ENVIROCON
CAPTURING CONCRETE EXCESS

STONEBLOC
RETAINING MANUAL

THE TIMBER ALTERNATIVE

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Build Ready Designs

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TIMELESS RETAINING

THE TIMBER ALTERNATIVE

Stonebloc is a gravity based, residential retaining wall system. The system is designed to be the alternative to traditional timber wall options, delivering a superior stone wall finish at a timber price point.

How do we do this? Great design.

Great design lies at the heart of our business. We think about the people who will use our blocks, and the places our blocks will be used.

Our design approach is guided by the power of simplicity, because simple products are fast to learn and easy to use.

When you dive deeper, the system delivers a powerful combination of benefits.

They're fast to install, reducing wasted time and labour.

They're strong, creating resilient walls.

They're unique, creating timeless looking walls and enhancing the aesthetic value of the development.

The system is build ready, and has been used on some of the largest residential developments in the country.

All of this is delivered at a total installed price point similar to traditional timber walls.

This manual contains all the information you need to get moving with Stonebloc - generic designs from small height, low load walls through to 2m high 12kPa walls, as well as detailed installation instructions and information on ordering blocks and the delivery process.

- ✓ **DRIVE PRODUCTIVITY**
- ✓ **FAST AND EASY INSTALL**
- ✓ **BUILD READY DESIGNS**
- ✓ **BUILDING CONSENT READY**
- ✓ **SUPERIOR LOOK**
- ✓ **50 YEAR DESIGN LIFE**

IMPROVING PRODUCTIVITY, BOOSTING PROFIT

Stonebloc isn't for every contractor. The timber retaining wall model is built on low material costs, high labour input, and a relatively slow build time.

Stonebloc is the opposite of this and suits contractors who want to improve productivity and boost profit.

The table below illustrates the efficiencies in the design and build process of Stonebloc over timber.

	STONEBLOC	TIMBER
BUILD READY DESIGNS	✓	✓
MINIMAL FOUNDATIONS	✓	
PRE-BUILD INSPECTION		✓
SPEED OF CONSTRUCTION	✓	
TIMELESS LOOK	✓	
EXTENDED DURABILITY	✓	
NON-DESTRUCTIVE DISMANTLING	✓	
INSTALLED COST	c$360/M2	c$385/M2

Pricing comparison as at June 2021, undertaken by QV Costbuilder for a 1.4m high retaining wall. Pricing comparison excludes freight to site.

MAKING IT EASY

In addition to this manual, Stonebloc offers a number of added tools to make the design and procurement of blocks hassle free.

CHAINAGE CALCULATOR:

The Stonebloc Chainage Calculator helps calculate the number of blocks required in a wall.

Stonebloc Wall Calculator

Customer	Joe Bloggs				**Site Address**	Paerata, Auckland							
Project Name	Stage1				**Date Completed**	5/6/2021		**Rep Name**					
Chainage (m)	10	12.5	16	20	30								89
Wall Surcharge	12	12	12	12	12								
Wall Height/Max Back Slope	1200/33	1400/33	1000/33	800/33	600/33								
200 Capper	0	15.625	20	0	37.5	0	0	0	0	0	0	0	73
800 Flat Top	12.5	0	0	25	0	0	0	0	0	0	0	0	38
800 Standard	0	15.625	20	0	37.5	0	0	0	0	0	0	0	73
800 Base	25	31.25	20	25	0	0	0	0	0	0	0	0	101
1200 Base	0	0	0	0	0	0	0	0	0	0	0	0	0
Wall Profile						0	0	0	0	0	0	0	

ONLINE ORDERING:

Order your blocks faster through our online store.

Five Easy Steps:

1. Visit envirocon.co.nz/shop
2. Select Stonebloc
3. Select your products
4. Use your Postcode for dynamic freight pricing
5. Check out

THE BLOCKS

1200 STONEBLOC BASE
Size: 800x1200x400mm
Weight: 900kg
Product Code: 4SB1200EBASETG

800 STONEBLOC BASE
Size: 800x800x400mm
Weight: 600kg
Product Code: 4SB800EBASETG

800 STONEBLOC STANDARD
Size: 800x400x400mm
Weight: 300kg
Product Code: 4SB800ESTDTG

400 STONEBLOC STANDARD
Size: 400x400x400mm
Weight: 150kg
Product Code: 4SB400ESTDTG

800 STONEBLOC FLAT TOP
Size: 800x400x400mm
Weight: 300kg
Product Code: 4SB800EFTTG

200 STONEBLOC CAPPER
Size: 800x400x200mm
Weight: 150kg
Product Code: 4SB200ECAPTG

200 STONEBLOC HALF CAPPER
Size: 400x200x200mm
Weight: 75kg
Product Code: 4SB400EHALFCAPTG

800 STONEBLOC END
Size: 800x400x400mm
Weight: 300kg
Product Code: 4SB800EENDTG

200 STONEBLOC END
Size: 800x400x200mm
Weight: 150kg
Product Code: 4SB200EENDTG

WALL STRUCTURE

BUILD READY DESIGNS

USING SPECIMEN DESIGNS

The following pages provide specimen design profiles for walls across three different loading scenarios (0-12kPa) and up to 2m high.

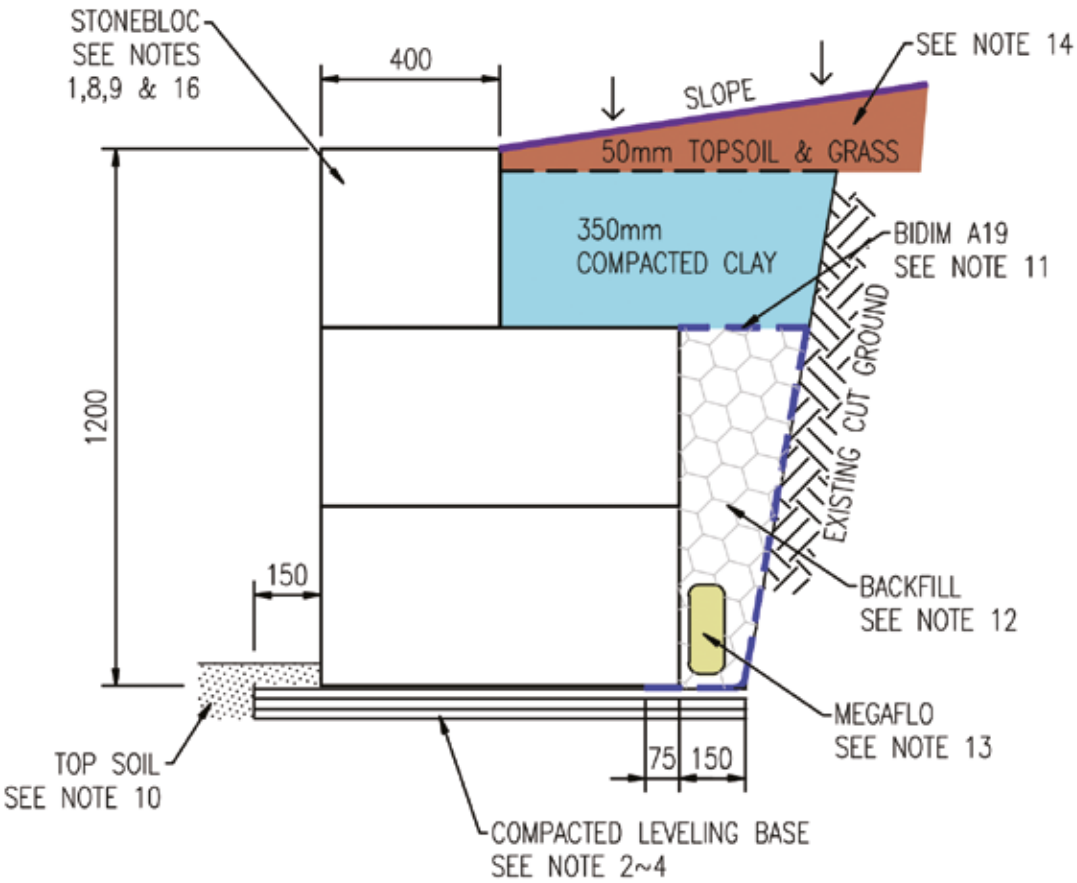
The wall profiles are backed up by calculations available on request from Stonebloc.

In all cases the underlying ground is assumed to be ‘good ground’. Where this is not present, a site specific design may be required. This can be completed by our consulting engineer - at an additional cost - or we can provide technical advice as required.

The wall designs are subject to the detailed design notes included on page 20.

Where a PS1 is required for specimen designs Stonebloc can provide one for a small fee.

Construction Detail



BOLD RETAINING

KEY ELEMENTS OF A WALL

There are a couple of key elements of a wall design which pay to get right at the beginning.

RUNNING BOND PATTERN

Blocks are stacked in a running bond pattern - each alternating layer sitting offset relative to the next layer.

HALF BLOCKS

Half blocks start and finish the running bond pattern on alternative layers.

END BLOCKS

End blocks have a texture on two sides for a continuous split stone texure on corners and at the end of walls.

ANGLE BLOCKS

For corners less then 90 degrees, custom blocks can be manufactured to order.

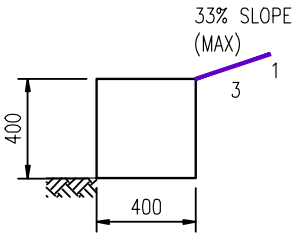
FOUNDATIONS

For walls being built on good ground, a simple leveling layer of fines is all that is required.

