

Weaving the
Waste out of
Furnishings.
A Textiles
Report.



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Executive Summary

The NSW Environment Protection Authority (EPA) engaged Karie Soehardi Consultancy of **Circular Design Thinking**, to conduct research on the local manufacture of seating and drapery (curtains) and the **textile waste** involved in creating these furnishings.

THE CHALLENGE

At the time of writing this report there is limited published data around furnishing textile waste in local manufacturing. The available published reports on textile waste tend to be fashion-centric. Written information found on dismantling furnishings for recycling of the materials and components, is conceptual.

Therefore **industry insight is fundamental** to understanding the amount of waste created in furniture production. It is also important to clarify the design and manufacturing process of these products, to understand how to dismantle them for the relevant waste streams.

To date, **no in-depth interrogation** has been carried out into local industry operations and what **true textile waste is being generated**. Therefore, it would be fair to say that no significant knowledge has been gained to this point, leading to any practical solutions on how to handle the vast amounts of waste produced.

THE METHODOLOGY

The following assumptions are used in this report:

- Interviews were conducted with local manufacturers, fabric houses and other stakeholders i.e. councils, recycling companies, material suppliers.
- This report includes desktop research of articles and publications on furnishing textile waste and furniture dismantling.

THE FINDINGS

This study is an attempt to **map out and identify the implications of pre-consumer textile waste in furnishing production**. In undertaking the research **3-5% of textiles became waste**, regardless of the size of the order or type of furnishing.

Recycling of the textile waste was also seen to be challenging due to **infrastructure and/or the price to recycle versus the cost of landfill**.

RECOMMENDATIONS AND PATHWAYS TO SOLUTIONS

To improve textile recovery, it is imperative to bring **manufacturers and bodies together** at the grass roots level. It will then be possible to **recognise strategies and best-practice solutions to control and mitigate the issues surrounding the waste created, eliminating it at its source - the commencement phases of design and production**.

Introduction

Acknowledgements

NSW Environmental Protection Authority and Circular Design Thinking would like to thank the contributors to this report - Kvadrat Maharam, Turner Bros, Zenith Interiors, Zepel Fabrics, Mokum Textiles, James Dunlop Textiles, FBD, E9 Design, Shade Studio, Southern Sydney Regional Organisations of Councils, Albury City Council and the numerous other people who made themselves available to discuss their own experience in furniture manufacturing, recycling, waste and disposal. Thank You.

It is necessary to look at the elements and componentry that makes up furnishing textile waste as a whole.

Fabric has usually been sewn, glued or fixed to other materials such as timber, foam and plastic before the **textile** is discarded.

It is industry knowledge that the **recycling or reuse** of furnishing textiles can only be solved if the dismantling of the entire product, (without contamination) can be accomplished.

When many think about **textile waste** they automatically think about **fast fashion**. However textile waste isn't just a problem for the garment industry. There is a different type of throw away textile and it's found in **fast-furniture**.

To date there haven't been effective channels for waste stream management of these type of textiles. Obstacles to understanding this textile waste lie within the design of each type of furniture. **Pre and post consumer** problems arise in both steps of the **road map** (following page).

In addition, these textiles can be deceptive, hiding in plain sight as a cushion, part of an armchair or a headboard.

Through this report, it has been discovered that **industry insight and engagement** is crucial to any implementation of change, however this cannot be done alone. Relationships with councils, the waste and recycling industry is paramount.

This report provides an opportunity to initiate connections between **stakeholders to create a strong infrastructure** for the **furnishings industry to remove waste and move to a circular economy**.

This report has only been possible due to the **willingness of contributors** to be **open and transparent about the realities** of their businesses, operations, product development and waste streams. All shared priceless, **innate knowledge and experience**.

What stands out the most, is how much these **contributors care** about the **environmental changes necessary** for their industry to thrive **without further harm** to the planet.

Shells for back
of chairs -
FBD's Padstow
factory

This report follows three fabrics through the production process of a sofa (lounge) and a pair of curtains sourced from local fabric houses to a factory and workroom.

Textile Study

Road Map

Step 1
Product
Design and
Planning

Step 2
Textile
Sourcing and
Ordering

Step 3
Production and
Pre-Consumer
Waste

Step 4
Storage and
Order
Distribution

Step 5
Installation
or Customer
Purchase

Step 6
Usage and
Post-Consumer
Waste



The Process

For both upholstery and drapery the production process remains the same.

Once the design of the project has been approved the design team will start selecting materials.

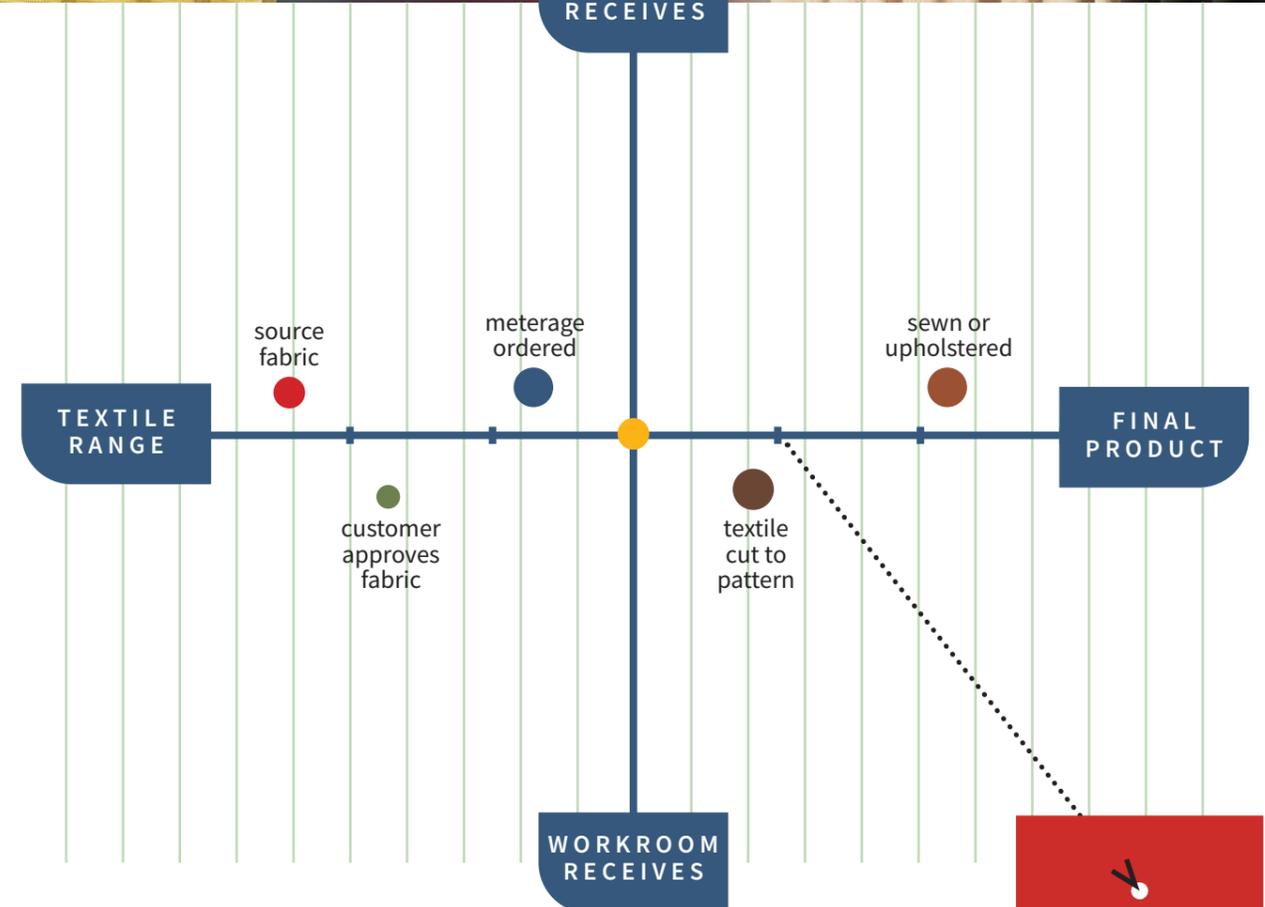
They will source a variety of fabric samples that suit the client's budget and taste.

The client will then approve the samples. Fabric needed to fulfill the order will be calculated and then ordered accordingly.

Turner Bros machinist completing the 'header' of a curtain.



FACTORY RECEIVES



P. 9

Textile offcuts are recycled or sent to landfill. They are unusable.



Drapery - An Outline

- What is a Drapery Textile?
- Understanding Drapery
- A Curtain Example
- Drapery Contributors
- A Drapery Study
- The Make of a Curtain



What is a Drapery Textile?

Drapery or soft furnishing textiles are used to make curtains, blinds and cushions.

These fabrics are categorised for **residential** and **commercial** use which allows the buyer to source 'fit for purpose' textiles.

In a nutshell, a drapery textile is a cloth used to cover a window.

Curtain materials can be solid or sheer. Sheer fabrics allow for light to enter a room. Curtain linings have different densities to filter light.

These textiles can be made of natural fibres, synthetics, metallics or a mixed blend.

Understanding Drapery

Drapery, also called curtains, are a type of window covering that is installed via fixtures that sit across a window.

Curtains are used for a variety of reasons: aesthetics to darken/lighten a room; and for acoustics (noise reduction).

From an **environmental perspective** curtains can cool a room in summer and retain warmth in winter (and by default reduce energy costs).

In this report, terminology will flip between **'drapery' and 'curtains'** as both are acceptable when discussing window coverings.

A curtain tends to use a lot of fabric as it needs to cover a window, without looking like a sheet.

Ready-made curtains are available in stores in 'standard' sizes. However there aren't standard window sizes. Many designers tend to specify **custom-made curtains** for commercial projects.

The formulas for calculating the amount of fabric needed for window coverings is shared in the examples over the following pages.

To clarify the details of making a curtain and all the possible variations, this report, tries to simplify curtain making as much as possible, in relevance to understanding the **textile waste**

created in production.

Things to note for fabric usage:

- Custom made curtains and linings are tacked together either with a fine plastic toggle or by hand. The only part of the curtain that is sewn together is the header (the top of the curtain). Not all curtains need to be lined.

- Cost effective drapery fabrics may have a rubber coating applied to the back of the fabric (**blockout**) or compile of three different threads (the darkest woven in the middle) to then create a **soft-weave**.

The following window coverings have been excluded in this report but still create textile waste:

- Fabric roman and roller blinds
- Industrial roller blinds
- Awnings and outdoor window coverings.



Example of
a soft weave
fabric at
Turner Bros.



Turner Bros - Fabric being moved around the workroom on a pulley system. This enables staff to manage the weight of the curtains as each part of the production process is completed.



Turner Bros - The curtain's hem is sewn first, not last.

To quantify the **textile waste** that can be found in a commercial project, it is important to explain the **amount of fabric** that can be used in **one window covering**.

Imagery from the site visits to Turner Bros has been included to reference the **different processes** involved in making a curtain (as well as the other materials or components needed to produce a covering).

An example has been created (with assumptions) to calculate the meterage of fabric needed in different scenarios.



Lead chain is sewn into the bottom of sheers to 'weight' them. 'Penny' weights are sewn into the corner of curtains. Wastage for these materials, is at disposal (as they are cut to length or used as necessary in the production process).



A Curtain Example

Below is an example of the details needed for a curtain maker to calculate fabric meterage, based on industry norms:

- Window frame is 210cm wide x 265cm height
- 30cm extensions on curtains for both sides of covering
- Curtain extends 20cm above window via a track or rod
- Hem finishes approximately 2cm above the floor
- Curtains have 1.5 fullness and part to each side
- Drapery fabric is 140cm wide
- Sheer fabric is 300cm wide

Using these assumptions the following meterage is needed for each type of window covering.

Plain fabric

Unlined plain curtain 16.5m
Lined plain curtain 33m

Patterned fabric

Unlined curtain 21.5m
Lined curtain 37.5m

Sheer curtain 7.5m

Plain and lined with sheer:

One covering
Allow **40.5m of fabric**

Three coverings
Allow **121.5m of fabric**



Another way to look at an example is to consider a commercial scenario.

