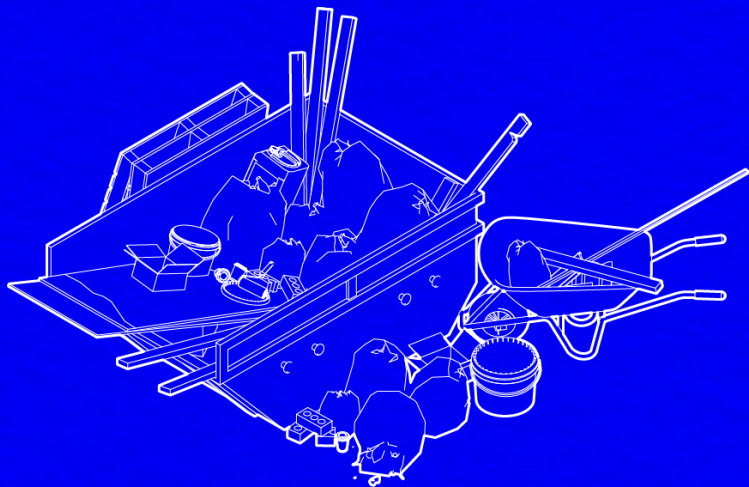


WHAT A WASTE (?)

Reusing raw materials from Australia's residential construction boom.

A system to give used materials a second chance.



Competition Identification Number: N22006

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PART 1:

THERES A PROBLEM WITH CONSTRUCTION WASTE

01. CONSTRUCTION WASTE

Australia's construction industry is massive, it equates to approximately 9% of its total Gross Domestic Product (GDP), with little signs of slowing with a projected annual growth rate of 2.4% over the next 5 years (Australia National Industry and Skills Committee 2022:para 3). However, the dilemma with an industry as big as construction is the unrelenting waste that's generated from it. Where construction waste alone within Australia accounts for 40% of all waste produced within Australia (Doust, Battista and Rundle 2021:1), a significant proportion for an industry that holds less than 10% of its GDP but generating almost half of its total waste.

01.01. RESIDENTIAL HOUSING

A significant proportion of Australia's construction however is localised within residential housing, where of the 9% GDP that construction holds, 5% of that is encapsulated within residential construction, particularly low-density suburban style developments. Being the second-largest economic multiplier of all 114 industries that make up Australia's economy (National Housing Finance and Investment Corporation 2020:2-3). This housing type is overrepresented, where single detached housing makes up approximately 70% of all housing within Australia, with the remaining comprising of either townhouses or apartments at 13% and 16% respectively (Australian Bureau of Statistics 2022:para 1). This degree in low density construction is drastically changing the Australia landscape, where between 2017 – 2022, the land development and subdivision in Australia market size growth of 5.9% (ibisworld 2022:para 1). Where post covid-lockdowns alone exacerbated this desired living trend, with people seeking lower-density housing to escape apartment living and the ability to work from home become common place(Schultz 2022:para 3). Further projecting that this issue regarding construction waste is only expected to increase in the future.

This type of construction will form the focus method and design solution that's lacking for a waste reduction resolution. Where not only does this type of housing generate significant waste, averaging 111.5 tonnes of per dwelling (Schultz 2022:para 2), but also proposes unique challenging dilemmas, such as long distances, smaller scale, and fragmented coordination between trades.



Nilupa Udawatta

Lecturer of construction management at Deakin University

“In the traditional arrangement, there is a lack of coordination or communication between builders, contractors and subcontractors, so it’s hard to implement [waste management plans],”

“Most residential projects end up putting all the waste in one bin,”

“This can cause contamination, which can reduce the possibility of reusing those materials.”

(cited in Weiner 2019:para 6)

01.02. WHATS THE SCALE?

It's evident these developments are growing at a sizeable rate, whereas of the June QTR 2022, 48,076 new dwellings had commenced construction alone (Australian Bureau of Statistics 2022:para 3). This impact can be witnessed within a brief period of just 10 years, where land previously allocated for farming and grazing have been steadily transferred to new residential developments and suburbs. All to meet Australia's growing housing needs for an increasing population of approximately 1.3% per year average (Australian Institute of Health and Welfare 2022:para 2). The impact on the landscape is hard miss.

Tarneit – Small scale

November, 2009



August 9, 2022

Craigieburn – Medium scale

February, 2010



July, 2022

Armstrong Creek – Large scale

November, 2009



April, 2022

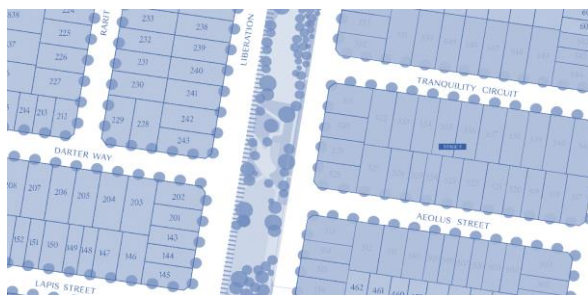
Nearmap (2022)

01.03. TYPES OF HOUSING & MATERIALS

Majority of the new housing being built in these developments typically follow a strikingly similar design trend and format. Following shared materials and designs to help lower costs and for an already rising construction costs, whereas over the September quarter, the country found itself facing the largest increase on record (Hamilton-Smith, Jurss-Lewis, Richards 2022:para 2):

Queensland	Western Australia	South Australia	New South Wales	Victoria
5.8%	3.3%	3.8%	4.0%	5.6%

This streamlined material and design process forms a rectangular corridor, channelled through the availability of released land with tighter street frontages, compensated by a deeper block to accommodate this proportion. This is also indicated where Australians blocks sizes are shrinking, where in the past 10 years the average size decreased by 13%, forcing tighter design allowances (Bleby 2022:para 9).



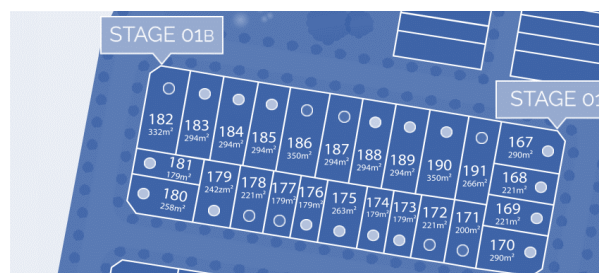
Harriott (2022)



Villawood (2022)



Frasers Property (2022)

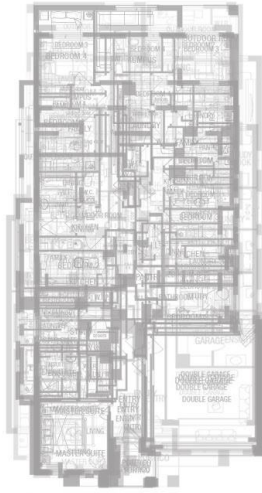


Forrest Green (2022)

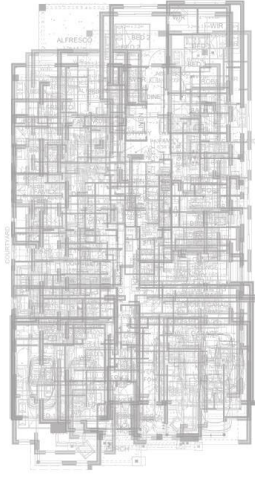
Above are typical examples of new land released within Armstrong creek & Lara, Victoria, demonstrating commonly sized allotments available throughout Australia. These range between 8.5 to 12.5, wide at their street frontage to around 28 -30m in depth. Ultimately this is to maximize space available which in turn forces a standardised size and proportions for homes being built.

This lack of land availability further pushes designs towards matching an ever-growing tighter allowance, permitting very little in the way of design fluctuation or orientation, entrenching a standardised residential building design. Below is an indication of new low density housing plan options.

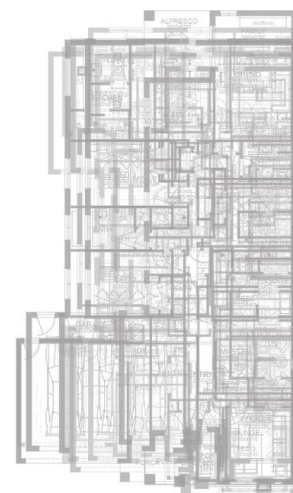
combination of 3 different major builders with 10 overlaid design options.



Metricon (2022)



G.J. Gardner Homes (2022)



Simonds (2022)

Whilst internal rooms are arrangeable, very little is changeable to the exterior form apart from small façade options, accommodated with a large street facing garages on a single side. Moreover, these homes commonly must fit within a specific design overlay or neighbourhood character guidelines stipulated for each new development, intended to create flowing homogenisation throughout the new development. For example, Armstrong Creek development outlines external walls to be construction of brick, texture coated material (Render) or weatherboard (Villawood Properties 2016:17). However, this can result in restricted pallet and materiality. Where typically the only major design differentially is left upon the street facing façade, where multiple options can be determined. However, this leaves the backend of the house featuring almost an identical construction method.



