

RECYCLED POLYCARBONATE ROOF AND WALL CLADDING SHEETS 0431

Circular re-use of disposable vapes

1. GENERAL

1.1. AIMS

Responsibilities

Requirement: Provide roof and wall cladding sheets made from shredded, decontaminated, disposable polycarbonate vapes. These sheets will provide shelter through construction and maintain reliable performance and durability, ensuring a functional lifespan of 10+ years while contributing to sustainable construction practices.

Selections: Conform to the Selections.

1.2. CROSS REFERENCES

General

Requirement: Conform to the *General requirements* work-section.

Associated Work-sections

0421 Roofing combined

0431 Cladding combined

1.3. INTERPRETATION

Definitions

Application: For the purposes of this work section the definitions given below apply:

-Disposable Vape: is a single-use electronic cigarette. It typically consists of a pre-filled e-liquid, a built-in battery, a heating element, and a mouthpiece, all encased in a compact, non-refillable, rechargeable casing. These devices are activated by inhalation or a button, delivering vaporised e-liquid to the user.

Once the e-liquid or battery is depleted, the device is discarded, contributing to e-waste and environmental concerns due to its mix of plastics, metals, and electronic components

-Vape Components (see diagram below): Relates to the mechanisms that are removed from the disposable vape; polycarbonate case and integrated mouthpiece, lithium battery, metal wires, circuit board, USB casing, metal coil, metal activator, ventilation tube, wire insulation, plastic stopper, adhesive tape, rubber seals, adhesive foam, foam wrapping, adhesive foam protectors, tube sleeve, wick and the wick sleeve.

-Panelling: a panel formed from recycled plastic reclaimed from Disposable Vape cartridges

-Chemical contamination: Contamination from disposable vapes is largely non-toxic in small amounts but can pose significant risks when accumulated in large batches. Exposure to these substances can irritate the eyes and skin and, when inhaled, may cause respiratory issues or lung irritation.

-Beam: a Beam formed from recycled plastic reclaimed from Disposable Vape cartridges

-Roofing: a Roofing Panel formed from recycled plastic reclaimed from Disposable Vape cartridges

-Reclaimed Plastic: material used to create all structural elements formed from reclaimed and recycled plastic from disposable vapes

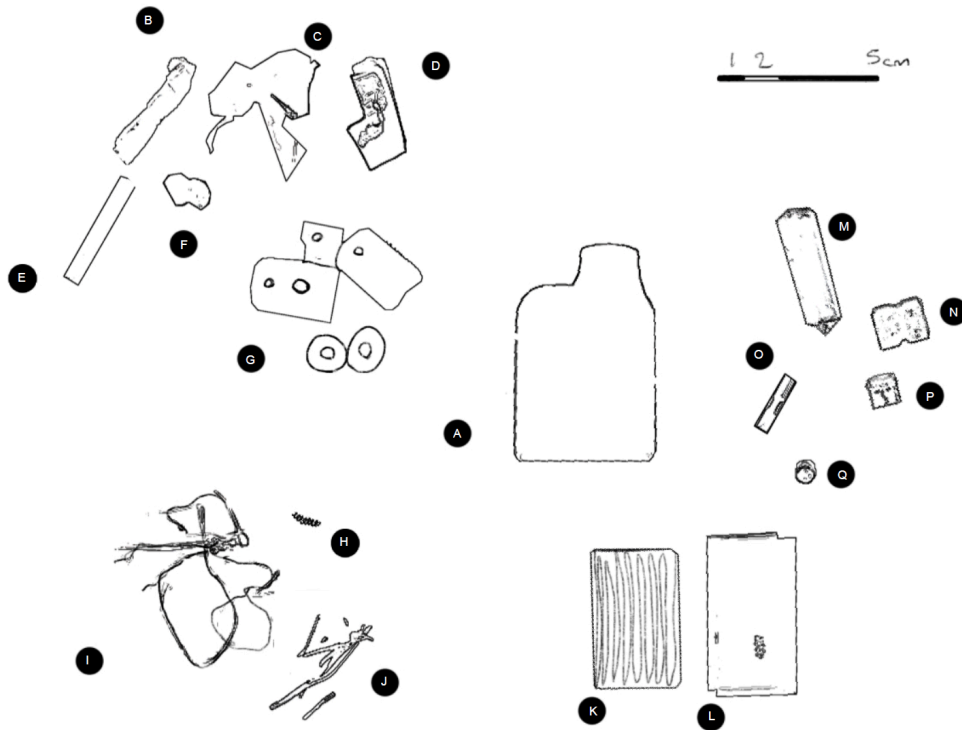


Figure 1 - Vape cartridge Legend:

For polycarbonate battens and sheeting and adhesive: A POLYCARBONATE CASE AND INTEGRATED MOUTHPIECE, B FOAM WRAPPING, C ADHESIVE TAPE, D ADHESIVE FOAM, E TUBE SLEEVE, F FOAM PROTECTOR, G RUBBER GASKET/SEALS

For further recycling: H COIL, I METAL WIRES, J WIRE INSULATION

To be destroyed: K WICK (CONTAMINATED WITH LIQUID), L WICK SLEEVE

For e-waste recycling: M LITHIUM BATTERY, N CIRCUIT BOARD, O VENTILATION TUBE, P USB CASE, Q ACTIVATOR BUTTON

1.4. SCOPE OF WORKS

Supply and instruction of recycled polycarbonate roof and wall cladding sheets as described on architectural drawings.

Requirements: Completion of inspection, samples and test panel prior to execution of application of panels in accordance with the architectural drawing set.

1.5. INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following to ensure that workmanship meets expectations:

- Reclaimed Plastic from Disposable Vapes prior to panel formation
- Reclaimed Plastic compressed test panel
- Reclaimed Plastic panel fabrication

1.6. SAMPLES AND TEST PANELS

Reclaimed Plastic condition sample

Requirement: Submit 5 cleaned samples illustrating the range of variation.

Condition: Cleaned and disassembled Vape Cartridges prepared from melting and reforming into panels.

Reclaimed Plastic Compressed Test Panel

Requirement: Submit samples of recycled plastic paneling for strength and durability testing

Performance: Rigid and Durable in Accordance to material specifications.

Reclaimed Plastic panel fabrication sample

Requirement: Submit samples illustrating the range of variation across Reclaimed plastic material elements.

Performance: Rigid and durable in accordance with material engineers requirements

1.7. TOLERANCES

Panel construction tolerances

Requirement: Conform to the **Tolerances table**.

Tolerances table

Dimension	Tolerance criteria: Permitted Deviation (mm)
Length	±10 mm
Width	±5 mm
Thickness	±2 mm

2. PRODUCTS

2.1. MATERIALS

Polycarbonate Sheeting/battens:

Preparation Process: Vape components (i.e. vape case, mouthpiece, wire insulation and plastic stopper - refer Section 1.3) to be shredded and recycled to form polycarbonate sheet. Vape waste to be collected via Council schemes, stored and delivered to manufacturing warehouse.

Dimensions: (Sheets) 1600mm Length x 1600mm Width panels. (Battens) 100 Width x 40mm thick battens. Ensure supplied lengths cut to size as required for installation (i.e. 2800mm) to reduce wastage.

Finish: Natural multicoloured finish

Application Performance: Weatherproof sheeting fixed to structural frame. For installation in wall and roof systems. Ensure exposure to UV for further decontamination (future recycling)

Adhesive Taping/Seals:

Materials: Vape components (i.e. recycled rubber seals, foam, and elastic)

Application Performance: Adhesive to connect polycarbonate sheets securely. Carry out onsite testing to ensure minimum fixing as required.

For reference - Chemical Contamination:

Mostly non-toxic but in large batches (many vapes discarded ending in landfill) can be harmful to humans in irritation to eyes and skin. Harmful to breathe in causing lung problems.

Pd: Palladium – In some circuit boards

Nb: Niobium – In some electronic components

Sb: Antimony – In wicks

W: Tungsten – Metal components

V: Vanadium – Most metal components
Bi: Bismuth - Metal and plastic parts. Mostly on coils
Co: Cobalt – In batteries and some coils
Si: Silicon - In most circuit boards
Sn: Tin - All sensors, circuit boards and some batteries

Note: Cobalt and Tin are both the most harmful components but will likely be mostly discarded.

3. EXECUTION

3.1. GENERAL

PROTECTION FROM CONTAMINATION

Requirement: Store polycarbonate sheeting in a well ventilated, and naturally lit space prior to construction. Wearing proper PPE is advised when handling sheets in case of contamination when stored in large clusters.