An office tower with **115 windows** of the same size - (210cm x 265cm) have requested plain, lined curtains and a sheer for each. The curtain workroom would need to allow for **4,657.5 metres of fabric.**

Other Considerations

The same office building is doing a refurbishment but have 115 existing curtains that need to be taken down for the new coverings to be installed.

As tenants tend to be responsible for the fit out and 'make good' of an interior, curtains and other fixtures are removed (as is furniture and even carpet tiles may be replaced). This is an industry expectation.

If this office tower completes a refurbishment/ tenant turn-over, every 5 years and has been established for 15 years, the amount of fabric to create curtains for this establishment over the time frame would equate to **13,972.5 metres.**

To date there aren't any legal requirements for accountable disposal of furnishings.

Current Pathways to Dispose

Curtains may be donated or sold but this would be a voluntary act by the office or tenant.

A label is usually sewn into back of the curtain header with the name and details of the maker - however this isn't something that is widely known.

Documentation of the design firm that specified the curtains, or the textile house the fabric was sourced from, may not be available.

Another consideration is the need for offices quickly dispose of the curtains and the most convenient and known way is through a skip bin that is sent directly to landfill.

Drapery Contributors - Zepel Fabrics

Zepel's 'Chance' has been made into curtains by SOM Blinds and installed at the Sussex House.

Zepel Fabrics was founded in 1978 by the Filipou Family that partnered with giant Belgium textile mill, **Bru Textiles** in the early 2000's.

Zepel transitioned in 2017, when the Filipou Family exited the business and Bru Textiles and **James Dunlop Textiles** formed the **James Dunlop Group**. James Dunlop textiles is the largest furnishings fabric house in Australasia. This entity enables an even further expanse of global resources available to the local market.

Brands under the umbrella include Zepel, Mokum, Pegasus and James Dunlop.

The Australian head office is based in Alexandria Sydney NSW.

James Dunlop brands actively develop environmental textiles, including recycled yarns, and have global industry environmental credentials as well as sustainable practices, including 'Living Wage', textile recycling, and beehives.

Est Lighting showroom -
Floor to ceiling curtains
designed and supplied by
Esenar in Zepel 'Allusion'.





Drapery Contributors - Turner Bros



Turner Bros was commissioned to make the window coverings for International House Barangaroo.

Turner Bros is a family business and was established in Kogarah in 1906. As a wholesaler, the company has been working with interior designers, architects and retailers for **116 years**.

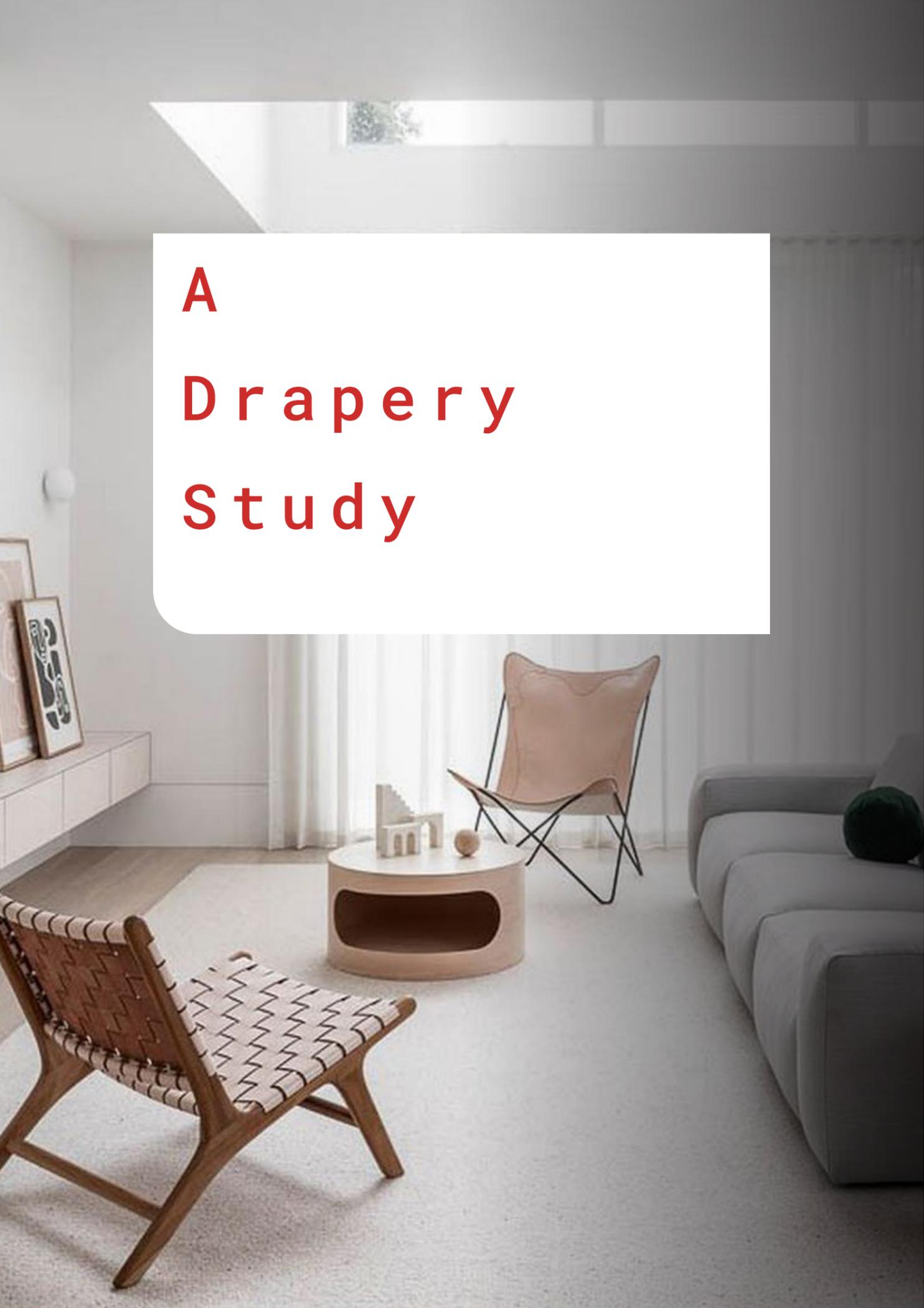
Ready-made curtains for retail stores, ceased being manufactured by the organisation in the 1990s when imported **ready-mades** were too cheap for Turner Bros to compete on price with.

Since then, all orders have been custom made for local projects as well as export.

Environmental projects Turner Bros have manufactured window coverings for:

- **International Towers Barangaroo**
- **International House Barangaroo**
- **1 Bligh St Sydney.**

All three projects have received green credentials including Green Building Council of Australia's **6 Star Green Star** rating and **5 star NABERS** energy rating, for the overall building fit out and construction.



A Drapery Study



Contributors were asked to take part in the study to highlight the processes of curtain making - and document the textile waste created within the procedure.

It is expected that the drapery study enables those external to the industry, to gain an understanding of the amount of textiles used and waste generated.

The drapery study follows a refurbishment order for a hotel in New South Wales using the fabric 'Retreat' from Zepel Fabrics and how it is then manufactured into a curtain at Turner Bros' Marrickville workroom.

Zepel | Retreat Fabric

The composition is 100% polyester and has a rubber backing to keep light out.

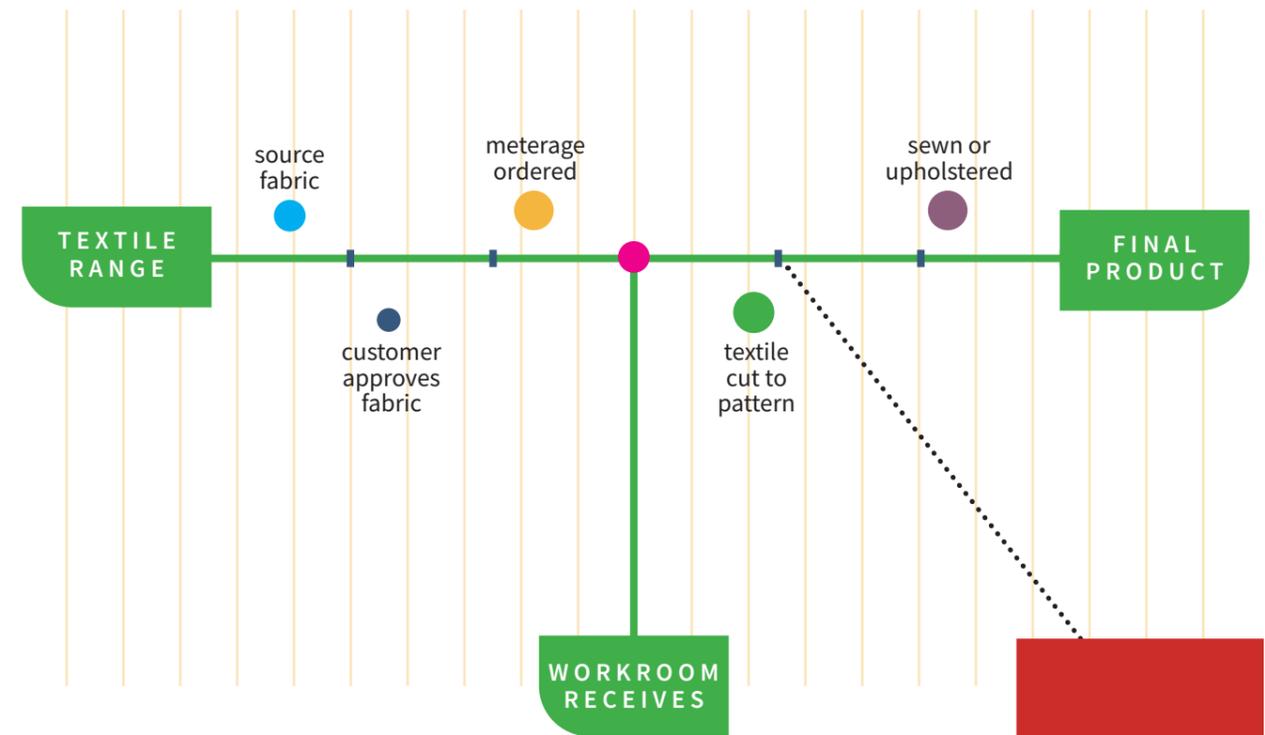
Retreat meets certification for Oeko-tex 100 (an environmental credential for the textile industry).

It has a colourfastness UV 6/8 Blue Scale rating - applicable for commercial fitouts.

