

APPENDIX 3 – RISK REGISTER CONTINUED

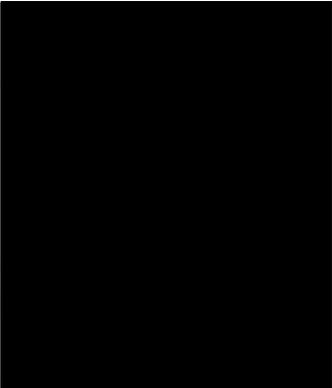
Risk ID	Risk Name	Mitigation	Mitigation Owner
1	Major London Events	Early engagement with planning and ensure known events are included in schedule. See also Annex 2 ITT Volume 2	Consultant
2	3rd Party works impact on stage 2 & 3 delivery	Early engagement Forward Planning & London Works, liaison with known schemes.	Consultant
4	Port of London Authority restrictions on River Working	Early consultation with PLA. Regular meetings going forward	Consultant
5	Conflict with other Projects	Early engagement with Forward planning. Liaison with known schemes.	Consultant
7	Bad Weather (severe)	Schedule works to minimise potential impact, have mitigation plans in place including use of 'winter' materials	Consultant
9	Section 61 Requirements impact on planned delivery	Early engagement with boroughs, Forward Planning. Consider construction techniques to reduce impact.	Consultant
10	Asbestos	Very Low Likelihood. Accept and be aware of risk moving forward. Provide appropriate PPE	Consultant
11	Lead	Accept and be aware of risk moving forward. Provide appropriate PPE for operatives.	Consultant
12	Heritage Structures	Early Engagement with HE where required. Adjust design's effect on appearance to eliminate need for HE approvals. Accommodate HE's requirements where possible.	Consultant
15	Insufficient Scope of Works	Specialist Consultant to undertake investigations and propose optimal scope of strengthening/refurbishment works to reduce the risk of further repairs without 'over-designing' the strengthening/refurbishment works. Project Team to review and select preferred option.	Consultant
16	Scope Creep	Undertake some investigations so that a more accurate estimate of repair extents is known. Procure contingent materials and allow additional time so that scope creep can be incorporated. Be prepared for any situation.	Consultant
18	Limited Contractor, subcontractor and plant capacity	Early engagement with Contractor and identify supply chain. Robust programme management.	Consultant
19	Required resource availability	Robust planning including resource forecasting.	Consultant
20	Utilities	Early engagement with Utilities companies if required. Develop survey information and identify possible shortfalls.	Consultant
21	Structural Failure (during works)	Use of specialist consultant to consider temporary loading cases, if required. Unlikely due to minimal nature of works.	Consultant

SECTION FOUR

Hammersmith Bridge Strengthening and Refurbishment Works

TfL 91313

18 May 2017
Confidential



Dear Sir

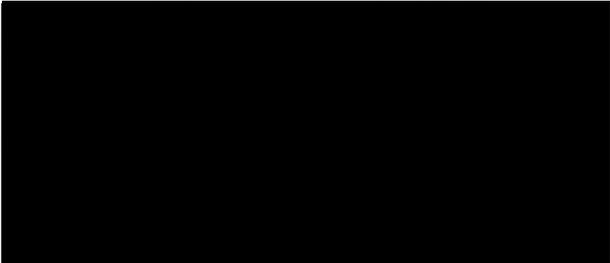
We are pleased to enclose our technical and commercial proposal for the Strengthening and Refurbishment of Hammersmith Bridge - Framework Reference No. TfL 91313.

We believe we have understood the scope and have congregated a very strong team to deliver this.

Should you feel that our service offering and associated fee proposal is not aligned with your needs or expectations, we would welcome the opportunity to discuss this with you.

If you would like to discuss our proposal with us, please don't hesitate to contact Tim Abbott on 020 8774 2997 or via email at Tim.Abbott@mottmac.com.

Yours faithfully
For Mott MacDonald



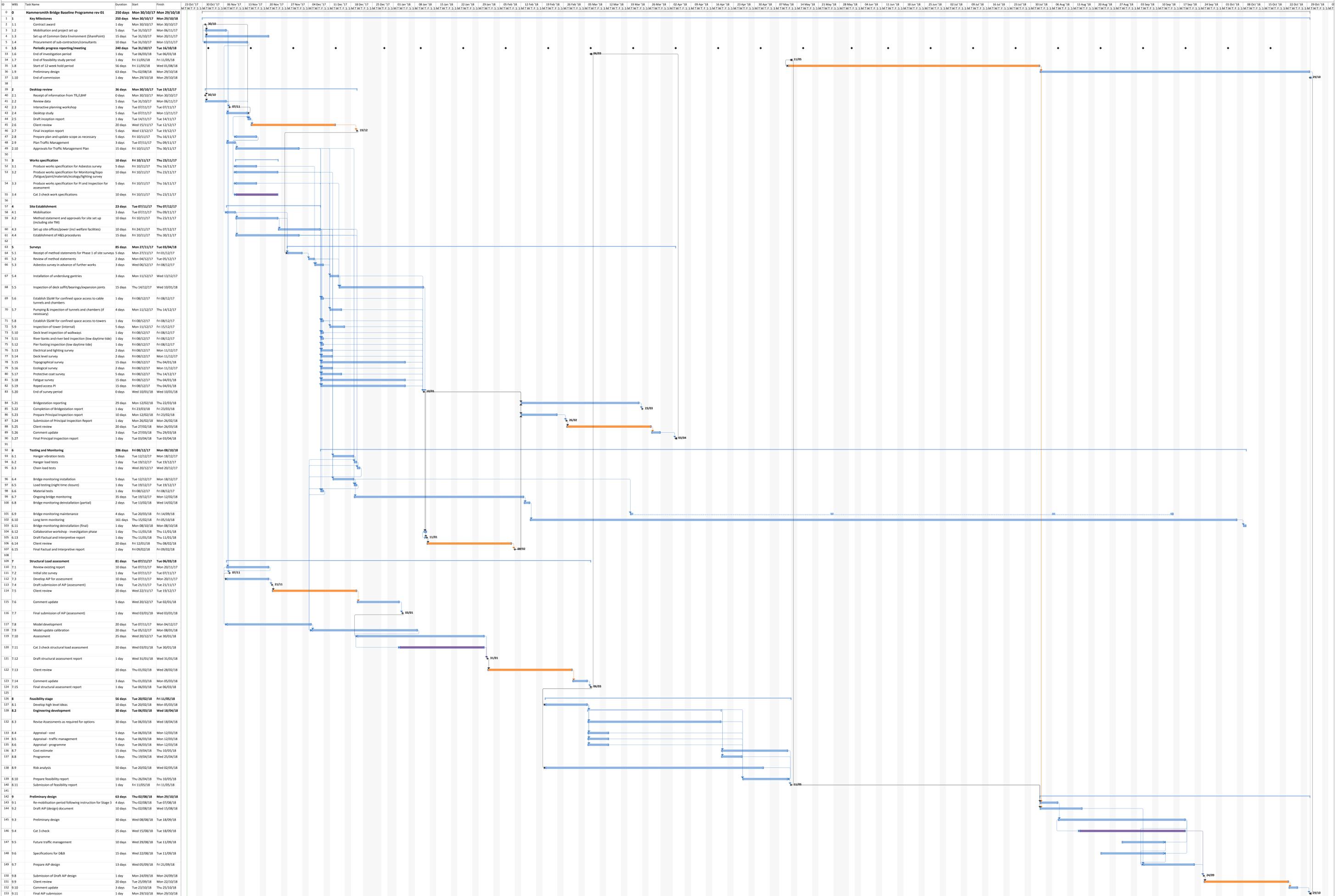
Divisional Manager (Metros and Civil)

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A. Curricula Vitae

Nationality	British
Profession	Civil Engineer
Specialisation	Civil/Structural Engineering
Position in Group	Projects Director – Metros and Civil Division
Year of joining Group	1990

KEY QUALIFICATIONS

25 years' experience in the design and construction of major civil engineering transport infrastructure. Specialist experience in the construction of long span cable supported bridges, steelwork detailing, fabrication and protective coatings, heritage bridges, cast iron and fibre reinforced polymers and project management of multi disciplinary teams in the UK and overseas.

EDUCATION AND PROFESSIONAL STATUS

Chartered Engineer, UK

BEng (Hons) Civil Engineering, Polytechnic of Wales

Member of the Hong Kong Institution of Engineers

Member of the Institution of Civil Engineers, UK

Member of The Welding Institute, UK

EXPERIENCE RECORD

2003 – present MOTT MACDONALD GROUP

2013 – present Projects Director – Metros and Civil Division

GRIP 2 Station Study – Civil discipline lead for a multidisciplinary feasibility study for a major station including two new 200m long road crossings of the rail corridor, a rail dive-under, a new rail over road bridge and two new rail over rail bridges.

Bermuda Swing Bridge – Project director for the feasibility study, approvals in principal (AIP), and detailed design of strengthening/replacement of the 100m road crossing between St David's and St George's Islands.

River Irwell Bridge – Project director for the superstructure detailed design (GRIP4+) of an asymmetrical network arch carrying two new railway lines over the River Irwell in Manchester, UK. The bridge has a span of 89m and is formed of a weathering steel tapering box for the arch, a fabricated asymmetric steel fabricated

'I' girder for the tie with steel cross girders and composite deck, the network is formed of a total of 92 tension bars of diameters up to 100mm. The signature bridge of the Northern Hub Alliance project will be the first network arch railway bridge in the UK.

Champlain Bridge Replacement PPP Project, Transport Canada, Montreal – Design team leader responsible for delivering the tender design of the approaches and co-ordinating and checking the design of the cable stay navigation span. The new bridge across the St Lawrence comprises three independent corridors (two highway and central light rail) formed of pre-cast balanced cantilever box girders to the 2.1km west approach and steel composite box girders to the 844m east approach. The architecturally derived portalised substructures, having a 51m wide crosshead, were designed of match cast post tensioned concrete units. Foundations comprised independent spread footings post tensioned onto the bedrock with rock anchors. Designed to the Canadian bridge code, durability assessments were required to justify the enhanced design life of 125 years and extensive use was made of stainless steel reinforcement. Seismic and ice loading heavily influenced the design.

The design JV of Hatch Mott MacDonald (HMM), Dessau and Ramboll worked for a consortium of Acciona, OHL, Samsung and Verreault.

N11 Arklow-Rathnew Road Scheme, Ireland – Leading a team for the detailed design of four overbridges on a design-and-build PPP (public private partnership) contract with BAM/Balfour Beatty. Structures included three overbridges and a major junction upgrade underbridge on the N7 at Newlands Cross with substantial reinforced soil approach embankments and H4A parapets, winner of the 2015 ACEI Presidents Award for Excellence in Design. All four bridges are two span structures utilising precast prestressed 'W' beams with an in situ deck slab and feature fully integral reinforced concrete piers and framed abutments with transition slabs.

Structures Package 1 – Station Road, Lewis & Shoreham Viaduct – Project director for the scheme design (Form 001) for Network Rail. Station Road Bridge, comprising four metallic spans and masonry arch approaches carries a two lane carriageway over Lewis Railway Station platforms and car park. Works to the structure include 'U' frame and local steelwork strengthening, removal of chalk fill and replacement with waterproofed concrete infill, full repaint and masonry repairs. Shoreham viaduct, a 16 span early steel viaduct carrying two rail tracks over the estuary of the River Adur, is to be strengthened by the addition of new intermediate 'U' frames and cross girders as well as various plated repairs. Structure will also be repainted.

Champlain Bridge, Montreal, Canada – Technical leader for a study to incorporate light rail transit onto the new Champlain Bridge crossing of the St Lawrence River. The study investigated various corridor layouts including single, double and multiple decks and using a double layer deck with the light rail on the lower deck thereby separating the traffic modes. Overall length of the crossing is approximately 3km with a 200m main span over the St Lawrence Seaway.