3.2. PANEL COMPOSITION / FABRICATION

1. Collect discarded disposable vapes from vape collection programs.
2. Deconstruct vapes into components, inclusive of material sent to refuse programs (e-waste).
3. Safely dispose of contaminated sections where e-liquid has breached the wick and wick sleeve.
4. Decontaminate polycarbonate elements by submerging in a deionized water bath to remove residues and toxins. Dry thoroughly to prepare for shredding.
5. Melt components for adhesive to create securing glue.
6. Shredding and Reformation by extracting and shredding the polycarbonate components.
7. Process the shredded material into roof and wall cladding sheets for construction purposes.
8. Secure the polycarbonate elements for application as battens to walls or sheeting to roof for shelter

3.3. ASSEMBLY DIAGRAM

(REFER TO ASSEMBLY DIAGRAMS FIG 2-5 BELOW)

Preparation

Requirement: place large stones as footings in accordance with Ishibatate technique

Technique: place large granite stones onto a bed of gravel and then compact to create solid footing

Installation

Layout Reclaimed Plastic Columns and Beams to allow assembly according to *Miyadaiku* principles where pegs are inserted into prefabricated holes and affixed with Wedges..

Fixing

Reclaimed Plastic Columns and Beams

- Self affixing through integrated pegs and holes designed into system
- Reclaimed plastic wedges hammered into pegs to prevent collapse

Reclaimed Plastic Panelling:

- Affixed through integrated pegs
- Secured using Adhesive created from recycled Vape materials

Defective components: Do not install component parts which are defective, including warped, bowed, dented, abraded or broken members.

Damaged parts: Remove and replace damaged members during installation

3.4 COMPLETION

Reinstatement

Extent: Repair or replace any damaged polycarbonate sheets/battens as required.

Touch up: Do not make good via paint finish to affected areas. Intent for sheets/battens is to show the recycling process through textured natural finish.

Cleaning

Requirement: Cleaning of sheets/battens as required (i.e. high-pressure wash, etc.). Apply soap for gentle clean. Do not use harsh and abrasive cleaning tools (i.e. scourers, steel brushes, etc.). Do not use harsh chemical cleaning agents.

EXAMPLE OF COLUMN TO BEAM CONNECTIONS
BASED ON MIYADAIKU (TRADITIONAL JAPANESE NAILLESS CONSTRUCTION)