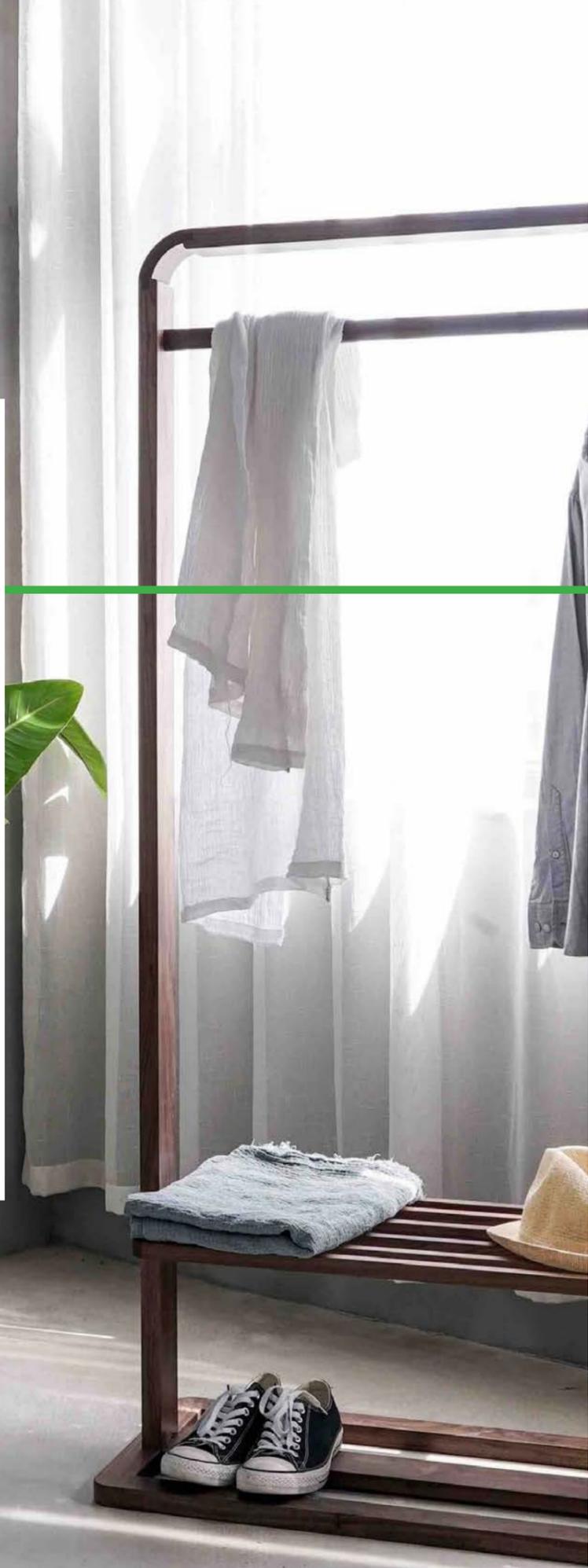
Retreat also has a fire retardancy applied (required in commercial settings).

When sewing with Retreat, stitch holes are unavoidable due to the rubber coating, so the curtain maker will need to sew a second seam to cover the holes from the needle of the sewing machine.

Retreat's usage is perfect for the case study - cost effective drapery for a hotel refurbishment.



The Make of a Curtain



NB: 1. PRODUCT DESIGN + PLANNING.

No details provided

2. SOURCING + ORDERING

RETREAT 535 Metres

Turner Bros receives 535m to fulfill hotel refurb

3. PRODUCTION + PRE-CONSUMER WASTE

Fabric is cut to spec + offcuts 3-5% textile waste produced

Retreat order created approx. 21.4 metres of waste disposed into landfill

4-5. DISTRIBUTION STORAGE + INSTALL

DELIVERED TO SITE

Curtains installed, others removed.

6. USAGE + WASTE

ASSUMPTION

Unwanted curtains sent to landfill.

Zepel sold **10,291 metres of Retreat Fabric** from June 2021 - June 2022. **5.2% or 535 metres** of this fabric was used to make the curtains in this case study.

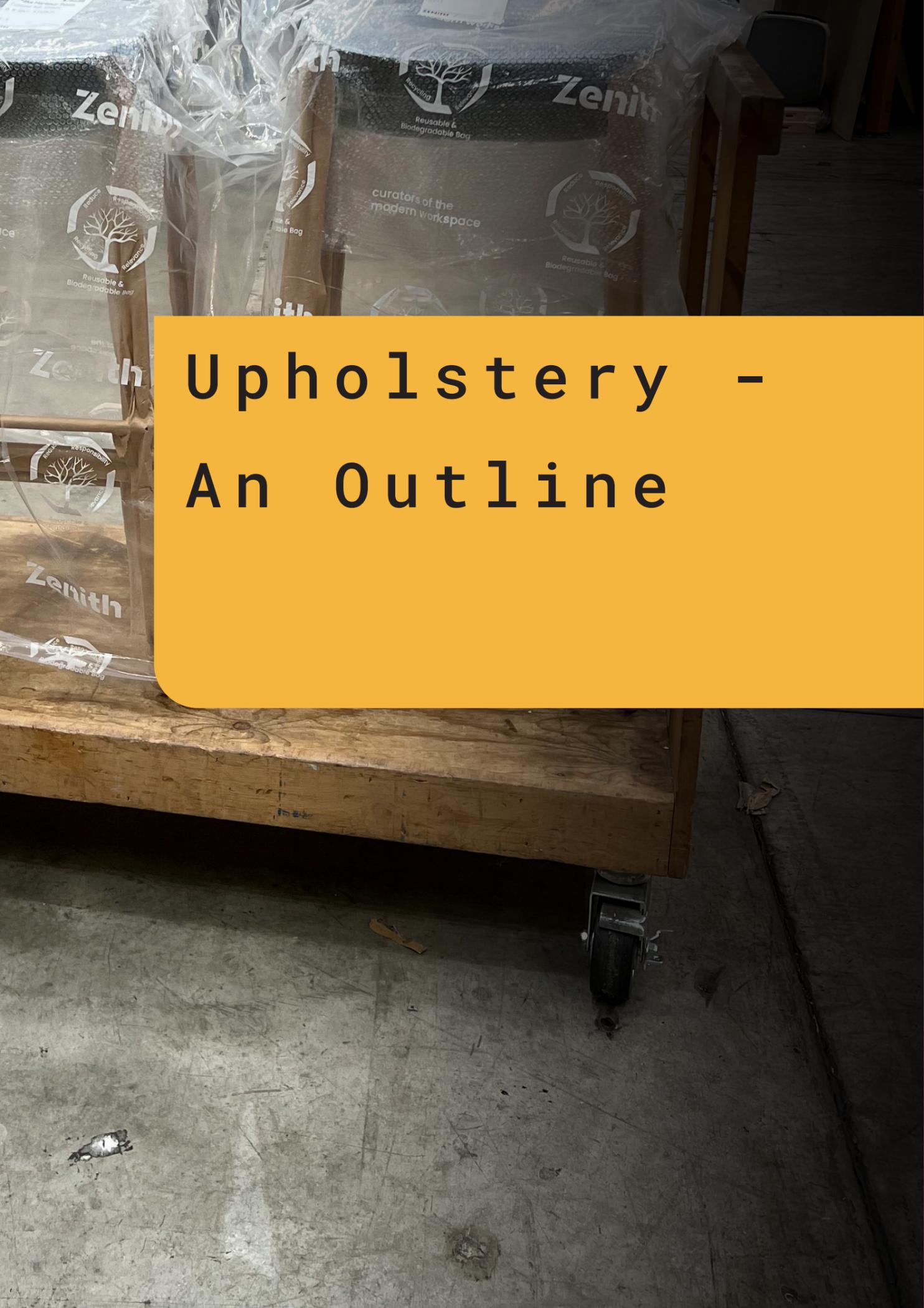
Once Turner Bros receives the **rolls of fabric** they mark the pattern and cut the **drops** (metres) to length. **The average waste on a roll is 3-5%.**

The Retreat fabric then goes through the production processes of sewing the hem, sides and header. The curtain is then checked for any mistakes, fabric damage and quality of make, before being packed and flagged as ready to be dispatched.

The Retreat order created approximately **21.4 metres of wastage**. The waste stems from the fabric being cut from the many rolls supplied to the workroom, so the **textile offcuts become unusable.**

Once produced and checked for quality, the curtains are installed at site, a 'walk-through' is done by the designer and end customer to check the quality of installation of product and finishes.

Once approved 'signed-off', the curtain order is now complete.



Upholstery - An Outline

- What is an Upholstery Textile?
- Understanding Upholstery
- Upholstery Contributors
- An Upholstery Study
- The Make of a Lounge
- A Retail Example
- Design + Innovation



What is an Upholstery Textile?

Upholstery textiles are fabric applications to cover sofas, lounges, armchairs, dining chairs, ottomans and other types of seating. These fabrics are categorised as **commercial** or **residential**. This informs the buyer what is '**fit for purpose**'.

Upholstery textiles need to meet a certain **martindale** or **wyzenbeck** (rub rate) to be used in commercial settings. Any ratings that are lower than 30,000 martindale aren't considered for these projects, as the **traffic** on the textile would wear the fabric too quickly and need to be

replaced in a short time frame. A **high martindale fabric 30,000+** is considered commercial standard and is expected to be durable enough for the **wear and tear** over the project's lifetime.

Upholstery materials can be made of natural fibres, synthetics or a mixed blend. Vinyls and leathers have been excluded, as although they are upholstery 'textiles', they technically aren't fabrics.

Understanding Upholstery

Seating does not tend to use as much meterage as curtains. However the amount of materials and components within upholstery are more extensive.

Upholstery is defined as the soft furnishings that are fixed or connected to a piece of furniture.

The upholstery materials include face (front), textile (or leather/vinyl), foam, dacron, springs and webbing.

An outline of other materials and componentry that can be found in an upholstered furniture includes; timber/metals, glues, adhesives, nails and screws, plywood, MDF, cardboard and staples.

Similar to the drapery case it was important to simplify details and focus on the processes in manufacturing.

For mechanical recycling to occur, materials need to be sorted into types of fibre for processing. As the upholstery is made up of bonded materials it can be time consuming to pull each piece from the other.

When glue has been applied to one or many of the materials, it can **contaminate** the furnishing textile so the whole product ends up being shredded and sent to landfill.

Types of Upholstery Fabrics

Cost effective furnishing textiles may have a **bonded backing** to give the face textile stability. This is so the fabric doesn't move when being cut and shaped around a piece of furniture.

Mid to premium fabrics are made with better quality yarn and designed to have weight and structure to suit usage.

Fibres commonly used in commercial upholstery include:

Wool - due to durability, weight and inherent fire resistance. 100% wool is a commercial standard but can be mixed with other fibres.

Polyester or a derivative such as **microfibre** - as it is moisture repellent, durable and easy to clean. It can also be inexpensive to produce or select.

Blended Fibres - Usually a polyester and natural fibre mix that meets a minimum of 30,000 martindale.

Suprisingly **cotton** is hardly ever used in commercial upholstery textiles and if used is usually a mixed composition.

Textile Treatments such as fire or stain resistant chemicals can be woven, sprayed or dipped onto the material.

A **positive trend** for textiles, is **recycled compositions** (including rPET - recycled plastic bottles) This is driven by specifiers and customers.

Offcuts from this study - paper patterns are mixed in with other materials such as leather, card and plastic.



Top selling Jac chair shells are stocked ready for completion. For every Jac chair sold, Zenith plants a tree with OneTreePlanted.



Seating for commercial spaces are broken into the following categories:

- Workplace
- Education
- Hospitality
- Public
- Retail.

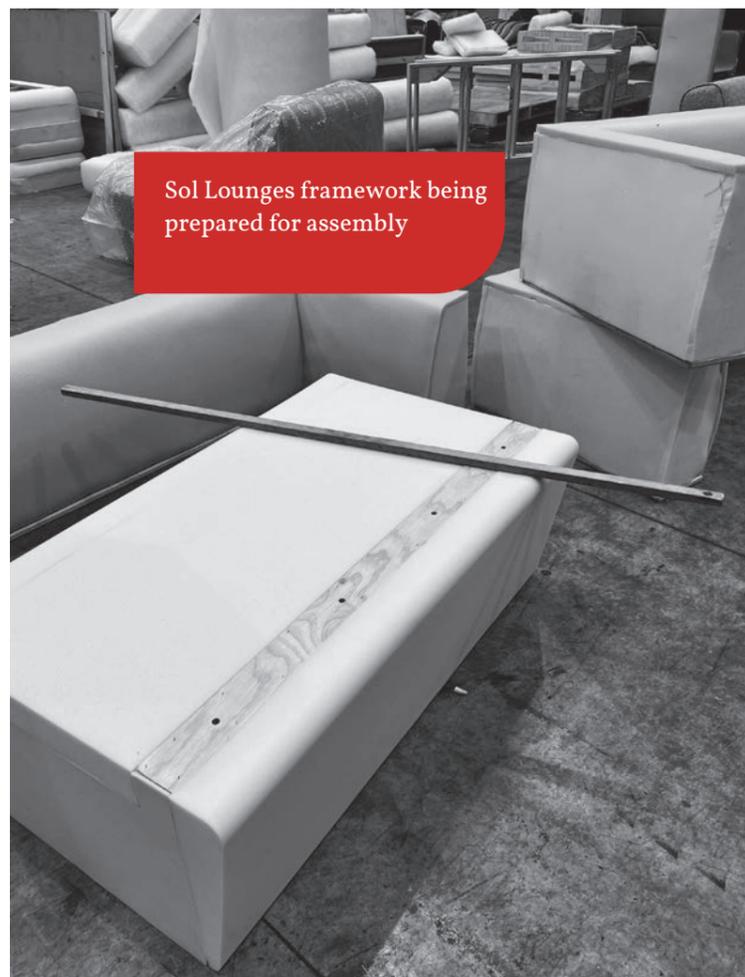
The type of upholstered seating systems include:

- Sofas
- Modulares
- Armchairs
- Ottomans
- Banquet
- Privacy.