0kPa UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 1

(MINOR STRUCTURES - AUCKLAND & NORTH)



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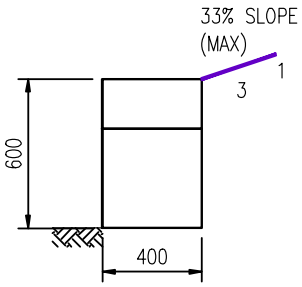

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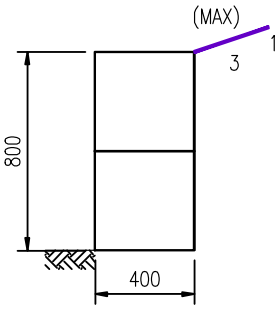

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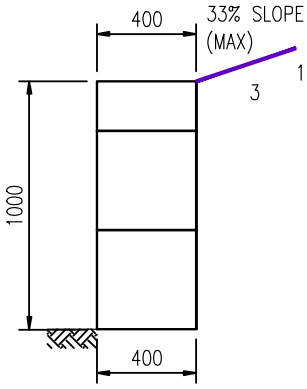

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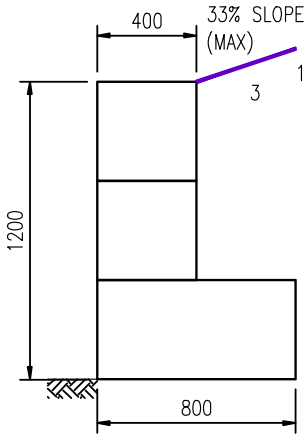

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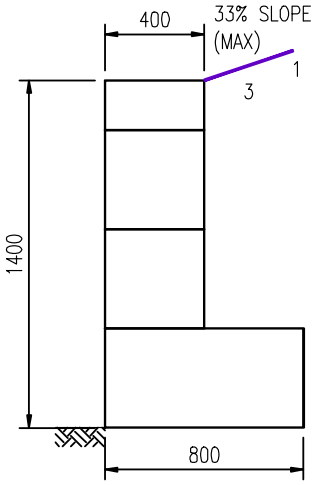

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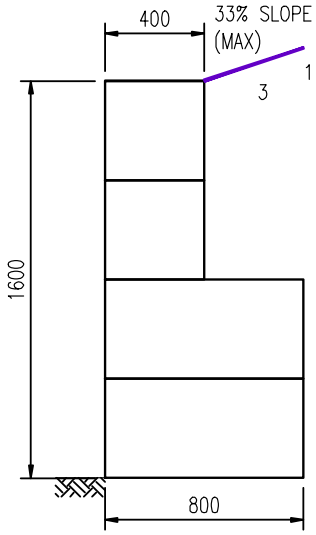

SB016

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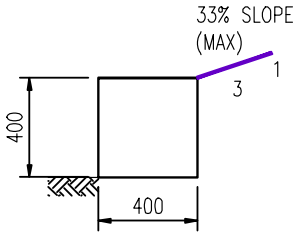
0KPA UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 1

(MINOR STRUCTURES - NORTH ISLAND EX AUCKLAND NORTH)



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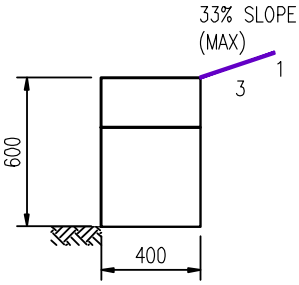

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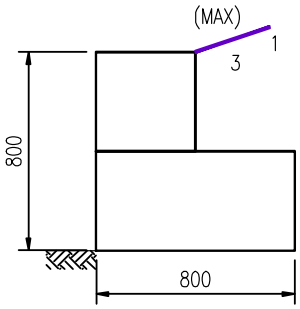

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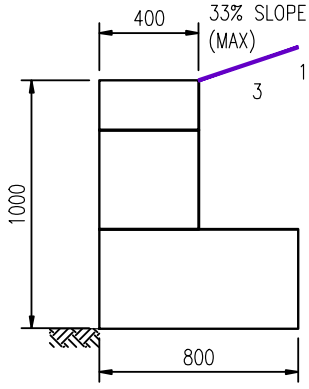

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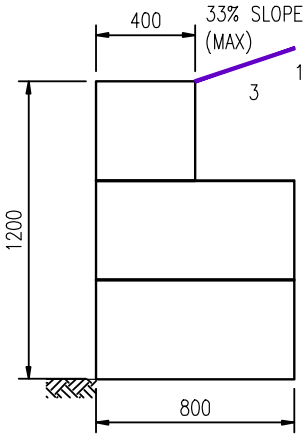

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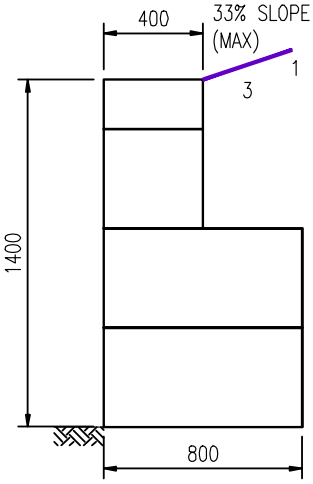

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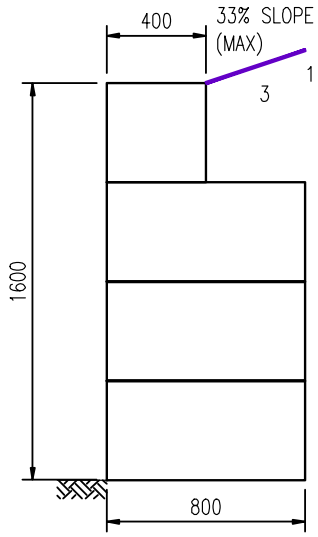

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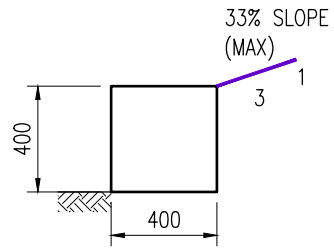
5KPA UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 2 (NORMAL STRUCTURES)



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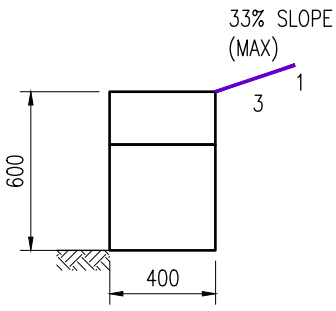

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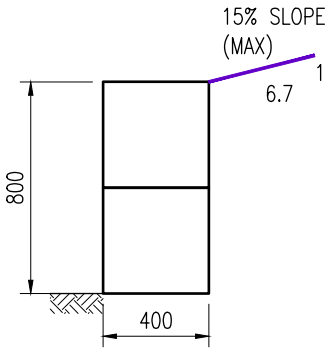

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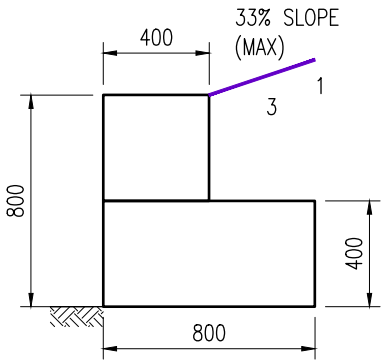

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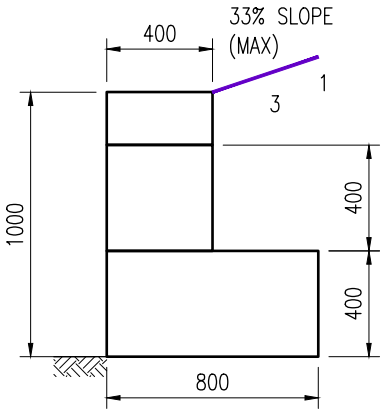

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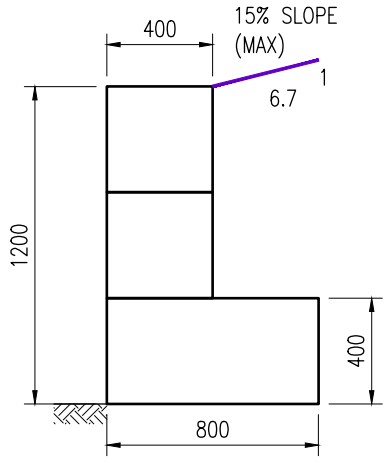

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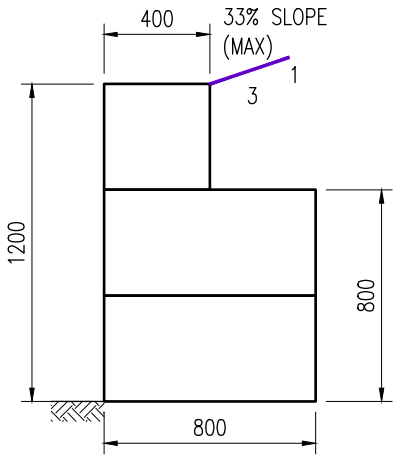

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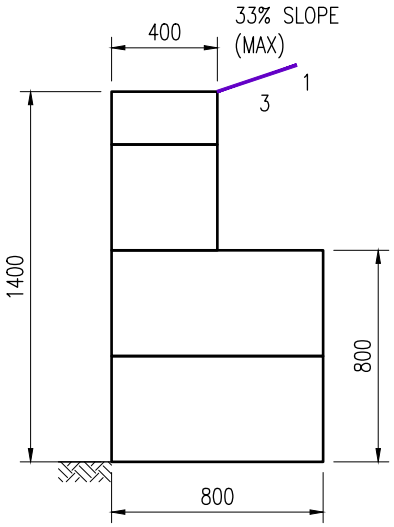

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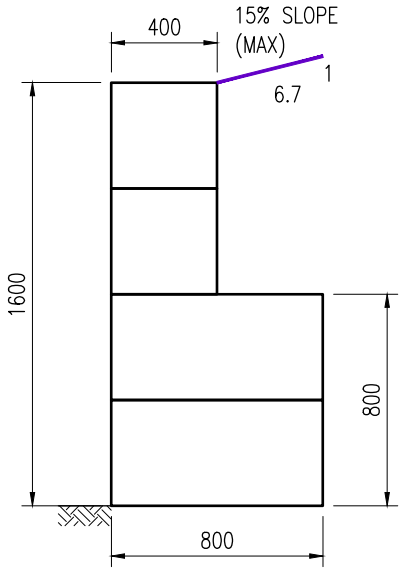


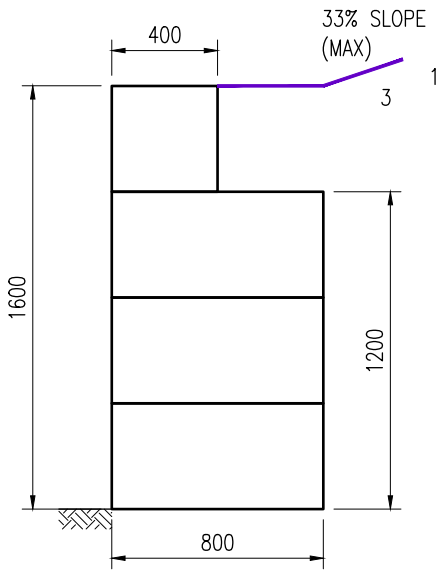
SB516

Note: Clips only required where balustrade is fixed to top of wall

ENVIROCON
CAPTURING CONCRETE EXCESS

5KPA UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 2 (NORMAL STRUCTURES)



