thames Coromandel District Council	TCDC Whitianga new RTS - Co-mingled + Glass -	383	40.8 x 3.6 x 11.4 m	466,250kg	Linda Malpaganti	02 Dec	SUBMITTED
5845		Santos 4A - v2-6	6	4.2 x 1.2 x 0.6 m	6,500kg	Daniel Rodrigues	02 Dec	DRAFT
5844		Santos 4A - v2-1 - v2	39	8.4 x 4.2 x 0.6 m	41,000kg	Daniel Rodrigues	02 Dec	DRAFT
5843		Santos 4A - v2-5	18	8.4 x 1.8 x 0.6 m	19,500kg	Daniel Rodrigues	02 Dec	DRAFT
5842		Santos 4A - v2-4	16	6 x 2.4 x 0.6 m	18,000kg	Daniel Rodrigues	02 Dec	DRAFT
5841		Santos 4A - v2-3	33	9.6 x 3 x 0.6 m	36,000kg	Daniel Rodrigues	02 Dec	DRAFT
5840		Santos 4A - v2-2	38	9 x 3.6 x 0.6 m	40,500kg	Daniel Rodrigues	02 Dec	DRAFT

3. STEP 2: 3D WALL DESIGN IN ENVIROBUILD

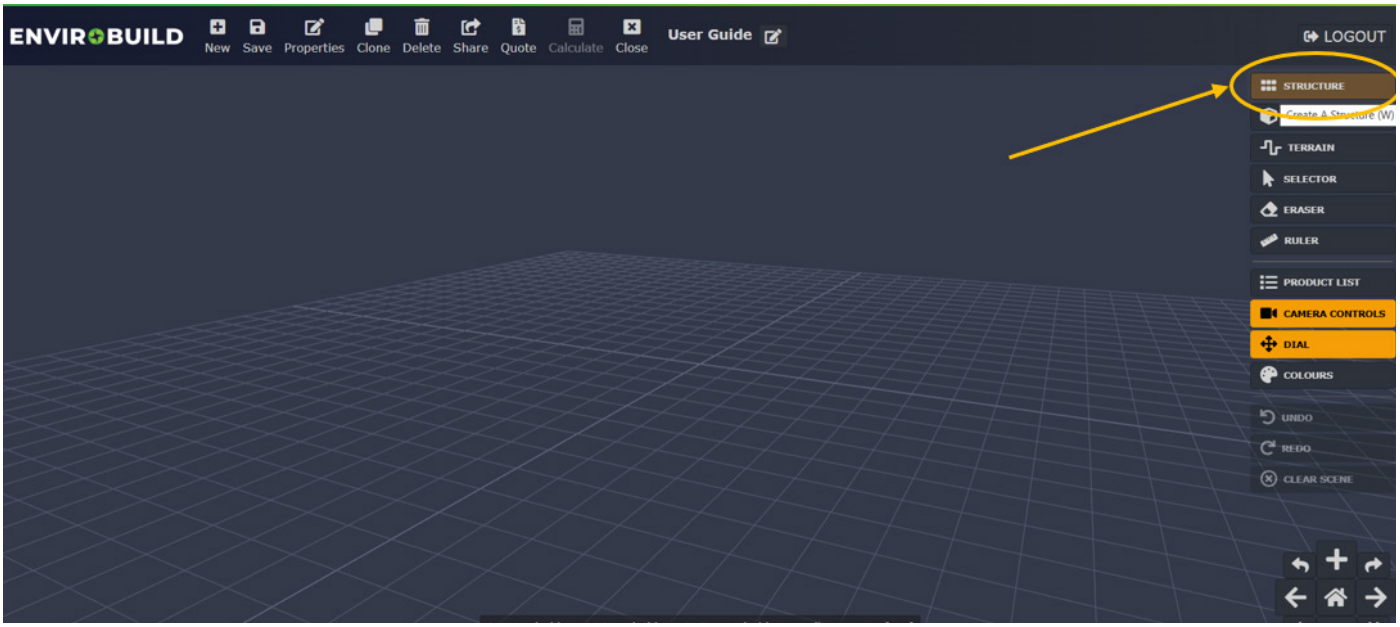
Before launching Envirocalc, you must first model the wall's geometry. The Envirobuild platform is a 3D design tool used for visualization and defining the physical structure.