Third Bosphorus Bridge – Lender’s technical advisor – Technical review of the 1,408m main span hybrid suspension/cable stay bridge carrying both road and heavy rail across the Bosphorus Straights.

Nipigon River Bridge, Canada – Technical advisor to the construction supervision team for a two span cable stay highway bridge in Ontario. Formed of a single tower and three planes of stay cables extensive use is made of post tensioned pre-cast elements and DUCTAL ultra-high strength concrete to facilitate construction outside the severe winter environment.

**2003 – 2012 Senior Project Manager/Senior Design Engineer
Metros and Civil Division**

Nottingham Tram – Phase Two, UK – Team leader for the design of four bridges carrying phase two of the Nottingham Tram as part of a major design and build contract with Skanska. Bridges included the strengthening and widening of the existing Grade 2 listed Wilford Toll Bridge, and three new bridges; Fairham Brook Bridge – a two span deck of pre-stressed concrete beams; Lenton South Junction Bridge a steel half through bridge carrying two tram lines over an operational railway and the A52 Clifton Boulevard Bridge – a signature bowstring arch spanning 60m across six lanes of traffic, the latter two bridges were driven into position using self-propelled multi-axle trailers (SPMTs) during a rail and road closure.

East Croydon Station Footbridge – Structures CRE (contractor’s responsible engineer) under a design and build contract with BAM Nuttall for the design of a new 100m long signature steel Vierendeel truss footbridge which was designed to be constructed within one of the UK’s busiest train stations. The structure was successfully push-launched into position over six operational tracks and station platforms, a first in the UK.

King Road Underpass – Design manager for the detailed design of a post tensioned single span aqueduct and design check of a reinforced concrete box slide for a grade separation of a level crossing in Burlington, Canada. Design carried out to the Canadian Bridge Code and CN Rail design standards.

Matino PV Panel Farm – Peer reviewer of a design check and forensic engineering study into the cause of abnormal deflections to the aluminium support structure to PV (photo voltaic) panels in the Matino solar farm in southern Italy.

Balcombe Tunnel – Project manager for the emergency retrofit repairs to steel suspended drainage platforms within a brick rail tunnel. The work included analysis of the aerodynamic loading resulting from the passage of trains within the tunnel.

Haymarket Station – CRE for the tender design of Haymarket Station in Edinburgh. An alternative design was prepared for the GRIP 5-8 bid with BAM Nuttall.

Mater Stop – Conceptual design of a reinforced concrete support and load transfer platform to allow construction of a hospital above a proposed metro station box and subsequent transfer of load onto the station box roof. The design, using interim bored piles, required a complex jacking and load transfer sequence whilst isolating the hospital building from construction and in-service vibrations.

Crossrail (C131) – Paddington Integrated Project – Design team lead for the RIBA E/F design of a new Hammersmith & City Line LU (London Underground) station and new taxi facility and access into London's Grade 1 Listed Paddington International station. Leading a multidisciplinary team, the designs were delivered to Crossrail, LU and Network Rail standards and procedures under an NEC Professional Services Contract.

London Cable Car – Technical advisor for the superstructure during the feasibility design and production of contract documentation.

Rochester Bridge Balustrade Refurbishment – Project manager under an ECC (Engineering and Construction Contract) Option D (target contract with BoQ – Bills of Quantity) for the refurbishment of cast iron balustrades to the Grade II listed Old Rochester Bridge in Kent.

A228 Stoke Railway Bridge – Design lead and coordinator for the detailed design and tender evaluation of a five span steel composite ladder deck highway bridge carrying the realigned A228 across an existing railway and environmentally sensitive (SSSI) marshlands.

New Thames River Crossing, London UK – Project manager for the feasibility design and costing of a new road crossing of the River Thames between Greenwich and Silvertown. The mid level crossing incorporated a record breaking vertical lift span of 200m capable of raising 30m to allow cruise ships to pass. Tied network arches were adopted for the three main river spans with steel box girders used within the approaches.

Port Mann Highway, Vancouver, Canada – Project manager for the Category 2 checking of 21 new and retrofitted highway bridges for the US\$2 billion highway DBFO widening for the main north/south arterial route through Vancouver. Checking was undertaken to the Canadian bridge design code and onerous project specific seismic design criteria.

Ryde Pier, Isle of Wight – Project manager for the inspection, assessment, feasibility study, interim strengthening and full re-decking of Network Rail's Grade 2 listed 700m long railway pier which serves the ferries on the Isle of Wight.

Coast Meridian Overpass, Vancouver, Canada – Design review of a launched six span cable stayed road over rail Bridge with steel concrete composite deck and spans of 125m.

Eastleigh Footbridge – Project manager for design of strengthening and refurbishment of a Grade 2 Listed covered steel and timber footbridge at Eastleigh Station for Osborne Rail.

Toll Bridges Seismic Retrofit Programme, San Francisco/Oakland, USA – Project manager for Mott MacDonald's engineering consultancy services to Bay Area Management Consultants (a joint venture of Hatch Mott MacDonald and URS) providing technical advice during the construction of the signature 384m span

\$1.5 billion self anchored suspension bridge (replacement for the east span of the San Francisco Oakland Bay Bridge).

Severn Suspension Bridge, UK – Production of a feasibility study into main cable augmentation and replacement options for the Highway Agency's 988m span Grade I listed bridge.

Newcastle High Level Bridge – Design project manager for the award winning £43 million refurbishment and strengthening of the Newcastle High Level Bridge, a Grade I listed cast iron heritage structure comprising six tied arch spans carrying both road and rail across the River Tyne. Works included detailed inspections, investigations, load testing, instrumentation, assessment, design of safety critical works; interim measures; refurbishment and repair works, a major research study into the fatigue performance of cast iron, strengthening of structural elements including complete replacement of the suspended timber road deck and a full repaint. The client was May Gurney and Network Rail.

Khalifa City Interchanges – Project manager for the independent design check of the reinforced concrete highway bridge structures at two interchanges on the Abu Dhabi/Dubai Highway.

Berkswell Bridge – Project manager for the design check of a reinforced concrete railway bridge deck replacement on the East Coast mainline.

2002 Senior Structural Engineer – Chaiyi, Taiwan

Taiwan High Speed Rail – Working with IREG, (International Railway Engineering Group), a consortium of European and local consultants responsible for the independent checking of the project. Responsible for the design review of steel bridges and the detailed design check of a three span steel box girder bridge with composite concrete deck having a main span of 90m.

1999 –2002 Senior Resident Engineer – Bangkok, Thailand

Rama 8 Bridge – Senior resident engineer responsible for the design review and construction supervision of a 300m main span asymmetrical cable stayed bridge over the Chao Phraya River in central Bangkok. The design and construct contract also included 4km of approach viaducts of prestressed concrete beams. Responsibilities included leading a 30 strong team of local engineers, inspectors and surveyors supervising the construction of the cable stayed bridge. Duties included the technical review and approval of design drawings, specifications, shop drawings, temporary works and the checking of all site operations, procedures and erection schemes. The client was the Bangkok Metropolitan Administration. Contract value 2.72 billion Thai Baht (US\$65 million).

1998 – 1999 TONY GEE & PARTNERS Design Engineer, Inchon, South Korea

Yong Jong Do Bridge – Co-ordination of temporary works check and review for the erection of the Yong Jong Do Bridge, a 4.4km long double deck bridge carrying six lanes of traffic and twin railway tracks to the new international airport. The

temporary works facilitated the horizontal strand jacking of bogey mounted 5000T warren truss bridge modules onto a floating barge before being towed into position and lifted vertically into position using strand jacks.

Inchon International Airport, Korea – Seconded to Hanjin Engineering and Construction Company to provide technical advice, design and supervision during the fabrication, assembly and erection of 13,000 tonnes of structural steelwork of the airport terminal building roof. The roof comprised cable stayed ‘pagoda’ trusses and 90m clear span tied arched trusses. Initially based at Hanjin’s fabrication yard, responsibilities included the review of shop drawings; supervision of welding quality; design of temporary works for strand jacking of terminal roof trusses; engineering reviews of all other temporary works schemes and drafting of technical method statements and specifications. On site, responsibilities included supervision of the welding and bolting assembly and management of lifting operations for the seven terminal roof truss modules, each weighing a maximum of 1200 tonnes. Other responsibilities included the inspection during manufacture and supervision during installation and stressing of high tensile tie bars to the pagoda roof trusses. The client was the Korean Airport Construction Authority, KOACA

1990 – 1998 MOTT MACDONALD GROUP

1996 – 1998 Design Engineer – Croydon

Battersea Yard Railway Bridge – Inspection and assessment leading into the feasibility and detailed design of strengthening works to a 127m long five span wrought iron viaduct of riveted plate construction. Work included preparation of all contract documentation for the client, Railtrack Southern.

Bridgeguard III Project – Site team leader during condition surveys and inspections of rail bridges in and around London, responsibilities included preparation of inspection reports and checking of assessment calculations.

River Wey Railway Bridge – Inspection and assessment of the River Wey railway bridge, an early steel underbridge of riveted plate construction with main river span of 26m, for Railtrack MPD Southern. This work included the development and evaluation of strengthening and repair details, and the preparation of contract documents.

1994 –1996 Assistant Resident Engineer, Tsing Ma Bridge, Hong Kong

Tsing Ma Bridge – Supervision of construction of a suspension bridge with 1377m main span designed to carry both road and rail traffic including the fabrication and erection of 7300 tonnes of steelwork for the 288m of the Tsing Yi approach spans, cable spinning and erection and site jointing of the main span deck units. Roles included the checking of heavy lifting schemes, checking of fabrication drawings and quality control of site welding, bolting and protective treatment works. The client was the Hong Kong Government.

1992 – 1994 Design Engineer – Croydon

A34 Newbury Bypass – Design of a continuous steel box girder/concrete deck composite highway bridge to BS 5400. Spans of 45m and of 37.5m, with twin open top box girders and concrete deck to carry the Donnington link road over the A34 Newbury Bypass.

Channel Tunnel Terminal – Design and detailing of steel and aluminium gantries and road signs within the Channel Tunnel Folkestone terminal complex.

Jubilee Line Extension, London Underground – Checking of Jubilee Line Extension station works at Waterloo and Canning Town stations, both BS5400 and to BS8110.

Strawberry Hill Bridge, British Rail – Category 3 detailed design check of a British Rail steel box girder bridge including piled foundations, superstructure and construction sequence.

1991 – 1992 Assistant Resident Engineer – UK Site

A20 Folkestone-Dover Trunk Road, Contract 3 – Construction supervision of urban roadworks within Dover including the two stage replacement of Snargate Railway Bridge, in fabricated 'I' beams with composite deck, construction of a new sea wall involving extensive piling works; construction of a new pedestrian subway; numerous retaining walls and service relocation works, including pipe jacking under the railway. The project included large scale earthworks in chalk.

1990 – 1991 Graduate Engineer – Croydon

Heathrow Express Rail Link – Finite element tunnel lining and junction designs utilising New Austrian Tunnelling Method (NATM). Settlement analysis for the project including the effects on London Underground's Piccadilly line and the Department of Transport's bridges on the M4 spur road.

Jubilee line Extension – Settlement analysis of shaft and tunnelling works.

Channel Tunnel – Design checks for the NVS shaft and design of access road from the A20 trunk road.

**1990 BORAL GAS, Australia
Civil Engineer – Gas Corporation of Queensland, Brisbane**

Outline design of a road transport liquefied petroleum gas (LPG) storage terminal in North Queensland. Site liaison with contractors of new highway works within Brisbane organising diversions and relocation of gas mains.