Nearmap (2022)

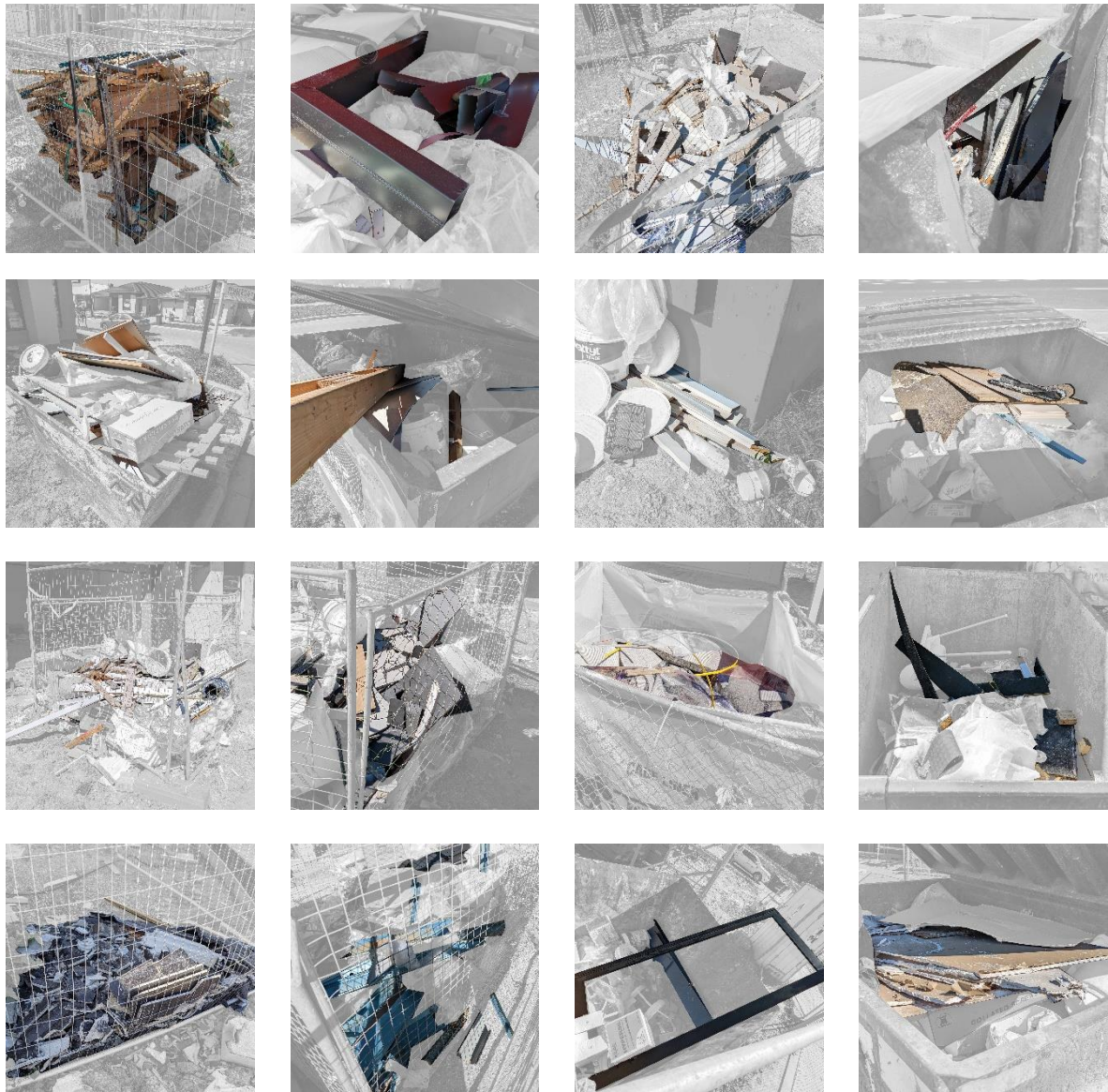
As indicated below, newer residential houses commonly follow a similar construction method and style. These houses have been sourced from all across Australia, including Armstrong creek, Tarneit, Glenmore Park, Oran Park, Aberglasslyn, Epping, Baldivis, Blakeview, Tugrah, Torquay and Craigieburn. All featuring shared materials and components.



Google Streetview (2022)

01.04. AT A GLANCE

A quick investigation into the sites situated around Geelong, it's evident how much construction material is being discarded. Where on the 14th September 2022, a brief 30 minute walk around the development within Armstrong Creek quickly indicated how much unused material goes straight into the skip bin and discarded.

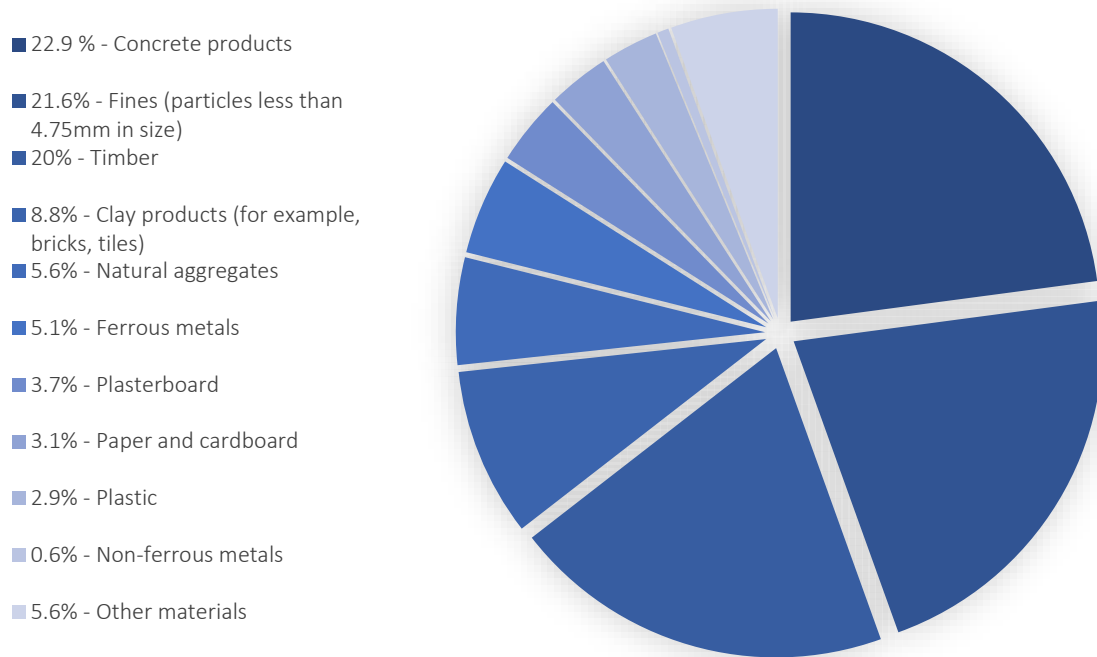


Materials found within the skips & trash piles

- Bricks
- Tiles
- Carpet
- Plaster
- Architrave
- Flashing & Gutters
- Plywood
- Cement Sheeting
- Timber
- Steel framing
- Windows

01.05. WASTE BREAKDOWN

As previously stated, construction and demolition produce around 40% of Australia's **total** waste. This equates to 27 million tonnes of waste being generated per year, generally comprising of concrete, bricks, plasterboard, metals, timber, glass, plastics, carpet, vegetation, rocks, soil, and sand (Your Home 2022:para 2).



(Your home 2022: para 3)

However, even though a significant proportion of that material is recovered, approximately 77%, with 76% being recycled (Your Home 2022:para 2), that still leaves almost a quarter of material completely discarded, where more needs to be done to help further reduce this percentage.

Whereas of those materials being recovered, are typically only sourced from larger scale projects, and less so than from smaller scaled projects, such as housing. As larger projects have the luxury of onsite waste separation tubs, helping to mitigate a significant proportion of that waste. This is where smaller projects lack that option, where materials are often combined within mixed loads and sent directly to landfill (Department of the Environment and Energy 2018:28). There is a lack of space for a system that currently exists and would be logistically difficult to manage that each individual site.

This indicates a significant shortfall for smaller residential projects, with materials managing to slip through the gap and end up in landfill. What's required is an option for these builders to access the same options that larger projects have, but flexible and tailored to a smaller scale, to help further drive down material wastage.