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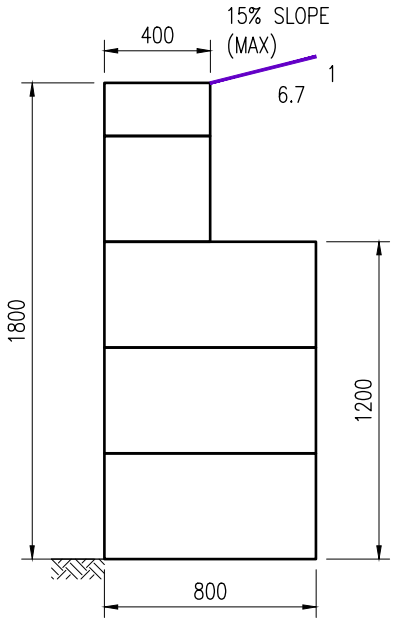

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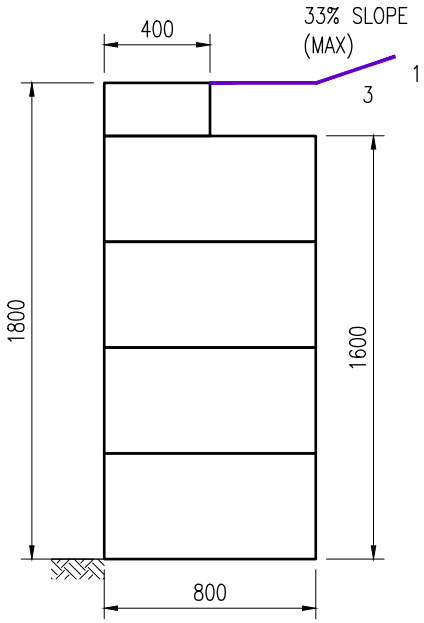

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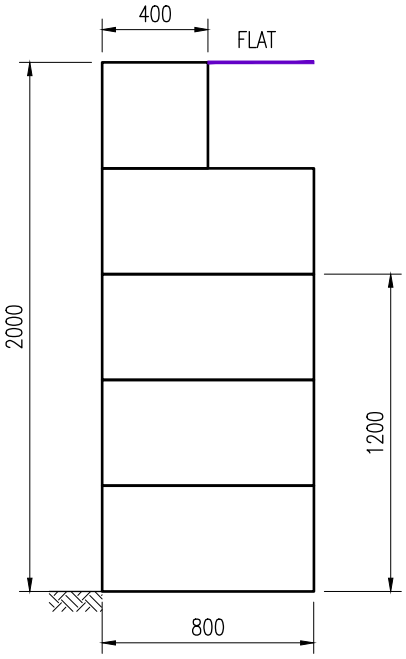

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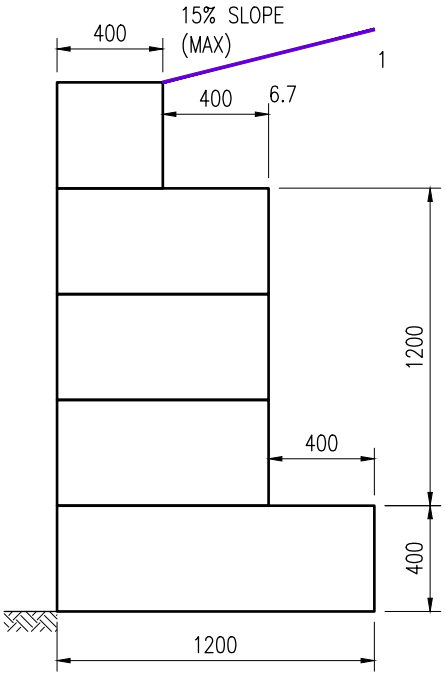

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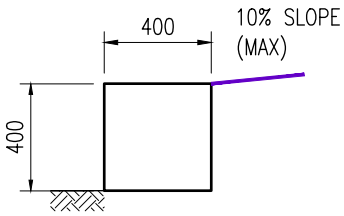
12KPA UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 2 (NORMAL STRUCTURES)



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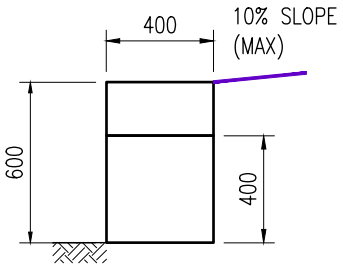

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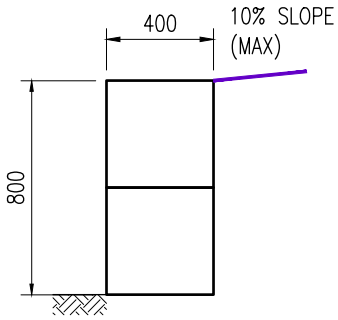

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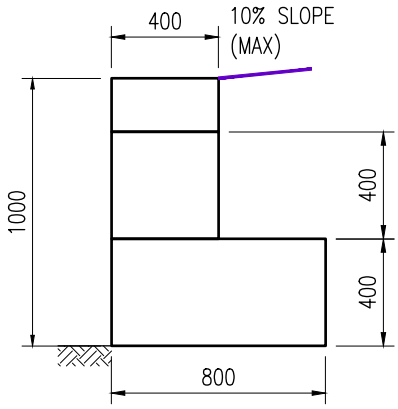

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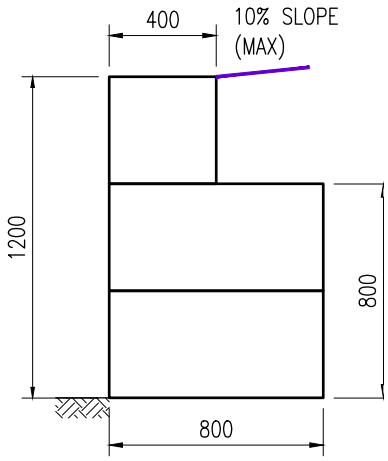

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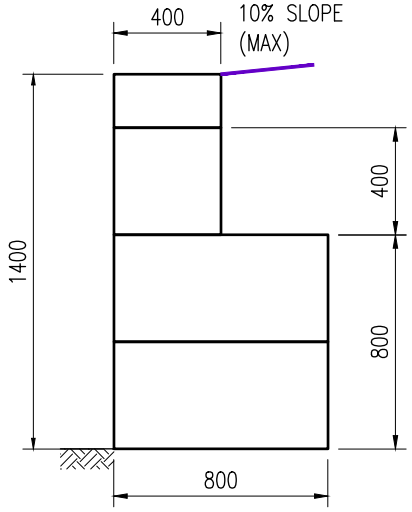

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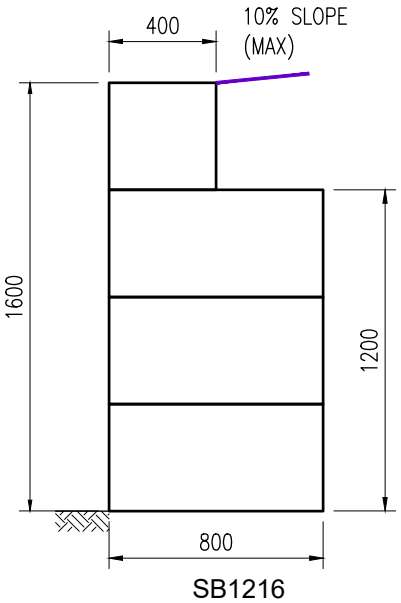

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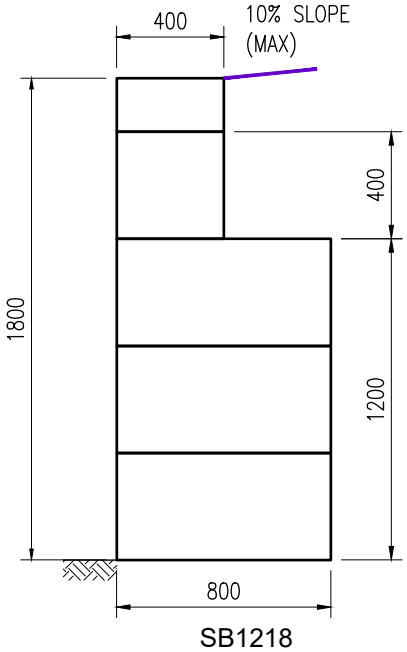

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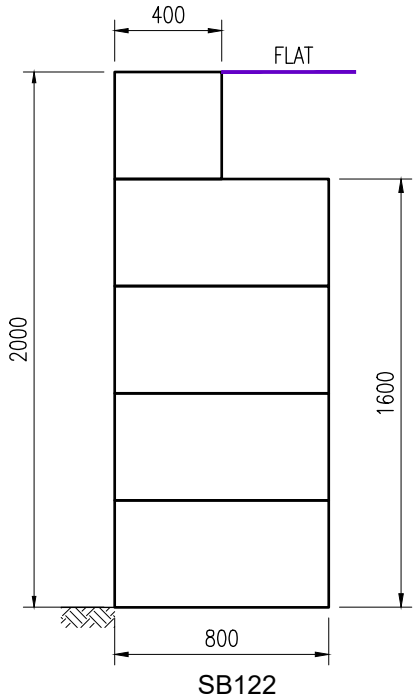


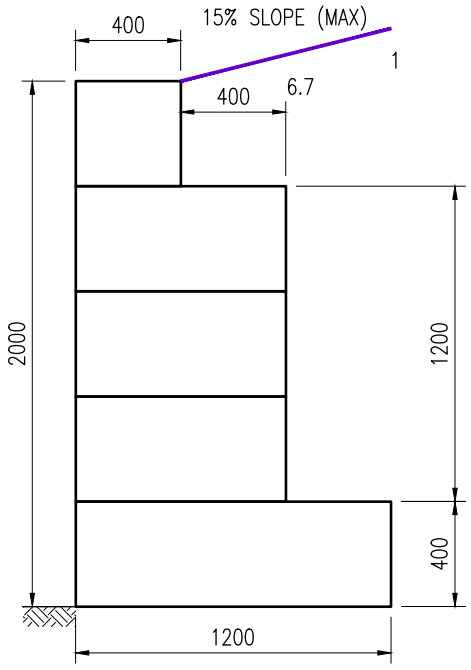
SB122

Note: Clips only required where balustrade is fixed to top of wall

ENVIROCON
CAPTURING CONCRETE EXCESS

12KPA UNIFORM SURCHARGE

LOAD BEHIND WALL IMPORTANCE LEVEL 2 (NORMAL STRUCTURES)