**1988 – 1989 MRM PARTNERSHIP
Junior Site Engineer**

North Devon Link Road – Supervision of construction of rural trunk road with extensive earthworks in shales and clay. Responsible for two large highway bridges

one of which spans the river Taw, both of post-tensioned in situ concrete voided decks. The client was the Department of Transport.

LANGUAGE CAPABILITY

English : Mother tongue
French : Spoken – basic
German : Spoken – basic
Thai : Spoken – basic

PUBLICATIONS

“A Bridge Fit for Kings” - Rama VIII Bridge. SouthEast Asia Construction, Nov/Dec 02, pp 56-64. [REDACTED]

“Assessment, Strengthening and Refurbishment of the High Level Bridge, Newcastle-upon-Tyne, UK”, Mezinarodni Sympozium 12, Brno 2007, pp 125-127. [REDACTED]

“Structural Conservation of Robert Stephenson’s High Level Bridge across the River Tyne”, Materials Evaluation March 2007, Volume 65/Number 3, pp 281-286. [REDACTED]

“Newcastle High Level Bridge – Restoring a Historical Road/Rail Bridge”, Davis, SG and Abbott, TC. Paper presented at the Institution of Civil Engineers Conference ‘Current and Future Trends in Bridge Design, Construction and Maintenance’, Beijing, September 2007.

“High Level; Bridge: engineering successful heritage solutions”, Proceedings of the ICE Journal of Engineering History and Heritage 162 August 2009, Issue EH3. pp 127-136. [REDACTED]

“Repair of fractured cast iron bridge”, Proceedings of the ICE Journal of Engineering and Computational Mechanics 162 September 2009, Issue EM3. pp 127-139. [REDACTED]

“High Level Bridge – Extending the Life of Heritage Bridges”, Austroads Bridge Conference 2011, [REDACTED]

Nationality	British
Profession	Civil Engineer
Specialisation	Bridges
Position in Group	Senior Project Manager – Metros and Civil Division
Year of joining Group	1987

KEY QUALIFICATIONS

Experience in the design and construction of steel composite and concrete bridges for railways and roads in the UK, Hong Kong, Portugal, United Arab Emirates, Ireland and Southern Africa.

EDUCATION AND PROFESSIONAL STATUS

Chartered Engineer

BSc Civil Engineering, University of Surrey

Member of the Institution of Civil Engineers

EXPERIENCE RECORD

1987 – present MOTT MACDONALD GROUP

2014 – present Senior Project Manager – Metros and Civil Division

Wessex Capacity Alliance – A £400 million programme of works to improve passenger capacity into Waterloo Station. Package lead for the design of rail viaducts at the approach to Waterloo International Station. Also member of the Alliance Management Team. Client: Network Rail.

2013 – 2014 MOTT MACDONALD PDNA (South Africa)

2012 – 2014 Senior Project Manager – Sub-Saharan Africa

Kampala-Entebbe Expressway – Designated bridges key expert within the Mott MacDonald Project Management Consultant team for the 50km long new-build expressway for client Ugandan National Roads Authority (UNRA). Contract value US\$497 million.

Transnet, Swaziland Rail Link – Discipline lead for Bridges subdivision for the tender design of a 150km long new rail line between Lothair in South Africa and Sidvokodvo in Swaziland. Due to the mountainous nature of the terrain, the scheme

requires a large number of structures including major viaducts. The estimated construction cost is ZAR7 billion.

ANE, Bridge Replacements in Zambezia Province, Mozambique – Designated bridge engineer for the design of two river bridges in Quelimane, Mozambique for client ANE (National Roads Administration). The bridges will replace two temporary Bailey bridges. The project includes hydrological study, social impact and environmental studies, a feasibility study with alternative bridge designs and tender design.

ENRC, Nacala Rail and Port – Civil and structural discipline lead for outline design stage of a 1200km long new build coal railway line and port facility in Mozambique. The railway will link the coal mine in Tete in the interior of Mozambique to the port of Nacala and is designed for a capacity of 100MTpa. Bridge structures include major viaducts, river crossings and road bridges.

2007 – 2012 Senior Project Manager – Metros and Civil Division

Vinci-BAM Nuttall JV for London Underground, Victoria Station Upgrade – Civil and structural discipline lead for the detailed design phase (RIBA Stages E and F) of a £600 million upgrade of the underground station to increase passenger capacity and allow step-free access. The project includes two major cut-and-cover ticket hall structures and new passenger tunnels.

Transport for London, East London Line Phase 2 – Design manager for the detailed design phase of a new 1.3km extension to the recently opened East London Line. The project includes three new bridges, extensive retaining walls, earthworks, track, drainage, roads and footpaths, noise barrier design and landscaping. Approximate scheme cost £30 million.

Hodariyat Bridge Design Check – Abu Dhabi, UAE – Project manager for the independent design check of a 200m span balanced cantilever bridge with incrementally launched side spans.

Al Raha Beach – Abu Dhabi, UAE – Project manager for the detailed design and independent check of 15 composite bridges for a new prestigious development. The architect led designs include network arches and up to 80m span, and three-span tubular arch structures up to 44m span.

Johor Petroleum Island Access Bridge – Project manager for the detailed design of a 1.7km long access viaduct. This forms a major part of the design of a bunkering facility off the Malaysian coast.

2004 – 2009 Principal Engineer – Metros and Civil Division

Transport for London, East London Line – Design manager for bridges and other civil engineering structures to preliminary design stage, including two rail-over-rail trusses of 90m and 80m span. Also technical advisor to client during the design and build phase. <http://www.tfl.gov.uk/ellc>

Egnatia Odos, Metsovitikos Bridge Check, Greece – Design check of balanced cantilever bridge of main span 235m and pier height over 100m. It forms part of the Egnatia highway through the Pindos mountain range. www.egnatia.gr/

Mabey & Johnson, Yallahs and Rio Grande Bridges, Jamaica – Project manager for substructure design for two major river crossings.

London Borough of Brent, Wembley Park Station Bridge – Project manager for a bridge strengthening scheme for a road bridge crossing Network Rail and London Underground lines, from feasibility study, through to detailed design and construction supervision.

1999 – 2004 Senior Engineer – Metros and Civil Division

Bridge Design Contingency Margins – Study for the Highways Agency of the correlation between increased load carrying capacity of bridges and construction cost.

Network Rail – Development of a computer program (CARA) which allows comparison of static and dynamic bridge loads of real trains.

Shortlands Junction – Detailed design of civil works for a new grade separated railway junction. This work is a design and build contract in conjunction with Geoffrey Osborne Ltd. The design work includes one road-over-rail structure and one rail over rail. Both are to be built offline and slid into position using the Autoripage® system. Additional design works include bored pile walls with several levels of props, and temporary jacking structures for the Autoripage® installation.

Railtrack, Cross Country Train Study – Dynamic analysis of representative bridge structures subjected to loading from new rolling stock. Risk assessment of effects of new trains on existing bridge stock.

Euston Area Remodelling (Part of West Coast Main Line) – Inspection and structural assessment of various railway bridges and other railway structures for client Balfour Beatty Rail Projects.

Assessment of Hemus Viaduct, Bulgaria – A 400m long high level viaduct requiring repair and strengthening. Assessment includes seismic checks in area of high seismicity.

General McMahon Bridge, Dublin – Project manager for assessment works. Inspection and structural assessment of bascule bridge for Dublin Corporation. The bridge is a Scherzer rolling leaf type with an orthotropic plate deck.

Route 10 – North Lantau to Yuen Long Highway, Hong Kong – Team leader (suspension) responsible for the preliminary design of the suspension system for the Tsing Lung Bridge, main span 1418m, forming part of the investigation and preliminary design of the 12.5km long Route 10.

1998 – 1999 Project Manager – Ireland

Project design manager for Southern Cross Route Motorway, a 7km section of orbital motorway which includes 17 bridges.

1995 – 1998 Project Manager – Dubai

Dubai Municipality - Preliminary study, design and preparation of contract documents for several footbridges in Dubai. Project value: Dirhams 12 million (£2 million). Supervision of construction of four footbridges as resident engineer.

Dubai Municipality, Preliminary study for Second Al Garhoud bridge - a 400m long bridge incorporating a lifting span and 2km of approach roads. The scheme studied was a widening of an existing bascule bridge crossing (Scherzer rolling leaf type). Project value: Dirhams 120 million (£20 million).

1992 – 1995 Design Engineer – Portugal

Caminhos de Ferro Portugueses (Portuguese Railways), Modernisation of the Linha do Norte, Portugal – Preliminary and detailed design for high speed rail project. Included rail and road bridges, and also footbridges at 12 stations. Inspection and assessment of railway bridges.

Pontejo (International Consortium of Contractors), New Road Crossing of the Tagus River, Lisbon – Preliminary design for tender design/build/operate concession.

Caminhos de Ferro Portugueses (Portuguese Railways), New Lisbon Freight Station – Detailed design of railway structures.

1990 – 1991 Design Engineer – Bridges Division

British Rail – Design check of railway viaducts for a new Waterloo International Terminal London.

Design of piers, abutment and anchorage in reinforced concrete of Tsing Ma Suspension Bridge for the Lantau Fixed Crossing in Hong Kong.

1988 – 1990 Design Engineer/Site Engineer

London Docklands Development Corporation – Design of 20m span twin leaf steel bascule bridge, steel concrete composite approach spans at each end and control cabin/plant room at Canary Wharf, London Docklands. The bascule decks are orthotropic steel. They rotate on pivot bearings and are raised by hydraulic cylinders.

Supervision of construction of bridges and associated buildings and mechanical and electrical works associated with bascule bridge and control cabin for the Canary Wharf eastern access.

1987 – 1988 Design Engineer

Design checks of composite and concrete bridges at A20, Dover.

Design engineer for A282 Dartford Thurrock Approaches, Kent. Design and preparation of contract documents for steel composite bridge deck, reinforced concrete and post-tensioned substructures and tied retaining walls.

Design of piled foundations and substructures for 10-span viaduct, for A282 Left Link Viaduct, Essex.

**1982 – 1987 EAST SUSSEX COUNTY COUNCIL
Assistant Engineer**

- Preliminary highway alignment design for various road improvement schemes.
- Site supervision of road and bridge construction of A22/A26 Uckfield bypass, including 10km of highway works and bridge structures.
- Geotechnical site investigation for various projects.
- Detailed design of two steel/concrete composite bridges over rivers on A21 Robertsbridge bypass. Feasibility study, preliminary design and cost estimating of bridges for various highway schemes. Detailed design and preparation of contract documents for various retaining walls.

**1980 – 1981 BAYER AG, WEST GERMANY
Trainee**

Site work for resident engineer (part of sandwich degree course) on construction of new pharmaceutical research centre.

LANGUAGE CAPABILITY

English : Mother tongue
French : Spoken – fluent; written – good; reading – good
Portuguese : Spoken – good; written – good; reading – good
German : Spoken – good; written – fair; reading – fair
Italian : Spoken – basic; written – basic; reading – basic

Nationality	British
Profession	Civil Engineer
Specialisation	Civil engineering
Position in Group	Director – Metros and Civil Division
Year of joining Group	1975

KEY QUALIFICATIONS

Over 40 years' experience on many types of engineering projects including the design and assessment of railway bridges, highway bridges, harbours, jetties, crushing plants, and refurbishment of historically important structures.

Experience has been gained in the UK, although some of the projects were for sites overseas.

EDUCATION AND PROFESSIONAL STATUS

Incorporated Member of the Institution of Structural Engineers

Higher Technicians Certificate in Civil Engineering, Westminster College

EXPERIENCE RECORD

1975 – present MOTT MACDONALD GROUP

1985 – present Divisional Director – Metros and Civil Division

Wessex Capacity Alliance – Currently the Alliance Leadership Team (ALT) participant for Mott MacDonald within the Wessex Capacity Alliance (WCA) comprising Mott MacDonald, Network Rail, Skanska, Colas and AECOM, working together to deliver major improvements to boost capacity at one of the UK's busiest stations, London Waterloo. This ambitious programme involves increasing capacity at London Waterloo Station by extending platforms 1 to 4 and re-instating the disused Waterloo International Terminal (WIT). The scope covers major alterations to station buildings, platforms, bridges, viaducts, track, signalling and extensive interfacing with stakeholders.