PART 2:

REDUCING CONSTRUCTION WASTE METHOD

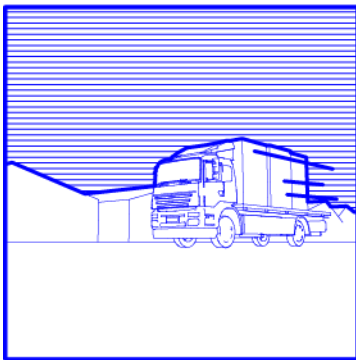
02. DESIGN PROPOSAL

02.01. RECYCLING & REUSE SYSTEM

Ultimately what's required is to start bringing down the waste from being sent to landfill, where the unused and left-over materials need to be collected in some format and repurposed elsewhere. Majority of materials discarded are perfectly serviceable, but no longer required on site. Where the silver lining of having very similar housing across the nation where a lack of diversity with its standardisation, makes it significantly easier to collect and sort. Therefore, a simplistic method of collection that can be established within the existing context to **collect** those materials, sort to **recirculate**, and **reuse** them is a proposal to help reducing the waste.

02.02. PROGRAM / METHOD

Salvaging materials - A 3-step process



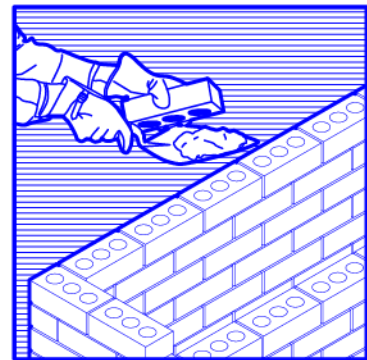
Collection

Collect those materials in a simplified and streamlined manner from site



Recirculate

Deliver those materials to depot that can be sorted into their properties and stored for collection



Reuse

Allow those materials to be acquired by the public or tradespeople for reuse

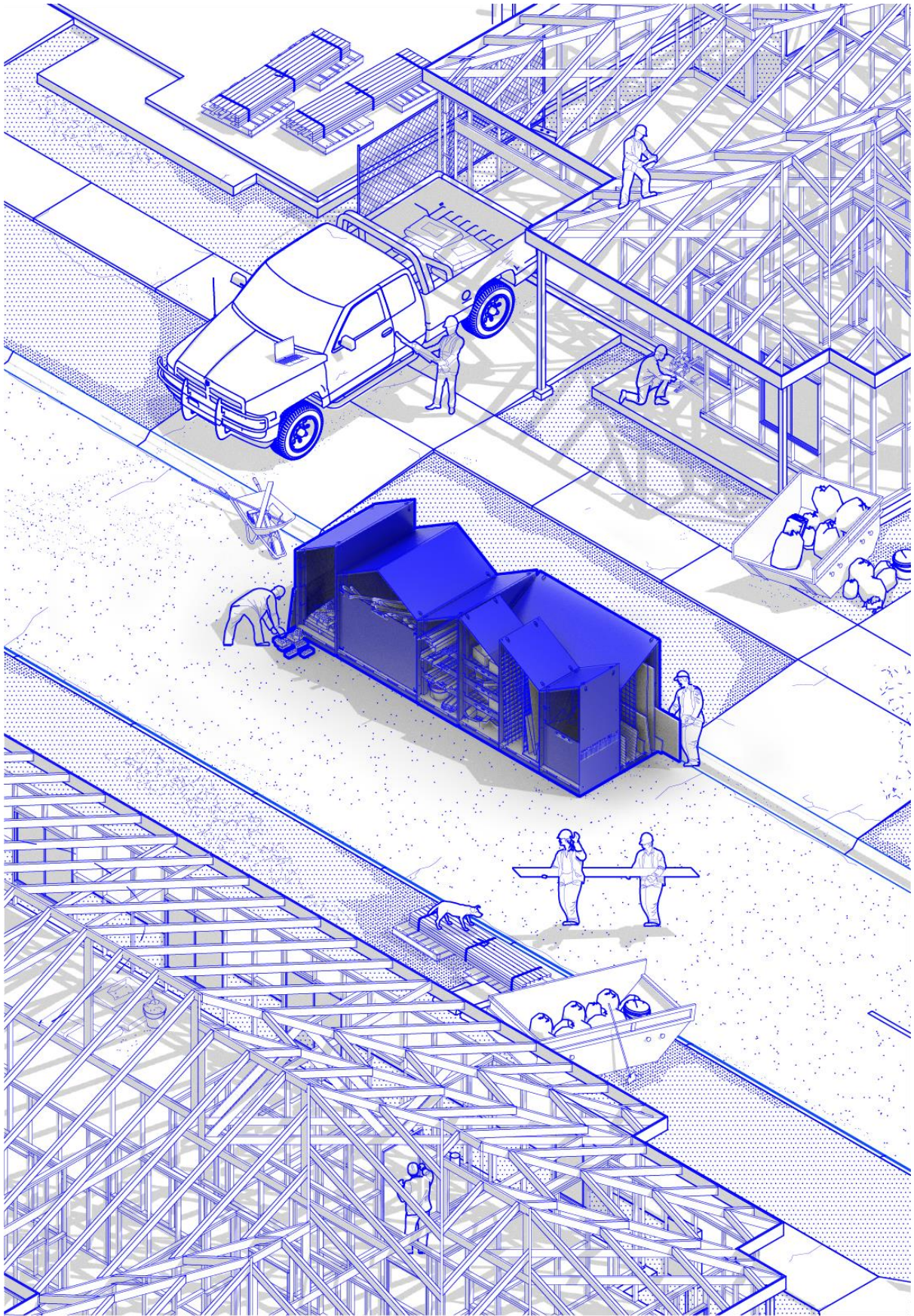
02.03. COLLECTION / CONTAINER SYSTEM

To collect the materials left on site, we propose a purposely designed sorting container system, called “What a Waste (?)”, that can be located within proximity to residential construction zones. Our proposed sorting container is smaller and more manoeuvrable than existing methods seen on large scale construction sites and can be shared amongst all local builders within a construction hotspot.

Design proposal – Modular container system



Container Visualisation



Axonometric view of containers being used on site

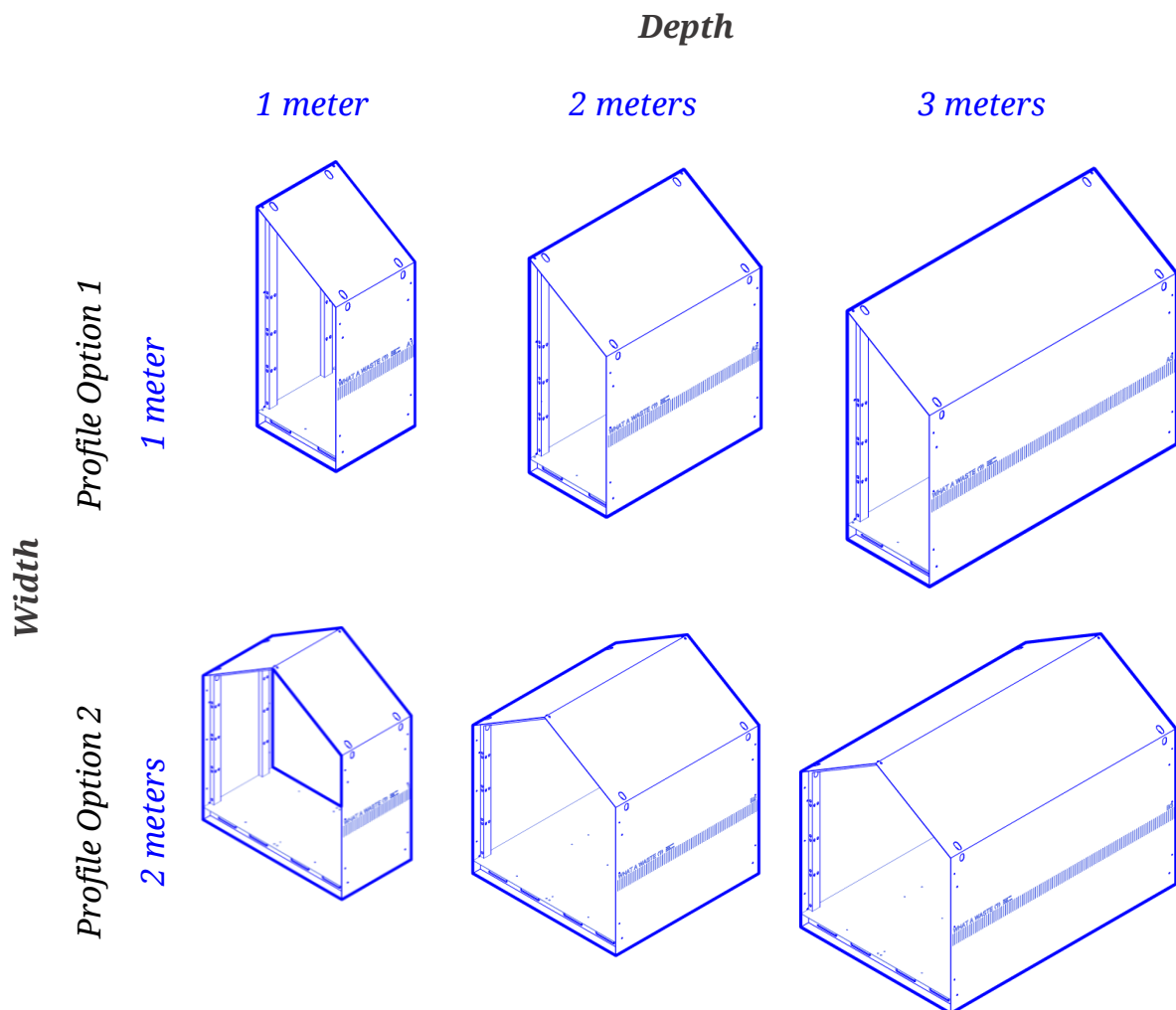
02.03.01. DESIGN

Container Base Sizes – 6 Different options, 2 main profiles.

