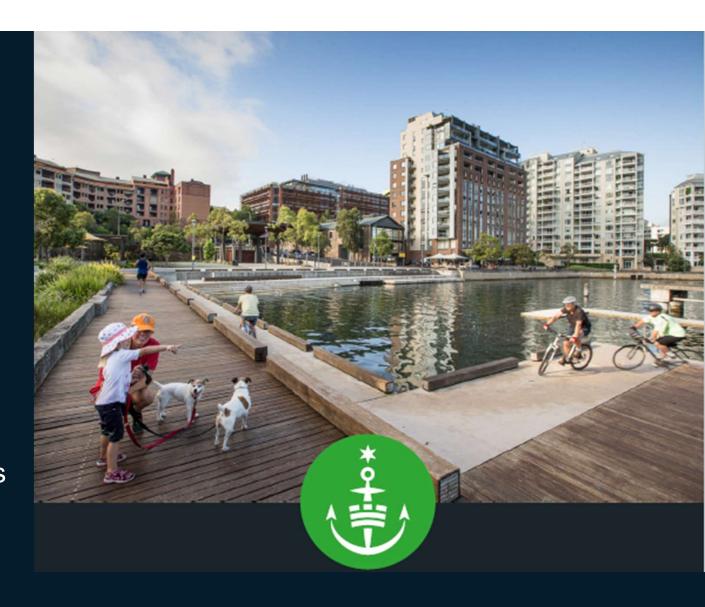
# City of Sydney Experience with Low Embodied Energy Construction Materials

Net Zero Construction Materials: A Briefing for Government Executives and Leaders

27 May 2021 CITY OF SYDNEY (1)



# **Strategic Context**

- Environment Strategy 2016-2021 – Focus: operational energy / carbon
- 2021-2025 Clear shift to carbon in wider context
- Multiple touch-points:
  - Own operations (civil works)
  - Specify low-e materials in procurement
  - Supply chain
  - Planning approvals
  - Resource recovery
  - Circular economy
  - Staff capabilities

#### Direction 1

Smart and resilient City operations

- Deliver energy, water and resilience outcomes through City asset design and management
- 2 Keep City parks green with water efficiency and alternate water sources
- Regenerate the environment through the City carbon-neutral commitment
- 4 Ensure the City's programs and services use resources efficiently
- 5 Reduce the amount of operational waste sent to landfill through avoidance and resource recovery
- Reduce embodied carbon in our supply chain and support circular economy outcomes
- 7 Manage environmental risks and issues

#### Direction 2

Efficient, future-proof buildings and transport powered by renewable energy

- Improve energy efficiency, water efficiency and waste management in existing buildings
- Drive all new buildings to be resource-effici and net zero energy
- O Support the transition to zero-emissions transport
- 1 1 Encourage community uptake of renewable electricity and stimulate the green economy
- 12 Support our residents to reduce utility costs and environmental impact
- 13 Help businesses to reduce utility bills and demonstrate environmental achievement



## **Direction 3**Regenerative and

inclusive city

- 14 Incorporate the perspectives of Aboriginal and Torres Strait Islander people in environmental action
- 15 Address equity issues related to climate change
- 16 Build community resilience and momentum on climate action
- 17 Support the development of circular economy systems
- Drought-proof the city by facilitating water recycling
- 19 Regenerate polluted waterways, air and land
- 20 Reduce the amount of residential waste sent to landfill through avoidance and resource recovery

#### Direction 4

Strong foundations for delivery

- 21 Build staff capability to deliver environmental outcomes
  - Deliver high-quality internal and external environmental reporting and communications
  - Employ efficient and effective decision-making processes



# **First Forays**

- 2010 Warm mix asphalt temperatures 20 to 50 degrees lower than traditional mixes - less energy inputs for same result
- 2010 15% to 20% Recycled asphalt pavement content road resurfacing program.
- 2014 Toner Pave Downer & cartridge recycling company, Close the Loop toner in asphalt mix reduces bitumen volumes, derived from crude oil
- 2018 Reconophalt extended range of 'waste' materials used in asphalt road resurfacing – street sweepings (grit/sand), toner, plastic bags, crumbed rubber (tyres)







## Latest initiatives

## **2019 Geopolymer Trial**

- Wyndham Road, Alexandria
- High traffic volumes
- Direct comparability to adjacent standard Portland Cement section
- Sensors installed within slab
- Uses 'waste' materials slag / fly ash + alkali binders

## <u>Video</u>

## **Next Steps**

 July 2021 – Low-e concrete (reduced cement content) for several footpaths, backed by Env. Product Disclosures (EPD)









# **Specifications**

- Reference GreenStar as a standard
- Encourage alternative materials aggregates & binders
- But alone have not driven the scale and pace of uptake needed

### Circuit breakers have been:

- External partnerships (UNSW, CRC-LCL, SSROC)
- Industry leadership commercial availability + willingness to partner

#### CITY OF SYDNEY 33 MATERIALS 3.3.1 CONCRETE All concrete used shall generally be ready-mixed concrete Sydney Ready-mixed concrete shall be obtained from an approve Specification and supply of concrete Streets Onsite-mixed concrete may be used where approved by the current edition of the relevant Australian Standard. The m to the satisfaction of the City's Representative 3.3.2 CONCRETE PROPERTIES

Concrete for the Works shall have a characteristic strength otherwise on the drawings. The strength will be dependen relevant section or on the drawings.

Concrete shall be of a consistency that it can be readily of the materials and without excess free water collecting a maximum for manually placed concrete and shall be teste testing concrete - Determining of the modulus of rupture

Concrete for use in kerb extrusion machines shall contain such consistency that, after extrusion, the shape of the ke

#### 3.3.3 SUSTAINABLE MATERIALS IN CONCRETE

The City has adopted the use of the Green Building Council of Australia (GBCA)'s Green Star MAT-4 as a standard with the following composition:

- · 40 per cent cement replacement
- · 50 per cent reclaimed water replacement
- 40 per cent coarse aggregate replacement
- 25 per cent fine aggregate replacement.

The City will consider the following alternatives to replace standard materials

- · Portland cement replacements
  - Ground Granulated Blast-Furnace Slag (GGBS)

  - o Amorphous silica (silica fume)
  - o Mineral additions (limestone)
- Geopolymer techniques and products (which are generally more suited to pre-cast applications). Note the City of Sydney Wyndham Street trial in April 2019. Once outcomes are agreed upon, geopolymer may be used.
- Virgin aggregate replacements
- Recycled pavement (sourced in situ or from external projects) recycled refers to both re-used sections as well as crushed and re-cast
- Reclaimed/avoided waste aggregates
- Blast furnace slag

# **People and Process**

## **People**

- Executive 'read' community & Councillor support for innovation
- Program Delivery Managers & Senior Project Coordinators implementation 'drivers'
- Specification engineers understandably conservative need to feel supported to participate in innovation
- Proactive contractors help stimulate innovation

#### **Processes**

- Enable flexibility in specifying / avoid excessive prescription
- Use tender processed to trigger contractor innovation
- Insert innovation KPIs into tender and contract documents
- Link to Industry rating schemes