Jac Chair 'with arm rest' being quality checked ready for packing and delivery.

This study follows two upholstery textiles through the production process of a chair and lounge order at the **Zenith Interiors** factory in Kingsgrove.

The **Kvadrat Maharam** fabrics are **Merit + Meld**. The fabric house's head office is in Surry Hills and has showrooms across Australia.



Sol Lounges framework being prepared for assembly

Upholstery Contributors - Kvadrat Maharam

Kvadrat Maharam is a unique joint venture between world renowned textile houses **Kvadrat and Maharam**. Both organisations are known for their premium quality fabrics. Established in 1968, **Danish brand Kvadrat** specialises in wool and colour. **Maharam founded in New York** in 1902 is known for pattern and durability.

Each company has targets around recycled content in their product development and both **report on environmental credentials and targeting**.

Kvadrat Maharam is currently in the process of auditing their carbon footprint and reducing impact in their operations.

Kvadrat takes back their wool textiles in Europe at the end of life-cycle to **process back into recycled wool ranges**.

Kvadrat has a commitment to **Science Based Targets** and a genuine focus to become net zero by 2040. Maharam also has an assortment of **stringent certifications** such as **Cradle to Cradle** and **Prop 65**.

Kvadrat Maharam is the premium textile house in Australia and is used in a lot of commercial work due to the quality and durability of the materials.

Australia is the **only country** to house this unique partnership which was established in 2001. The local business is at present implementing sustainability strategies around its own environmental targets.



Zenith Interiors Kingsgrove Factory
Study Seating completed

Upholstery Contributors - Zenith Interiors

Zenith Interiors began as a partition and joinery company in 1956.

Zenith's factory originated in Melbourne with independent showroom facilities, purchasing and then selling the factory's products.

In 2009 a parent company was established and furniture began to be manufactured in Kingsgrove NSW.

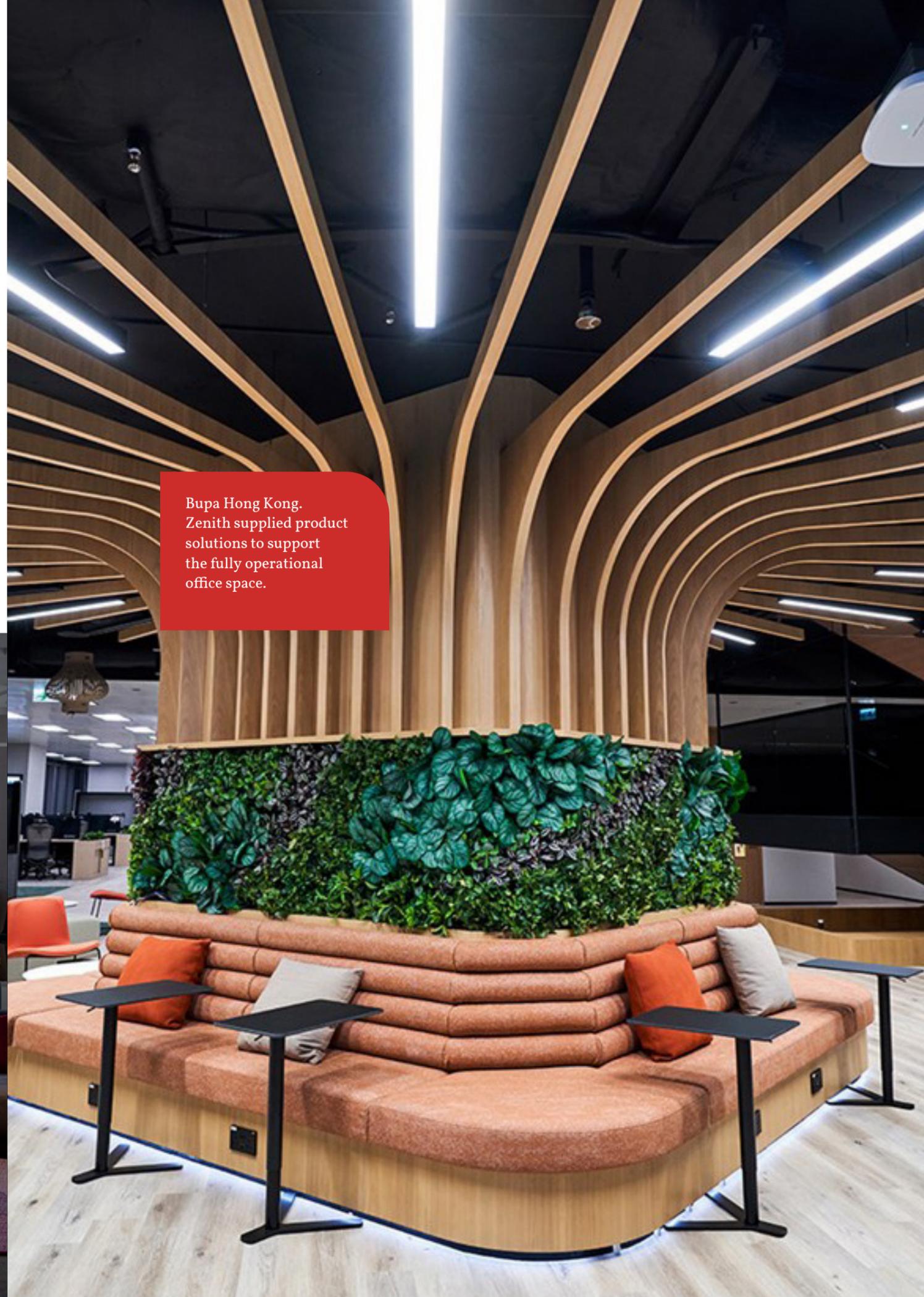
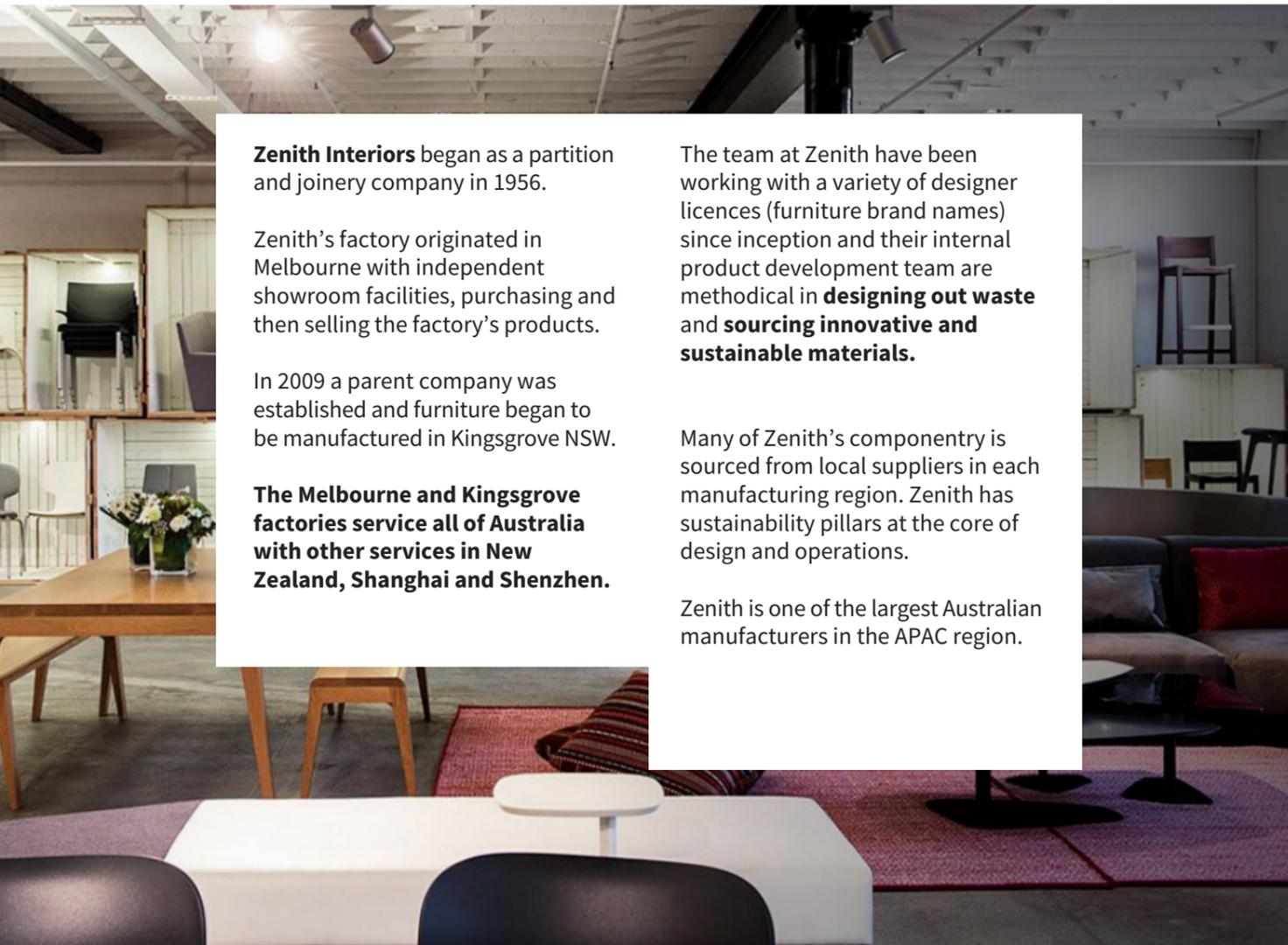
The Melbourne and Kingsgrove factories service all of Australia with other services in New Zealand, Shanghai and Shenzhen.