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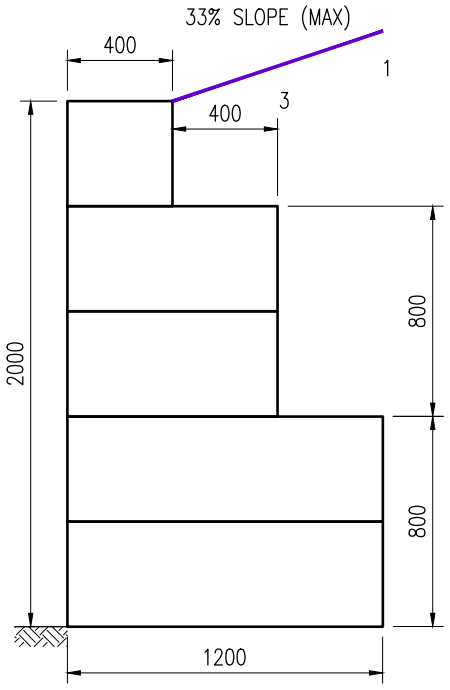

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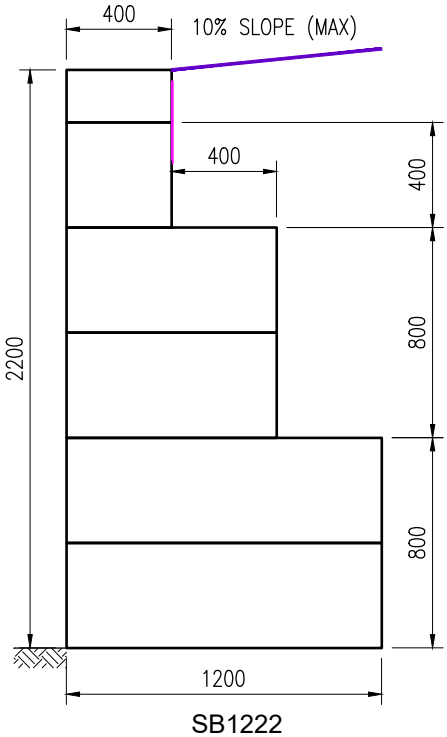

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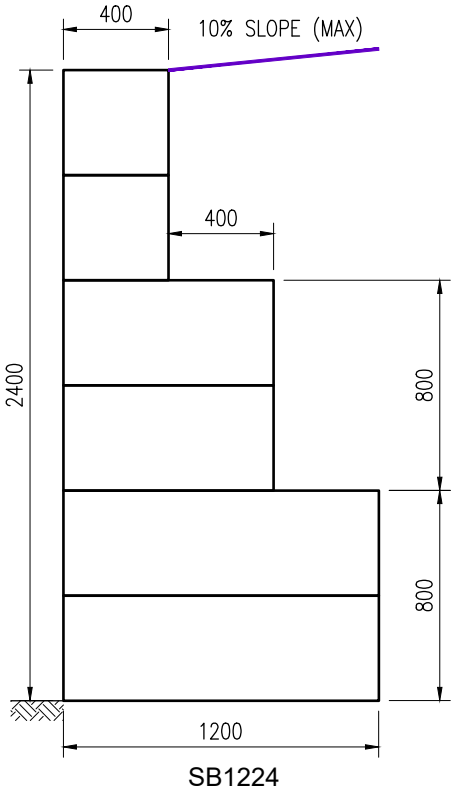


SB1224

Note: Clips only required where balustrade is fixed to top of wall

STRONG RETAINING

DESIGN NOTES

1. TYPICAL STONEBLOC SIZE IS 800MM (L) X 400MM (W) 400MM (H) OR 300KG EACH. INSTALLATION OF STONEBLOC MUST BE IN A ACCORDANCE WITH INSTALLATION MANUAL. ALL INSTALLATION WORK MUST BE CARRIED OUT IN ACCORDANCE WITH HEALTH AND SAFTEY AT WORK ACT 2015 GROUND CONDITION.

2. COMPACTED LEVELLING BASE (NORMALLY SITE CONCRETE OR COMPACTED HARDFILL) FOR THE WALL SHALL BE DESIGNED AND SUPERVISED BY OTHER SUITABLY QUALIFIED PROFESSIONALS. AS A MINIMUM, IT SHOULD PROVIDE STABLE INSTALLATION AND LEVEL PLANE FOR VERTICAL STONEBLOC WALL SYSTEM AND ASSOCIATED EARTHWORK. INSTALLATION OF THE STONEBLOC CAN ONLY PROCEED UPON APPROVAL OF THE SUITABLY QUALIFIED PROFESSIONAL ENGAGED TO CARRY OUT CONSTRUCTION MONITORING OF THE EARTHWORKS AND LEVELLING BASE. ALL UNSUITABLE GROUND AND/OR SUBSTRATE MATERIAL SHALL BE REMOVED AND REPLACED BY OTHERS.

3. THE DESIGN HAS ASSUMED THE SUPPORTING SUBSTRATE TO BE CAPABLE OF 300KPA ULTIMATE LIMIT STATE (APPROPRIATE STRENGTH REDUCTION FACTOR PER NZBC IS EXPECTED TO BE APPLIED WHEN COMPARED TO DESIGN PRESSURE EXERTED BY THE WALL AS SHOWN IN THE CALCULATION).

4. THE GROUND MUST NOT EXHIBIT ONE OR MORE OF THE FOLLOWINGS:

   - POTENTIALLY COMPRESSIBLE GROUND SUCH AS TOPSOIL, SOFT SOILS SUCH AS CLAY WHICH CAN BE MOULDED EASILY IN THE FINGERS, AND UNCOMPACTED LOOSE GRAVEL WHICH CONTAINS OBVIOUS VOIDS.
   - EXPANSIVE SOILS BEING THOSE THAT HAVE A LIQUID LIMIT OF MORE THAN 50% WHEN TESTED IN ACCORDANCE WITH NZS4402 TEST 2.2 AND A LINEAR SHRINKAGE OF MORE THAN 15% WHEN TESTED FROM LIQUID LIMIT IN ACCORDANCE WITH NZS4402 TEST 2.6.

   - ANY GROUND WHICH COULD FORESEEABLY EXPERIENCE MOVEMENT OF 25MM OR GREATER FOR ANY REASON INCLUDING ONE OR A COMBINATION OF LAND INSTABILITY, GROUND CREEP, SUBSIDENCE, SEASONAL SWELLING AND SHRINKING, FROST HEAVE, CHANGING GROUND WATER LEVEL, EROSION, DISSOLUTION OF SOIL IN WATER AND EFFECTS OF TREE ROOT.

   - AS PER NZBC B1, BASIC NORMAL MAINTENANCE TASKS FOR FOUNDATIONS ON EXPANSIVE SOIL SHOULD ENSURE THAT:
     A. THE DRAINAGE AND WETTING OF THE SITE IS CONTROLLED SO THAT EXTREMES OF WETTING AND DRYING OF THE SOILS ARE PREVENTED, AND
     B. THE POSITION AND OPERATION OF GARDENS ADJACENT TO THE DWELLING ARE CONTROLLED, AND THE PLANTING OF TREES NEAR TO FOUNDATIONS IS SUITABLY RESTRICTED, AND
     C. ANY LEAKS WHICH DEVELOPED IN PLUMBING, STORM WATER OR SANITARY SEWAGE SYSTEMS ARE REPAIRED PROMPTLY

5. THE FOLLOWINGS ARE GEOTECHNICAL PARAMETERS ASSUMED AND MUST BE VERIFIED BY SUITABLY QUALIFIED PERSONNEL AS PART OF THE PROJECT-SPECIFIC DESIGN DETAIL PROCESS.

Ø' = 30	SU = 80kPa	c 0,1000 = 0.22 (any sites within Auckland & Northland Region)
Y = 18KN/M^3	c'= 1kPa (minimum)	

6. DEEP SEATED SLIPPAGE (GLOBAL INSTABILITY) AND OTHER GEOTECHNICAL HAZARD (E.G., LIQUEFACTION) IS NOT CONSIDERED, THUS SHALL BE ADDRESSED BY SITE'S GEOTECHNICAL ENGINEER.

7. GROUNDWATER IS ASSUMED NOT TO BE PRESENT BEHIND THE ENTIRE WALL HEIGHT.

8. NO PERMANENT STRUCTURE SHALL BE CONSTRUCTED WITHIN 1.5X THE WALL HEIGHT. EXAMPLE: NO PERMANENT STRUCTURE IS ALLOWED WITHIN 1.5M MEASURED FROM THE OUTSIDE SURFACES OF STONEBLOC FOR A 1M TALL WALL.

9. IN EVENT WHERE SERVICES ARE TO BE LOCATED WITHIN THE PROXIMITY (AS ABOVE) OF THE WALL, THE IMPORTANCE LEVEL (AS DEFINED BY AS/NZS1170.0) SHALL NOT EXCEED THE IMPORTANCE LEVEL IL2 UNLESS A SPECIFIC DESIGN IS CARRIED OUT BY SUITABLY QUALIFIED PERSONNEL.

10. THE WALL HAS BEEN DESIGNED ASSUMING THERE WILL BE NO BACKFILL ON THE TOE OF THE WALL I.E., 0MM EMBEDMENT, UNLESS SHOWN OTHERWISE ON DRAWING. HOWEVER, UNDER NO CONDITION SHALL SUPPORT SUBSTRATE (DESIGNED AND CONSTRUCTED BY OTHERS) OF THE WALL BE UNDERMINED.

11. FOR THE PURPOSE OF FILTRATION AND SEPARATION, PROPRIETARY NON-WOVEN GEOTEXTILE BIDIM A19 FROM GEOFABRICS NZ, SHALL BE STORED, HANDLED, INSTALLED, OVERLAPPED AS PER MANUFACTURER S RECOMMENDATIONS.

12. THE BACKFILL SHALL BE FREE DRAINING MATERIAL (TYPICALLY GAP20, GAP40, DRAINAGE METAL) LAID IN LAYERS OF 200MM. ONLY HAND-HELD COMPACTION PLANT IS TO BE USED WITHIN 1.5M BEHIND THE STONEBLOC WALL.

13. THE DRAINAGE SYSTEM WITHIN THE BACKFILL TO BE COMPLETED USING PROPRIETARY SUBSOIL DRAIN - MEGAFLO FROM GEOFRABRICS NZ WITH CONNECTION TO APPROVED DISCHARGE POINT ON SITE SURCHARGE & ACCIDENTAL LOAD.

