Re-decking Hogarth Flyover

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Agenda

- LoHAC overview
- Background
- Risk management
- Design phase
- Construction phase
- Completion & re-opening
TfL London Highways Alliance Contract (LoHAC) Project Set-Up

- Four geographic Framework Area
  - → NW, NE, S, C
- One contractor per Framework Area appointed – Design & Construction Capability
- 8 years in length
- Based on NEC
- NW Value approx £50M p.a.
TfL London Highways Alliance Contract (LoHAC) Project Set-Up

• Two ways to procure work:
  → Cyclic and reactive activities paid under an annual lump sum payment; core services.
  → Individual work ordered items under schedule of rates – Tasks.

• Payment options:
  → Lump sum
  → Re-measure
  → Target cost

• ‘Find and Fix’ by contractor or Employer inspection and contractor fix.

• Design by Client, build by contractor or design and build by the contractor:
  → Feasibility design under a time charge
  → Detailed design by contractor using a  % design fee based on construction costs

• Open book.

• Flexibility and room to grow.
Location

- Single lane
- 20mph speed restriction
- 2.0m width restriction
Background

• Built as temporary structure in 1971
  o Designed by Sir Bruce White, Wolfe Barry and Partners

• 250m long, 17-span flyover, concrete-steel
  o Span lengths varying between 8m to 18m

• 40+ years service life
  o In excess of its original intended use

• Strategic importance
  o 10,500 vehicles carried per day
Background - context
Structure Condition

- Capacity assessment undertaken in 2013 → Rapid evaluation vs 3T weight limit
- Structure History
  - Maintenance regime unsuccessful in maintaining condition;
  - Concrete repair scheme proposed at late stage; but
  - Safety concerns prevented implementation of repair programme
Client Brief

- Inspect & Assess
  - Determine the current condition
- 3T Live Load
  - A minimum requirement Hogarth Flyover
- Interim measures/risk management to BD 79
  - In the event of a 3T live load being unavailable
- Develop Solution for strengthening/replacement
  - In the event of a 3T live load being unavailable
Risk Management
Condition Monitoring

- 2013 assessment
  - → 3T Live Load
- CA re-assessment
  - DL only at delaminated areas
  - SOLUTION REQUIRED
  - Hidden strength in concrete slab
  - Risk assessed
- Commenced monitoring to BD 79
- Red, Amber, Green (RAG) & Black trigger levels
- Weekly night closure for top & underside inspections
- Emergency Preparedness Plan in case of Black status – communications protocol, diversion routes
## Condition Monitoring

### Condition of Element (examples)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Delamination &amp; spalling over 50% of panel area AND spalling more than 10mm past 2\textsuperscript{nd} layer of bottom rebar.</td>
<td>Close Flyover until emergency strengthening installed.</td>
</tr>
<tr>
<td>Red</td>
<td>Delamination present over more than 20% of panel area.</td>
<td>Weekly monitoring; Prepare to install emergency strengthening.</td>
</tr>
<tr>
<td>Orange</td>
<td>Minor spalls; some exposed reinforcement.</td>
<td>Monthly monitoring; Programme emergency strengthening.</td>
</tr>
<tr>
<td>Green</td>
<td>No spalling or delamination present.</td>
<td>Quarterly monitoring</td>
</tr>
</tbody>
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Condition Deterioration

- Pre-October 2013
  - Semi-critical areas
  - Spalling >25mm
  - Rebar de-bonding over lengths >1m

Photos 3 and 4: “Semi-critical”
Condition Deterioration

- October 2013
- Critical areas
- Spalling >40mm
- Bottom rebar fully exposed
- Rebar not bonded to concrete over lengths >1m
Condition Deterioration

Critical spans pre-October 2013

Critical spans after full delamination survey during closure, October 2013
Post October 2013 Delamination Survey

- Propping of category ‘Black’ areas & continued monitoring
- Further development of TfL business case for capital funding
- ECI development of construction methodology to identify constraints and timings
- Programme changes to 6 week closure during school holiday period in summer 2014
Constraints

• Stakeholders
  o Hounslow Council
  o Vegetation on Hogarth Roundabout → Chiswick Society
  o Noise → Local residents
  o Dust → Residents and road users
  o Lighting → Road user safety concern

• Demolition
  o Safe methods & areas of work

• Site Compound & working space
  o Site contained within live roundabout & adjacent to live roads.
    Logistics on cranage, materials storage & removal of demolition materials

• Traffic management closures
  o Highly visible & on news daily
Design Phase
Solution Development

Superstructure & substructure capacity

Lighting requirements

Trees

Live carriageways

Residential areas

Commercial businesses
# Deck Replacement Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Construction Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM1a – Night-time flyover closure, working along structure</td>
<td>£ 4.7M</td>
</tr>
<tr>
<td>TM1b – Night-time flyover closure, working from both ends of structure</td>
<td>£ 5.1M</td>
</tr>
<tr>
<td>TM2a – Full closure of flyover, precast deck panels with in-situ deck at west end</td>
<td>£ 3.6M</td>
</tr>
<tr>
<td>TM2b – Full closure of flyover, precast deck panels</td>
<td>£ 3.7M</td>
</tr>
</tbody>
</table>
New Deck Details
Methodology – New Panel Installation
Noise & Air Quality Monitoring
Lighting

- Carriageway qualities and junction density
- Crime data
- Ambient lighting

• Recommendations
  - Remove all luminaries and associated infrastructure over Flyover
  - Install new lighting on off ramp for eye adaptation onto A4 carriageway
Construction Phase
Procurement Challenges

• LoHAC procured on an NEC Term Services contract

• Hogarth Flyover procurement moved from Lump Sum (option A) to Target Cost (option C)
  o First time on LoHAC this has been implemented
  o Shared risk via pain/gain mechanism
  o Driven by TfL’s desire for cost certainty
  o Delivered an approximate 15% reduction in the estimate to £3.1M outturn cost

• Supply chain
  o Responsive & committed suppliers during preliminary and optioneering phase of the project
Advanced Works

Crane mat installation
Precast factory visit
Demolition
Steelwork Assessment, Repairs & Painting
Deck Installation
In Situ Deck
Waterproofing Installation
Parapet Installation
Surfacing, Kerbs & Drainage
Final Inspection
Completion & Re-opening
Completion & Re-Opening

~40 years old

+42 days

+12 days

+22 days

+31 days
Re-Opening

Collaborative working between TfL, CA & Stakeholders central to successful and timely delivery of project – **re-opened 10 hours early**
Drive Through
Final Thoughts

CIRIA C764
Hidden Defects in Bridges
Thank you

Jack Rose
Yunus Hussein
Hogarth Roundabout Restoration
Background – Typical Deck Detail

- Precast deck
- Angle
- Main longitudinal beam
- Pier
- Rubber bearing strip
- Beam buffers
- In situ deck
Superstructure Analysis

Superstructure analysis

Longitudinally fixed at Span 8

Idealisation over pier
Methodology – Crash Decks

- Crash decks

→ Hung crash deck for spans over carriageway

→ Self supported crash deck elsewhere for full access
It does happen...