Technical Governance Champion – Technical Governance Champion role is to support Mott MacDonald's Metro and Civil (MNC) business to determine if there are any gaps in technical competencies i.e. ability to apply engineering principles/rules, specialist skills and or practical knowledge. If any gaps are identified, to direct a working group(s) to define the problems and provide a framework to deliver a Technical Excellence Improvement Plan which enables solutions to be developed,

administered and measured. The aim is to improve quality and reduce commercial, programme and reputational risks.

Cuxton Road Detailed Design – Project director responsible for detailed design to replace the existing two decks with standard U-type bridge decks and modify the existing permanent way. Client: Balfour Beatty Rail Services Ltd.

RSSB 1592 Bridge Dynamic Analysis – Project director responsible for the study of dynamic analysis of typical GB bridge types and future train design. Client: RSSB.

Ferry Road Benfleet Reconstruction – Project director for the replacement of the existing six decks with standard U-type bridge decks, undertake modifications to the existing platforms including associated permanent way works. Client: BAM Nuttall.

IEP Bridge Resonance GRIP 3 – Project director for the dynamic analysis of representative bridge structures subjected to loading from new rolling stock. A risk assessment of effects of new trains on existing bridge stock was undertaken, and a final report of the findings and recommendations provided to the client, Network Rail.

Tennison Road Bridge – Project director and CEM (contractor's engineering manager) for the outline and detailed design reconstruction of the Tennison Road Overbridge, a nine span structure carrying a two lane carriageway and footway over the London Bridge lines. Client: Network Rail.

Hackney Wick Station Redevelopment – Project director for the outline and detailed design of the works associated with the redevelopment of Hackney Wick Station. The project entailed installing a subway beneath the existing railway line and associated lifts and stairs to platform level. Client: AMCO.

Brighton Road 2/46 Surbiton Reconstruction – Project director for the feasibility study, preliminary and detailed designs of Brighton Road Bridge, which involves the replacement of five bridge decks that are to be replaced within a single 72 hour possession of the railway, near Surbiton Station. The design adopted the SDD (standard design details) U-decks. Client: BAM Nuttall.

Forest Lane Vehicle Incursion Scheme – Project director for a scheme undertaken for Osbornes, considering the options available to manage the risk of vehicle incursions for a road running parallel to strategically important Network Rail railway lines. The feasibility study used risk based assessments to present schemes for a challenging and heavily constrained site in East London.

Spandrel Walls: Managing the Risks – Project manager for this Network Rail HQ study, considering the risk associated with spandrel wall defects. The study to date has included a desk top and site review of higher risk arch structures, identification and specifications for structures suitable for monitoring works, statistical analysis of the Network Rail arch stock, and the management of a sub consultant and in-house checking team undertaking finite element modelling works for spandrel wall behaviour and defects.

Managing Risks Associated with Spandrel Walls – Network Rail HAQ – Project director for this Network Rail HQ study, considering the risk associated with spandrel

wall defects. The study has included a desktop and site review of higher risk arch structures, identification and specifications for monitoring works, statistical analysis of the Network Rail arch stock, and the management of a sub consultant and in-house checking team undertaking finite element modelling works to establish spandrel wall behaviours.

East Croydon Station Footbridge – BAM Nuttall – Project director for the detailed design of a 90m long, Vierendeel truss, footbridge spanning the second busiest interchange station in the UK. The footbridge provides a Disability Discrimination Act (DDA) compliant platform interchange and an improved east-west connection to future property development. The structure will be launched over the live railway to avoid the constraints of railway possession working.

Peer Assist to Network Rail, UK – Director responsible for providing peer assist services to Network Rail HQ in conjunction with Gerrards Cross tunnel failure, Stewarton underbridge failure and Ely derailment.

Standard Underbridge Designs, UK – Director responsible for the development of a suite of standard underbridge designs on behalf of Network Rail. The commission involves the detailed design to both BS5400 and Eurocode of standard Z-type, U-type, E-type bridge and the Category 3 independent check of the box girder bridges.

Construction Partnership Framework, UK – Project director for over 30 bridge strengthening and remonstration schemes. The commission has included the award winning reconstruction of 10 bridge spans outside Clapham Junction during a 100 hour possession and the strengthening of a wide range of metallic structures whilst minimising the effects on operational traffic.

Crossrail, UK – Director responsible for all bridge works associated with central tunnel package. The scope includes elevated viaducts, individual bridge replacements, bridge widening and associated infrastructure works.

East London Line, UK – Director responsible for providing bridge related ‘peer assist’ to the Transport for London (TfL) team. Tasks include reviewing contentious/complex issues and advising on the appropriate way forward.

West Coast Route Modernisation – Bridge Replacements – Director responsible for the design of 10 replacement bridges on the West Coast Mainline, including box girder, Z-types and billet decks.

Replacement of Newtown Road Bridge, Ashford, Kent – Director responsible for the replacement of a railway bridge deck and abutment. Concept design, managed the approvals process, provided procurement advice.

North London Line, UK – Director responsible to TfL (Transport for London) for the review of Network Rail’s GRIP stage submissions relating to civil engineering aspects. The reviews cover modifications to existing assets such as bridges, embankments, cutting, retaining walls, the design of replacement underbridges and underbridge widening schemes.

Blackfriars Railway Bridge, UK – Carried out 3D model verification against load testing of this wrought iron multispan arch bridge over the River Thames. Project manager for the inspection/assessment and preparation of feasibility studies into the options for repair/strengthening of this strategic railway bridge crossing the River Thames. The commission also included the inspection and assessment and feasibility studies for nine approach structures of varying age/form of construction.

Gerrards Cross Tunnel Collapse, UK – Project director responsible for providing Network Rail with technical support throughout the tunnel recovery programme. Responsibilities covered reviews of design proposals, Form A, Form B and method statements.

Ely Rail Derailment, UK – Project manager responsible for providing initial technical support to Network Rail related to the decision to reconstruct the bridge rather than strengthening.

Newcastle High Level Bridge – UK Network Rail LNE May Gurney Construction Ltd – Project director for the principal inspection, and assessment of the historically important multispan tied arch cast iron Grade II listed structure. The assessment included a complicated 3D analysis, real train load assessments, adopting limit state and permissible stress calculations in accordance with Railtrack's latest standards RT/CE/C/015 issues 1 and 2. A key task within the project was to understand the structure's 'real' behaviour which involved the development and execution of full scale load testing utilising two Class 56 locos. Currently responsible for the detailed design and technical support for the £30million refurbishment/strengthening contract.

Network Rail – Southern Region – Director responsible for the 10 year joint venture structures assessment framework contract 2003-2013. The joint venture team is responsible for the inspection and assessment of Southern Region 'structures' comprising underbridges, overbridges, footbridges and station structures. The team also assists the regional structural engineer in the development of assessment management strategies/tools.

Network Rail – Headquarters – Director responsible for the development of Network Rail's national database for bridges 'DEBRA'. DEBRA will comprise a comprehensive system to interrogate and store bridge strength data to provide readily available asset knowledge by Network, zone/region, route, bridge and individual bridge elements. The program incorporated a mixture of route clearance techniques using relative and absolute vehicle loading comparisons to compare available bridge strength information with Network Rail's obligations for rail traffic and asset stewardship.

Network Rail – Headquarters (Assessment Code for Footbridges Study) – Director responsible for the development of a scoping study to identify the requirements for a footbridge assessment code. The project involved consultation with industry experts, key territory engineers, collation of data relating to historical problems with the assessment of footbridges and review of current UK and international codes of practice.

Owen Street Diveunder Box Slide – Project co-ordinator for the tender design of this strategic rail crossing within Network Rail's Midland zone. The box, some 70m

long, will be slid into position during a weekend possession of the railway. The site presents many challenges including buried canal infrastructure, significant services, a history of mining subsidence and not least the constraint of working adjacent to the line railway.

Railtrack Southern Structures Framework – Co-ordinator for the framework which incorporates inspections/assessments of rail/road bridges and feasibility studies for the strengthening and reconstruction of under strength structures.

Railtrack Southern Asset Management – Project manager/co-ordinator for a series of asset management studies. The tasks involve working closely with the zone to assist in reviewing/developing procedures for the management of their structures/risk.

Current studies cover the management of water ingress into tunnels, identification of hidden tunnel shafts, identification of hidden (buried) bridge parts and procedure for managing the risks, development of a prioritised asset register for footbridge inspections/assessments and potential remedial works, development of procedure for the management of restrictions on infrastructure train movements.

Aston Expressway Bridge B7 – Project manager for the Category 3 checks of this multispan single cell trapezoidal steel/concrete composite box girder viaduct.

Shortlands Junction Diveunder – Project co-ordinator for the preparation of design and build tender documentation and detailed design of this strategic grade separation within Railtrack's southern zone. The project incorporates a complex arrangement of jacked box structures, bored piled walls, soil nail cutting slopes, earth reinforced embankments and associated drainage and railway formation designs.

Blackfriars Railway Bridge – Project manager for the inspection/assessment and preparation of feasibility studies into the options for repair/strengthening of this strategic railway bridge crossing the River Thames. The commission also included the inspection and assessment and feasibility studies for nine approach structures of varying age/form of construction.

Railtrack Feasibility Studies (Tranche 4) – Project co-ordinator for the team undertaking inspections/assessments and feasibility studies into the options for repair/strengthening or renewal of nine structures within Railtrack southern zone.

Route Clearance for Class 180 and Class 67 Trains – Project co-ordinator for a study looking at zonal route clearance of bridge structures, incorporating dynamic analysis of representative structures subject to loading from new rolling stock. Client Railtrack HQ.

European Rail Research Institution (ERRI) Report 221 – Project manager responsible for preparation of ERRI (European Rail Research Institute) Report D221. This report examines the potential effects of the proposed European railway loading (Load Model 2000) on transverse spanning floor elements of railway bridges. This work has been undertaken for the ERRI committee in close co-operation with Railtrack HQ.

Railtrack North West Zone – Project manager for the independent checking of 23 footbridges forming part of safety improvement scheme to remove pedestrian level crossings on the West Coast Main Line. The footbridges were of the Midland Region type with various substructures and access provisions including stairs, ramps etc.

Bridge/Trackform Dynamics Study for West Coast Route Modernisation (WCRM) Project – Technical advisor to the project team and Railtrack HQ on this technically challenging project, which examines the potential risks associated with the introduction of new generation trains operating at speed up to 160mph over existing UK bridge stock.

The study covers the whole of the proposed West Coast route and has involved site monitoring and bridge specific dynamic analysis of some 130 structures, complemented by risk based assessment of a further 2500 structures with a view to achieving 100 route clearance.

A key part of the second phase of the study has been to undertake research and development work to enhance the industry's knowledge/understanding of the behaviour of ballast under high levels of vibration. The results will be used to challenge existing, believed to be conservative, acceptance criteria thus reducing the necessity for physical mitigation measures.

The project has also involved the preparation of three guidance note documents for the design, strengthening and assessment of railway bridge subject to dynamic loading; including the effects of resonance. These documents have been produced in conjunction with Railtrack HQ and are likely to form the basis for future Railtrack Group standard.

Project Manager for 'Virgin Cross Country' Train Study – Dynamic analysis of representative bridge structures subjected to loading from new rolling stock. Client Railtrack HQ.

Railtrack Feasibility Studies Tranche 3 – Project co-ordination for the team undertaking inspection/assessments and feasibility studies into options for the repair/strengthening or renewal of 10 structures within Railtrack Southern zone.