14. THE SURFACE SURCHARGE LOADING UNDER LONG TERM STATIC LOAD SHALL NOT EXCEED THE STATED VALUE.

15. THE WALL HAS NOT BEEN DESIGNED FOR ANY POINT LOAD ACCIDENTAL, BALLISTIC OR IMPACT LOAD. .

16. WHERE THE WALL HEIGHT MEETS OR EXCEED 1M MEASURE FROM THE TOP OF WALL TO TOP OF LOWER GROUND, A BALUSTRADE / FENCE IS NORMALLY REQUIRED FOR COMPLIANCE CLAUSE F4 OF NZBC. THE DESIGN AND CONSTRUCTION OF SUCH BALUSTRADE / FENCE (BY OTHERS) TO RESIST STRUCTURAL ACTION (E.G. IMPOSED ACTION) SHALL BE LIMITED TO OCCUPANCY TYPE A (OTHER)/C3 WITH TOP EDGE NOT EXCEEDING 1.3M FROM TOP OF WALL.

BLOCK ORDERING AND DELIVERY

TRANSPORT OPTIONS

Stonebloc has a number of core services and procedures related to the movement of blocks. We offer two options when it comes to freight:

OPTION 1: Envirocon or Stonebloc Organised Delivery Only

OPTION 2: Customer Organised Pick Up

These guidelines will introduce you to the minimum requirements for each transportation option to ensure all deliveries occur on time, and in a cost effective way.

ENVIROCON ORGANISED DELIVERY

BENEFITS:

- Cost savings through Stonebloc buying power
- Greater flexibility on delivery times
- Best option for self-install projects

Stonebloc will offer to organise delivery of blocks to site. You will be responsible for offloading the blocks at site. This is the perfect option for customers who intend to install the blocks themselves.

HOW DOES IT WORK?

1. **REQUEST A QUOTE –** Where a customer indicated they will be completing their own install, the freight price shown on the quote will be for Stonebloc Organised Delivery only.
2. **ACCEPT THE QUOTE –** By accepting the quote you agree to comply with Stonebloc's site access and unloading requirements outlined below. Any delays may result in extra charges for you.
3. **ORGANISE DELIVERY DATES –** Your Stonebloc representative, and Stonebloc freight supplier will work with you to organise a delivery time. All site access requirements and guidelines outlined below apply. If there are any special requirements relating to your site, you will need to raise this with your Stonebloc representative to ensure deliveries comply with requirements.
4. **CUSTOMER OFFLOAD BLOCKS –** When the blocks arrive to site it is your responsibility to offload the blocks. To minimise chipping while offloading blocks, Stonebloc strongly recommends using lifting equipment as outlined in the guidelines below. Included in the price of delivery is 30 minutes wait time to offload blocks. Waiting longer than 30 minutes may incur extra costs which will be passed on to you.

PRODUCTIVE RETAINING

CUSTOMER ORGANISED DELIVERY

You are able to organise collection of the blocks from a Stonebloc manufacturing yard.

HOW DOES IT WORK?

1. **ACCEPT THE QUOTE –** When accepting a quote, specify to your Stonebloc representative if you intend to organise your own transportation for the blocks.
2. **DISPATCH DOCKETS –** All pick-ups from a Stonebloc yard require a dispatch docket, you will receive this from your Stonebloc representative. The truck driver picking up the blocks will need to present a copy of this when arriving at the yard. Organise with your Stonebloc representative an expected pick up date.
3. **PICK UP –** Before arriving at the yard, the truck driver will be required to call the yard dispatcher (the number will be listed on the dispatch docket) to inform them of an expected arrival date. The truck driver will be required to comply with all Yard Health and Safety directives.

Where you opt to organise pick up, Stonebloc warrants the blocks and condition of the blocks only up to the stage they are loaded onto the truck. All customer-organised pick-ups are subject to yard operating requirements.

Stonebloc recommends the following guidelines for customer organised pick ups:

TYPE OF TRANSPORT

Stonebloc blocks will only be loaded on to a flat deck, or curtain sider truck. Careful consideration needs to be given to how the blocks will be unloaded when selecting the transport type. **NB: We will not load on fixed sided trucks.**

LOADING AND UNLOADING TRUCKS

- When loading at a Stonebloc manufacturing yard, loading must be completed by a Stonebloc staff member.
- The truck driver is ultimately responsible for the distribution of the load across the deck, and should direct the dispatcher on where to place pallets.
- Consideration should be given to the size and weight of blocks when placing loads. Stonebloc 400 Series are stacked on pallets allowing for two pallets across a deck.

PALLETS

All Stonebloc blocks will be delivered on pallets. The pallets are refundable on return to Envirocon in good working order.

- 400 Standard blocks are delivered 12 per pallet, for a total weight of 1.6 tonne
- 800 Standard blocks are delivered 6 per pallet, for a total weight of 1.8 tonne.
- 800 Base blocks are delivered 2 per pallet, for a total weight of 1.2 tonne.
- 1200 Base blocks are delivered 2 per pallet for a total weight of 1.8 tonne.

RESILIENT RETAINING

LOAD RESTRAINTS

- Blocks and pallets must be tied down to the deck.
- It is expected that land transport regulations are complied with. Where chains are required, edge protectors must be used between the chain and the edge of the block to prevent damage to the block.
- It is the responsibility of the transport company operator to ensure they comply with all regulatory requirements, including all applicable NZTA requirements.

GENERAL GUIDELINES AND REQUIREMENTS

The following applies where Stonebloc provides freight services.

SITE ACCESS

Clear site access is essential to the smooth delivery of blocks. When establishing whether there is clear access to site you should keep in mind blocks are transported on large trucks, often fully loaded and weighing in excess of 33 tonne. The following should be considered when assessing site access:

- Access – Average width of trucks transporting blocks are 2.5m wide. Access should be a minimum of 3m wide. Ensure over hanging trees, plants, or other obstacles are either cleared in advance, or are sufficiently high enough for trucks to pass under.
- Turning – Trucks will require sufficient space to turn on site. It is your responsibility to notify the Stonebloc representative if turning space is limited.
- Ground Conditions – Good access requires firm level ground, capable of bearing the weight of a fully loaded truck and trailer. Where weather causes ground conditions to change, your Stonebloc representative should be notified immediately.
- Gradients – Where access to site is via ground of varying gradients you must ensure it is passable by a fully loaded truck. Steep gradients, or incorrectly prepared roads can result in an inaccessible site.

NB: Delays caused as a result of the site not complying with the above guidelines will result in extra charges being passed on to you.

EFFECTS OF TRANSPORT ON BLOCKS

The movement of the truck while in transit can result in minor chipping of the blocks. This is largely unavoidable.

LIFTING EQUIPMENT

Stonebloc blocks weigh between 75kg and 900kg. As such, it is important to ensure appropriate lifting gear is available. There are multiple ways of lifting the blocks depending on the requirements of individual projects, the type of truck freighting the blocks, and the ground conditions at site.


FAST RETAINING

The following guidelines provide an overview on best practice when lifting Stonebloc blocks. This should be read in conjunction with the Approved Code of Practice for the Safe Handling, Transportation and Erection of Precast Concrete available from Worksafe NZ.

EQUIPMENT

LIFTING ANCHORS

Stonebloc blocks incorporate an Ancon certified lifting anchor as the central lifting point. Standard Stonebloc 800 blocks use a 1.3t anchor 120mm long. 1200 blocks incorporate two 1.3t anchors 120mm long. The Foot Anchor Capacity Table below outlines the Working Load Limits of Foot Anchors for the given strength of concrete at the time of lifting:

Anchor Load Group	Anchor Length	Concrete Compressive Strength at Lift (f'c)				
		10 MPA	15 MPA	20 MPA	25 MPA	30 MPA
1.3	120	1.30	1.30	1.30	1.30	1.30

Source: Reid Construction Systems Design Guides 2008

Foot anchors should be inspected and free of damage, nicks or rust before lifting.

Note: Foot anchors are designed to be lifted vertically. Under no circumstances should the lifting anchor be used outside its design parameters. Refer to Stonebloc Quality Control Guidelines for information on minimum block strength.

LIFTING CLUTCH

Stonebloc blocks are lifted using an Ancon lifting klaw.The lifting klaw is easily connected to the anchor head by admitting the anchor head into the slot of the lifting klaw and rotating the tab of the lifting clutch until is rests on the concrete surface.

The klaw is designed so that it cannot accidentally disengage while under load. Despite this, care should be taken when lifting.

WARNING: Using any lifting device other than an Ancon klaw will void the block warranty and may lead to failure of the lifting anchor.

Lifting klaws should be regularly be checked for wear and tear. The table below shows the maximum and minimum thicknesses for the clutch.

Size	H (max)mm	H (min)mm
1.3	13	5.5

LIFTING MACHINERY

Common equipment used when lifting blocks include:

- Forklift
- Front end loader (tractor, telehandler etc)
- Excavator
- Crane

Regardless of the machine chosen, it should have a minimum lifting capacity of 900kg for moving the heaviest Stonebloc.

The use of any of the above lifting equipment is subject to Approved Codes of Practice issued by the Ministry for Business, Innovation and Employment. The operator of such equipment should be competent and aware of industry best practice and regulatory requirements.

TRANSPORTATION AND SHOCK LOADING

Transporting loads over uneven terrain can induce anchor loads that are 5 times greater than those calculated from weight of the concrete element. As such, always lift the block using forks under the block when transporting over uneven terrain. Failure to do so will void the block warranty and may result in failure of the lifting anchor.

RIGGING

CHAINS

Chains are used to connect the lifting clutch to the lifting point on the lifting machine.

Only certified chains should be used to lift blocks. Chains should have the following minimum lifting capacities:

BLOCK	CHAIN LIFT CAPACITY
800 Standard	**300kg**
800 Base	**600kg**
1200 Base	**900kg**

Before lifting, chains should be inspected for:

- A current test tag
- Corrosion
- Worn, stretched, or deformed links
- Worn, stretched or deformed hooks and fittings
- Wear on load pins and to ensure retainers are installed correctly

Operators and installers should refer to the Ministry of Business, Innovation and Employment's Approved Code of Practice for Load-Lifting Rigging.

SLING ANGLE

There are two main types of machinery used to lift the blocks via the foot anchor.

FORKLIFT OR FRONT-END LOADER WITH FORKS OR TELEHANDLER

Where a forklift or front-end loader with forks is used to lift and maneuvers the block, a load tested and certified boom should be fitted to the forks as per the manufacturer of the boom recommendations (correctly chained to the fork mast).

EXCAVATOR

Where an excavator is used to lift and maneuver the blocks, the chain should be attached to the end of the excavator arm via a certified connection, preferably without the bucket.

ANGLE OF CHAINS

When lifting a standard 1200 block, the chain hangs vertically from the attachment point on the machinery.