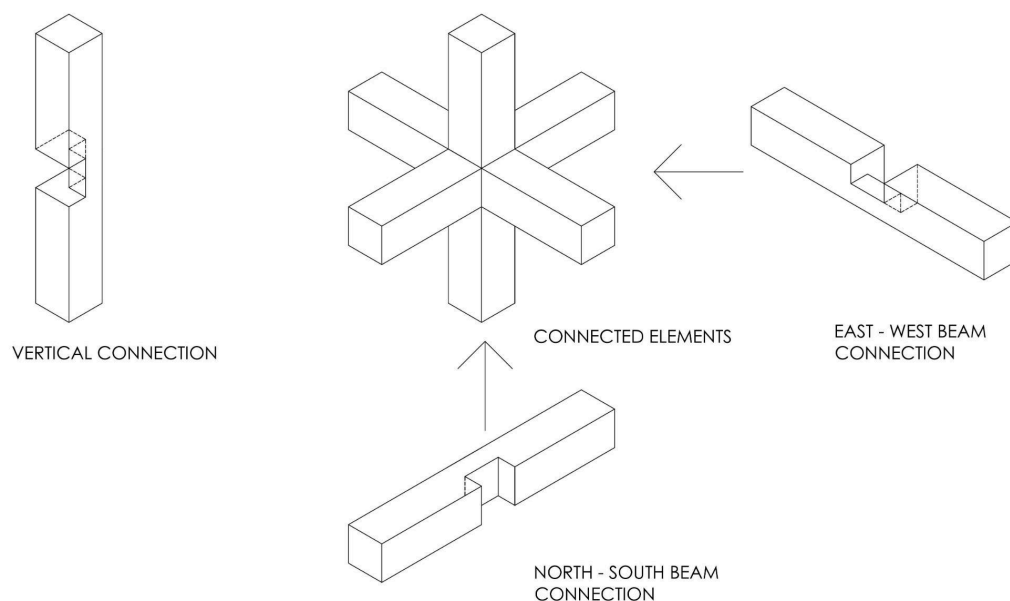


Figure 2 - Column to beam connections

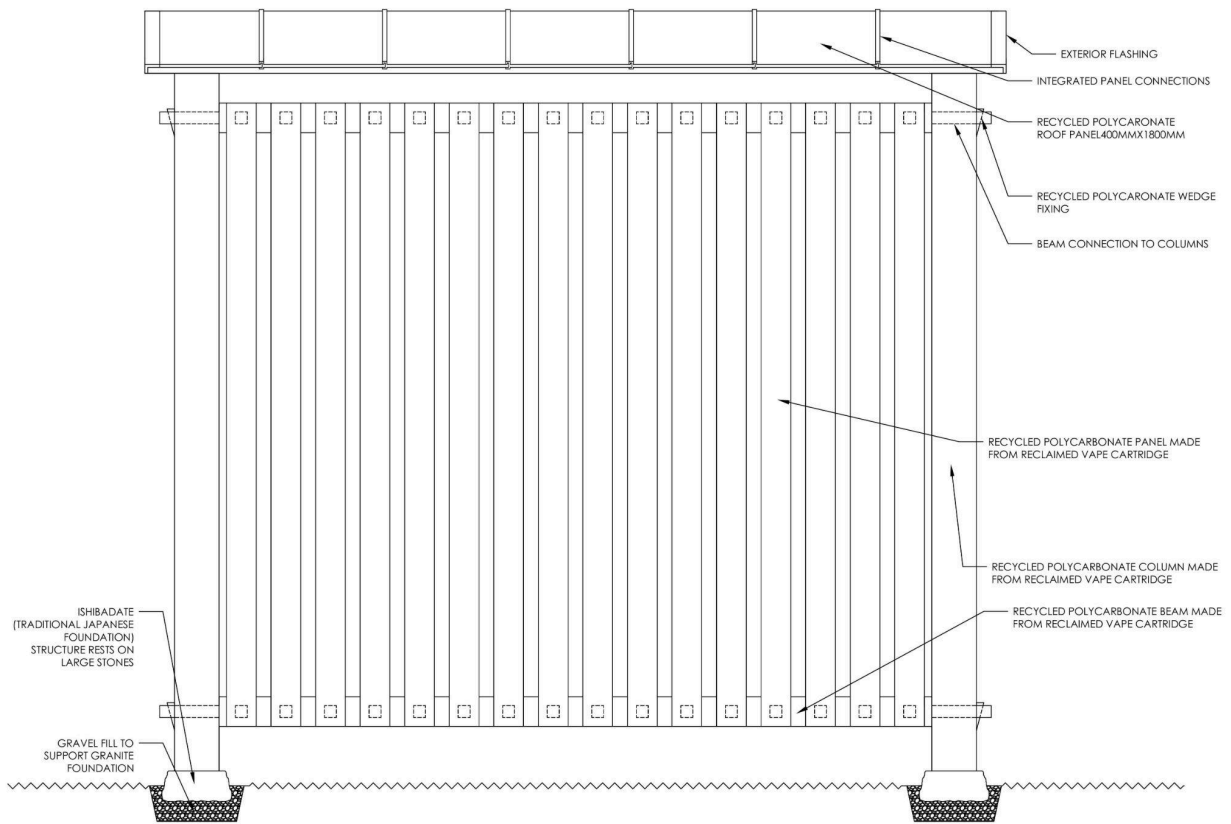


Figure 3 - Elevation view of product

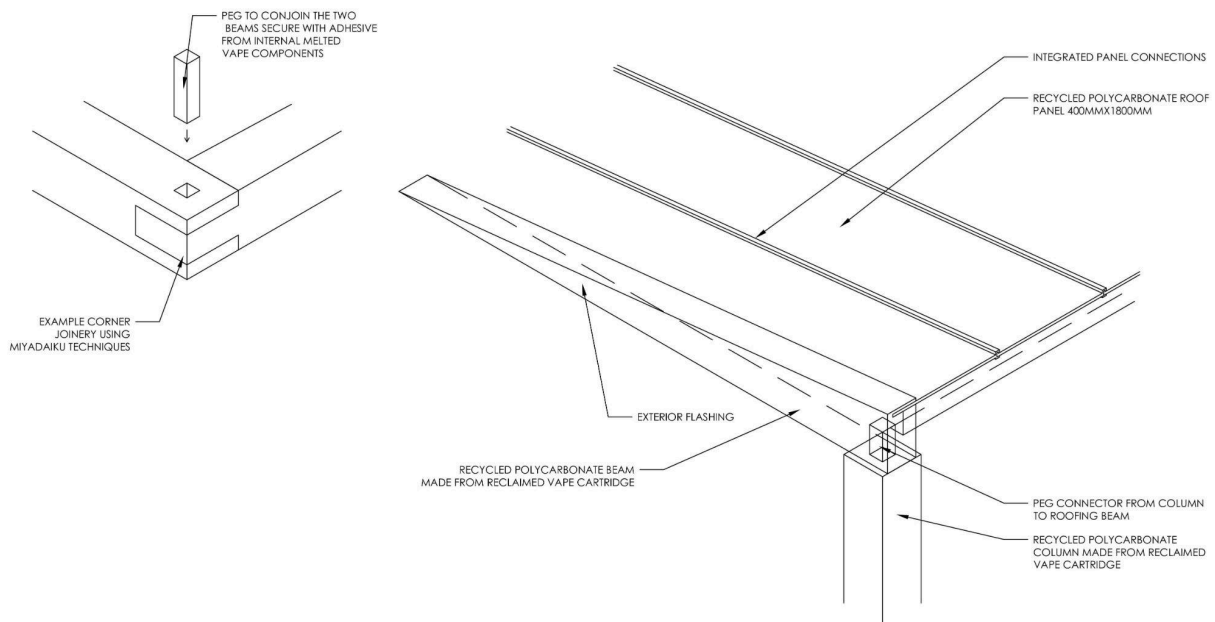