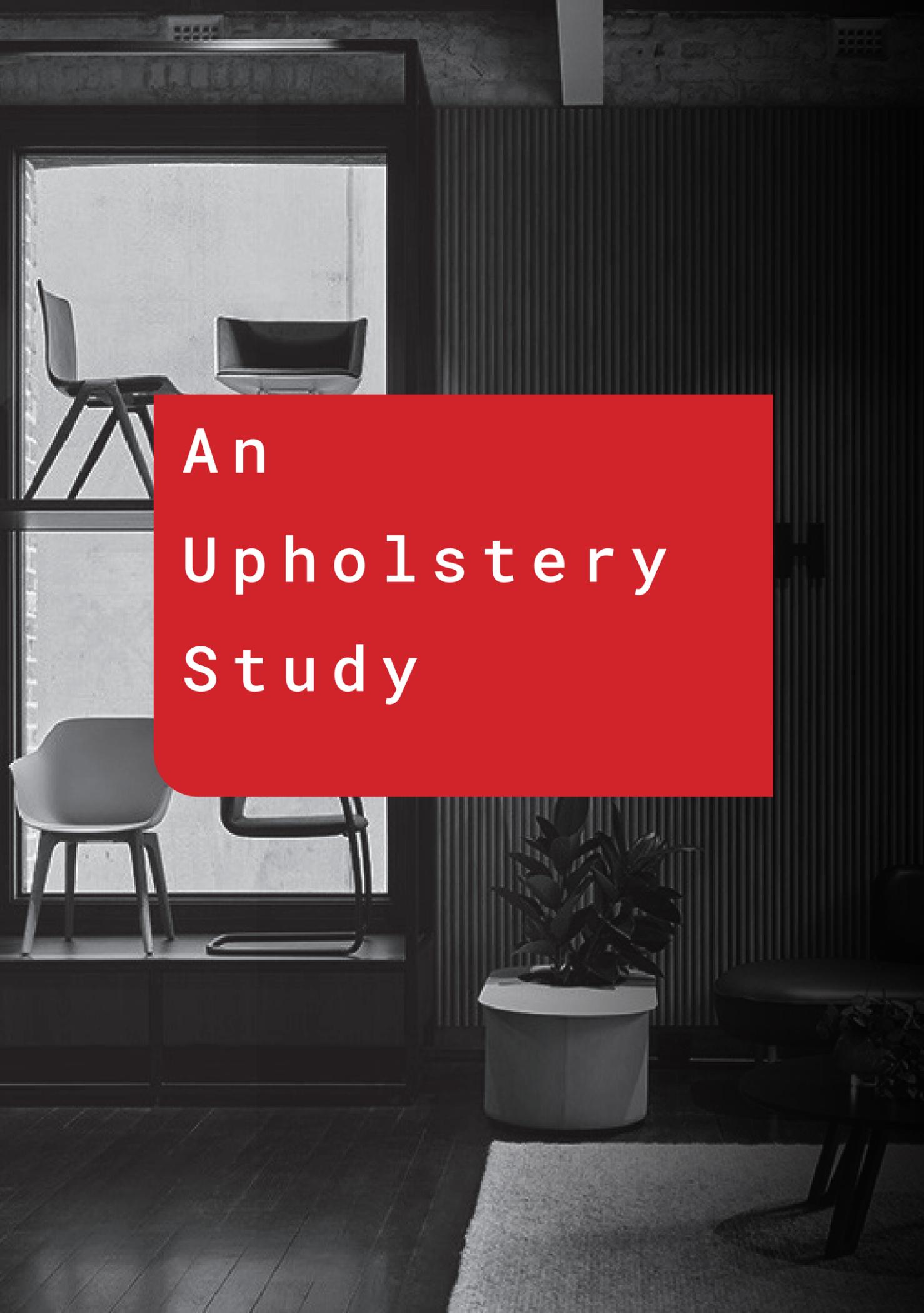
The team at Zenith have been working with a variety of designer licences (furniture brand names) since inception and their internal product development team are methodical in **designing out waste** and **sourcing innovative and sustainable materials**.

Many of Zenith's componentry is sourced from local suppliers in each manufacturing region. Zenith has sustainability pillars at the core of design and operations.

Zenith is one of the largest Australian manufacturers in the APAC region.

Bupa Hong Kong.
Zenith supplied product solutions to support the fully operational office space.





An Upholstery Study

Contributors were asked to take part in the study to create insight into the processes of making seating and chairs.

This upholstery study provides those external to the industry with a bird's eye view into the amount of textiles used (and what type of waste is generated) when producing a piece of upholstered furniture.

The upholstery study follows an order for a retail refurbishment using the fabrics 'Merit' and 'Meld' from Kvadrat Maharam.



MERIT + MELD

Fabric Specifications

The Merit and Meld fabrics are being used in a retail refurbishment. It is expected that a certain amount of customers will visit the shop over a period of time.

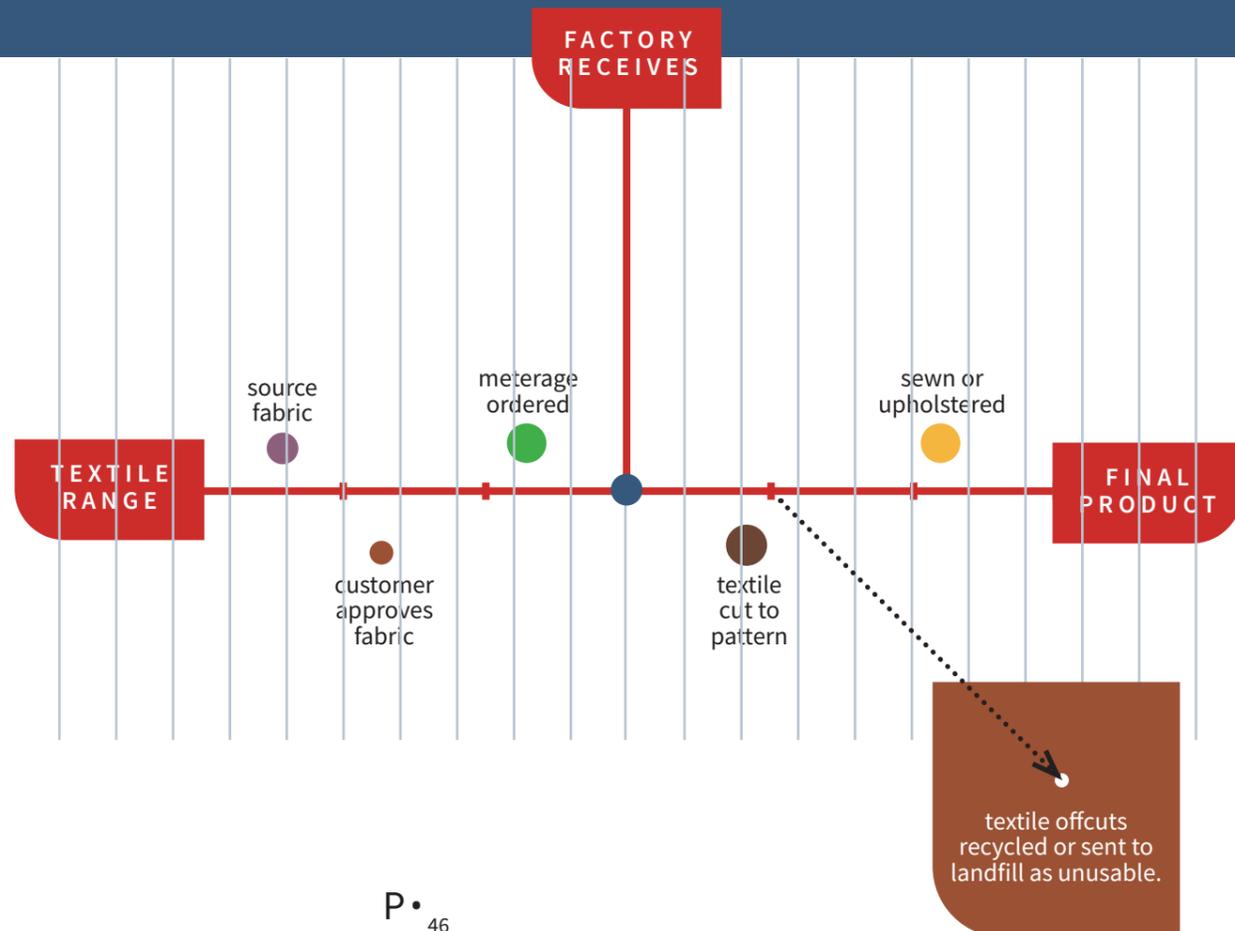
The textiles have to be durable enough for a variety of people of different shapes and sizes to sit down on, on an ongoing basis for the life-expectancy of the refurbishment.

Each fabric has a high **rub rate of 100,000** making them user friendly for the brief.

Merit - 76% Post-Consumer Recycled Polyester, 24% Polyester

Meld - 68% Post-Consumer Recycled Polyester, 32% Polyester

Both fabrics have a mixed synthetic composition. The reasoning is that recycled fibres are shorter than virgin fibres, so recycled content need to be spun with virgin content for strength and stability.



The Life of a Lounge

NB: 1. PRODUCT DESIGN + PLANNING.

No detail provided

2. SOURCING + ORDERING

KM 16.7 Metres

Zenith receives **16.7m** to fulfill retail refurb

3. PRODUCTION + PRE-CONSUMER WASTE

Fabric is cut to specification
5% textile waste produced

Merit + Meld created **0.835m** of waste disposed into landfill

4-5. DISTRIBUTION STORAGE + INSTALL

DELIVERED TO SITE

Packed + sent to retail store

6. USAGE + WASTE

ASSUMPTION

Unclear if previous seating was sent to landfill or donated

From June 2021- June 2022, Kvadrat Maharam sold **20,839.8 metres of Merit** and **13,242.9 metres of Meld** upholstery fabrics.

These orders were flown in from Denmark and the United States. In this study they were sent directly to Zenith. Kvadrat Maharam doesn't hold stock but works with a sampling system of fabric ranges.

Again to keep the focus on textiles, we have summarised the processes in the factory:

- Timber shapes are cut and prepared
- Foam is attached to the shapes
- Seat backs also assembled
- Foam and upholstery fabrics attached
- Legs assembled.

Fabric is cut and prepared at the Kingsgrove factory to produce as little waste as possible. The fabric is then hemmed - ready to be upholstered to the furniture's framework.

Zenith used **2.2 metres of Merit** and **14.5 metres of Meld** for this study (a refurbishment in a retail store). Both fabrics are less than 1% of meterage sold for the year.

The **Jac chairs** used 2.2 metres of Merit and had **less than 5% textile wastage**. The **Sol Lounges** used 14.5 metres and again had **less than 5% textile waste**.

As the fabrics have been upholstered to other components, considerations to factor is the waste of the other materials.

Jac Chair

Foam is cut to size, Zenith therefore doesn't have foam waste (however it is not clear what % of offcuts is created for the supplier).

Metal legs are also pre-fabricated, creating zero waste for Zenith. Again it is not clear what % waste, if any, was created for the fabricator supplier.

Sol Lounge

Foam kits are ordered pre-cut, so Zenith doesn't have any foam waste.

MDF had less than 5% waste

Plywood had between 5%-10% waste in delivering this study.

Zenith uses commercial **water-based glues and adhesives** in all of their products.

Uholstery Example - Retail

90,900 metres of pre-consumer textile waste per year is created. Currently, there isn't any accountability around industry disposal.

The upholstery road map presented in this report explains the meterage used in producing a piece of furniture.

When viewed in units and not in single pieces, an awareness of the amount of fabric needed to manufacture a textile product is understood.

This map also highlight an assumption of what meterage would have been disposed of in each refurbishment. As both drapery and upholstery road maps are commercial examples it is important to present another layer of **textile usage - a calculation of volume retail sofa orders over one year.**

FBD (Furniture by Design)

FBD is a furniture manufacturer based in Padstow and has been trading for 37 years. FBD supplies to large retailers such as **Harvery Norman, Freedom and Domayne.**

In the past several years, the team included a commercial arm with a focus on sustainable and innovative materials.

FBD has a wealth of experience and knowledge when it comes to making assumptions for the **retail market.**

Working with the team at FBD the following assumptions were used:

- A standard 2.5 seater sofa uses 10.5 metres of fabric
- Wastage of each material averages 5-10%
- 9 major NSW retail furniture manufacturers
- Each factory has the capability to produce approximately 20,000 units (sofas) per year.