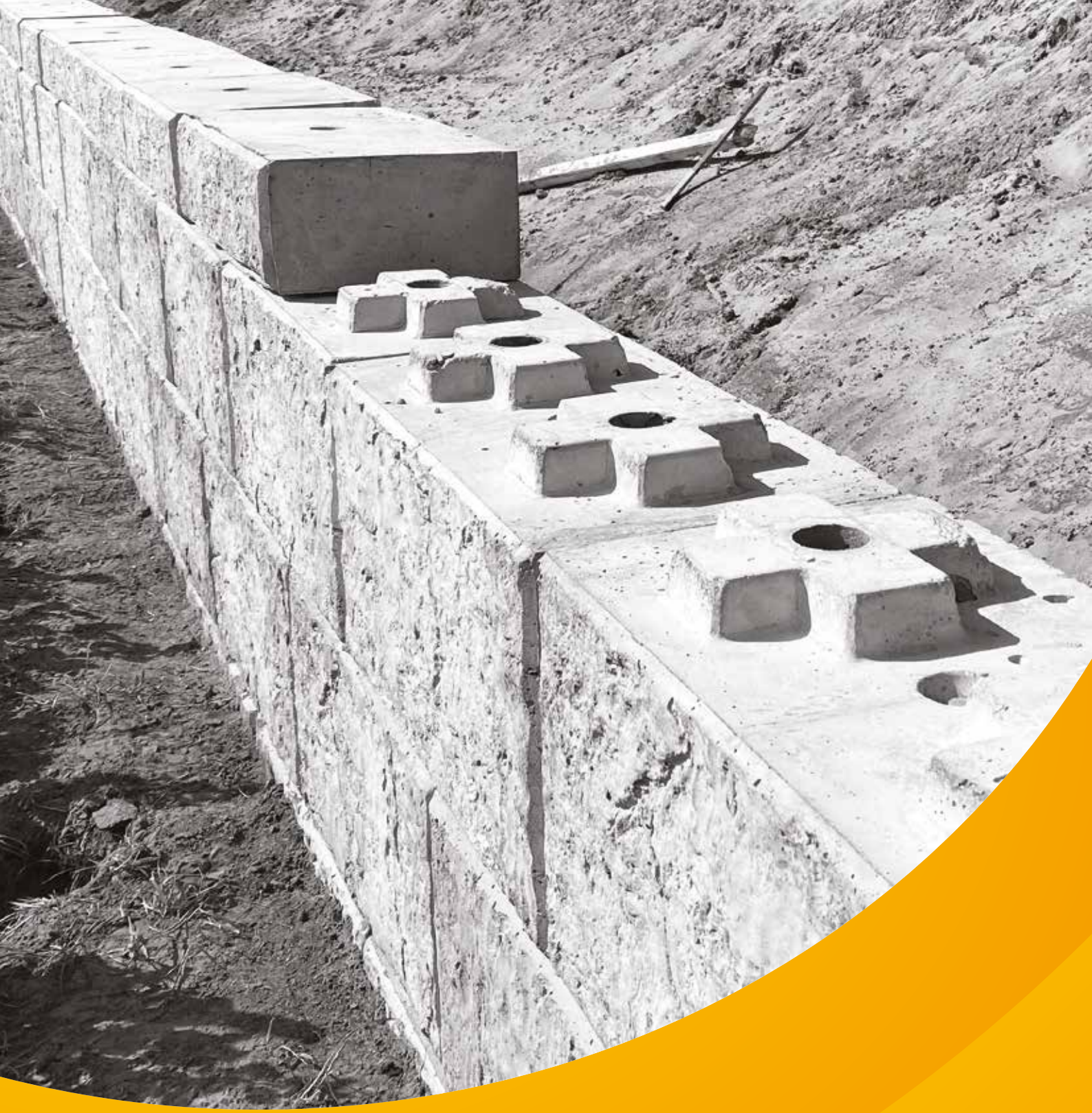
When lifting either a 600 block or 1800 block two chains are used to connect the lifting clutches to the machinery. The angle at which these chains hang from the machinery impact the load capacity of the lifting anchors.

As a minimum, the angle at which the chains hang from the machinery should be no greater than 60°.

SAFETY

Safety is the paramount concern when operating machinery and lifting heavy blocks. Below are a list of basic safety guidelines – in no way is the list exhaustive or a substitute for a proper job hazard identification process.

- **Do not stand under, or near a block while it is being lifted.**
- **Machinery should only be operated by competent persons with appropriate training and certificates.**
- **All lifting clutches, chains, and booms should be regularly checked and be in good working condition.**
- **Only Ancon lifting klaws should be used, use of any other lifting clutch/device will void the block warranty and may result in failure of the lifting anchor.**
- **Blocks should never be transported over distances or rough terrain using the lifting anchor.**
- **Where it is intended the blocks are to be lifted regularly (more than five times in one year), blocks with dual lift anchors will be required.**



INSTALLING BLOCKS

TOOLS AND EQUIPMENT

Below is a list of of core tools and equipment required to successfully install a Stonebloc wall.

EXCAVATOR capable of lifting up to 900kg block.

CHAIN safety rated to 900kg.

LIFTING KLAW attached to the lifting equipment.

INSTALL STENCIL Stonebloc supplied to ensure accuracy in first row placement.

PINCH BAR used to manoeuvre the block once placed on the ground.

CROW BAR used to leverage blocks when not sitting correctly.

HAND BRUSH or leaf blower to clear fine debris from the block during placement.

STRING LINE used as a guide for placing the blocks in a straight line.

INSTALLING THE BLOCKS

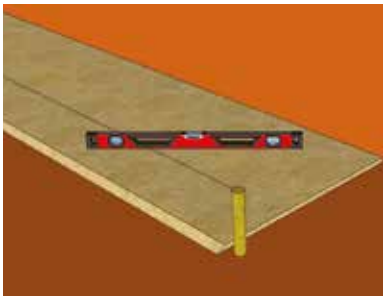
Before working with the blocks ensure installation staff have read this manual in full.

Installation staff should also conduct a job specific Job Safety Assessment, complete a Safe Work Method Statement for the job, and consult with other PCBU's on site to ensure all hazards are identified before commencing work.

Equipment should be checked for compliance and necessary certification before lifting blocks.

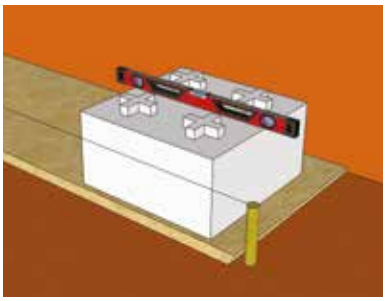
STEP ONE

Run a string line along the length of the wall as guide.



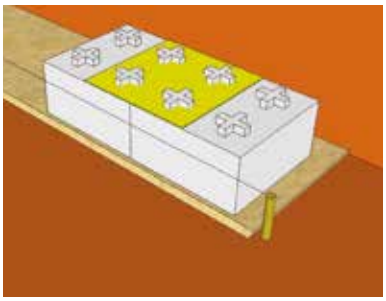
STEP TWO

Ensure the fines are level in both horizontal directions in the immediate area you will place the block.



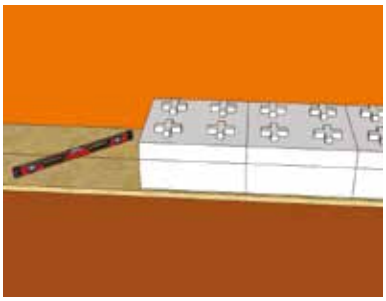
STEP THREE

Place your first block. Leave a gap of 5mm between the front of the block and the string line. Ensure the block is level in both horizontal directions.



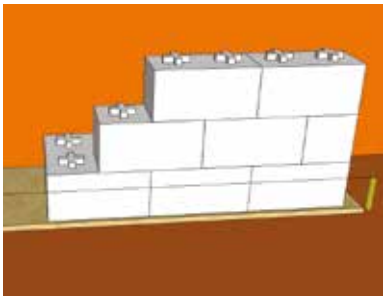
STEP FOUR

Place the next block using the stencil to ensure the correct spacing has been achieved. **Achieving the correct spacing is the most critical part of the installation process.**



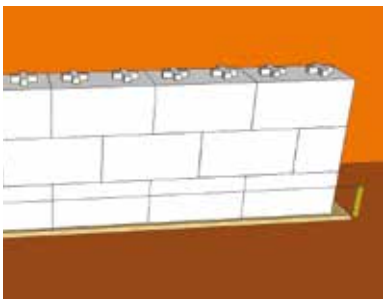
STEP FIVE

If required, use the long level to smooth out more of the levelling fines. Check it is level in both horizontal directions.



STEP SIX

Once you have placed 3-4 base blocks, return to the start of the wall to place the remaining layers. Simply stack the blocks on top of each in a running bond pattern.



STEP SEVEN

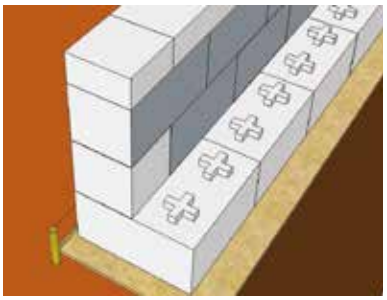
Continue to place the blocks, building the complete wall as you move along the length of the cut.

TIPS AND TRICKS

- Achieving the correct spacing is the most critical part of the installation process. Get this wrong and the whole build process will be difficult.
- Building the whole wall as you move down the length of the wall is both faster, and allows you to identify and sort out any incorrect spacing issues more efficiently.
- For minor adjustments between blocks, use a crowbar to lever the blocks.
- Check the blocks for deformities before placement. Non true to size blocks will slow down the install process and cause binding. Refer to Stonebloc Geometry Guide, for more information on block sizing.

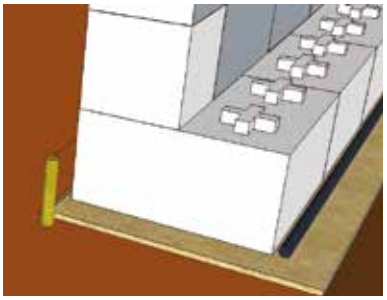
BACKFILLING

Before commencing, refer to engineering design notes on page 20.



STEP ONE

Optional: Add a layer of mudguard between the wall and drainage material to prevent unsightly leakage between the blocks.

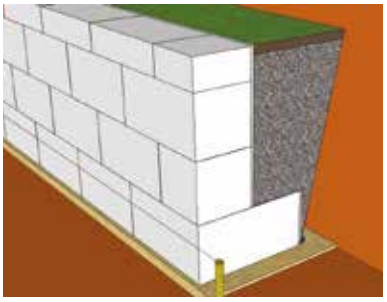


STEP TWO

Place Megaflow, or similar, along the base of the wall.