Newcastle High Level Bridge – Project manager for the principal inspection, and assessment of the historically important multispan tied arch cast iron Grade II listed structure. The assessment included a complicated 3D analysis, real train load assessments, adopting limit state and permissible stress calculations in accordance with Railtrack's latest standards RT/CE/C/015 issues 1 and 2. A key task within the project was to understand the structure's 'real' behaviour which involved the development and execution of full-scale load testing utilising two Class 56 locomotives.

Blythe Park Bridge – Project manager for the Category 3 design check on a tied arch bridge for a road crossing of the M42 motorway. The 78m single span bridge comprises twin fabricated steel arches which support the composite concrete road deck using cable hangers between the carriageway and the footways.

Construction Partnership Framework (Railtrack Southern/Laing Management) – Project co-ordinator for the detail design and technical support during construction of a variety of railway underbridge strengthening and renewal projects.

Royal Victoria Dock Footbridge – Project manager for the Category 3 check on a 135m single span high level footbridge over the Royal Victoria Dock which is now a popular venue for sailing. The bridge structure comprises an articulated steel spine beam braced by cables and supported on tubular steel trestles. The pedestrian deck is supported on cantilever brackets from the spine beam. The design of the structure allows for the future installation of an underslung transporter car to carry 40 passengers.

Railtrack Feasibility Studies – Co-ordinator for feasibility studies into the option available for the repairs, strengthening and/or renewal of 21 structures within Railtrack's Southern zone. The key aspects of the project were to work with Railtrack to maximise use of the current assets and where required develop low cost strengthening and reconstruction proposal that can be implemented with a minimum of disruption to the railway.

Newark Dyke Railway Underbridge 278 – The existing structure, built circa 1900, comprises two parallel 80m span, early steel, riveted, through trusses.

Responsible for undertaking a feasibility study into the options available for the repair, strengthening and/or renewal of the existing structure. The commission was later extended to incorporate the detailed design and construction supervision of holding repairs along with the preparation of design and build contract documentation for a replacement structure. The proposed structural form being capable of permitting the operation of high speed trains up to a line speed of 160mph.

The project incorporates many interesting topics some of which, are listed below:

- Detailed design of bridge strengthening measures to permit the existing structure to operate safely until reconstruction can be implemented.
- Establishment of high speed line design parameters and acceptance criteria, which were currently outside the scope of Railtrack standards.
- Preliminary designs for a replacement structure, capable of permitting high speed line operation, including consideration of structural dynamics/resonances and passenger comfort criteria.
- Evaluation of methods that might be adopted to increase the theoretical design life of the proposed structure beyond 120 years.

Maybury Hill Underbridge 2/84 – Project manager for the inspection, assessment, feasibility study and detailed design of a single span replacement (Z-type) underbridge carrying two local lines and the up/down main lines between West Byfleet and Woking stations.

Project manager responsible for the preparation of feasibility studies for Hall Road and Malcolm Road underbridges, investigating options for repair/strengthening and/or reconstruction. This work being undertaken in conjunction with Jackson Civil Engineering, the incumbent extended arm contractor.

Project manager responsible for the preparation of feasibility studies investigating the options for repair/strengthening of three short span (12m-15m) double track railway metal underbridges in East Anglia. This work being undertaken for the extended arm contractor May Gurney.

Shoreham Viaduct – Project manager responsible for the inspection, assessment, feasibility study and preparation of strengthening works for this 350m long plate girder wrought iron railway viaduct over the River Adur. The project involved the development of strengthening works, which can be implemented during short railway closures.

Victoria Road – Responsible for the preparation of detailed designs for the strengthening of a 12m span, two track, wrought iron plate girder bridge carrying two tracks over Victoria Road, Shoreham-by-Sea.

Royal Victoria Dock Footbridge – Project manager for the Category 3 check of a 135m span slender footbridge. The project involved complex 3D dynamic analysis, assistance in the development of appropriate connection details and support to the client, LDDC, during fabrication works.

Hulme Bridge – Project manager for the Category 3 checking of the ICE Merit Award winning tied arch bridge near Manchester. Work included three dimensional analysis of the deck, arch and suspension hangers for both erection and permanent load cases.

Oxted Viaduct – Project manager for the inspection assessment, feasibility study and detailed design of strengthening works to this three span ageing wrought iron truss viaduct (total length 90m) carrying the local lines over the A25 between Oxted and Hurst Green stations.

Baswich Viaduct – Project manager for the Category 3 check of this 100m long multispan steel/concrete composite railway viaduct. The key features to this project included the justification for reuse of the existing foundations and the bridge slide method of installation over a navigable waterway.

Ash Vale Underbridge No 2 – Category 3 Check – Project manager for the independent check of a railway box structure and its associated slide track. The checks included for the structure in its temporary and permanent position.

Staines River Bridge – Repair and Strengthening – Project manager for the corrosion survey, assessment and repair and strengthening design of an eight span railway bridge over the River Thames.

Duties include the arrangement, procurement and supervision of all site works subcontracts.

Project manager for the Category 3 checks of various bridges for WS Atkins (CEDAC) including underbridges No.2 Ash Vale, No.14A Hartlands Bridge, No.15/1 Claygate Lane, No.151 Baswich Viaduct, No.154A Landor Street, No.763, 777 and 785 in East Anglia.

Ely Railway Bridges – Project manager for feasibility study into the options available to strengthen or replace two wrought iron railway bridges, including inspections and assessments of the structures.

Project engineer responsible to Railtrack for the Category 3 checks of a reinforced concrete portal structure to be jacked through an embankment beneath Smitham railway station. The checks included for the structure in its temporary and permanent position and encompassed a review of the contract documentation.

Project engineer responsible for the design and detailing of Battersea Yard railway bridge, a three span steel/composite bridge deck slid onto pre-constructed foundations during a 72 hour possession.

Working for Railtrack on a feasibility study to establish the option for replacing Battersea Yard bridge in London.

Project engineer responsible for the independent design check of railway underbridge No.583 comprising half through box girder construction with transverse spanning steel T-ribbed deck.

Project engineer responsible for a number of bridge inspection and assessment commissions for the County of Kent and a post-tensioned concrete bridge for the NRA (National Roads Authority). These projects have involved the implementation of the Department of Transport's special inspection procedures for post-tensioned bridges BD 50/93.

Design team leader responsible for the design of a 100m twin span composite structure incorporated within a design construct contract.

Project engineer responsible for independent design checks of a number of contracts associated with the Jubilee Line extension project. This work is of a varied nature and includes modifications to existing structures, in situ and post-tensioned segmental concrete viaduct structures and deep buried box structures. Notably the post-tensioned twin box viaduct carrying the Docklands light railway over the Jubilee line extension at Canning Town.

Project engineer responsible for Category 3 checking of the Channel Tunnel Waterloo International Terminal for British Rail. This work comprised all structural aspects associated with the safe running of the railways and highway loaded elements of the infrastructure, including basement construction, track carrying structure, terminal roof, modifications to existing structures and a number of highway loaded buried box structures.

Team leader for principal inspection/load assessment for 10 structures in the County of Kent. Also associated with principle inspection of 52 structures on the M25 motorway in Kent.

Undertaking Category 3 independent design checks for British Rail, including bridges for London Midland Region and various arch reconstruction and railway underbridges on the 'boat train' routes through Kent, including:

Moss Lane Bridge – A two span continuous half-through structure and associated foundations.

West Malling Bridge 587 – A half-through replacement deck.

Loampit Vale Bridge 601 – A series of half-through Z-type structures and associated foundation and platform works.

Arch Reconstruction – Three arch reconstruction contracts incorporating ten bridges for which checks included structural integrity, survey work and structure gauge compliance.

As a member of a design team, involved in the design and detailing of a variety of steel railway and highway bridges together with their substructures including reinforced, pre-stressed and pre-cast concrete and composite bridges as well as load bearing brickwork.

Worked extensively on steel/concrete composite bridges in both a design and checking capacity. The structures included curved and skew constructions in both box and plate girder construction.

Also gained experience in bridge inspection and assessments whilst preparing reports for existing local authority and London Underground bridge structures being checked for BD21/84 loading.

1980 – 1984 Assistant Engineer

Experience has been gained in the checking of a number of cut-and-cover tunnels including work on Bell Common and Holmesdale tunnels which form part of the M25 orbital motorway.

Experience includes work on several major marine contracts in the UK and overseas.

Gained experience in the design and detailing of bridge structures (to BS5400) as a leading technician engineer, involved in the design of a number of replacement railway bridges.

Also worked on a number of highway bridges, including the assessment and subsequent refurbishment of a Cross Keys bridge Category 2 listed structure comprising a swing span section of truss construction and two simply supported plate girder spans built during the late 19th century. Throughout the refurbishment contract was called upon by the resident engineer staff to inspect and formulate repair details for highly corroded components. Valuable experience gained here has enabled quick assessment to pinpoint areas of possible concern when inspecting existing structures.

Also undertaken ground surveys relating to bridge structures and housing estates.

Involved in the design and site supervision of a refurbishment contract of a swimming pool complex.

Also carried out a number of structural surveys of residential buildings and the preparation of condition reports.

1975 – 1980 Junior Technician

Initial training was undertaken in the Marine department which was involved in the planning and design of a multimillion pound port complex in Iraq and in refurbishment contracts for jetties in the Humber River.

Further training was in the Structures department where it was necessary to prepare general arrangement and reinforced concrete drawings for a basalt crushing plant in Syria designed to withstand earthquake loading and for a structural steel fuel tank and its supporting structure.

LANGUAGE CAPABILITY

English : Mother tongue

Nationality	British
Profession	Civil Engineer
Specialisation	Bridges
Position in Group	Projects Director – Metros and Civil Division
Year of joining Group	2003

KEY QUALIFICATIONS

Project direction and project management of major/minor bridge design projects. Leading a team of bridge/structural design engineers. Preparation of concept design, preliminary design and detail design of bridges, flyovers and highway structures. Liaising with various departments/authorities, facilitating a smooth and effective flow of information as well as analysing and resolving technical problems. Experience in structural inspection, conditional survey, assessment, repair and strengthening of bridges and highway structures. Good verbal and written communication skills; able to quickly establish a strong sense of rapport, competence and professionalism with co-workers and management. Skilled in computer operation and programming. Extensive use of software for analysis and design. Experience in rail bridge asset management.

EDUCATION AND PROFESSIONAL STATUS

Graduate (1st class) in Civil Engineering, Karnataka Regional Engineering College, Surathkal under Mysore University, India

Member of the Institution of Engineers (Chartered Engineer), India

Member of the International Association for Bridge and Structural Engineers, Zurich

EXPERIENCE RECORD

2003 – present MOTT MACDONALD GROUP

2003 – present Projects Director/Senior Project Manager/Principal Engineer/Senior Engineer – Metros and Civil Division

Bridge Parapet Strike and Bridge Strike Policy – Project director to develop a framework for Network Rail for diagnostic decision making for railway structures that supports an optimised process of engineering evaluation for asset engineers and demonstration of the diagnostic framework (as proof of concept) by way of media and guidance for six common structural issues / defects.

Bridge Parapet Strike and Bridge Strike Policy – Project director for delivering a risk based study to define and calculate the safety risk associated with:

- bridge strike to underbridges
- parapet containment to overbridges and lineside structures

The outputs from this study will inform Network Rail Asset Policy and assist Network Rail (NR) Asset Managers in determining when/what risk mitigation is appropriate and priorities.

Level 0 Assessments for Network Rail, Wessex Route – Project director for delivering Level 0 assessments and alternative assessments for different types of bridges in concrete and steel Wessex Route in Network Rail.

Girder Buckling Study – Project director for undertaking a study to determine load carrying capacity of half through girders. This work is of a research nature.

Three Croydon Bridges – Project director for delivering GRP 3 – Form 1 design reports for three road bridges in Croydon for Network Rail.