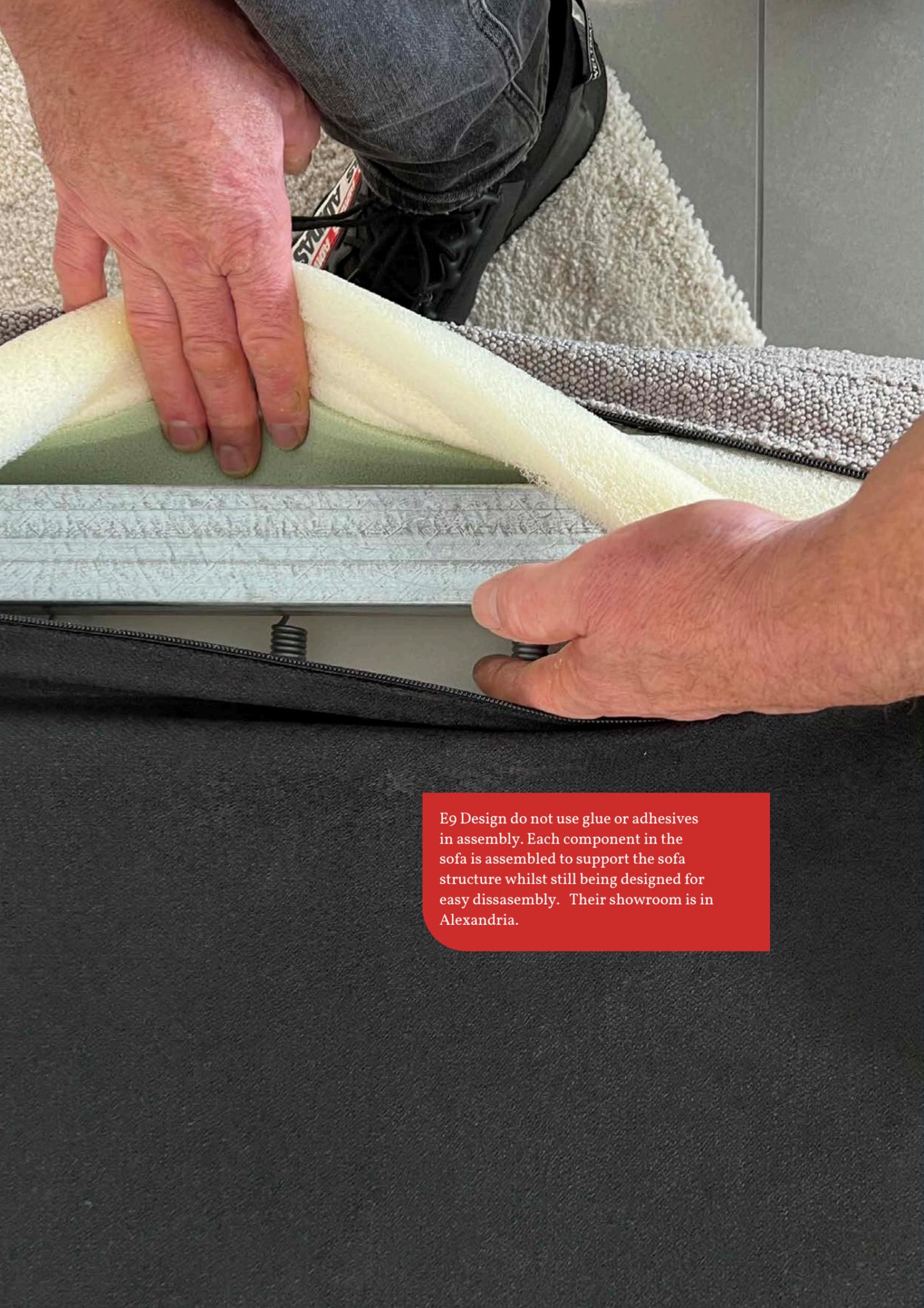
Using this assumption:

- **19,800 units** (sofas) created per factory
- **202,000 metres** of fabric to fulfill each factory order.

NSW Retail output per year:

- **178,200** sofas
- **1,818,000 metres** fabric used
- **90,900 metres** of pre-consumer textile waste produced (5% average).

When interviewing councils, it was unclear how many sofas they had received for landfill, due to many household goods being shredded in council clean ups.



Design + Innovation - E9 Design

E9 Design do not use glue or adhesives in assembly. Each component in the sofa is assembled to support the sofa structure whilst still being designed for easy disassembly. Their showroom is in Alexandria.

The youngest company in this report is E9 Design. Steven Higgs, the owner, has a background in volume manufacturing for **King Living** and **Fantastic Furniture**, having opened and run factories in Australia and megafactories in Asia.

Seeing the way industry has worked for the past forty years and the amount of waste it creates, he knew there could be a more sustainable way to manufacture furniture.

By starting with a new range Steven can '**design sustainability**' into **each piece of furniture** which is more difficult for his counterparts who have to re-design **existing models for an environmental criteria**.

It is interesting to note that E9 doesn't use adhesives. **All joinery and components are designed to work together not fixed together.**

This means when fabric is ready to be recycled, the covers are simply zipped off and zippers cut out. This is true also for the timber or metal legs that can be screwed off and recycled.

Coming out of retirement and working from a factory in Marrickville, Steven is joined by his two sons, who are learning the skills of furniture making and how to manufacture sustainably through circular design methods.

Findings and Results

“70% of the environmental impact of products and services is determined in the design stage”.

Ellen MacArthur Foundation
Circular Economy in the Furniture Industry 2017

So what was learnt from the report?

When visiting the workrooms and factories, a standard 3-5% of waste was noted by the contributors, (regardless of the size of the order or the style and shape of the product).

Therefore it is safe to assume that **3-5% pre-consumer textile waste** is a furnishing industry standard.

Following the **road map**, assumptions could only be made about **Steps 1 and 6**.

Again looking at the road map, what happens to the large amount of window coverings that are no longer needed after a site is refurbished?

If drapery uses more fabric than upholstery why aren't there more curtains in skip bins and on the side of the street?

Is it because curtains can be hidden away underneath all the other rubbish or is it because they don't get replaced as often as a sofa?

In commercial settings a piece of furniture tends to be updated to 'refresh' a fit out before curtains. From a residential perspective soft furnishings and furniture will also be replaced before curtains are.

What was observed?

Interviewing owners and staff revealed a consensus regarding the **lack of infrastructure to recycle pre-consumer furnishing textiles, as many were not aware of solutions or found the price of recycling an obstacle compared to the cost of landfill.**

An expectation of each company is to recycle wherever possible yet limitations exist;

- The infrastructure, i.e. textiles need to be delivered to the recycling centre
- Textiles need to be separated from other waste which may not be feasible due to human resources or delays to production
- A budget to accommodate textile recycling might not be available and queries lay around the inexpensiveness of recycling other materials such as cardboard, metals and paint.

Other considerations

There seemed to be at least one main 'environmental champion' in each business interviewed - and they seemed to be behind the drive for environmental change.

Sustainable end-of-life solutions for upholstery textiles proved more complicated to manage than curtains.

This is due to disassembly as explained earlier in the report, as the upholstery textile is attached to other materials. Curtains can have the header and weights in the hem cut off, so the fabric is easily recycled.

For true recycling of materials found in furniture waste, waste has to be designed out of the product at concept stage.





Current waste disposal

Both workrooms and factories continue to search for **solutions for usable textiles waste** of their own accord. Yet many avenues are capped due to oversupply to charities and schools.

The **two fabric houses** in the study recycle their offcuts and samples through **TRAKS Textiles**. Fabric houses on average have smaller amounts of offcuts compared to the quantities manufacturers do.

Three of the contributors who want to recycle found the **cost of recycling vs landfill** still an obstacle for their businesses.

Scale

The fact that NSW has the capacity to manufacturer **178,200 retail sofas** a year with **90,500 metres** of pre-consumer **textile waste** originating from this capability is staggering.

When reviewing the meterage sold in Australia of the **three fabrics** this report (**44,373.7 metres**) it is assumed through production, **1,775 metres** of these three textiles would become waste.

The next several pages elaborate on the research findings discussions leading into recommendations.

Textile Recyclers
Australia's
depot
Jamisontown



Assumption

If 4.5 million metres of fabric is sold over the course of a year and 5% is pre-consumer waste, the result is potentially 225,000 metres of furnishing textiles ending up in landfill.



Additional Insights

After interviewing and doing site visits with contributors and other stakeholders, several insights need to be noted when looking for solutions to resolve textile waste in industry.

These acknowledgements are expected to support informed decision making.

Tracking

Digitally tracking the disposal of textile waste in furnishing products will enable industry to start quantifying the waste found in furnishings and seek a variety of pathways to recycle and upcycle these materials.

Digital tracking of materials is critical to making waste a resource.

This software is a QR system already being realised in Europe and the US. Wool associations are using QR software to track their bales.

Note other innovations to track fabric include weaving digital 'dna' into a textile.

Connection

As there are so many factors to consider when looking at circular solutions for materials and products, environmental consultants and sustainability managers are reaching out to one another **globally**.

Learnings are shared and expanded upon. This not only supports the circular change that is coming but breeds innovation and new thoughts to conquer old programming and mindsets.

This type of **original thinking** is supporting how textiles are designed, compiled and disposed of.

Warranties vs Realities

Local manufacturers and workrooms are making furnishing products that are built to last.

They have warranties and guarantees that support this. In the interiors industry it is well known that furnishings get 'turned around' in commercial settings every 3 - 5 years.

Retail furnishings can have anything from six months to three years life spans. **'Buy well buy once'** is a common statement used in marketing and at premium retail levels. But the interiors industry is aesthetically driven - many companies are updating and reinventing to stay relevant.

Interior fit outs filled with furnishings, wallcoverings, furniture, lighting, flooring are being ripped out and thrown into skip bins on a weekly basis around NSW.

Transparency

Ideally if each fabric house could **confidentially supply** the amount of metres they sell each year to then calculate the volume of waste (3-5%) reverse logistics around operations and facilities needed to recycle this amount could be planned however this is commercial in confidence.

The **ratio of manufacturers and workrooms in NSW** compared to the rest of Australia, would also calculate the output of products being made locally.

Teamed with the data that **councils, waste and recycling organisations** already have, would determine the infrastructure needed in NSW for **circular processes to be realised.**

Collaboration and transparency is needed.

Circular Design

Education around circular design is paramount to utilising waste as a resource and designing the end of life cycle into products at concept stage.

Recycled content is critical, as is learning to dismantle existing types of furnishings for re-purpose.

Universities and colleges around the world are already teaching students about circular design, which they will take into their careers.

It is accepted that companies need support to make the shift to redesigning and reimagining existing products for the future.

Background for Recommendations

Sustainable Development

Goals

Also known as the **SDGs** - are 17 multi-layered goals that were created by the United Nations as a call to stop poverty and to protect people and planet.

‘Ensuring that by 2030 all people enjoy peace and prosperity’.

Recommendations for the report focussed on the following:

- **SDG 8 - Decent Work and Economic Growth**
- **SDG 9 - Industry, Innovation and Infrastructure**
- **SDG 12 - Responsible Consumption and Production.**

Industry

Insight

There are many early-adopters in the furnishing industry, doing what they can to make change as they believe intrinsically that the planet will not survive if manufacturing and production methods don't change.

There are others in the industry that do not believe they need to change the way they produce or source furnishings and will address 'sustainability' if and when they are required to.

2030 Target

The Australian Government has pledged that by **2030 Australia will have reduced carbon emissions by 43%** (baseline 2005). This is an increase of 15% from the previous commitment of 26-28% for the same time frame.

In conjunction with the new target, the Australian Government is also submitting a **Nationally Determined Contribution** to the United Nations, stating a plan for Australia to have **net zero emissions by 2050.**

Why is this important to the textile and furniture industry?

As Australia does not have a large manufacturing industry for materials and components, a local manufacturer or maker still imports these products into NSW to assemble or produce furnishings.

Therefore although these local organisations will have a lower carbon footprint than their competing importers they'll still have to quantify their footprint if the tax for 100,000 emissions is passed.

Reach

Outside of the study, Circular Design Thinking and TRAKS Textiles Recycling collectively have thousands of discussions with the textile, furniture and homewares industry.

TRAKS Textile Recycling has several fabric houses and rug companies who are using their service and advocating and/or incentivising their customers to do the same.

Circular Design Thinking is working with a multitude of retailers, wholesalers and manufacturers who want to contribute to waste solutions by testing and implementing circular principles in their businesses and product development.

The Recommendations for Weaving the Waste Out

1. Education

Education enables people to make informed decisions. Therefore, to **weave waste out of textiles** and other materials found in furnishings, decision makers of a company need to be educated around the **circular economy, as well as green credentials and environmental targets specific to the industry.**

As a priority those who design, operate and make final decisions need to be educated first.

Waste as a commodity needs to be understood when designing. It also needs to be understood by the people who run the organisations - **how can it be profitable for their businesses to value this waste and what is the return on investment to do so?**

Sustainability is now commonly known as an expectation in the industry. Many are not sure where to start, nor how to implement these changes into their business plans. **Making profit in the future will stem from the additional services of repair, reuse, maintain, disassemble - reassemble.**

The textile and furniture industry has run on a linear model since inception. Education around sustainable business models and the circular economy are crucial to companies rethinking and reimagining their manufacturing

and material use.