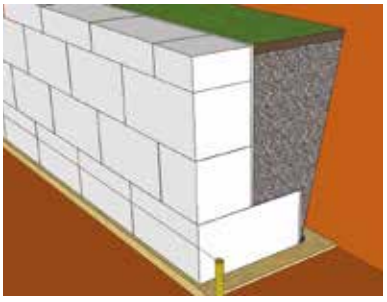
STEP THREE

Add a minimum 200mm thick layer of free flowing (GAP20, GAP40) drainage material behind the wall.



STEP FOUR

Where a balustrade is being added to the top of the wall, allow for 350mm thick [from the top of the wall] compacted clay.



STEP FIVE

Finish with top soil level to the top of the wall.

WALL DESIGNS FOR BALUSTRADES

Where a wall height is, or greater than, 1m high fall protection is required. While Stonebloc does not endorse any particular balustrade solution, we do provide a number of generic wall designs to support multiple balustrade options which comply with relevant regulatory codes.

Two factors play an important role in the ability of a Stonebloc wall to support top and rear mounted balustrading. The height of the post, and the distance between posts.

The height of the post determines the lever action on the block. The higher the post, the more reinforcing required. For the purposes of Stonebloc generic designs the maximum allowable post is 1.1m from the top of the wall. This height is the regulatory minimum required for fall protection.

The distance between posts determines the amount of force each post exerts on the wall. The shorter the distance, the less the force exerted. For the purposes of Stonebloc generic designs two spacing options are considered 1.6m spacing, and a maximum of 2.4m spacing. The table below displays the force differential between the two spacing options;

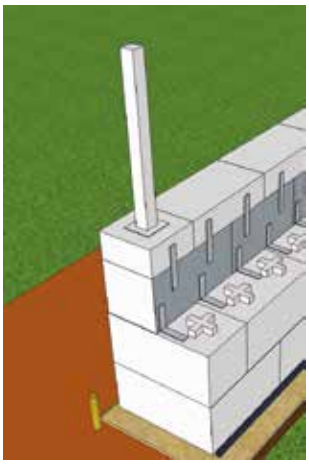
LINE LOAD	POST SPACING (MM)	LOAD/POST
0.75 kN/M	1600mm	0.9kN
	2400mm	0.6kN

There are three balustrade mounting options available with a Stonebloc retaining wall:

- Top Mounted - where the posts are bolted directly to the top of the wall.
- Rear Mounting - where the posts are bolted directly to the back of the wall.
- Separated Fencing - where the posts are physically separated from the wall.

TOP MOUNTED BALUSTRADE

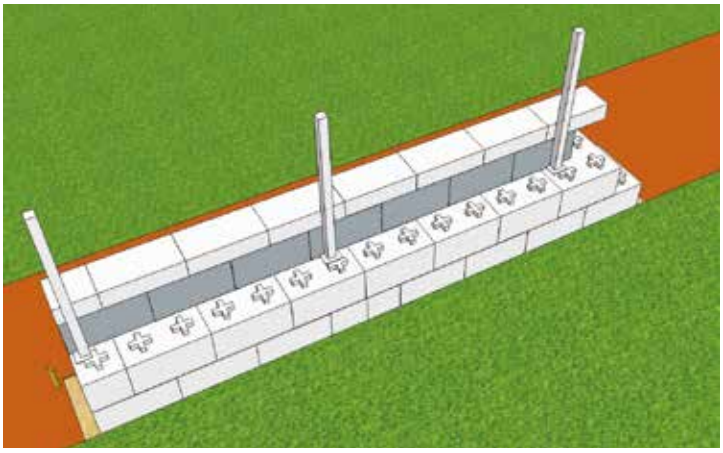
Stonebloc is one of the few retaining wall solutions which provide for balustrading to be top mounted. In order to support top mounting, the blocks do need to be tied together with brackets. The brackets need to be stainless steel in order to provide sufficient corrosion resistance to meet council requirements for consent.



REAR MOUNTED BALUSTRADE

Rear mounted balustrades are more common on timber walls. Stonebloc walls can support rear mounted balustrades without the need for reinforcing clips, where the height of the balustrade above the top of the wall is no more than 1100mm high, and the spacing between the posts is no greater than 2400mm.

The Stonebloc wall design supporting this balustrade mounting requires the posts to be fixed to a minimum of two different blocks. The exact fixing specifications should be provided by the balustrade/fence supplier.

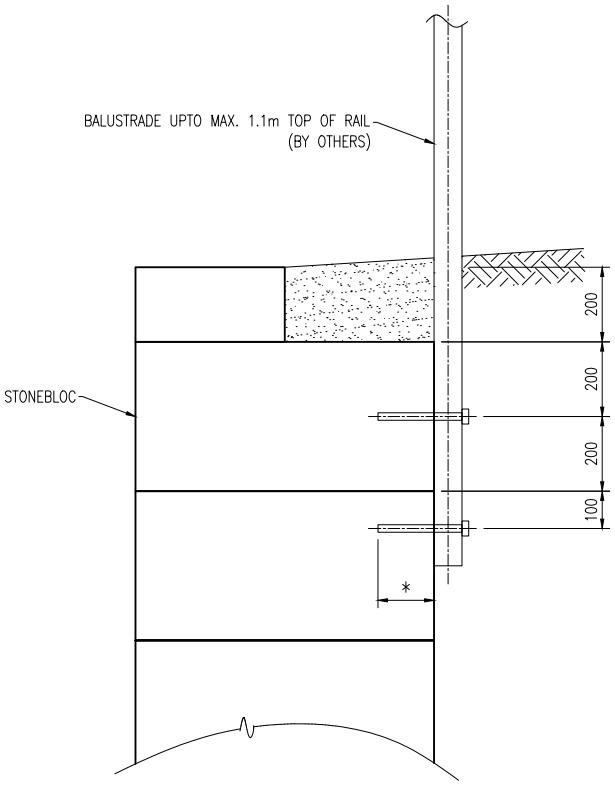


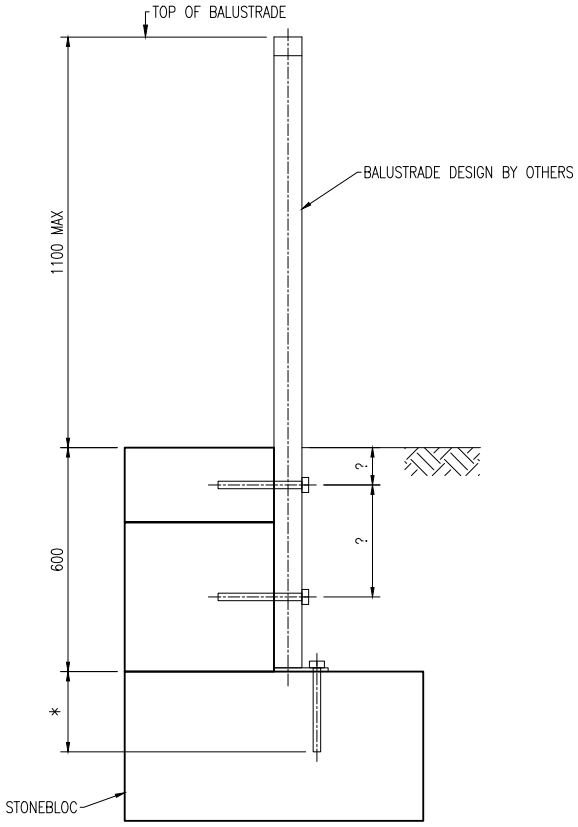
SEPARATE FENCE

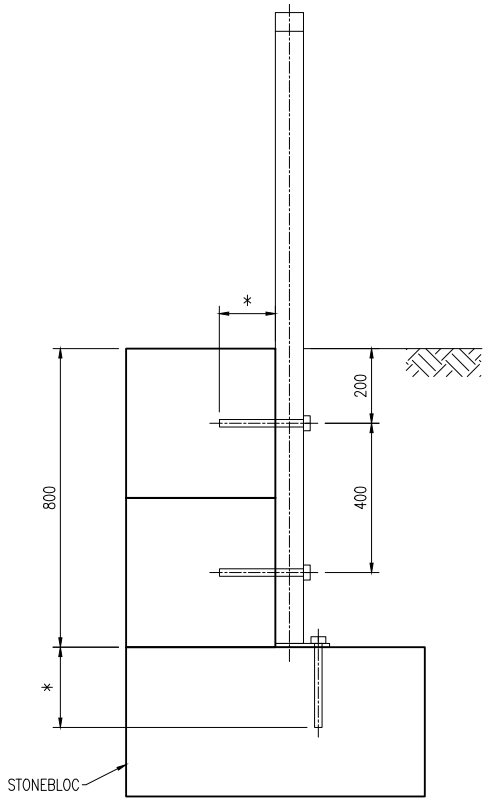
This is the most common fencing/balustrade solution for retaining walls. The fence posts are concreted in place behind the retaining wall. As the fence is physically separate from the retaining wall there is no need for the wall design to consider supporting the fence design.

When selecting this option, remember to consider the wall profile - in some cases the fence posts will need to be offset a minimum 850mm from the front face of the wall.

FIXING DETAILS FOR REAR MOUNTED BALUSTRADE

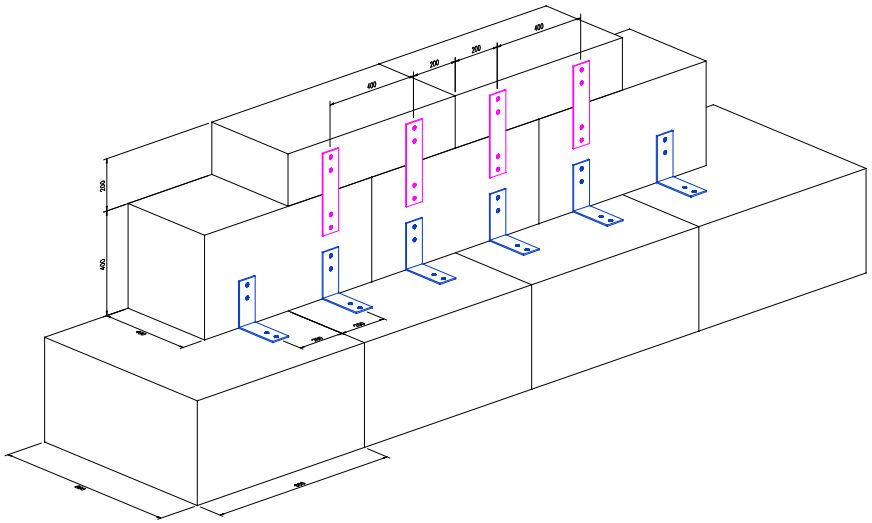




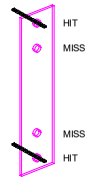


ENVIROCON
CAPTURING CONCRETE EXCESS

BRACING DESIGN FOR TOP MOUNTED BALUSTRADE



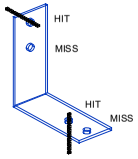
STONEBLOC CLIPS FOR BALUSTRADE RELYING ON WALL FOR STABILITY (SEE NOTE 16).