1. **Log in to your Envirobuild account.** You will see your project dashboard, where all previous work is saved.
2. **Create a New Project.**

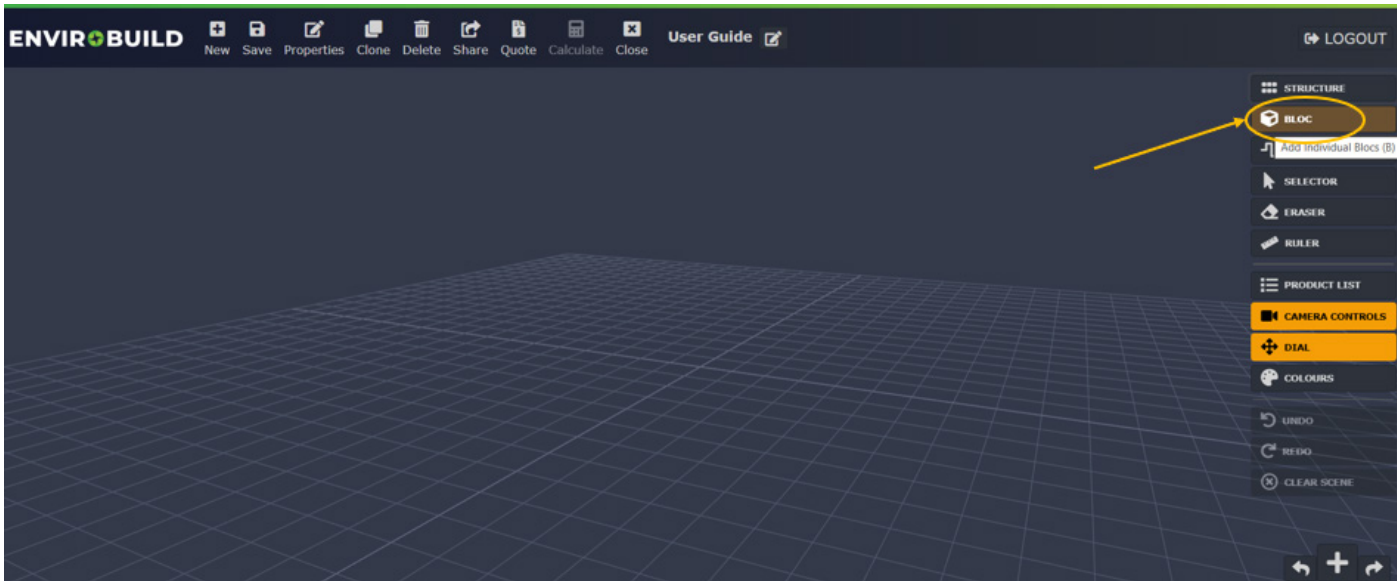


3. **Model the Wall Geometry.** You have two ways to do this:

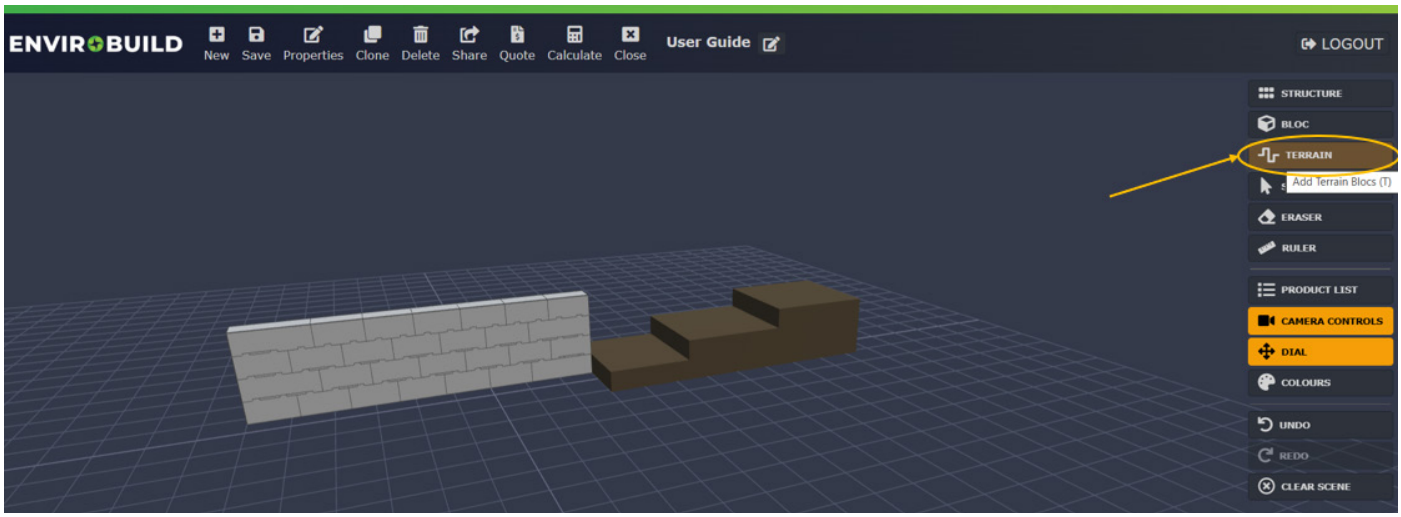
- **Structure Tool:** Quickly define a standard wall by its primary shape and dimensions.