Wessex Capacity Alliance Project – Project director for the Wessex Capacity Alliance project to deliver the circa £450 million Wessex Capacity Improvement Programme. The Alliance includes Skanska, Colas Rail, AECOM, Mott MacDonald and Network Rail. This is to plan and carry out major improvements to boost capacity at the UK's busiest station, London Waterloo, as well as other stations on the Wessex Route.

Northern Hub Inner (G4-8) – Member of the team undertaking civil and structural engineering design and technical advisory services to Skanska-BAM JV for the development and construction of the works within the Northern Hub and NW Electrification Alliance, for the sections of the works previously known as Northern Hub Central, operating as an integrated team with AECOM, under a single engineering and project management team. Involved in the review of the assessments and preparation of structural strengthening design of masonry viaducts.

Champlain Bridge Replacement Tender Design – Member of the team delivering the tender design of the approaches for the St Lawrence River crossing comprising approximately 3km of elevated highway and transit way. Scope includes the tender design of foundations, piers and superstructure to the Canadian code, provincial guidance documents and the employer's requirements set down in the request for proposal. Scope also includes provision of experts in seismic design, durability and corrosion protection.

The navigation span comprises a cable stay bridge which is to be designed by Ramboll. Mott MacDonald is responsible for the review and high level checking of the design of the cable stay bridge. Mott MacDonald is working as part of the Hatch Mott MacDonald Canada team which forms the lead part of a design joint venture with Dessau and Ramboll.

Hidden Critical Elements – Wessex Route, Network Rail – Project manager for secondment to Dyer & Butler to: 1) Assist with reviewing assessment of bridges and hidden critical elements (HCE) categorisation and condition from desk top study; and

2) Site visits as part of Dyer & Butler's team to identify solutions to uncover HCE for easier inspection.

East West Route Category 2 Check – Project director for undertaking Category 2 check of the Level 2 assessment of Denbigh Hall Junction Bridge and the Level 1 assessment of Bletchley Flyover.

Victoria Bridges (Eccleston, Elizabeth and Ebury) GRIP 4: Form 002 Design – Project manager for the development of GRIP 3 Form 001 design for three bridges in Victoria station – Eccleston, Elizabeth and Ebury.

Hazledean Road Bridge – Project director for undertaking a general inspection of Hazledean Road Bridge (overline) and preparation of General Inspection Report as per Network Rail format.

Level 0 Assessment Training, Help Line Desk and Wessex CAM – Project director for providing training for 15 trainees per session as and when required, help desk support service, update the Tools – adding CRE (contractor's responsible engineer) names to the Tools as and when required and delivering Wessex CAM for culverts and footbridges.

Network Rail Vauxhall Cross GRIP 2 Study – Project director for undertaking a feasibility study of viable solution for Vauxhall Station Cross Road Widening. The project comprises of developing maximum three options of conceptual design, cost estimates, installation programmes, risk assessments, environmental reviews and impact on the stakeholders.

M40 Gaydon Road Overbridge – Project director for carrying out the design check of the widened bridge deck in accordance with approvals in principle (AIP) rev C signed by HA (Highways Agency) on 05/06/14 and the subsequent attached addendum.

Ngawi-Kertosono Toll – Project director for carrying out sample checking of bridge structures on Ngawi-Kertosono Toll Road.

Level 0 Assessments Phase 3 – Project manager for undertaking Level 0 assessments of circa 1200 bridges comprising masonry arches, underbridges, overbridges and footbridges.

Victoria Bridges (Eccleston, Elizabeth and Ebury) GRIP 3: Form 001 Design – Project manager for the development of GRIP 3 Form 001 design for three bridges in Victoria station – Eccleston, Elizabeth and Ebury.

Level 0 Assessment Tools for Phase 1a and Phase 1b (Underbridges, O&A Bridges and Footbridges) Network Rail HQ – Project manager for the development of a suit of Level 0 assessment tools for metallic and concrete underbridges, metallic and concrete O&A (occupation and accommodation) bridges, metallic and concrete footbridges, Footbridge templates including preparation of guidance notes and justification report.

Civil Structures for BP Algeria and BP Jordan – Project manager for the detailed design of structural works for BP exploratory wells in Algeria and Jordan.

Acton Dive-under, Atkins – Project manager for the Category 3 check of the design of the Acton Dive-under with secant and contiguous piled walls, track base slab and top slab.

Assessment Tool for Underbridges, Network Rail HQ – Project manager for the development of a Level 0 Assessment Tool for underbridges capable of assessing the principle elements of a half through type metallic underbridge, trialling of the Level 0 assessment tool for 100 bridges and validation of the Level 0 assessment tool for five bridges, preparation of guidance notes and justification report.

RAIB 6 and 7 Assessment Challenge, Network Rail HQ – Project manager for the data collection and specific high level review of about 1100 underbridges and 50 footbridges across the Network to assist Network Rail to comply with the recommendations RAIB 6 and 7 following the collapse of the Stewarton underbridge.

Vauxhall Station Arches, Network Rail – Project manager for the Category 2 check for the design of the lift holes through the arch barrels and opening through arch span piers.

Crossrail – Lord Hill’s Bridge and Royal Oak Station, Arup – Project manager for the Category 3 check for the effect of the tunnelling for cross rail under the Lord Hill’s bridge and booking hall of the Royal Oak Station.

Heathrow Terminal 2B – Substructure, Mott MacDonald – Project manager for the Category 2 check of diaphragm walls, piling, base slab, apron slab and other substructure elements for the Heathrow Terminal 2B.

M2 Medway Bridges – Principal and Special Inspection, Highway Agency Area 4 BBMM – Project manager for the principal inspection and special inspection of both the old and new M2 Medway Bridges. The assignment included preparation of inspection reports, bridge management plans and design of small works for both the bridges.

Stewarton Underbridge, Network Rail HQ – Project manager for providing engineering support services to Network Rail following collapse of Underline Bridge GBK/088 on 27/01/09.

Network Rail South East Territory – Ten year framework contract 2003-2013. Project manager for South East Territory involving inspection, inspection reports, assessment reports for various types of bridges (rail bridges, road bridges and footbridges) of different material types (steel, wrought iron, cast iron, concrete and masonry) and of different forms of construction (half through, deck, truss, arch; ORR (Office of the Rail Regulator) route availability verification study – project manager for South East Territory.

Network Rail South East Territory – Footbridge study for Anglia area.

Transport for London – Congestion mast study. Design of mast foundation, checking of construction drawings for the foundation, visiting the site and assisting the contractor on technical issues.

London Borough of Sutton – Principal inspection and assessment of BRG 060. Project manager carrying out the day-to-day work including reviewing the inspection and assessment reports.

Network Rail South East Territory – Station examination. Project management and review of the examination reports.

Portsmouth City Council – Copnor Road bridge replacement. Undertook inspection and prepared inspection report for the existing bridge for the council.

Network Rail – Scoping study for a new code for the assessment of footbridges, building supporting structures, platform canopies and train sheds, Phase 1.

Assisting the project manager and co-author of scoping study report for the new code.

Structures Assessment Ten Year Framework Contract – 2003-2013 for Network Rail Southern Region.

Assisting the project manager in various project management works and responsible for carrying out the footbridge study for Network Rail southern region, to prioritise the inspection and assessment process considering family type footbridges based on available existing information regarding structural condition of various elements and a risk based assessment of the occurrence of adverse loadings. The study includes a risk assessment package which will provide each structure with a risk ranking based on carefully considered criteria.

1996 – 2003 **MAUNSELL SHARMA ZAKARIA, Kuala Lumpur, Malaysia**

2002 – 2003 **Associate – Bridge Section**

1997 – 2002 **Principal Engineer – Bridge Section**

1996 – 1997 **Senior Engineer – Bridge Section**

Responsible for management of bridge/flyover design projects from inception stage to construction stage including concept design, preliminary design and detail design; led a team of bridge/structural design engineers; numerical analysis and design of bridge elements; preparing overall programme of the projects including preparation of budget estimate; assisting in management issues related to the projects; liaison with the client, authorities and other consultants for facilitating a smooth and effective flow of information as well as analysing and resolving technical problems; preparation of project proposals for tender purpose, consultancy agreements and technical specifications.

Types of bridges and flyovers include pre-cast segmental post-tensioned box superstructures erected by span by span method/in situ post-tensioned box superstructure supported on reinforced concrete piers and large diameter bored piles; pre-tensioned I-beam and reinforced concrete (RC) deck on spun piles.

Involved in the following major projects:

Project Manager for Primary Distributor Road – U4 in Putrajaya with 12 bridges of various types such as cast-in-situ variable depth two span continuous box girder, I-beam and deck, three-span continuous constant depth box girder.

Ampang – Kuala Lumpur Elevated Highway – Comprising pre-cast dry jointed segmental box girder superstructure, cast-in-situ substructure and large diameter bored cast-in-situ piles; team leader for the design substructure.

New Pantai Highway – Preparation of tender design, scheme drawings for 15 bridges and underpasses.

Putrajaya Development for Bridges 1 and 4 – As a member of the team for the preparation of concept proposal, co-ordination between design team and the client, Putrajaya Holdings Sdn Bhd and other consultants involved.

1990 – 1996 CONSULTING ENGINEERING SERVICES (I) Pvt Ltd, New Delhi, India

1994 – 1996 Deputy Project Manager – Bridge Department
1990 – 1994 Senior Engineer – Bridge Department

Involved in carrying out various types of services for bridge and flyover projects such as preparation of concept design, preliminary design, tender design, detail design (structural, hydraulic and geotechnical), estimate, liaison with client and other related departments, condition inspection of existing structures, recommendation of action plan, preparation of reports.

Various types of structural elements of bridges and flyovers include in situ pre-stressed box girder, pre and post-tensioned I-beams and T-beams on reinforced concrete piers and large diameter bored piles.

Major projects involved in were:

Andhra Pradesh State Highway Project, India – Condition inspection, recommendation for action plan, hydraulic investigation, geotechnical investigation, design, drawing and cost estimate for more than 100 minor and major bridges.

Flyovers in Hyderabad, India – Preparation of concept plan, preliminary design, drawing, bill of quantity and technical note during tender stage for nine flyovers in Hyderabad.

Bridge across River Ravi at Basholi, Jammu and Kashmir, India – Preparation of preliminary design, concept drawings and cost estimate for a cable stayed bridge with main span length of 328m and side spans of 130m each.

Bridge across Rajapuri Creek in Maharashtra, India – Preparation of concept plan, preliminary design, drawing, bill of quantity and technical note during tender stage for a bridge of 573.75m long comprising of 15 spans of 38.25m.

Flyover Bridge at SV Road and Western Expressway Crossing at Mahim Junction – Preparation of concept plan, preliminary design, drawing, bill of quantity and technical note during tender stage for 292m stilt portion and 383m ramp portion.

Involved as a member of the design team for the following projects:

Bridge across Thane Creek at Airoli, New Bombay, India – Bridge length of 1030m comprising 19 spans of 50m and two spans of 40m.

Punjabi Bagh, Ring Road Crossing, New Delhi – Four level intersection with flyover, subway and underpass.

Five Bridges – On NH-5 (rivers Paleru, Manneru, Gundlakama, Musi and Mudigunda) in Andhra Pradesh, India.

ADB 6th Road Project in Lao PDR – 32 bridges with RCC/PSC girder and RCC deck slab on RCC (reinforced concrete construction) piers/abutments with open/well foundation.

Bridges across River Gowthami Branch of Godavari at Kotipally and Bodaskuru in Andhra Pradesh, India – Two bridges with 40m span PSC box superstructure on well foundation.

Namkading – Savannakhet Road Project, Lao PDR – 45 bridges over rivers/streams with PSC T-beams and RCC deck.