Each of the 6 base containers are designed with a 1000mm X 1000mm grid base system, feature 2 main profiles, though sharing common components amongst each other to streamline fabrication and ensuring interchangeability for modulating. This 1000mm X 1000mm grid allows for a more manageable size, and constrains itself to fit within a maximum 2000mm width for:

Transportation. Small enough to fit within a standard size truck/lorry bed and manageable with a small onboard crane. Also, compact enough to be movable with pallet jack trolley or small forklift within a warehouse.

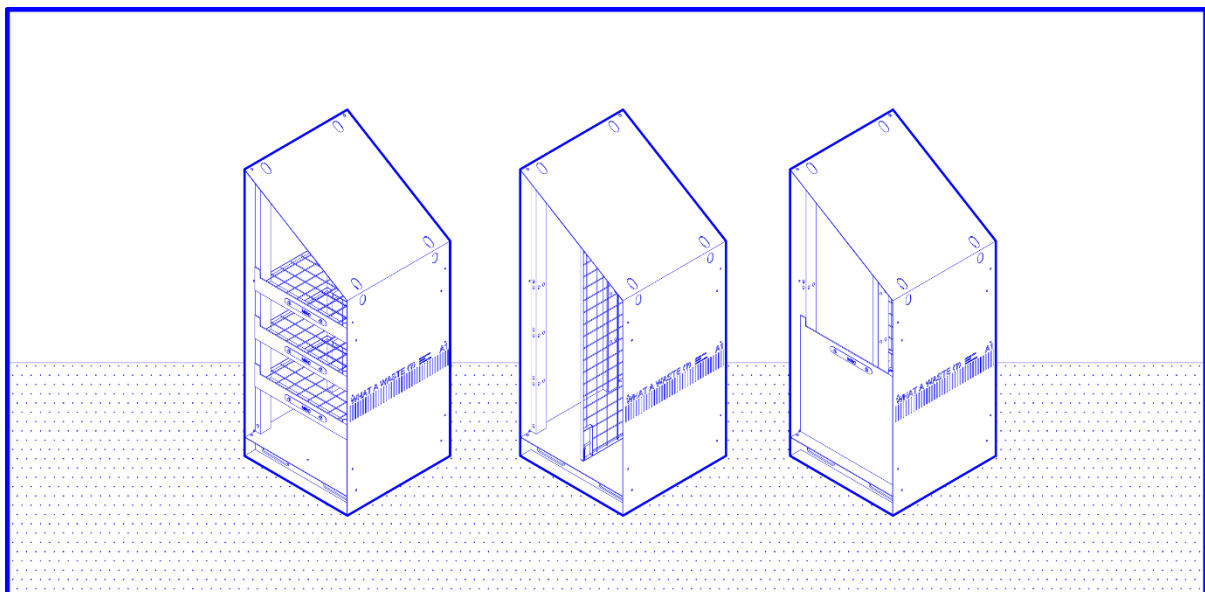
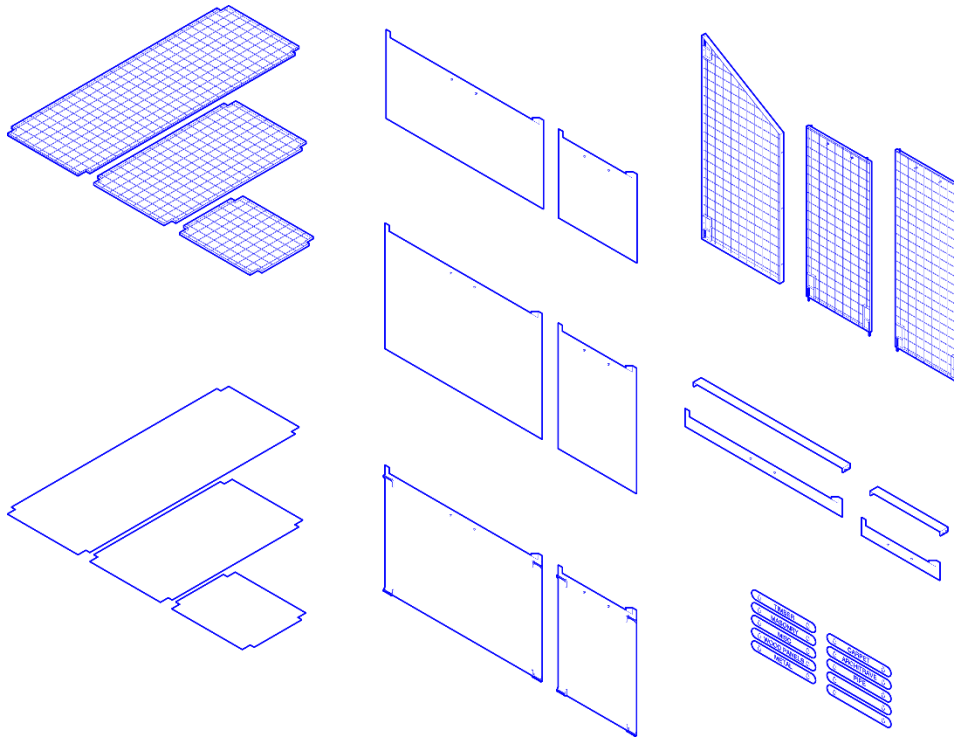
Placement. Short & compact enough to fit with a standard carpark width, allowing for the containers to be placed on the side of the road, causing minimal obstruction to traffic and space.



The containers can be arranged on site in any configuration

Container Parts – Modularity & Flexibility

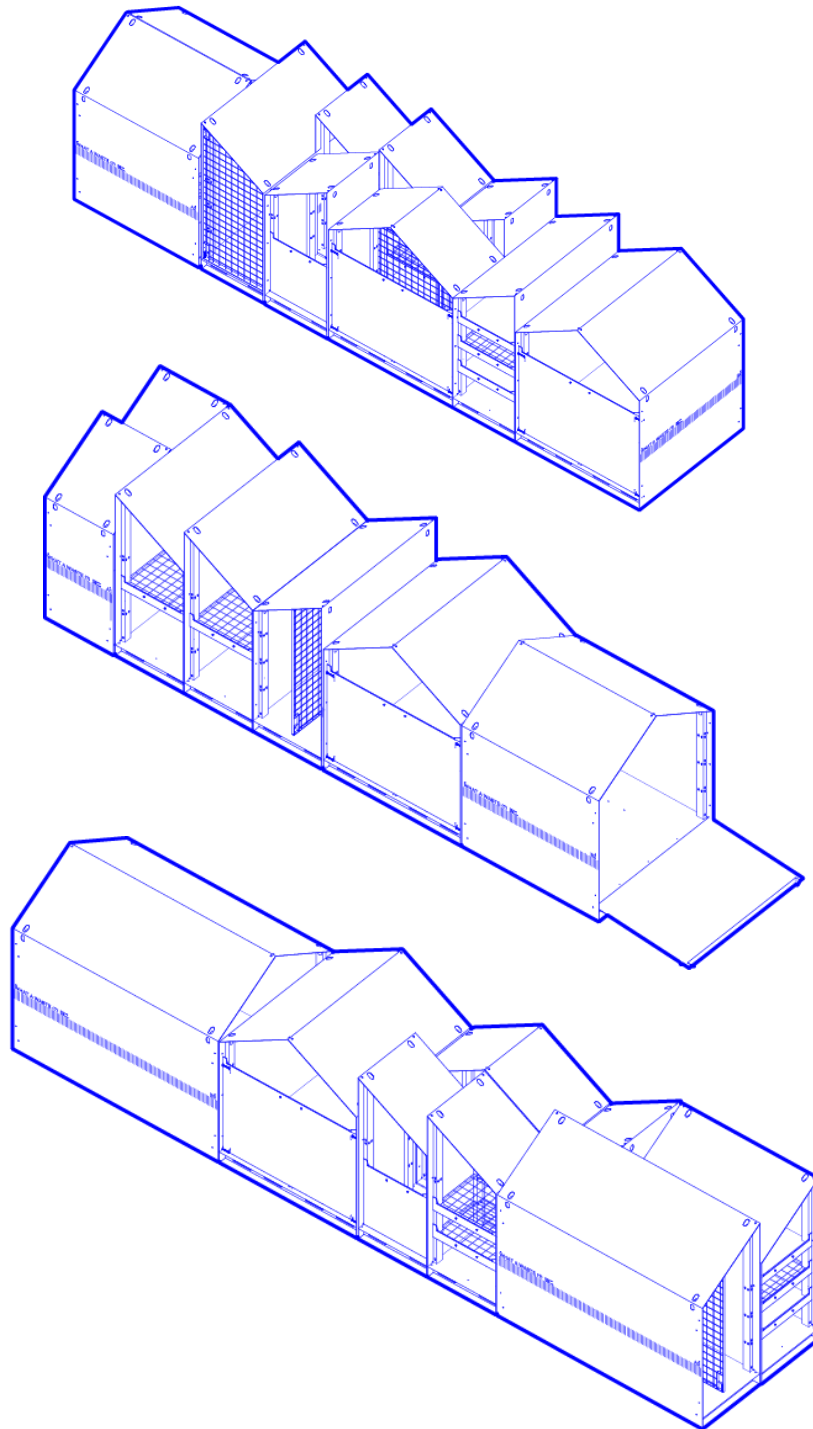
The entire range of containers feature **20 modular internal components** that can be arranged to ease the collection of different proportional materials. These include brackets, shelving, name plates, dividers, and face plates, all being easily interchangeable for the different sized containers with ease.