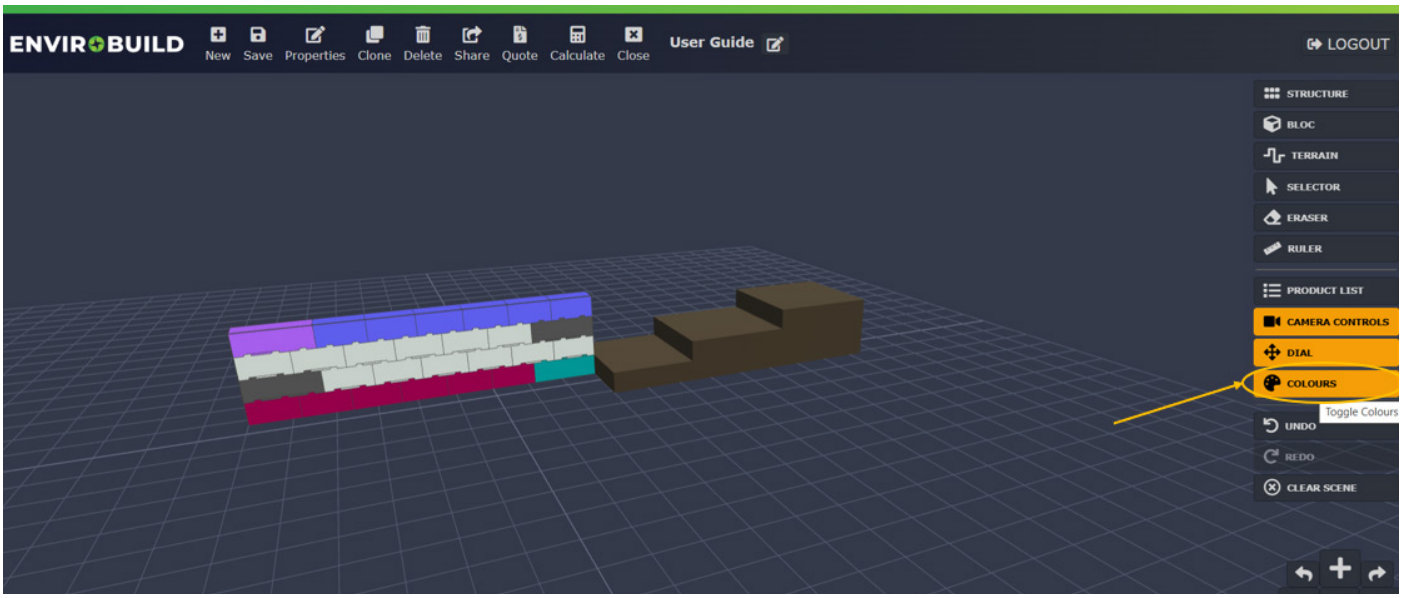
- **Free Draw Tool:** For custom layouts, select specific block types and place them individually on the design board.