Turbhe Flyover at New Bombay, India – Reinforced concrete construction (RCC)/pre-stressed concrete (PSC) box girder simply supported spans on open foundation resting on rock.

16 Bridges under Cyclone Reconstruction Project, Andhra Pradesh, India – RCC/PSC box girder/voided slab type superstructure.

Verapuzha Bridge across River Periyar in Ernakulum, Kerala, India – 1029m long with spans of various lengths (120/80/50/30/20), continuous PSC/RCC box/voided slab founded on wells.

Bridge over River Yamuna near Naini, Uttar Pradesh, India – 1640m long with continuous PSC box girder of 120m and 50m spans.

While working with Mott MacDonald Group, Croydon, United Kingdom, from June 1993 to June 1994 was involved in the following projects:

- Lantau Fixed crossing, Tsing Ma Suspension Bridge, north and south slip road viaduct structures, Hong Kong
- A-34 Newbury Bypass, Bridge no 22, 26, 28 and 30, UK
- Jubilee Line Extension, Canning Town Station, DLR elevated platform and viaduct structures, UK

1985 – 1990 STUP CONSULTANTS LTD, Calcutta, India

1988 – 1990 Design Engineer
1986 – 1988 Assistant Engineer
1985 – 1986 Trainee Engineer

Involved in carrying out geometric design, hydraulic design (span fixation, scour depth calculation), structural design of various elements of bridge and flyover structures. Structural elements of bridges and flyovers included superstructure, piers, abutments and foundation.

Major projects included:

- Bridge over river Mahanadi at Bonaigarh, Orissa, India – length 1150m with 50m RCC box girders
- Bridge over river Kathjodi, Orissa, India – length 900m with 50m RCC box girders
- Bridge over river Paika in Orissa, India – length 480m with 48m RCC box girders
- 11 bridges in Bhutan
- Bridges over river Kundil and Barapani in Assam and over river Myllep in Meghalaya, India – length of 75m and 125m respectively
- 12 Bridges on JNKK Road, Meghalaya, India
- Durgapur Bridge at Calcutta, India – 297m long with 27m PSC T-beam and deck on pile foundations
- Bridge over river Kuradhinala in Orissa, India – length 99m with 33m RCC T-beam and deck
- Flyovers for Second Hooghly Bridge at Calcutta, India – pre-cast and cast-in-situ T-beam and deck
- Bridges over rivers Kaloo and Williamnagar in Meghalaya, India – length 165m with 33m long spans
- ROB and RUB on NH37 in Assam, India – length 540m
- Canal aqueduct over railway lines at Sakrigali Ghat, West Bengal, India – length 75m

**1984 – 1985 THE DEPARTMENT OF NATIONAL HIGHWAY AND PROJECTS,
GOVERNMENT OF ORISSA, Bhubaneswar, India
Assistant Engineer**

Worked as a member of team involved in design and checking the design of minor and major bridges and culverts in Orissa, India.

Checking of design for the extension of Barabati Stadium, Orissa, India.

SUPPLEMENTARY INFORMATION

Accomplishments and Awards:

National Merit Scholarship from 1977 to 1984, India

Confederations of British Industries Overseas Scholarship, UK (1993 – 1994)

Countries of works experience:

India, Bhutan, Lao PDR, United Kingdom, Malaysia.

LANGUAGE CAPABILITY

Oriya : Mother tongue
English : Spoken – fluent; written – fluent; reading – fluent
Hindi : Spoken – good; written – fair; reading – fair

PUBLICATIONS

Co-author for:

“Short-to-medium Span Bridges – Need for Standardisation of Precast Elements”, in “The Indian Concrete Journal”, October 1995.

“Planning, Design and Construction of the Turbe Flyover, New Bombay”, in “The National Seminar on Planning and Management of Bridges and Flyovers”, 17-18 May 1996.

“Design Challenges of an Urban Elevated Highway, Kuala Lumpur, Malaysia”, in 16th Congress of the IABSE, 1999.

“Shaping Network Rail’s Bridge Asset Management – Level 0 Assessments”, in The IET Asset Management Conference 2013, London, UK.

Nationality	British
Profession	Programme and Project Management
Specialisation	Quality assurance, quality control
Position in Group	Project Manager – Metros and Civil Division
Year of joining Group	1980

KEY QUALIFICATIONS

Extensive experience working in Europe, Africa and the Middle East auditing quality assurance and quality control for the construction of roads, bridges and railways, in a career spanning over 40 years. Quality compliance auditing all aspects of civil engineering construction including factory acceptance testing of materials and components.

EDUCATION AND PROFESSIONAL STATUS

International Register of Certificated Auditors

Construction Industry Training Board, Trade and Supervision Certificates General Foreman (1975)

Winner of the Institute of Clerks of Works, Building on Quality award for Roundhill Viaduct 1994.

Merit award issued by the ICE for Roundhill Viaduct 1995.

Commendation award issued by the ICE for the A249 High Level Bridge 2007

Engineering Excellence Award 2012 issued by the ICE for Ore Tunnel

Member of the Chartered Quality Institute

Member of the Institute of Clerks of Works 1376

EXPERIENCE RECORD

1980 – present MOTT MACDONALD GROUP

2012 – present Project Manager – Bridges Division

2013 – 2014 CP4 Civils Enhanced Spend Programme

Construction manager and resident engineer responsible for overseeing the quality of construction works on site, working for and reporting directly to Network Rail senior management. Responsible for monitoring, inspecting and witnessing critical aspects of the construction. Producing weekly progress and engineering reports.

2012 – present Ryde Pier Repair Works

Network Rail Ryde Pier requires structural repairs to remain in service. Steelwork strengthening to crossheads, rail bearers, concrete repairs and cathodic protection. Acting as Network Rail Resident Project Construction Manager reporting directly to senior Network Rail staff.

2011 – 2012 Ore and Bo Peep Tunnels

Network Rail Ore and Bo Peep Victorian brick lined tunnels required extensive structural repairs to continue in service. The repairs consisted of brickwork stitching, injection grouting, shotcrete, ram arches, drainage, rock bolting, track realignment, re-ballast and re-rail. The works were carried in nine week and 72 hour blockades. Acting in the role of Network Rail Resident Engineer reporting directly to senior Network Rail staff.

2008 – 2011 Gerrards Cross Tunnel

The project consists of a three pin pre cast-arch tunnel constructed through a railway cutting in the middle of Gerrards Cross. The tunnel is over filled forming a level area on which a Tesco store and car park are to be built. In 2005 during the original construction the tunnel collapsed onto the live rail tracks below. Following the collapse Mott MacDonald was commissioned by Network Rail to give engineering reconstruction technical support including resident site engineering staff. Acting in the role of Network Rail resident engineer on-site responsible for the review, approval and implementation of method statements, quality assurance, quality control compliance auditing and the safety of Network Rail infrastructure, reporting to Mott MacDonald project director and senior Network Rail staff.

A difficult and demanding project requiring particular attention to the safety of the live rail infrastructure running through the site.

2007 – 2008 Victoria Station Upgrade

Forms part of London Underground Limited's (LUL) network improvement scheme including design and development to RIBA stage E of the public concourses, ticketing halls, access points, ventilation and fire suppression. Responsibilities included management of the survey team, specialist subcontractor surveyors, work scope document submissions, final reports, and client liaison. Working closely with the client, statutory undertakers, Westminster City Council, listed building owners, local developers, highway authorities, underground infrastructure maintainers, bus and taxi operators.

A high profile complex project having the largest passenger movements in London demanded the greatest care with planning and execution survey works to minimise disruption to the travelling public.

2006 – 2007 Road Reconstruction – Jersey Highways Authority

Mott MacDonald was commissioned to design and supervise road reconstruction works on the island and bring the construction standards up to those of the UK. Acting as the resident engineer on behalf of the Jersey Highways Authority over seeing the works and training local staff to meet the current standards in pavement

material production and construction. Reporting directly to the Jersey Ministry and Mott MacDonald directors.

2005 – 2007 Isle of Sheppey Crossing

A high level bridge crossing from the mainland to the Isle of Sheppey, constructed under a design build finance and operate arrangement, is a 1250 metre, 18 span launched steel and concrete bridge with associated road works, earthworks and drainage. Acting in the role of Highways Agency resident engineer. Responsibilities included inspection, surveillance, auditing of quality assurance and quality control during construction. Reporting directly to the Highways Agency and Mott Macdonald directors.

2004 – 2007 Channel Tunnel Rail Link Section 2

Section 2 of the new build high speed rail link from the Thames crossing at Dartford to the terminal at St Pancras including two new stations and two new maintenance depots. Responsibilities included inspection, surveillance, auditing of quality assurance and quality control for the 800 series contracts including track, OHLE, fixed equipment and buildings. Responsible for the interface between the Highways Agency A2 trunk road and the new rail route. Working with and reporting to Mott MacDonald senior managers and directors.

1997 – 2004 A2 Pepper Hill

The new-build channel tunnel rail link runs parallel to and crosses the A2 trunk road at Pepper Hill. The Highways Agency required a resident engineer to act on their behalf during the construction of the rail tunnel road crossing, new road alignment and interchange construction. In the roll of Highways Agency resident engineer responsibilities included quality assurance and quality control auditing of the highways works, interface liaison between the new rail construction and the A2 rebuild works. Reporting directly to the Highways Agency and Mott MacDonald directors.

2002 Channel Tunnel Rail Link Section 1

Acting as Highways Agency resident site engineer for the structures affected by the CTRL project. Responsibilities included monitoring and auditing of quality systems for Contracts 420, 430 and the Highways Agency. Preparing, conducting and reporting technical audits for all aspects of the contract quality systems. Preparing and conducting meetings with the Highways Agency, Union Rail, Rail Link Engineering and Mott MacDonald.

2000 Railtrack Telecommunication Mast Project

Responsibilities included conducting site evaluation surveys for the erection of telecommunication masts on land owned by Railtrack, preparing and submitting detailed technical reports to the client.

1997 A74/M6 DBFO

Resident site engineer for the £150 million upgrade to motorway standard, involving on line widening, offline new build, reinforced earth embankments, soil nailing, road, rail, river bridges, drainage, peat replacement and stone mastic asphalt paving.

Commissioned by the lending banks to carry out independent audits covering quality control, contract compliance and monthly payment reviews. Monitoring of method statements, works procedures, risk assessments, non conformance reports and the technical queries systems. Reporting to the Mott MacDonald project director and the funding banks.

1983 – 1997 Senior Clerk of Works – UK Site

A34 Newbury Main Contract – A 6km south section, earthworks, drainage, bridges and pavement.

Responsibilities: Quality control, including the inspection of all works, preparation of technical and progress reports, liaison between the contractor and the resident engineering staff.

A34 Newbury Advance Contract – A 14km site clearance and protester evictions in preparation for the main contract.

Responsibilities: Liaise between Mott MacDonald, Highways Agency, police, contractor, media and environmental protection groups. Supervision of the protection of badgers, snakes, snails, birds and protected flora.

Checking and authorisation for payment, all plant, labour, materials and security costs. Maintaining safe practices and procedures during 'protester' actions on-site.

A262 Biddenden-Sissinghurst Road Improvement Scheme for Kent County Council – A 6km single carriageway reconstructed full depth in part and overlaid 100mm in others. General drainage improvements, signing, footpaths and traffic management to Chapter 8. Responsible for all reconstruction works, measurement, quality control, liaise with general public and Kent County Council engineer.

A20 Folkestone to Court Wood Contract 2 – Construction of a 9m x 63m span viaduct using the balanced cantilever precast glued segmental post-tensioned construction method. Responsible for checking reinforcement, stressing, duct alignment and casting of segmental units. Erection of viaduct using heavy lift cranes with the balanced cantilever system. Installation of stressing tendons, final tensioning and grouting of all tendons. Deck waterproofing and final surfacing.

