“From Grey to Green”
A Green Deck in Hung Hom for Social Innovation
Existing Scenario
Issues: Poor air quality and safety concern with the overloaded footbridge

The Cross Harbour Tunnel is the most congested tunnel plaza in the world (daily usage in Jan 2014: 117,554)
Issues: Poor connection within the district
Overview of the district with the Green Deck
Green Deck Benefits (I) – Enhanced neighborhood quality
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Proposed Art Gallery
Green Deck Benefits (I) – Enhanced neighborhood quality

District Park
Green Deck Benefits (I) – Enhanced neighborhood quality

District Park
Willow Edge & Reflection Pool

Viewing Deck and Food & Beverage

The Pavilion

Amphitheatre / Arena
Pedestrian circulation on midlevel walkway
Green Deck Benefits (II) – Improved Connectivity

Pedestrian circulation on deck level
Green Deck Benefits (II) – Improved Connectivity

Cycling Tracks on deck
Green Deck Benefits (II) – Improved Connectivity

Inter-district cycling and pedestrian connection
Green Deck Benefits (II) – Improved Connectivity

Inter-district cycling and pedestrian connection
Green Deck Benefits (III) – Improved Environmental Quality

Dust, Air, Noise

Deck Enclosure
The Deck edges will form the enclosure wall around the area beneath, including the Tunnel Portal, Toll Plaza and part of Hong Chong Road for effective air treatment and the control of air quality. Deck enclosure is a combination of ventilation louvre walls for supply air and solid fire rated walls.

Air filtration
Exhaust air from vehicles in Toll Plaza, at the Hung Hom Entry/Exit of Cross Harbour Tunnel and part of Hong Chong Road is first sucked into the air filtration system. This system includes pre-filter for removal of large particles in the air flow, electrostatic precipitator (ESP) and biofilter modules for removal of large proportion of very fine, respiratory and harmful particles (Suspended Particulate Matter). These filter modules are regularly cleaned by water spray nozzles shown in the picture on the right.

Air Purification
Then the air passes through an activated carbon filter to remove noxious gases in the exhaust air like nitrogen dioxide, unburned hydrocarbons, ozone and benzene. These filters are arranged in W form layout which was proven the most effective. The air will then be discharged at suitable altitudes and appropriate locations to atmosphere to statutory compliance.

Air Ventilation
The air at ground level beneath the Deck are constantly displaced and treated in the filtration and purification system creating a negative pressure within whereas the waiting lobbies, bus stands and toll booths are constantly supplied with fresh treated air creating a positive pressure.

Exploration of Biofiltration
The pollutants in the exhaust air may be filtered through the garden beds and planting medium on the Deck. Air purification capacities using this system may be further explored.

Notes: Technical Info above is from http://www.frontline.de/index.php/produkte/air-filters-for-road-tunnels
Green Deck Benefits (IV) – Enhanced Development Potential

Potential space available for conventions / other uses (e.g. retails) (about 30,000 sq.m to 40,000 sq.m.)
Green Deck Benefits (IV) – Enhanced Development Potential
Green Deck Benefits (V) – Benefits to Tourism
(Proposed Conference Centre)
Green Deck Benefits (V) – Benefits to Tourism (Proposed Conference Centre)
Green Deck Benefits (V) – Benefits to Tourism
(Proposed Conference Centre)
International Precedents

The Central Artery / Tunnel Project
Big Dig, Boston, United States
International Precedents

New York High Line
International Precedents

Cheonggyecheon, Seoul
Structural Concept

Column location
Columns are located strategically to minimize the impact to the traffic at road level below. Columns are placed either at Bus Stands, Pedestrian Islands, or center divider of road. They are spaced at 9000mm center to center.

Main Structural System
Due to the span of the structure, steel trusses system is by far the most economic system to adopt for the deck spanning across the wide road area. Primary steel space trusses will be installed at each column grids and with secondary steel space trusses at interval space to reduce the span of the structural floor girders. Steel girders will then be placed at suitable space on the main top chord of trusses to support the reinforced concrete composite slab with profile deck at Podium level. The column and the portal structure along traffic directions will be reinforced concrete beam-column system with pile foundation to sound rock.

Proposed Truss Type, Depth and Fire Rating Required
Steel trusses are in space truss arrangement so they will be stable during transportation as well as individually installed on supporting pier. Space trusses is also efficient and suitable for long span structure while keeping the tonnage of steel at a minimum to ease hoisting and construction. Moreover, space trusses can accommodate E/M services to pass through without occupying additional space underneath the main structure.

Minimum of 240 minutes FRR is suggested to protect the steel truss. Spray protection of Vermiculite (Spray Cement Paste) is intended to be applied over steel truss.

Landscape Podium Deck
The structural floor system will be a reinforced concrete composite slab with profile deck supported by the steel girders and eventually sit on top of the long span trusses.

Plant room level in between
In addition to the podium deck, a structural floor system will be installed in the middle of truss by connecting steel main beams to the verticals. The structural floor system will be a reinforced concrete composite slab with profile deck that is supported by the steel secondary beams on top of these main beams at mid level.

Low Rise Building on Deck
Due to the weight of the building, columns of the building will have to be aligned with node points (The intersection of vertical or diagonal strut to the top main chord) of trusses. The load from building will be transferred directly to the truss system and the reinforced concrete column of the deck and eventually down to the foundation system.
2014 Green Building Award – Merit Award

Merit Award 優異獎
Research & Planning Category

Proposed Green Deck Over Cross Harbour Tunnel Plaza

Client/Developer
The Hong Kong Polytechnic University

Project Manager
Mr. Chiu Pui-chung, M.I.Struct.E.; The Hong Kong Polytechnic University

Architect
 Dennis Lo & Ng Cho Man

Structural Engineer
COWM

Quantity Surveyor
Long & Co. Hong Kong Limited

Landscape Architect
ARCO

Environmental / Socioeconomic Consultant
Dennis Lo & Ng Cho Man

Architect & Engineers HK Limited

Traffic Consultant
COWM

Organiser:
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<td>Effect of the Green Deck on the local noise environment</td>
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Thank you