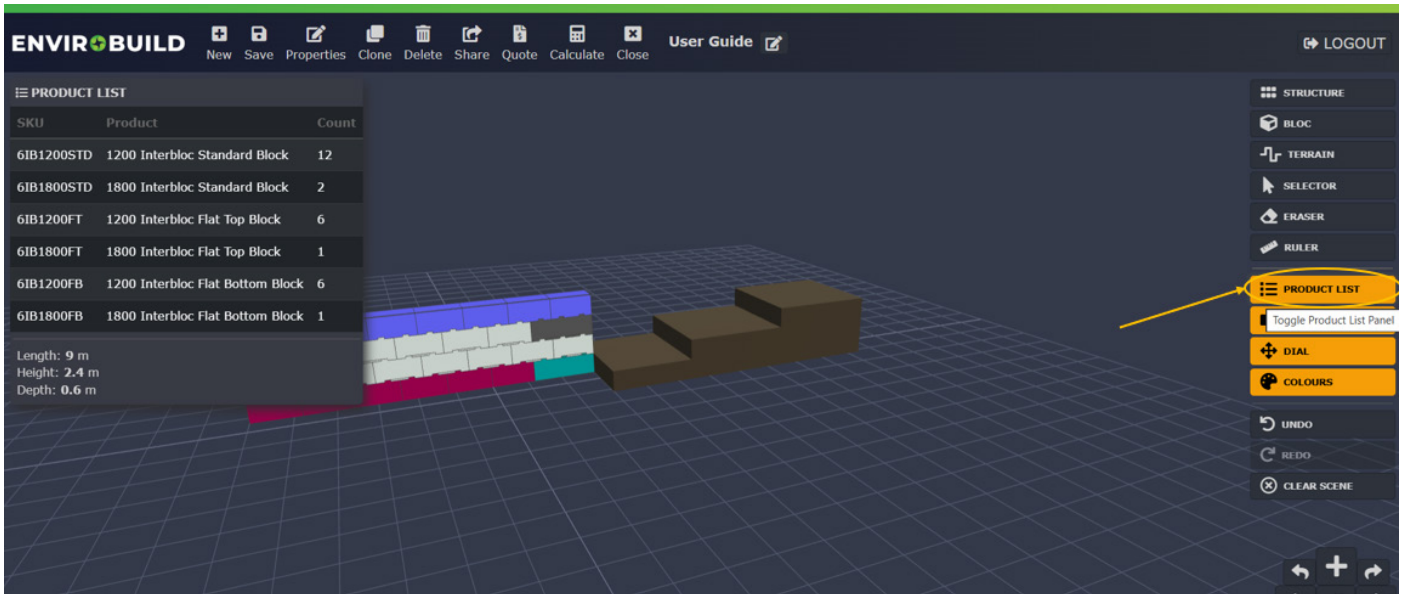
4. **Utilize Design Aids (Optional):**
- **Terrain Tool:** Visualize how the structure will integrate with uneven ground levels.



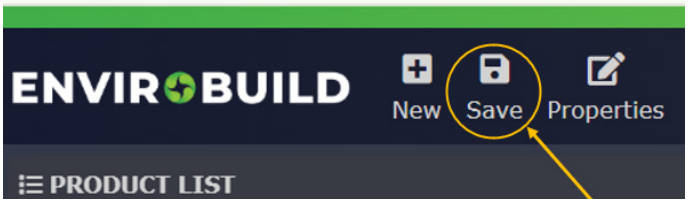
- **Color Feature:** Display colors to different block types to create clear installation plans for contractors.



5. **Review the Product List:** Once the design is complete, the ‘Product List’ tab provides an exact bill of materials with all the required SKUs.