The containers can be configured for different materials.

Arrangement Options – accommodating needs

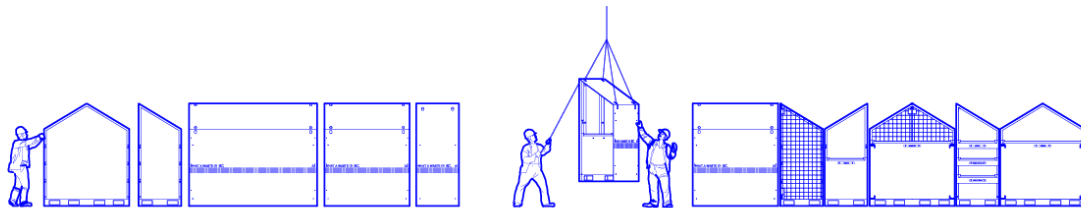
Once each container is fitted out and finalised, they can be bunched together and form a single unit, where combinations are limitless and flexible. Each arrangement can be configured depending on their use within the area or demand being seen within a particular development. Such as if more timber is being discarded in one area, a larger container could be inserted to collect that additional material.



The containers can be arranged on site in any design.

Aesthetics – Form building

The pitched roof form of the individual containers characterizes the traditional residential home profile. Whilst simultaneously providing practical uses such as sheltering materials from the elements and structural mounting points for the containers themselves. This also helps create a unique identifier on site, creating an easily recognisable program and brand through its foreign and streamlined form. Differentiating itself enough from other skip bins and containers found around the area, helping to remove confusing for standard waste disposals.



When placed together, they suggest a residential streetscape elevation

Colour – Identifier

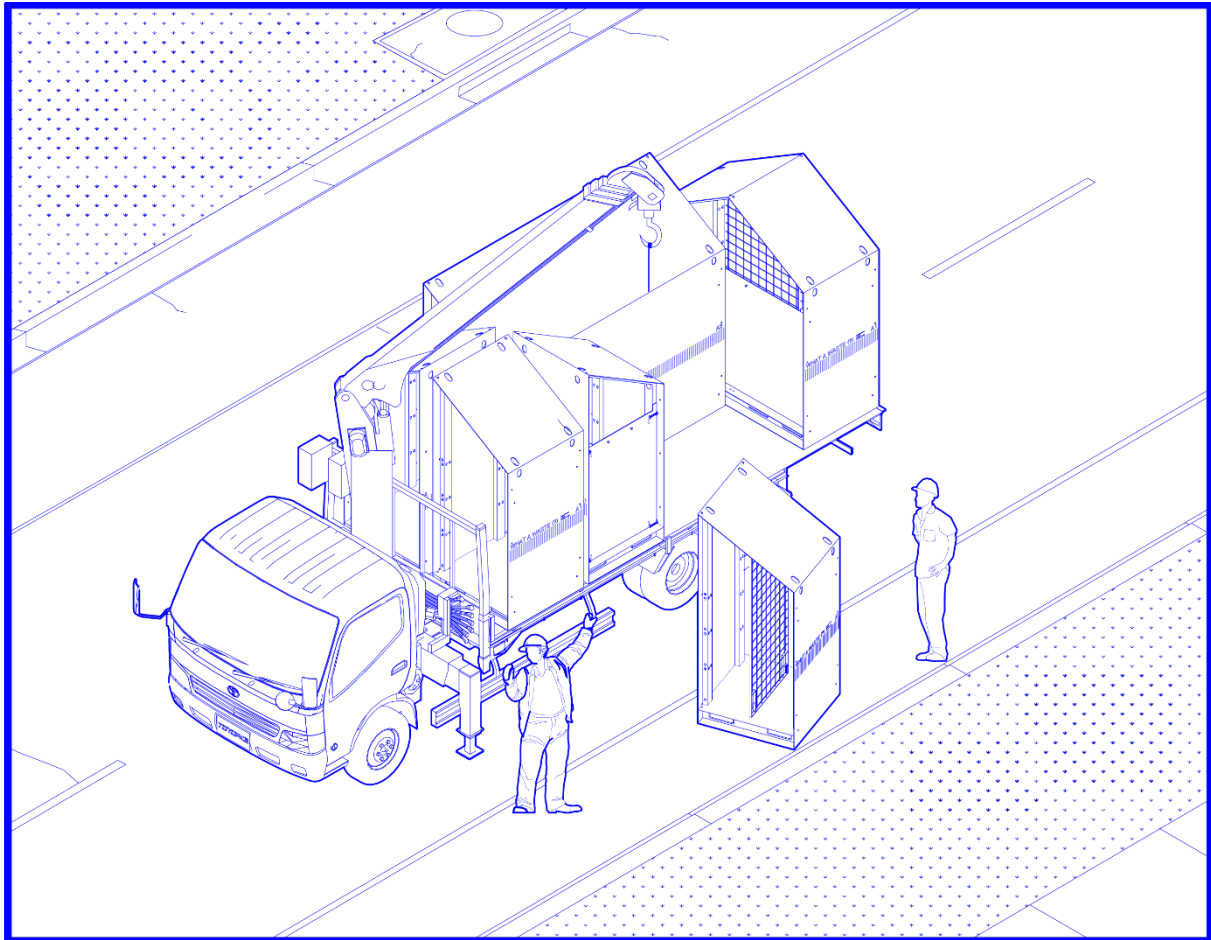
The rich blue colour palette reflects those found in traditional recycling associations, borrowing an already established colour to programme identifier. This also helps to differentiate itself from other bins found on construction sites much like the form, whilst its vibrancy helps to avoid accidental collisions due to its temporary street parking allocation.



Much like high visibility clothing, “What a Waste (?)” Containers are easily identifiable

Delivery – A workable scale

Each individual container is compacted enough to be easily transported by a smaller truck, featuring anchor points based off shipping container designs, to be lifted into location via a small onboard crane. Using a smaller truck will aid in maneuverability for traveling within commonly cluttered and busy construction areas. In addition, the bases are designed to fit within the standardized pallet system, where within a warehouse setting, they can easily be moved around with either a standard pallet jack or forklift.



Containers can be easily and quickly transported on smaller trucks.

Construction – Durable and easy to build

Each container has been designed to reflect similar manufacturing methods to that of existing skips and would be fabricated in very much the same way. Comprised of steel plate and square tubing, with blue powder coating for hard wearing and simplistic enough for mass production.

Name – To make you think

The term “What a Waste (?)” is presented to be thought provoking. It proposes the question through an off the cuff exhaustive and expressive nature when faced with such wastefulness. However, begs the question of is it waste? To think about the impact, and how these materials could be reused. Does it have to be waste? It’s a matter of perspective and how we perceive the items we use them. To some it may be seen as not worth their time, but to some it may be an opportunity, and that we should facilitate the opportunists and encourage reuse.

Incentive – Why should trades use this?