Designers need to be taught to design for easy disassembly and then reassembly.

Companies that take part in these education pieces and start to administer changes in their businesses would be **rewarded** through schemes or funding and other subsidies.

This could be done through a tier system receiving **green subsidies**, as they work towards circularity.

The model would be structured to incentivise and change processes. Companies would collaborate across multidisciplinaries.

However similar to changing habits around cigarette smoking (legislation), **organisations would need to be discouraged** to use landfill. By making **landfill more expensive**, and **recycling and green options** more accessible, a natural balance would start to occur*.

Note: Discussions with existing waste stream organisations who currently service landfill would be needed, to reshape their services towards circularity solutions if they so choose.

*In 2018 Sweden lowered its carbon emissions by 17% implementing a scheme that taxed emissions & funded carbon-reduction projects.

2. Circular Tracking Stations

Digital tracking of materials is critical to making waste a resource. As noted in the report, upholstered furniture can be difficult to disassemble. This is an obstacle.

Tracking stations would allow for materials to be separated and quality resources tagged via QR systems before being processed back into the production loop as a recycled material.

A Circular Tracking Station has been conceptualised but needs collaboration and input from all stakeholders to come to fruition.

Therefore to analyse post-consumer upholstery textile waste and the additional materials, **controlled testing** needs to take place.

FBD in Padstow has volunteered to pilot a **dismantling operation** over one weekend, with selected **post-consumer sofas**. Invited attendees from government, waste, recycling, SSROC and other councils, will witness the assembly and then the disassembly of sofas and chairs over this same weekend.

These stakeholders would also share their own invaluable input about furnishing waste and its disposal.

Another furniture manufacturer outside of this study who is willing to test dismantling and recycling for variances and similarities is **Cult Design** (also in Padstow).

Documentation of materials, waste contamination, resources and operational learnings from these tests would be reviewed by all as a starting point for further work on developing Circular Tracking Stations.

From a council perspective, **Albury City Council** is willing to test processes around dismantling furnishings, again for recycling solutions.

Both Reverse Resources and TRAKS Textiles are working on different pathways to mitigate textile waste and recycle it. The feedback from both organisations will help combat the amount of textiles that needs to be handled.

It is expected that all tests would be done before building the strategic framework around the **Circular Tracking Stations**.

3. Infrastructure

The early adopters in textiles and furnishings are seeing **the gap, which is infrastructure**. As noted previously, intentions to recycle, upcycle and reuse are set to fail unless they are matched by a strong foundation or volume to make the infrastructure commercial.

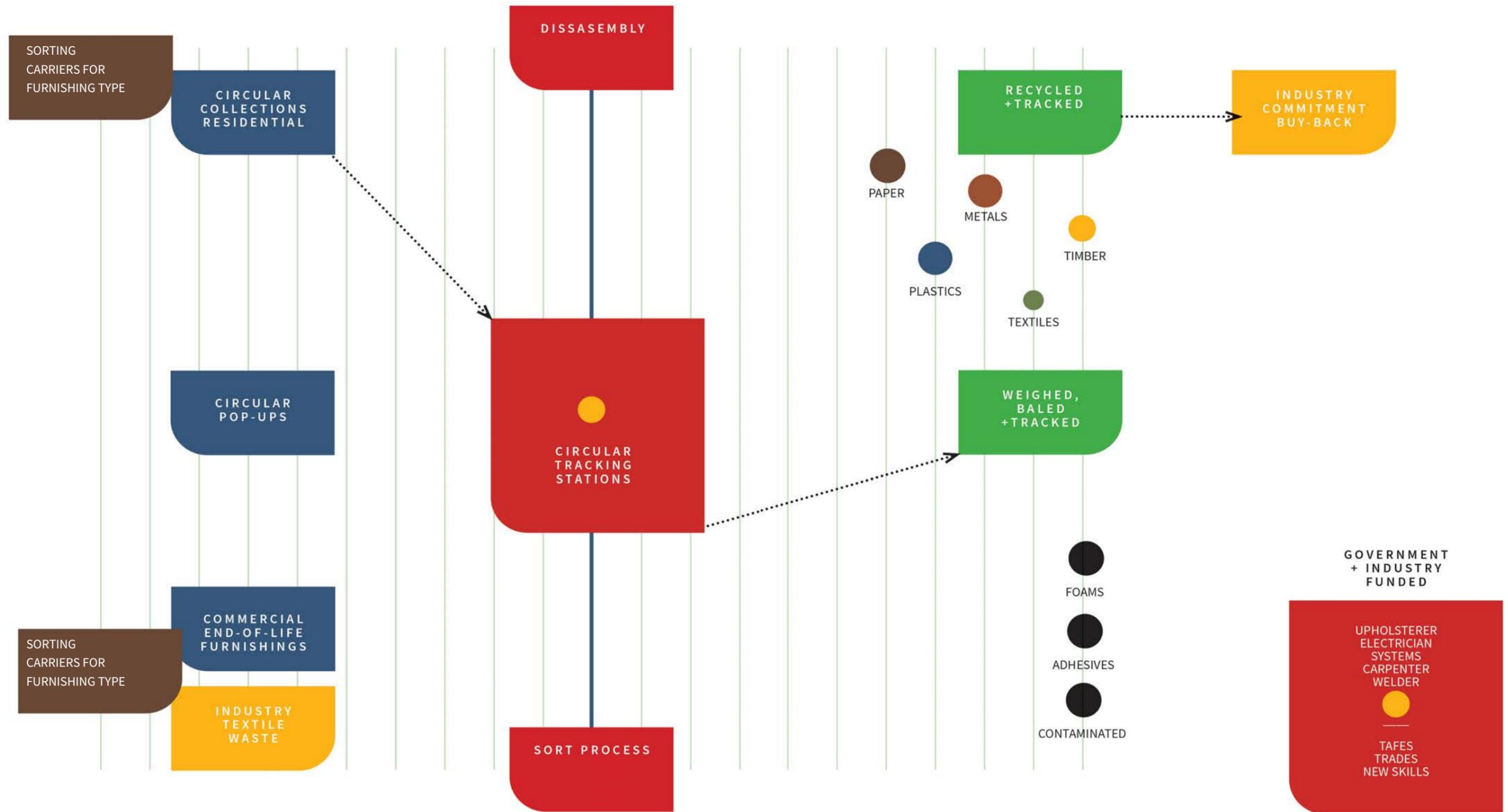
A call to action for industry knowledge is needed in mapping out processes, systems and facilities.

Identifying what already exists and **connecting the dots will** create an eco-system for 'closed loop' solutions and de-risk duplication.

Experts in each division would be called on to help build a reverse logistics framework of how waste can be woven out of textiles.

Budgets to consider for funding, include the Modern Manufacturing Initiative (\$500M) and 'ReMade in Australia' (\$18.2M).

Circular Tracking Station Concept





Conclusion

Textile waste in production of upholstered furniture and soft furnishings has long been understood by those who work in the industry. By following the production process of the road maps, clarity around how to calculate the volume of **pre-consumer textile waste being generated (between 3-5%) across the disciplines, was quantified.**

Unfortunately, **offcuts in pattern making are unavoidable** due to the different shapes and sizes fabrics need to be cut into. **Therefore regardless of how small the waste is, textile waste is an expectation of the production process.**

Previously the reduction of waste in industry hasn't necessarily been because of environmental concerns but rather to keep costs down and be resourceful. The reason fabric offcuts are discarded is because they are unusable in other products.

The local furnishing industry faces many issues when it comes to sustainability and responsible waste management (cost being a major concern). Balancing local labour and operational costs, material and design challenges, freight and transport costs (both local and international), quality of materials, finishes and treatments, accessibility of recycled content at competitive pricing can be daily concerns.

However terminology being used to describe textile and other waste is changing. Although waste is not yet considered a valued asset (which is the goal of circularity) **an expected accountability around waste is forming because of customer expectations, team members, peers and competitors.**

The furnishing industry is an industry of competitors that are all facing the same problem. As this report has shown, many are willing to collaborate to test and develop opportunities to solve waste in manufacturing.

This report was written to give the reader an insight into local furnishing manufacturing but it was also written to observe the experts themselves - the experience and knowledge they have cannot be underestimated when looking to solve

these challenges. **Through community these stakeholders have the intellectual property and physical volume needed to make textile waste and other materials viable to disassemble, recycle and upcycle on a commercial basis. In silo, they do not.**

So, it is due to this, that a strategic framework can start to be developed around Education, Infrastructure and Circular Tracking Stations. The recommendations, although large, are necessary in weaving the waste out of furnishing textiles.

The next steps are to build a collective platform of trusted experts and stakeholders who are invested in circular strategies. Many key partners have been identified through the research in this report but there are many more that need to be included - alongside other types of furnishing manufacturers and importers.

A business model proposal with timelines, budgets, finance and tools will need to be created for each recommendation. It is expected that there will be milestones which are reviewed on a regular basis as testing continues before becoming established programs.

It may seem like a daunting task but as many businesses know there is already a global focus, driving momentum and pushing the textile industry into a new evolution of circularity.

In conclusion, recycled content and utilisation of textile waste has been common in many underdeveloped countries since the inception of textile production. The Industrial Revolution's textile industry had 'rag-and-bone-men' who collected textile 'rags' and sold them back to textile merchants to be shredded, cleaned and re-spun.

In 2022 'waste as a resource' is perceived to be 'new thinking' due to a culture of 'take, make, dispose' which became commercially acceptable from the 1960's. The solutions lie in the history of textiles and other materials - going back to basics (valuing the resource) and working collectively to extend the life cycles of the materials used in manufacturing.



Circular Design Thinking | Karie Soehardi Consultancy.

Founder Karie Soehardi has over 20 years of experience in textiles, furniture and homewares, having worked as a fast-fashion buyer for retailer David Jones through to owning her own textile and wallpaper studio 'Ella and Sofia' which designed and printed locally. In addition to the products themselves, Ella and Sofia serviced residential and commercial clients with custom window coverings.

As her career continued Karie became the Upholstery Product Developer for textile merchant Charles Parsons, Product Manager for Milliken Floorcoverings AU and Armadillo's Product and Design Manager for AU, US and UK. Karie has worked with suppliers locally and internationally and has first hand experience with dye houses, mills and factories across Europe and Asia.

Realising the interiors industry needs support in the shift from linear to circular, Karie launched 'Circular Design Thinking' alongside Vivek Suri with global operational experience in the textiles industry and Bradley Tucker an environmental scientist who specialises in biodiversity and carbon sequestration projects.

It is the team's mission for 2/3 of the industry to be circular by 2030.