Figure 4 - Isometric view of product

BEAM TO POST CONNECTION DETAIL

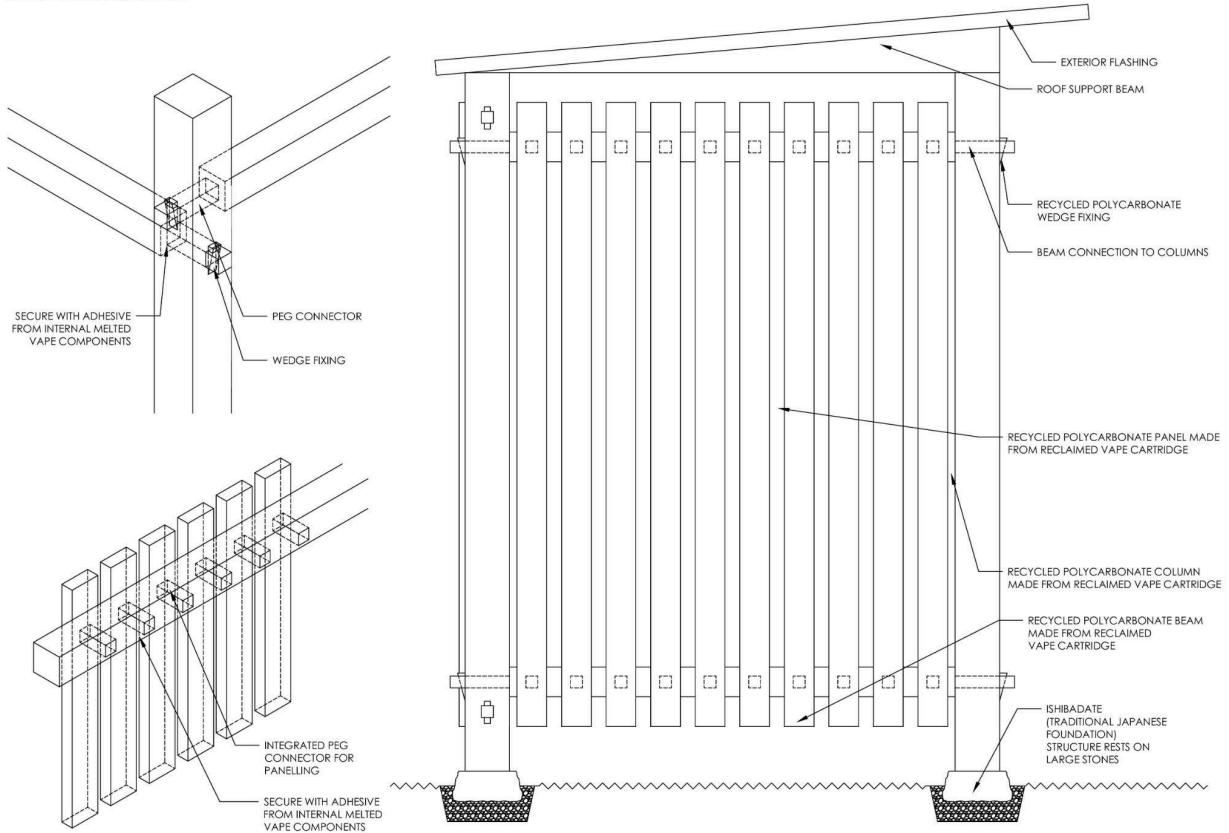


Figure 5 - Beam to post connection detail

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