I-CLIP

HIT DENOTES INSTALL M12 STUD ANCHOR A4 316SS T12080SSA AS PER INSTALLATION DATA METHOD

MISS DENOTES NO ANCHOR BOLT IS REQUIRED



L-CLIP

INSTALLATION DATA

Trubolt Stud Anchor A4 316 SS T12080SSA

Product Code:	T12080SSA
Effective Embedment:	50mm
ETA-04/0010 issued 2017/01/24	

Effective Embedment :	50mm
Minimum thickness of base material :	100mm
Hole diameter in the base material :	12mm
Hole depth in base material material :	74mm
Installation torque :	50.00 Nm
Base plate thickness :	5mm
Profile family (section type) :	
Clearance Diameter :	14mm

INSTALLATION METHOD

Installation

1. Drill or core a hole to the recommended diameter (same as the TruBolt™) and depth using the fixture as a template. Clean the hole thoroughly with a hole cleaning brush. Remove the debris with a hand pump, compressed air or vacuum.
2. Insert the anchor through the fixture and drive with a hammer until the washer contacts the fixture.
3. Tighten the nut with a torque wrench to the specified assembly torque.

PRODUCT RANGE This catalogue details the Stainless Steel range of BOWMAC products. Refer to separate brochure for the Hot Dip Galvanised range of BOWMAC products.

STANDARDS Applicable Timber Standards are NZS 3603 and NZS 3604:2011 - Section 4 Durability.

DESIGN LOADING These can be derived from the characteristic strength of bolts in timber, using the relevant design code NZS 3603.

DURABILITY The selection of BOWMAC Stainless Steel brackets should be made in conjunction with the MiTek Durability Product Selection and Durability Flow Charts in Section 4 of the current MiTek Structural Fixings On-Site Guide. These selection charts are an alternative solution to Table 4.1 NZS 3604:2011.

The recommendation and use of BOWMAC Stainless Steel brackets prescribed in these selection charts is based on supporting advice from Les Boulton & Associates - Materials and Corrosion Consultants in their report # 99267.

When used, handled and installed in accordance with the above conditions, BOWMAC Stainless Steel brackets meet NZBC Clause B2 for 50 years durability performance requirements.

Depending on specific weather exposure and salt spray environments, there may be evidence of 'tea staining' on the surface of Stainless Steel brackets.

Tea staining is a visual issue only and DOES NOT affect the structural integrity of the bracket. To minimise this occurrence, it is suggested that a regular washing / maintenance cycle be implemented using warm water with a mild detergent and a cold fresh water rinse.

It is NOT advisable for any BOWMAC Stainless Steel products to be painted over as this may affect the natural anti-corrosive characteristics of stainless steel.

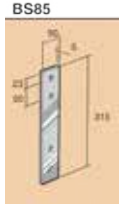
CUSTOM PRODUCTS BOWMAC also manufactures custom-made products to suit specific requirements, using Hot Dip Galvanised Steel and 304 Stainless Steel. A lead time by discussion is required to allow for manufacture.

AVAILABILITY Stainless Steel BOWMAC Brackets can be purchased from Builders Supply Merchants or indented through the merchant from our Auckland and Christchurch warehouses.

END USE The purchaser is responsible for checking the suitability of any component for its intended use.

STRAPS

BS85



BS55

STONEBLOC CLIPS FOR BALUSTRADE

PRELIMINARY

REV	DESCRIPTION	DATE	BY
A	PRELIMINARY – FOR CLIENTS COMMENT	20/04	RP

ENVIROCON
667B Great South Road, Penrose
Auckland
Ph: 0800 468 375
Email: contact@envirocon.co.nz

Resilient Structure Ltd.
Tauranga, New Zealand
Ph: 027 2 RESILIENT
Email: mail@resilientstructure.co.nz

RONS DRAUGHTING SERVICES
Copyright: Rons Draughting Services
Rotorua, New Zealand
Ph: 0223230816 Email: ronsdraughting@gmail.com

THIS ANGLE INDICATES HOLES ON FS.
+ INDICATES HOLES ON FS.
◆ INDICATES MARK END

CLIENT			
DRAWN	RP	01/02/2021	
CHECKED	CZH	01/02/2021	
APPROVED			
SCALE	N.T.S.	SHEET SIZE	A1

PROJECT: STONEBLOC LOW-HEIGHT RETAINING WALL
CONCEPT NON SITE-SPECIFIC DESIGN FOR USE WITHIN LIMITS (SEE NOTES)
SITES WITHIN AUCKLAND & NORTHLAND REGION ONLY
TITLE: TYPICAL DETAILS
PROJECT NO. 1005-01 | SHEET No. 005 | REV. A

FAQ'S FOR STONEBLOC

DO THE BLOCKS CONTAIN STEEL REINFORCING?

No, Stonebloc is a solid, vibrated, concrete block.

WHAT MPA CONCRETE IS USED?

20-30MPA depending on requirements. All blocks guaranteed to reach a minimum of 20MPA at dispatch.

DO GENERIC DESIGNS ACCOMMODATE A SLOPE IN FRONT OF THE WALL?

Yes, the designs can accommodate up to 3% typical downslope in front of the wall.

DO THE RESISTING MOMENTS RELY ON THE MASS OF THE WALLS OR IS COHESION BETWEEN THE SOIL AND THE BACK FACE OF THE WALL ALSO UTILISED?

The resisting moment considers the vertical (downward) component of the active pressure.

CAN STONEBLOC INCORPORATE GEOGRID TO FURTHER REINFORCE THE WALL?

Yes - geosynthetic textiles can either be sandwiched between, or cast into the blocks, to create a MSE type wall. This approach would require a specific engineering design.

CAN THE BLOCKS BE PAINTED?

Yes, use a concrete primer before applying the top coat.

CAN THE BLOCKS BE MANUFACTURED WITH COLOURED CONCRETE?

Yes, however there is an added cost for this.

CAN STONEBLOC CHANGE THE FRONT TEXTURE ON THE BLOCKS?

Yes, however this will have both lead time and cost implications.

CAN STONEBLOC BRIDGE UTILITIES AND SERVICES?

The short answer is yes. Request a bridging utilities information document from your Stonebloc rep for more detail.

CONSTRUCTION MONITORING – INSPECTION ACTIVITY		
A	**OB-SPECIFIC – GROUND & LEVELLING BASE**	
1	SETTING OUT JOB LOCATION AS PER CIVIL PLAN	X
2	BULK EARTHWORKS TEMPORARY STABILITY	X
3	COMPACTED LEVELLING BASE – SEE NOTE 2 OF DRAWINGS	X
4	GEOTECHNICAL ASSUMPTIONS – SEE NOTE 3, 4, 5 & 6 OF DRAWINGS	X
B	**JOB-SPECIFIC – SERVICES**	
1	UNDERGROUND SERVICES (THAT REQUIRES BRIDGING OR OTHERWISE, IF ANY) – SEE NOTE 9 & 10 OF DRAWINGS	X
C	**JOB-SPECIFIC – STONEBLOC**	
1	RE-CHECK LEVELLING BASE. ANY ANGULAR DISTORTION (ESPECIALLY IN TRANSVERSE DIRECTION) MUST BE LESS THAN • 2MM EVERY 400MM – FOR 400MM WIDE BLOCK • 4MM EVERY 800MM – FOR 800MM WIDE BASE BLOCK • 6MM EVERY 1200MM – FOR 1200MM WIDE BASE BLOCK ALSO SEE ITEM 5 BELOW AS LEVELLING BASE HAVE AN EFFECT ON WALL PLUMBNESS.	X
2	CHECK FOR ANY VISIBLE VOID OR LOCALISE DEPRESSION BETWEEN BASE BLOCK AND LEVELLING BASE. IF A NORMAL WRITING PENCIL CAN BE FITTED INTO THE DEPRESSION, RECTIFY IMMEDIATELY	X
3	BEFORE ADDING THE UPPER LAYER OF BLOCK, TOP OF BLOCK MUST BE CLEAN OF DEBRIS. USE BRUSH OR BLOWER.	X
4	CHECK VERTICAL GAP – MUST BE PARALLEL	X
5	CHECK VERTICALITY OF AS EACH LAYER OF BLOCK IS INSTALLED. LEANING FORWARD (AWAY FROM BACKFILL) – MAXIMUM 1MM EVERY 400MM	X
6	CHECK VERTICALITY OF FULLY INSTALLED WALL	X
D	**OB-SPECIFIC – BALUSTRADE**	
1	MARK LOCATION FOR I-CLIPS AND L-CLIPS ON WALL	X
2	ENSURE STRAPS ARE STAINLESS STEEL BOWMAC BS85 (I-CLIP) AND BS55 (L-CLIPS)	X
3	ENSURE ANCHOR BOLTS (MECHANICAL FASTENER) IS STAINLESS STEEL TRUBOLT STUD ANCHOR A4 316 SS. SEE INSTALLATION DATA ON DRAWING	X
4	CHECK INSTALLATION TORQUE (50NM) FOR TRUBOLT TO BOWMAC	X
E	**JOB-SPECIFIC – BACKFILL**	
1	FRONT (TOE) IS FLAT OR WITH MAXIMUM 3% SLOPE. SEE NOTE 11 OF DRAWINGS.	X
2	BIDIM A19 IS TUCKED UNDER THE BASE BLOCK. INSTALL PER MANUFACTURER'S RECOMMENDATION. SEE NOTE 12 OF DRAWINGS	X
3	DRAINAGE SYSTEM IS INSTALLED TO MATCH CIVIL DRAWINGS. SEE NOTE 14 OF DRAWINGS.	X
4	BACKFILL IS LAID TO SPECIFICATIONS. SEE NOTE 13 OF DRAWINGS	X

STONEBLOC
ENDURING, TIMELESS, RETAINING

ENVIROCON
CAPTURING CONCRETE EXCESS

STONEBLOC.CO.NZ 0800 468 375

Version 2.1, August 2021