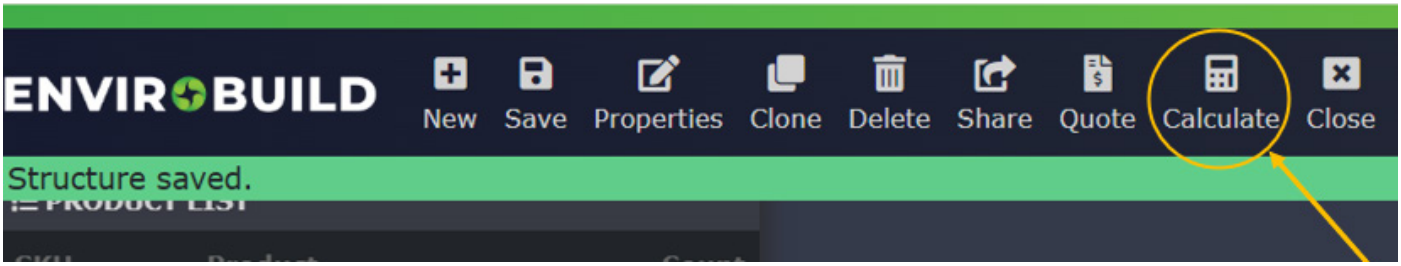
6. **Save your project.**



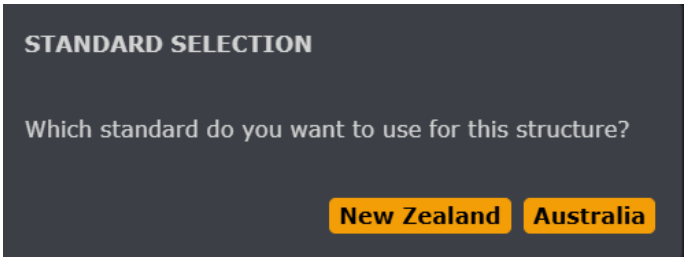
4. STEP 3: LAUNCHING ENVIROCALC

With the wall geometry defined and saved, you can now proceed to the engineering analysis.

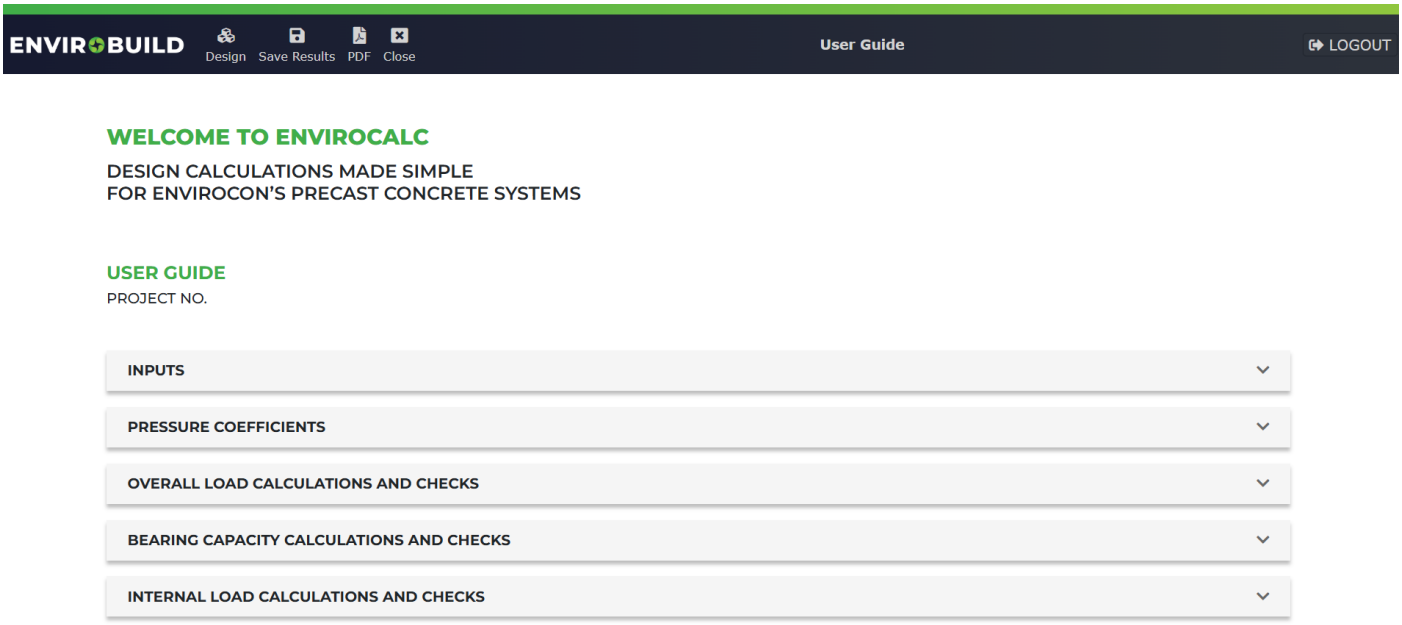
1. From the top menu in Envirobuild, click the **‘Calculate’** button.