A system like this allows trades who dislike the amount of waste they generate, to have an alternative method that they typically don’t have an option for. However, all trades could benefit from the fact that by filling up their own skips less, there’s a financial incentive to use these containers first, and reduce how many skips they need to go through. Where their bins could ultimately only contain legitimate waste.

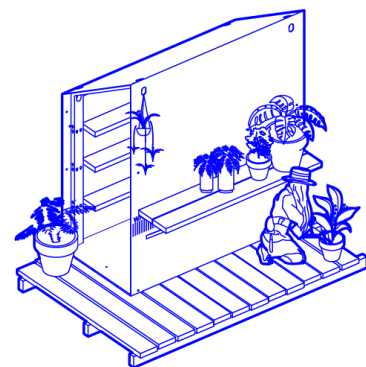
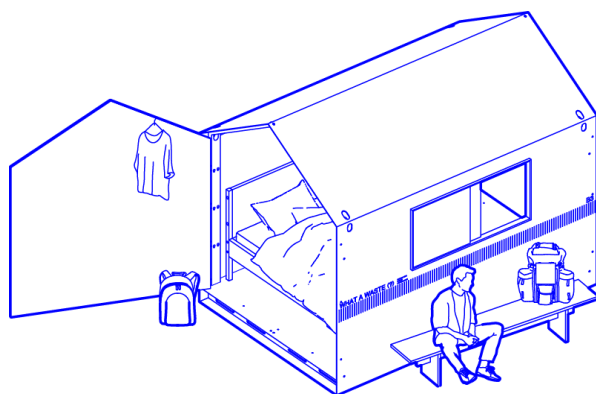
Materials – What will be collected?

It would be idealistic to collect all left-over materials possible, however logistically that would be extremely difficult. Though to being with it could attempt to focus on the primary raw materials being discarded and expand from there. Such as looking at collecting:

- Bricks
- Tiles
- Carpet
- Plaster
- Architrave
- Flashing & Gutters
- Plywood
- Cement
- Sheeting
- Timber
- Steel framing
- Paints
- Trench mesh
- Corrugated iron

End of Life – Other uses

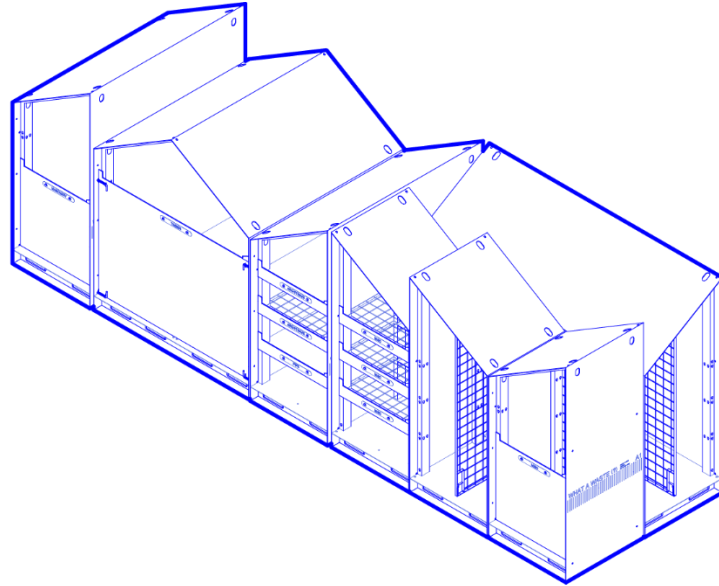
Unfortunately, these containers can’t last forever, they will eventually need to be decommissioned like shipping containers have to be. However, due to their nature and small scaled design, can easily find second life functions, much like the materials they once held. These could include temporary disaster housing for the homeless or garden/storage sheds in people’s backyards.



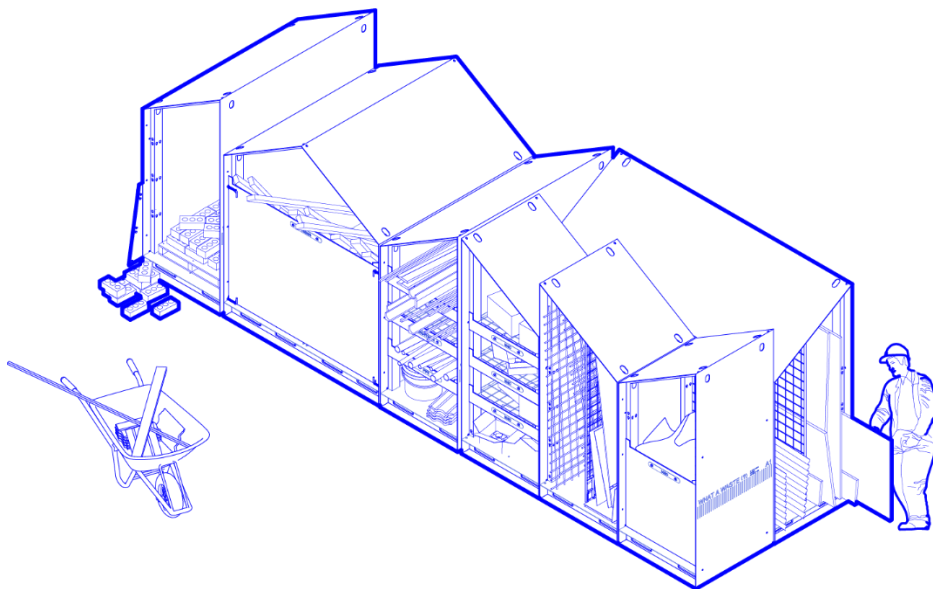
Use – As easy and intuitive as possible

Once the containers have been delivered and arranged within a busy residential development, all trades people within the area can begin to fill up each tub with its allocated material until full. Each container features a name plate to help differentiate what each container deposit is intended for.

