

WRAP Designing Out Waste Actions

The table below summarises the designing out waste actions which have been taken in the design of Tottenham Court Road and will be implemented throughout the foundations, substructure and main works phase.

Designing Out Waste Actions	Intended Result
Ensure materials have a recycled content.	Having recycled content in materials closes the recycling loop and creates a market for material which is recycled. Percent of GGBS/PFA (Ground granulated blast furnace slag/pulverised fuel ash) to be used in concrete for foundations and main works will be maximised.
Challenge the design standards to minimise thickness of diaphragm walls.	By minimising thickness of diaphragm walls, waste will be reduced through less excavation and less material needed to construct the wall.
Off site fabrication of pile reinforcement cages for foundations.	Off site fabrication of cages will eliminate off cuts on site.
Optimise the box to minimise volume.	Minimising box volume reduces the amount of material which needs to be excavated and reduces the amount of material needed to construct the station box.
Off site fabrication of some station elements e.g. platform sections; external pre-cast concrete cladding panels, glazing and M&E plant.	Off site fabrication of station elements reduces off cuts on site.
Finishes, covers etc to be demountable, plug and play etc so they are easily removed for maintenance and repair.	Easy removal of station elements will reduce waste in the future when maintenance, replacement and refurbishment are needed.
Reduce platform widths.	Reducing platform widths can reduce the size of the station overall, reducing the amount of material to be excavated and material needed for construction.
Opportunity to reduce duplicated air handling units on some non-critical sections.	Reducing duplicated air handling units will reduce the amount of materials which are needed which will also reduce waste through reduced off cuts and packaging.
Use modular build to allow for flexibility in maintenance / repair and cater for future technical improvements.	Planning grid in South Block of Western Ticket Hall is now 1 grid and was previously 3 grids. Platform level design is modular. Having one grid allows for repetition which reduces waste. Modular components at platform level reduce waste through repetition, and also reduces waste for maintenance and repair.
Standardise materials and component sizes, architectural finishes, equipment and forms.	Standardisation is achieved through common specification for M&E, other opportunities limited due to layout being fixed by existing street pattern/layout.

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	Standardisation of equipment and forms will make processes more repetitive and reduce waste.
Develop a building log book to record equipment disassembly information.	Knowing the correct way to disassemble components will reduce waste when maintenance, replacement and refurbishment are required.
Design for ease of future deconstruction.	The use of modular elements for architectural and M&E components will ease future maintenance and deconstruction reducing possible generation of waste because there will only be a need to replace the module rather than the whole item.
Omit/minimise internal cladding and general wall finishes & specify surface mounted fittings.	The back of house is not clad. Front of house cladding is for acoustic performance. Reducing cladding reduces waste through less materials being used which can become waste, including through off cuts and packaging.
Use exposed services, where practical.	There is no ceiling in the back of house areas and limited ceiling in public areas, only where services could be interfered with by the public. Reducing ceiling reduces waste through less materials being used which can become waste, including through off cuts and packaging.
Pre-wire lights with plug and socket connectors.	Pre wired lights reduce off cuts on site.
Minimise use of suspended soffits through better design.	Most public areas will not have suspended soffits, except 'low' areas such as location of ticket machines. Reducing suspended soffits reduces waste through less materials being used which can become waste, including through off cuts and packaging.
Use the building's structure to form concrete ventilation ductwork.	Fire fighting stair used to form ventilation ductwork; this replaces the need to use materials such as metal for ductwork.
Use flat soffit for slabs to reduce formwork and off cuts.	Formwork and off cuts will become waste therefore by using flat soffits which do not require them, waste will be reduced.
Implement all Value Engineered items as soon as possible.	Most value engineered items involve reducing the station size or components needed which will all reduce waste.
Design for manufacture not manufacture for design.	Components are off the shelf where they are available off the shelf. Any bespoke design necessary will be standard throughout the station, e.g. light mountings required for acoustic

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	<p>performance. C100 common design items have been adopted to achieve standardisation across all Crossrail stations.</p> <p>Off the shelf and standardised components create repetitive processes which reduce waste through processes such as off cuts.</p>
Reduce the amount of cable trunking.	Generally, the lighting and small power, emergency lighting and 110V containment shall be combined into a 3 compartment trunking rather than each system having its own trunking. This reduces materials required and therefore the potential for waste to be generated.
Use blocks for internal walls where use of pre-cast concrete is not feasible.	Using blocks instead of in-situ cast concrete would reduce waste through incidence such as miss pours. Pre-cast concrete formed off site will not generate any waste on site as it will be manufactured to fit, therefore is the most desirable.
Reduce cladding externally around vent towers.	<p>East vent shaft has no cladding - all exposed concrete.</p> <p>Reducing cladding reduces waste through less materials being used which can become waste, including through off cuts and packaging.</p>
Select materials with less maintenance/replacement (filters, insulation, light fittings) i.e. components with long life.	Materials with a long life will require replacing less often generating less waste.
Incorporate ducts and risers within floors and walls.	Incorporating ducts and risers in floors and walls reduces the need for cladding which can generate waste through off-cuts and packaging.
Ensure that floor to ceiling heights are consistent to encourage off-site fabrication.	Floor to ceiling heights cannot be consistent throughout the whole station, due to M&E, structural and staircase height issues. However the horizontal and vertical planning modules provide a standardised floor to ceiling height within each module, which reduces the chance of off-cuts and consequently waste.
Design out 'sharp' junctions/interfaces to omit requirement for additional protection and rails.	Radiused corners are proposed to the tunnelled area junctions and coordinated to avoid additional protection/ handrails, which would generate waste through off-cuts and packaging.