2. Select the appropriate design standard for your region.



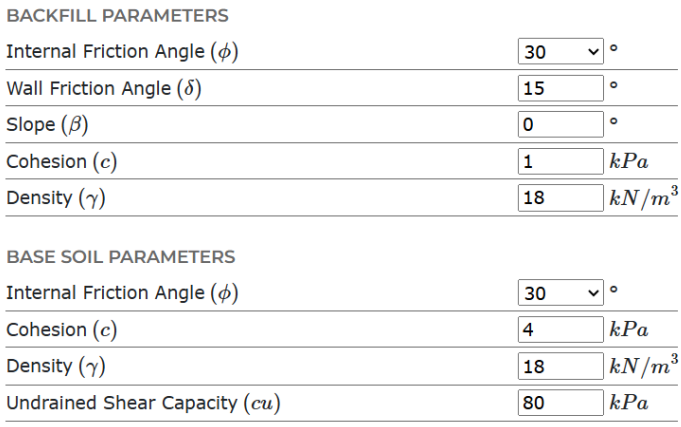
3. The Envirocalc interface will launch, with the Structure Dimensions section automatically populated from your 3D design.



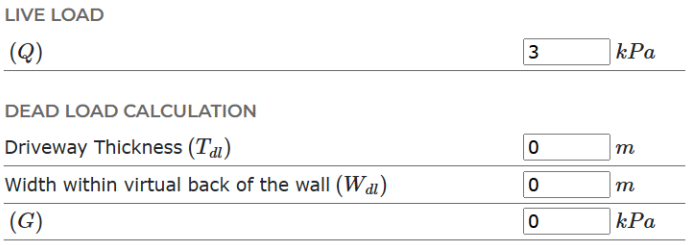
5. STEP 4: INPUTTING GEOTECHNICAL & LOAD PARAMETERS

The Envirocalc 'Inputs' tab is where you will define all site-specific geotechnical and loading conditions.
Important Note: Upon launching, Envirocalc populates many fields with common, default values to provide a sample case. These defaults are placeholders only. For a final, accurate design, you must override these defaults with the specific parameters from your project's geotechnical investigation report.

1. **Complete the Backfill and Base Soil Parameters:** Enter the required soil properties (ϕ, δ, β, c', γ, cu) from the geotechnical report.



2. **Define Surcharge Loads:** Enter any permanent (G) or imposed (Q) surcharge loads.



3. **Set Seismic Parameters:** Select the Region and Subsoil Classification. Envirocalc will automatically populate the associated seismic factors from the NZS 1170.5 code tables. These can be manually adjusted if required.

HORIZONTAL ACCELERATION COMPONENT CALCULATION

Subsoil Classification	Class A, B & C
Region	Christchurch
Distance to Closest Building	> 1.5H

FACTORS

Peak Ground Acceleration Factor ($C_{O,1000}$)	0.3
Wall Displacement Factor (W_d)	0.3
Return Period Factor (R)	0.5
Site Response Factor (f)	1.33
Topography Amplification Factor (A_{toppo})	1.2

6. UNDERSTANDING AUTO-GENERATED PARAMETERS

Envirocalc automatically calculates or populates the following parameters based on the inputs you provide and the embedded code logic. These can typically be manually overridden if required by the design engineer.

- **Seismic Factors & Coefficients:**
  - Based on the Region and Subsoil Classification, the software determines the Peak Ground Acceleration Factor (Co,1000), Return Period Factor (R), and Site Response Factor (f) from the tables in NZS 1170.5.
  - These factors, along with the Wall Displacement Factor (Wd) and Topographic Amplification (A_toppo), are used to calculate the final Peak Horizontal Ground Acceleration (amax) and the Horizontal Seismic Coefficient (kh). This kh is then used to derive the seismic earth pressures (Kae) and inertial forces (Hinertia).
- **LRFD Factors:**
  - The software auto-populates the requisite Load Factors (e.g., αEP_STATIC = 1.6) and Strength Reduction Factors (e.g., ϕsl, ϕpp, ϕbc) as specified in the B1/VM4 methodology.

7. STEP 5: REAL-TIME ANALYSIS & DESIGN ITERATION

Envirocalc provides instantaneous feedback on the wall's stability, allowing for rapid and efficient design optimization directly within the analysis interface.