Empty containers



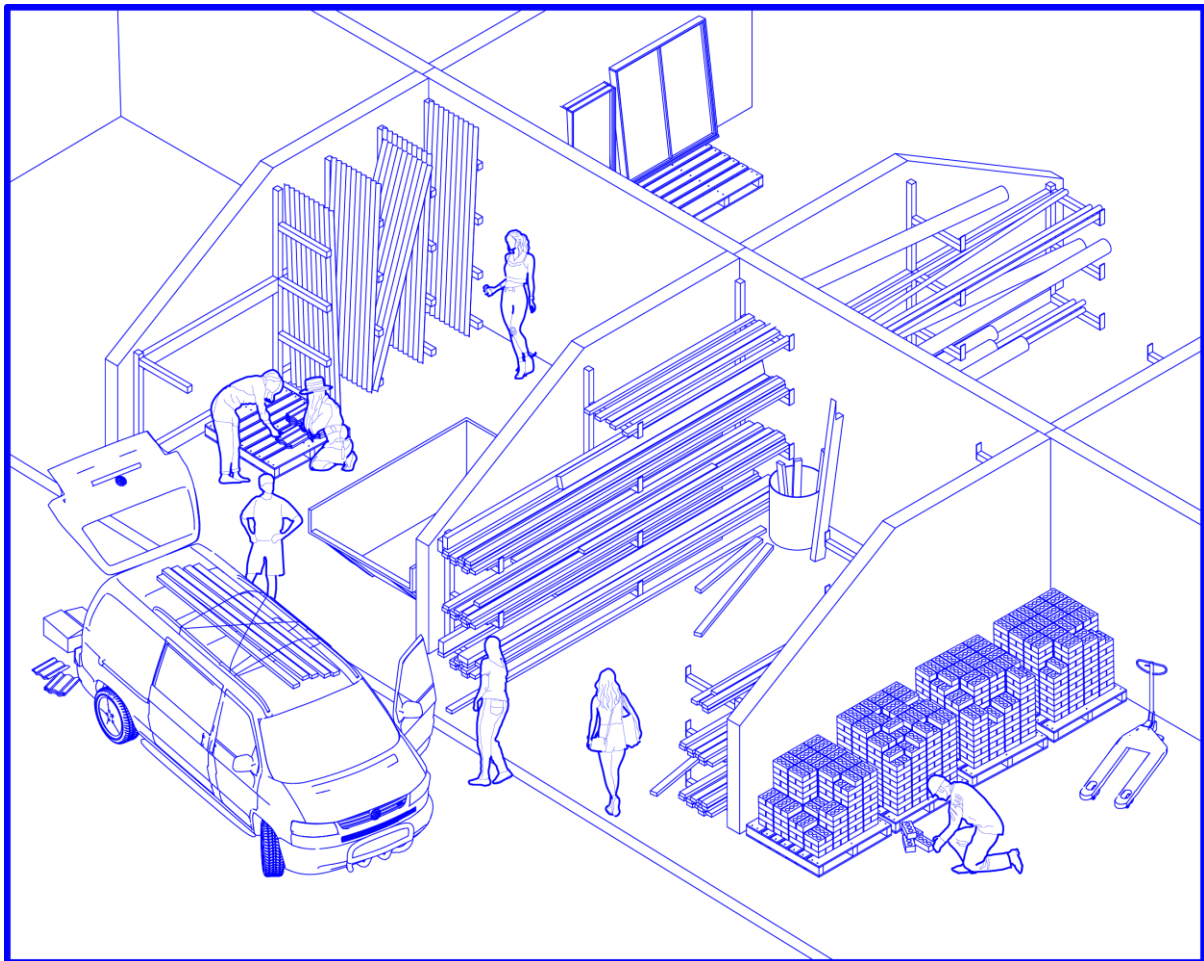
Full containers



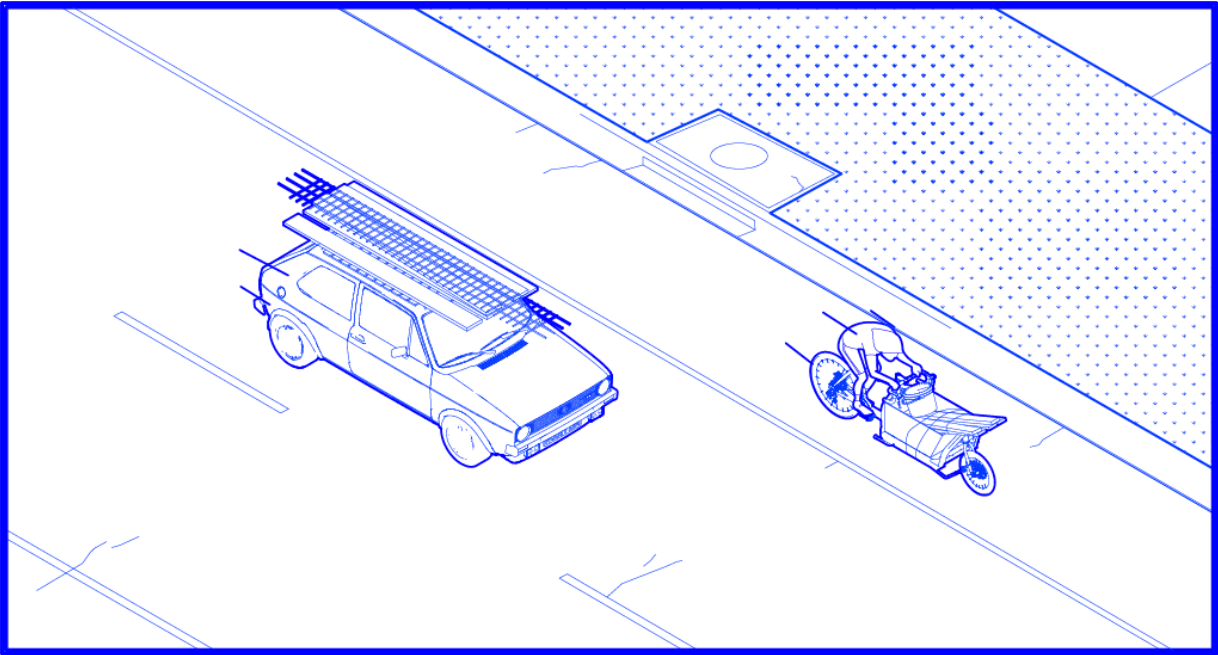
Before & After

02.04. REDISTRIBUTION / COLLECTION POINT

Once the discarded materials are collected through the container system, they can be returned to a local depot centre and emptied. From there, they can be sorted into their different categories and stored for collection. This depot should be easily accessible by the public, where they can sift through the recovered materials for collect and take them home.



Example of a collection depot, with materials sorted into their different properties and easily accessible.



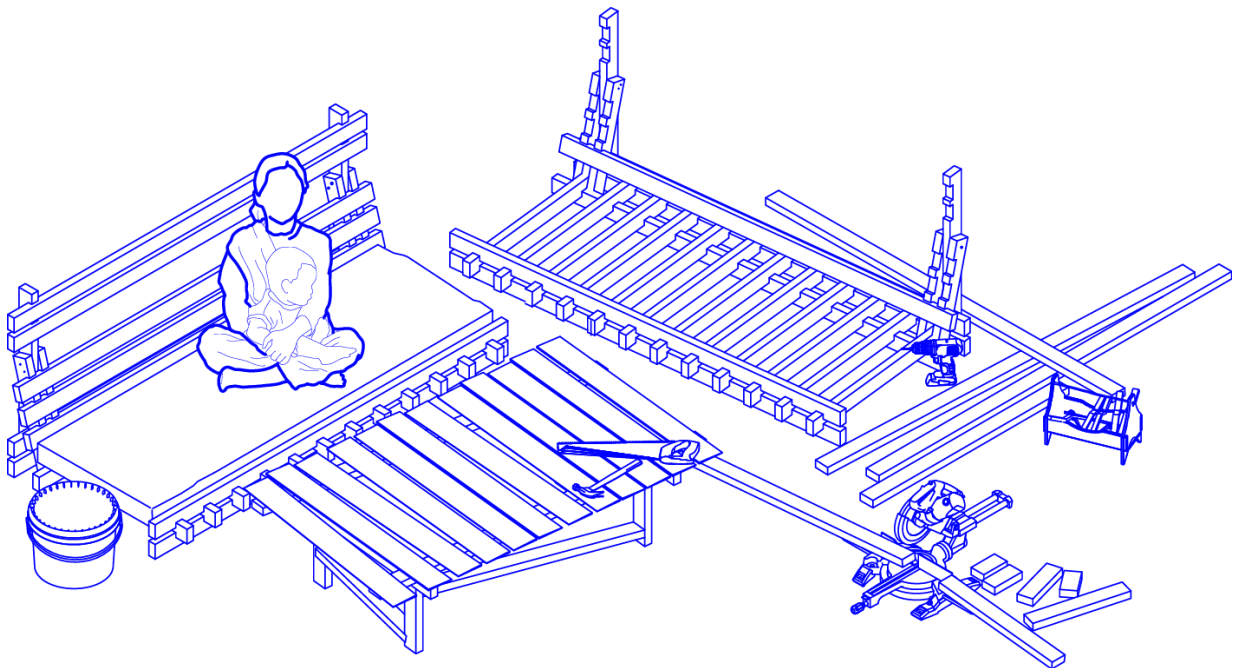
Everyday people and trades can then take what they need and bring it home.

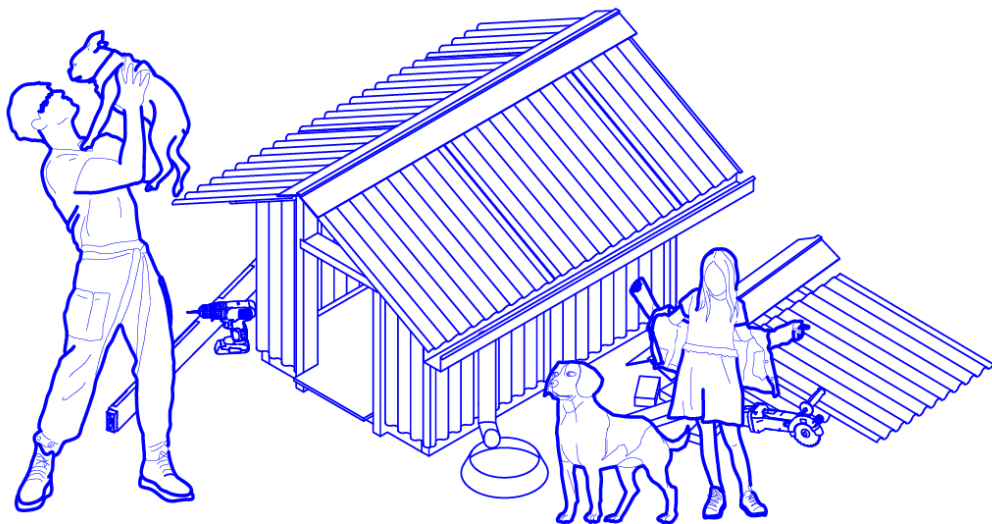
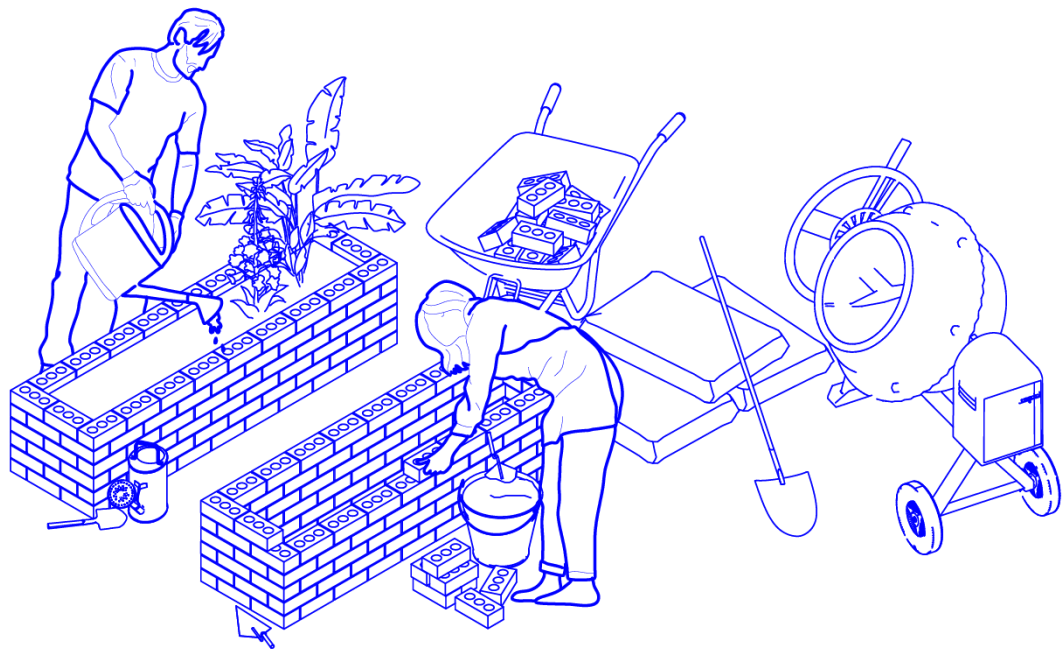
02.05. REUSE