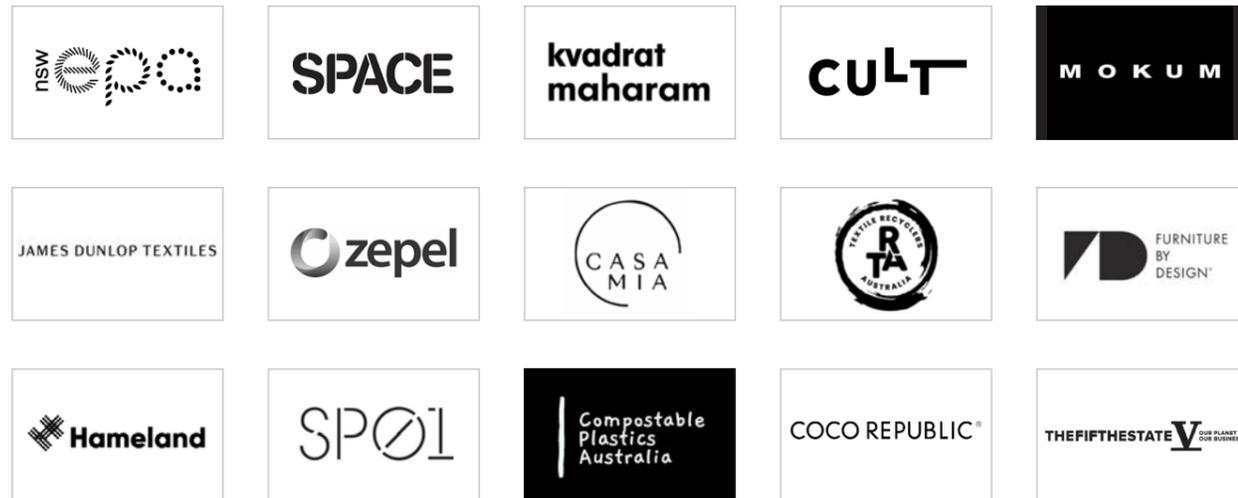
CIRCULAR DESIGN THINKING

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Clients



PATHWAYS TO A SUSTAINABLE FUTURE

Karie Soehardi Consultancy (KS) partnered with Textile Recyclers Australia (TRA) to form **TRAKS** (spelling mistake intended) in late 2021 to keep furnishing textile waste out of landfill. Still quite new in its journey, it is important to know that the furnishing brands shown below have committed to keeping these textiles out of landfill.

This partnership was formed due to their common goals. The operational capacity TRA has to recycle and the industry relationships and insights KS enables them to offer this opportunity.

Collectively the TRAKS team has over 100 years of textiles experience.

The Process

Currently textiles and rugs are sorted into the different types of fibres and colours, cleaned and shredded. The shredded textiles are then sent to India to be spun back into recycled yarn to then purchase from the market.

The TRAKS team are researching and testing onshore solutions for other pathways and collaborations. As this report shows many solutions are needed to keep textiles out of landfill.

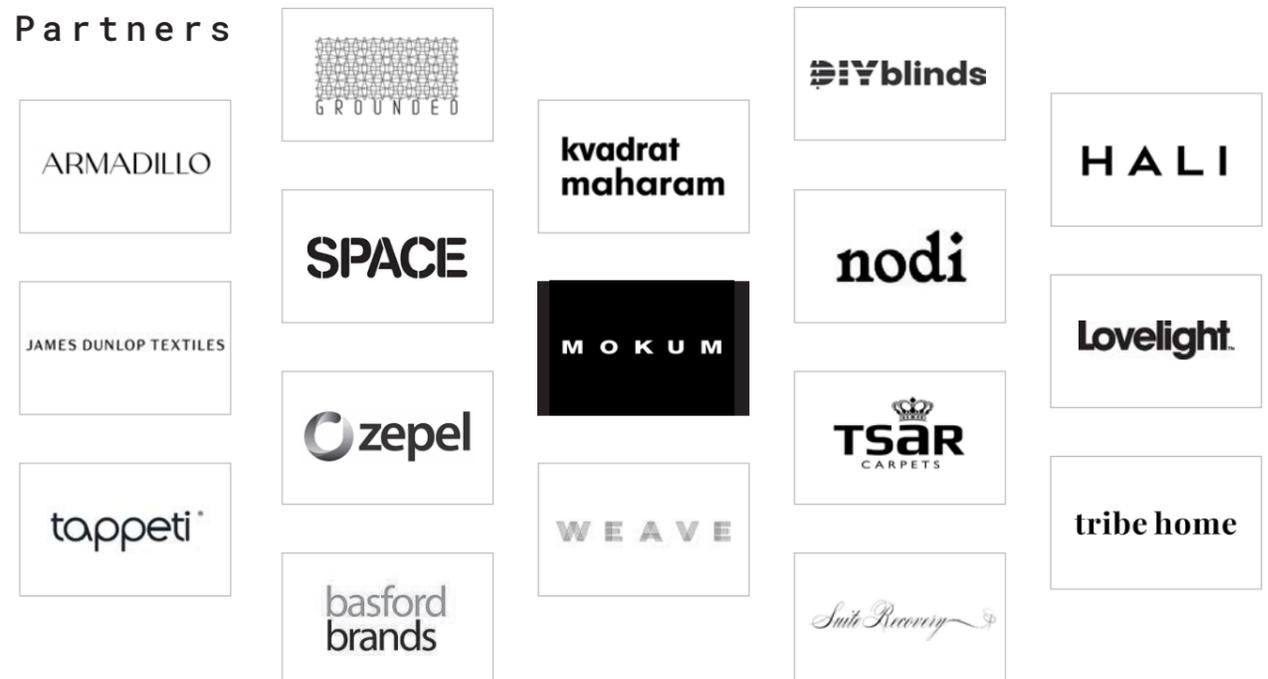
TRAKS c/o TRA

Unit 1, 9-11 Abel St Jamisontown 2750

www.trakstextiles.com

email: recycle@trakstextiles.com

Partners



<p>kvadrat maharam</p>	<p>Kvadrat Maharam Pty. Ltd. 17 Foster Street Surry Hills 2010 T: +61 2 9212 4277 australia@kvadratmaharam.com www.kvadratmaharam.com</p>
<p>turnerbros.</p>	<p>Turner Bros Furnishings Pty. Ltd. 10 Vincent St, Marrickville 2204 T: +61 2 8594 0700 sydney@zepelfabrics.com www.turnerbros.com.au</p>
<p>Zenith</p>	<p>Zenith Interiors Pty. Ltd. 109 Vanessa St, Kingsgrove 2208 T: +61 2 9114 8333 sydney@zepelfabrics.com www.zenithinteriors.com</p>
<p>Ozepel</p>	<p>Zepel Fabrics Pty. Ltd. Suite 26, Lvl 1, 69 O’Riordan St Alexandria 2015 T: +61 2 9332 2018 sydney@zepelfabrics.com www.zepelfabrics.com</p>

<p>Ozepel Retreat* 10478 Zepel</p>					
<p>Status Brand Collection Country of Origin Finishes</p>	<p>End of Line <u>Zepel</u> — Asia 3 Pass Blackout</p>	<p>Composition Width Weight Horizontal Repeat Vertical Repeat</p>	<p>100% PL 300cm / 118.1" 1320.0g/m / 1207g/yd None / None None / None</p>	<p>Martindale Wyzenbeek Colourfastness Fire Retardancy Environmental</p>	<p>— — UV 6/8 Blue Scale AS 1530.3 Oekotex 100</p>
<p>Care Instructions</p>					
<p> Do not bleach Drip dry in shade Warning: Iron reverse side use barrier cloth</p>	<p> Do not dryclean Low iron max 110C</p>	<p> Do not tumble dry Machine wash cool gentle cycle</p>			
<p>Usage</p>					
<p> Curtains</p>	<p> Accessory</p>				
<p>Attributes</p>					
<p>Use Fabric Continuous</p>					
<p>Notes</p>					
<p>Stitch Holes Unavoidable</p>			<p>Rolled Full Width On Core</p>		
<p>Colours</p>					
<p>Beach</p>	<p>Charcoal</p>	<p>Cloud</p>	<p>Cotton</p>	<p>Driftwood</p>	<p>Dusk</p>
<p>Husk</p>	<p>Lagoon</p>	<p>Linen</p>	<p>Midnight</p>	<p>Palm</p>	<p>Pebble</p>

Specifications

Meld
466387

maharam

Application

Seating, Systems, Upholstered Walls

Note: This textile is available as a made-to-order pillow.

Characteristics

Content: 68% Post-Consumer Recycled Polyester, 32% Polyester

Finish: Stain Repellent

Additional Finishes Available: Alta, Alta Food and Beverage, Antimicrobial Stain Resistant Finish with Impermeable Backing, Crypton, Nanotex, Nanotex with Impermeable Barrier

Backing: None

Width: 54" (137cm)

Bolt Size: 35 yards (32 m)

Weight: 16.5 oz/ly (512 gr/lm)

Country of Origin: USA

Price

Contact your sales representative for pricing.

Maintenance

W/S-Clean with water-based cleanser or mild, water-free dry cleaning solvent.



Testing

Abrasion: ASTM D4157, 100,000 double rubs Wyzenbeek

Note: Abrasion test results exceeding ACT Performance Guidelines are not an indicator of product lifespan.

Multiple factors affect fabric durability and appearance retention.

Acoustics: ASTM C423, 0.85 NRC

Flammability: AS/NZS 1530.3

AS/NZS 3837 Unadhered

ASTM E 84 Unadhered

BS 476 Unadhered*

BS 5852 Crib 5*

CAL 117-2013

CAN ULC S102 Unadhered

EN 1021-1*

EN 1021-2*

EN 13501 Unadhered*

GB/T 17591*

ISO 5660 Unadhered

NFPA 701*

*passes with additional treatment

Lightfastness: AATCC 16E, 40+ hours



Specifications

Merit
466444

maharam

Application

Seating, Upholstered Walls

Note: This textile is available as a made-to-order pillow.

Characteristics

Content: 76% Post-Consumer Recycled Polyester, 24% Polyester

Finish: Stain Repellent

Additional Finishes Available: Alta, Alta Food and Beverage, Antimicrobial Stain Resistant Finish with Impermeable Backing, Crypton, Nanotex, Nanotex with Impermeable Barrier

Backing: None

Width: 54" (137cm)

Bolt Size: 45 yards (41 m)

Weight: 17.1 oz/ly (530 gr/lm)

Country of Origin: USA

Price

Contact your sales representative for pricing.

Maintenance

W/S-Clean with water-based cleanser or mild, water-free dry cleaning solvent.



Testing

Abrasion: ASTM D4157, 100,000 double rubs Wyzenbeek

Note: Abrasion test results exceeding ACT Performance Guidelines are not an indicator of product lifespan.

Multiple factors affect fabric durability and appearance retention.

Acoustics: ASTM C423, 0.80 NRC

Flammability: AS/NZS 1530.3

AS/NZS 3837 Unadhered

ASTM E 84 Unadhered

BS 476 Unadhered*

BS 5852 Crib 5*

CAL 117-2013

CAN ULC S102 Unadhered

EN 1021-1*

EN 1021-2*

EN 13501 Unadhered*

GB/T 17591*

ISO 5660 Unadhered

NFPA 260

SN 198 898*

*passes with additional treatment

Lightfastness: AATCC 16E, 40+ hours



zenithinteriors.com
Zenith

SOL-SIT Modular Lounge



Features:
SOL-MIX is designed around four key pillars of contemporary working behaviours: facilitating spaces for formal or informal meeting situations, social aspects of our daily routines, creative collisions for knowledge sharing, and moments requiring retreat and focus.

SOL-SIT's seating modules comes in a variety of dimensions, whether singular or lounge. It is available in either geometric or curved forms. Exceptionally modular, with a back or as an ottoman, straight, concave or convex shape.

Options:

- Ottoman
- Lounge Chair
- Convex Lounge & Ottoman
- Concave Lounge & Ottoman

Design: ZENITH DESIGN STUDIO

Warranty: 5 years

Certification: GECA

Finishes:
Single or two tone upholstery seat and back in COM. Refer to ZENITH House Fabric Specification for options.

zenithinteriors.com


JAC Classic Zenith

Features:
A combination of elegance and comfort, with strength and stamina, the Jac Classic has natural application across a myriad of interior solutions from workplace and education to hospitality.

Options:

- Upholstered seat pad
- Upholstered shell in one or Two-tone upholstery

Design: SCHAMBURG + ALVISSE

Warranty: 5 years

Certifications: BIFMA, Greenguard, GECA

Awards: Good Design Award Winner 2020

Finishes:
Polypropylene or upholstered shell. Refer to ZENITH House Finishes Specification for full range.

Solid American Oak Timber base.

Polypropylene:

					
Canvas White ZPL_008	Black Night ZPL_006	Gum Grey ZPL_007	Indigo ZPL_009	Olive ZPL_010	Blush Pink ZPL_011

American Oak:

 Natural

Dimensions



Classic Chair
OW 470mm
OD 525mm
SH 450mm
OH 820mm



Classic Tub
OW 650mm
OD 520mm
SH 450mm
OH 820mm

1

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