- **Real-Time Stability Checks:** As you input your parameters, observe the stability check results on the right side of the screen. The status updates instantly:
- **Green Checkmark:** The design is stable and compliant for that specific limit state.
- **Red 'X':** Indicates a failure. The design action exceeds the design capacity and requires modification.

OVERALL STABILITY CHECKS

STATIC		EARTHQUAKE	
Overturning Stability	✓	Overturning Stability	✓
Short Term Sliding Stability	✓	Short Term Sliding Stability	✓
Long Term Sliding Stability	✗		

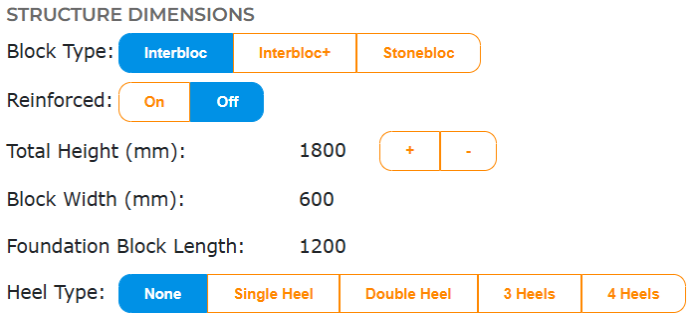
BEARING CAPACITY CHECKS

STATIC		EARTHQUAKE	
Short Term Safety Factor	✓	Short Term Safety Factor	✓
Long Term Safety Factor	✗		

INTERNAL STABILITY CHECKS

STATIC		EARTHQUAKE	
Overturing Point 1	✓	Overturing Point 1	✓
Overturing Point 2	✓	Overturing Point 2	✓

- **Rapid Design Iteration:** If a failure is indicated (Red), you can iterate towards a stable design directly within the Envirocalc interface without returning to the Envirobuild design board.
- Use the controls in the Structure Dimensions section to modify the design. For example, you can:
    - Increase the Heel Width or Heel Height.
    - Change the Heel Type (e.g., from a Single to a Double Heel).
    - Increase the Wall Embedment Depth.
    - Toggle Reinforcement on.

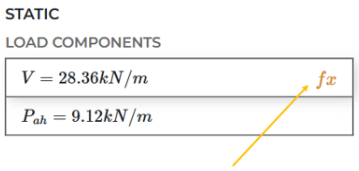


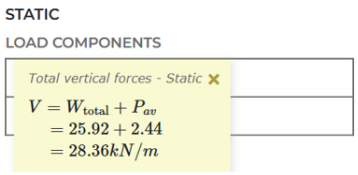
- With each adjustment, the stability checks on the right will instantly update, providing immediate feedback on the impact of your change. This allows for rapid design optimization, enabling you to efficiently find the most economical and stable wall configuration that satisfies all ULS checks.

8. STEP 6: REVIEWING DETAILED CALCULATIONS

Envirocalc provides full transparency for engineering review.

1. Scroll down and expand the 'Detailed Calculations' tabs (e.g., Overall Load Calculations, Bearing Capacity, etc.).
2. For further clarity, click on any numerical value within this section. A pop-up will display the exact formula and variables used to derive that specific result.

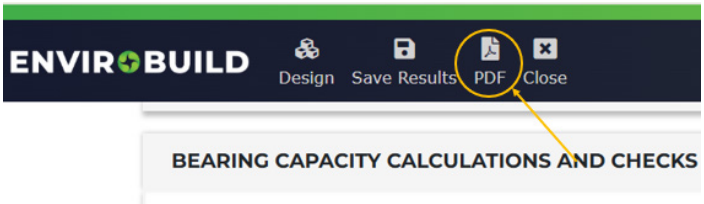




9. STEP 7: GENERATING THE FINAL REPORT

Once your design is stable, generate a formal design report.

1. Navigate to the 'PDF' function.
2. The software will compile a comprehensive, consent-ready PDF document containing all inputs, a summary of the ULS checks, and the full detailed calculations for submission and peer review.



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At Envirocon, we lead the way in sustainable construction with our innovative precast concrete block system, designed to support the circular economy by transforming surplus concrete into durable, reusable building solutions.

As the country's first accredited construction product stewardship scheme, we create ultra-low embodied carbon products that can be reused, recycled, or repurposed at the end of their life, and our buyback guarantee keeps concrete in circulation and out of landfills.