Once the materials have been collected and taken home, people can repurpose those materials for however they see fit, from using them around the home for everyday projects like building furniture or making simple home repairs. Alternatively, tradespeople can integrate those left over materials back into construction projects.

Home project examples include:

- Garden beds
- Brick paths/paving
- Outdoor furniture
- Construction fencing
- Edging of gardens or walking paths
- Dog kennels
- Construction for outdoor pavilions
- Building outdoor fireplaces/pizza oven

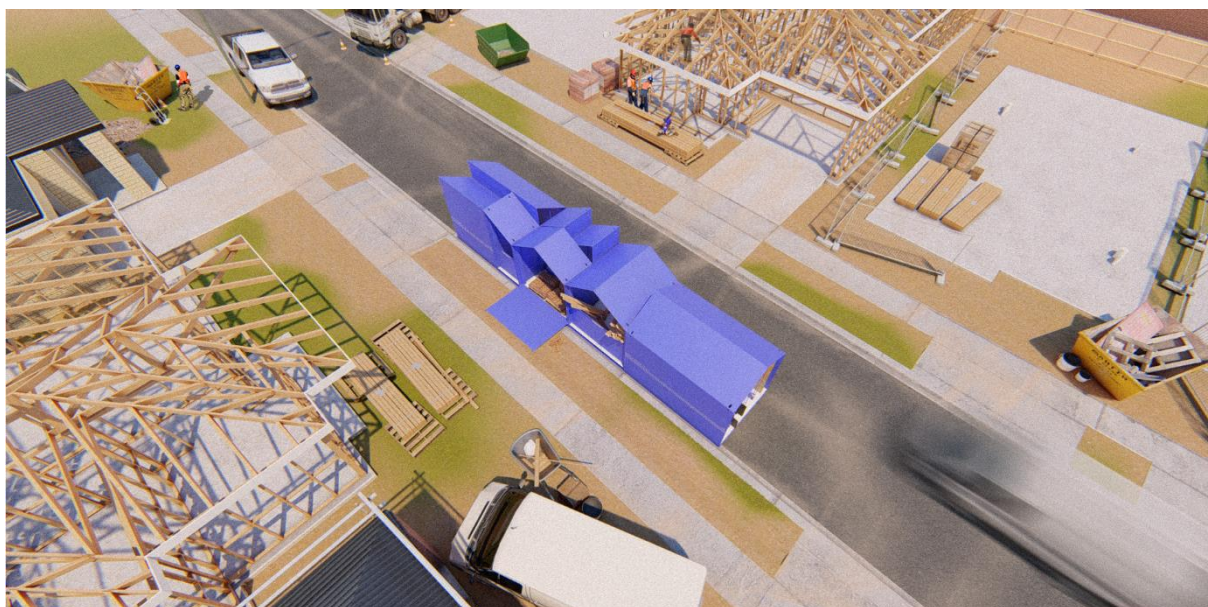




Examples of people reusing construction materials

03. CONCLUSION

The What a Waste (?) container system seeks to fill a significant gap presented within Australia's residential construction boom, through a system that's flexible, expandable, and easy to use. Helping to drive down Australia's construction waste, creating a more circular economy, whilst simultaneously offering everyday people access to left over construction materials for home projects.



What a Waste (?)

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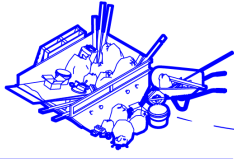
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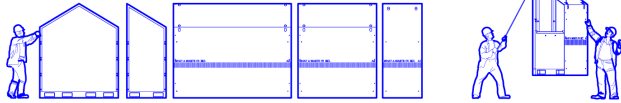
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WHAT A WASTE (?)



[Surplus construction material, it doesn't have to be a waste]

Reusing discarded materials from Australia's residential construction boom. A modular and flexible container collection system, localised around major residential construction zones, giving discarded and left over materials a second chance. Helping to reduce its already 40% contribution to Australia's total waste.



1 System, 6 different containers, 20 sectional pieces

Method of salvaging materials

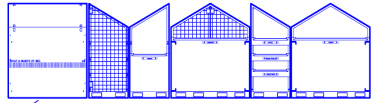


Collection

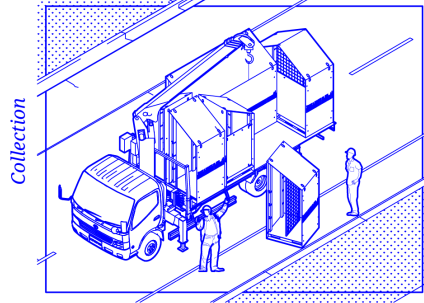
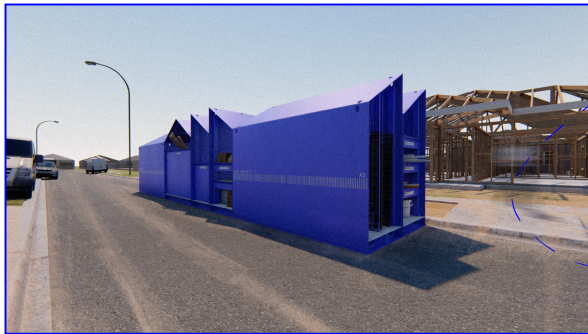
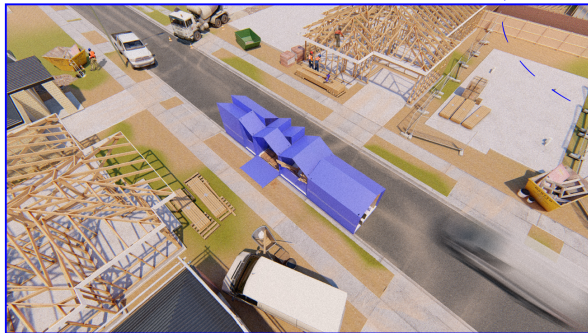
Recirculate

Reuse

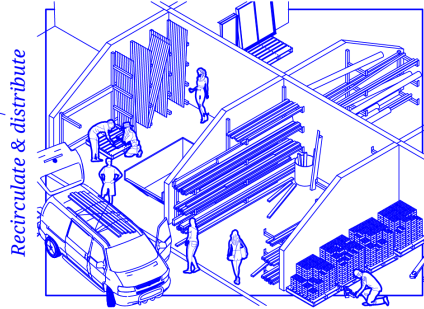
Collect the leftover materials, redistribute them back into a single point, reuse those remaining materials



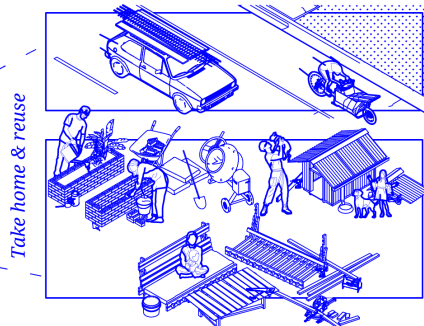
Customise and build for different materials



Collection



Recirculate & distribute



Take home & reuse