Fairlee Road Link, Isle of Wight – Control and supervision of earthworks, subways, drainage, roadworks, traffic management, liaison with national road authority (NRA) concerning works adjacent to and associated with the River Medina. Reporting directly to the Isle of Wight County Surveyor and NRA Winchester.

Newtown Creek Footbridge – Control of all construction works and piling. Liaised with the National Rivers Authority and Harbour Master concerning river access, pollution control, protection of flora and fauna in area of conservation.

Topographical surveys for the proposed footbridge spanning tidal creek on the Isle of Wight.

HCC Gypsy Site, Totton – The project consisted of drainage, earthworks, roads and hard standings, constructed in an area of site of special scientific interest (SSSI). Control of outfall construction on the foreshore and liaison with National Rivers Authority (Winchester) concerning pollution control.

“The Brooks Development” for Winchester County Council (WCC) – The project consists of a deep basement constructed within diaphragm walling, using extensive dewatering followed by the construction of underground car parking and retail sales floors.

Responsible for monitoring the structural integrity of the works, with particular emphasis given to the effect on adjacent structures, services and highways, reporting directly to WCC senior engineer.

A27 Havant to Chichester Contract – The project consisted of extensive earthworks, 11km dual carriageway, rail bridges, culverts, underpasses and concrete road. The pavement was constructed using a patent slipform concrete paver. Responsible for checking earthworks, bridge construction, all operations associated with the “Live Rail” British Rail bridge works and supervision of the concrete train/paver.

M3 Motorway Contract 2 – The project consisted of 4km of road, excavation and fill to valley peat bog, two river bridges constructed in cofferdams, one water culvert, two frame bridges and one post-tensioned bridge. Liaison with Southern Water Authority concerning pollution control, temporary works, river diversion and flow control. Responsible for checking, excavation and fill to the peat bog area, construction of cofferdams, falsework, reinforcement, concrete, level and general setting out to bridges.

Redheugh Bridge Project, Newcastle-upon-Tyne, 1982 – 1983 – Responsible for checking levels and alignments, falsework reinforcement, concrete placement, final tensioning of the cables and tendon grouting.

1980 – 1982 Clerk of Works/Inspector – Saudi Arabia

Joined Mott, Hay & Anderson (Now Mott MacDonald) as a clerk of works/inspector on the VOTRAKON sites, Saudi Arabia. The project consisted of construction on seven sites, each consisting of training establishments, accommodation and support facilities.

Responsible for all aspects of quality control and design liaison.

1978 – 1980 ROBERT MATTHEW, JOHNSON MARSHALL, Saudi Arabia Senior Inspector

Employed by Robert Matthew, Johnson Marshall as a senior inspector on the construction of hospitals and ancillary buildings in Saudi Arabia. Responsible for quality control, costing and payments.

1976 – 1978 CONSTRUCTION SUPERVISION, Liberia

Employed as a construction supervisor on system building contracts in Liberia. Construction of temporary river bridges, roads and port facilities.

1965 – 1975 VARIOUS EMPLOYMENTS

Worked as a chargehand, foreman, general foreman and site agent on general domestic and industrial building works.

1961 – 1965 APPRENTICESHIP

Commenced a five year City & Guilds apprenticeship.

LANGUAGE CAPABILITY

English : Mother tongue

CURRICULUM VITAE – [REDACTED]

Designation: Site Manager

Courses and Certificates Held: IRATA Level 3
First Aid at Work Certificate
SMSTS (Site Management Safety Training Scheme)
Personal Track Safety Certificate
CSCS Card
Confined spaces trained
Environmental compliance (in-house training)
Behavioural change (in-house training)

Work History:
2006 – Present

[REDACTED] Site Manager: Ensuring site workforce (including CAN's sub contractors) works in a safe manner, in accordance with company-wide and project-specific health, safety and environmental documentation.

Carrying out site inductions, briefings, toolbox talks, training etc as may be reasonably requested, including associated record keeping.

Planning and executing works to reflect the project programme, working in the most cost efficient manner whilst conforming to health, safety, quality and environmental requirements.

Maintaining high standards of discipline and general site tidiness, including compliance with general and specific site rules.

Maintaining high standards of personal conduct in all work related actions.

Invoking disciplinary procedures if required, in accordance with CAN procedures.

[REDACTED] Select list of projects undertaken whilst acting as Site Manager:

Trawsfynydd NPS - Structural survey to various elements of the reactor buildings. Extensive repairs to buildings. Very high levels of HSQE compliance on site, working very closely with Magnox/Dawnus (clients) due to the sensitive locations.

Holmes Chapel – Railway Viaduct, Grade 2 Listed Structure carrying live railway line. Complex access and rigging above Water. Extensive brickwork repairs to arch soffits and spandrels, using CANSpan cradle systems; High line supplies over inaccessible ground; Client liaison and other contractors interface. Aid bolting; High level painting.

Hartlepool Power Station – Management of a large and difficult/complex concrete repair project. Difficult access on a live power station. Inspection and investigation works. High levels of HSQE compliance and security on site.

Kilburn House - Detailed inspection including intrusive investigation.

Chelsea River Bridge, London - Inspection and dimensional survey of railway bridge.

Edinburgh City Council - Periodic safety surveys and inspections of high-rise council properties.

Sandwell Metropolitan Borough Council - Inspection and investigations to a number of high-rise council properties.

Glasgow Bridges - Principal inspection of numerous bridges including difficult access and rigging.

WRG Eastcroft Incinerator - Inspection and maintenance to 35m deep waste collection pits.

HOBBIES: Climbing, diving, travel, reading and photography

B. Newcastle High Level Bridge Technical Papers

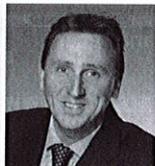
(referred to in Sections 1.4 and 1.5)

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Proceedings of the
Institution of Civil Engineers

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Engineering History and Heritage



Tim Abbott
Senior Project Manager,
Mott MacDonald,
Croydon, UK



Les Ayling
Conservation engineer,
English Heritage,
London, UK

High Level Bridge: engineering successful heritage solutions

T. Abbott BEng, CEng, MICE, MHKIE, MWeldI and L. Ayling IEng, AMIStructE

In May 2008 the High Level Bridge, which spans the River Tyne between Gateshead and Newcastle-upon-Tyne, reopened following a seven-year, £42 million programme of repair and strengthening that also encompassed its conservation as an important piece of UK national heritage. The bridge has a statutory designation as a grade I listed building, the highest designation, and is a strategic part of the rail and road systems in the north east of England. A decision was taken that the bridge required more than its regular maintenance; it required 'renewal'—a term used by English Heritage not for replacement but for a process that occurs at a longer cycle than maintenance and is more drastic in terms of interventions and the loss of heritage values. The varied nature of necessary repairs and interventions to historic buildings (bridges are buildings under the protective legislation) means that there are no easily defined rules; judgement and the application of principles of conservation are how protection and change are managed. This paper seeks to explain the methods and processes used to give this bridge a sustainable future while managing the changes to protect and respect its historic value.

1. INTRODUCTION

Constructed in 1849, the two-tier, six-span the High Level Bridge now carries two railway lines, road traffic, cyclists and pedestrians across the River Tyne between Gateshead and the heart of Newcastle city centre (Figure 1). This cast-iron heritage structure, designed by Robert Stephenson with plans prepared under the direction of Thomas Harrison, is one of Network Rail's 'major structures' and provides a strategic turning loop on the East Coast Mainline.

The structure comprises six 'tied arch' spans, each of 39 m, and approaches; together, the bridge is a total of 412 m long. The isometric view in Figure 2 shows the structural components typical of each main span. Figure 3 shows the typical cross-section both in its original form (a) and in its current form (b), although not all the alterations shown in (b) were carried out during the recent works. The majority of the structural elements are of cast and wrought iron, but both the road and rail decks have been strengthened by the addition of steel elements as described in Table 1.

An inspection and assessment by consultant Mott MacDonald

found many elements of the bridge in need of repair and strengthening. In 2001, May Gurney, contractor for the owners Network Rail, embarked on a major 'renewal' contract to strengthen, refurbish and extend the life expectancy of the bridge. The bridge was reopened to the public on 30 May 2008. The works included

- (a) complete replacement of the suspended road deck including
 - (i) replacement of all steel cross-girders
 - (ii) provision of new drainage and deck waterproofing systems
 - (iii) replacement of corroded sections of the wrought iron suspension hangers
 - (iv) installation of an alternative load path to 'fatigued' cast iron girders
 - (v) installation of vehicle impact protection to safeguard rail traffic
- (b) restoration and electrification of the original character-defining lamp standards
- (c) extensive metalwork repairs
- (d) strengthening of rail deck cross-girders, including award-winning (Institution of Civil Engineers historic bridge awards 2007) research and development into the fatigue performance of cast iron
- (e) complete repaint of the structure in heritage colours.

The statutory listing description of High Level Bridge states that it is 'one of the finest pieces of architectural iron-work in the world'¹ and in a study of bridges commissioned by English Heritage was described as being 'the best example of a tied arch construction'.¹ Of the 232 bridges listed grade I on the statutory list, High Level Bridge is one of only three cast iron railway bridges. Therefore, with this value as a piece of engineering heritage, the repairs and interventions had to be designed so that the value of its setting and the significance of its parts were not diminished.

2. HISTORY

When the High Level Bridge was designed, steam locomotives weighed 25 t and traffic on the lower road deck comprised horses and carts and pedestrians. The weights of locomotives increased rapidly thereafter, as did their frequency. By the 1880s, 800 trains were crossing the bridge each day;² currently there are approximately 60 crossings per day, which is similar to the number when the bridge first opened. By 1900, locomotive

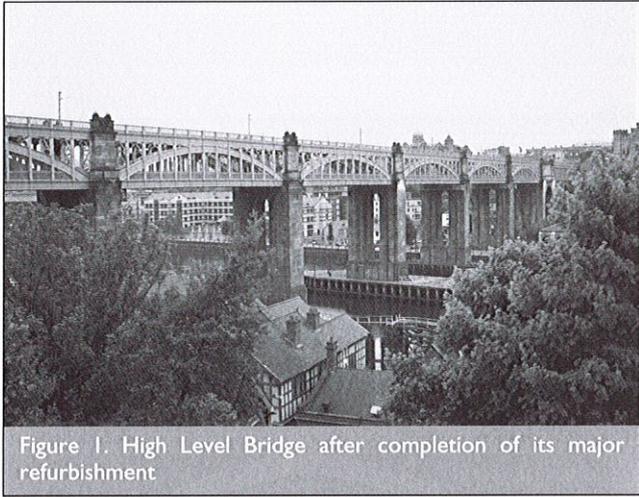


Figure 1. High Level Bridge after completion of its major refurbishment

weights had increased fourfold and peaked at about 130 t in the 1950s. It goes without saying that road traffic has also changed beyond recognition; in the 1920s the road deck was modified to accommodate two tram tracks and since then has become a key bus route between Newcastle and Gateshead. Before closure of the lower deck for the recent strengthening works, heavy use was made of the two lanes by double-decker buses and, despite a signed weight limit of 3 t for other road users, there were regular infringements by heavy goods vehicles.

The High Level Bridge was constructed shortly after a number of failures of cast-iron bridges. Stephenson took great care to optimise the cast iron mix design and the majority of elements were proof tested before assembly. Despite the huge increases in live loads over time, with the superior quality of the ironwork and the design margins built in, only local strengthening of members has been necessary. The primary members—the arches and tie chains—have remained unchanged. Noteworthy modifications to the structure are listed in Table 1; some represent good examples of conservation, others do not.

3. CONSERVATION MANAGEMENT

Conservation principles were developed and agreed early in the project by the client, designer, contractor, English Heritage and both Newcastle City and Gateshead Councils. These principles were then incorporated into a conservation plan¹ that was adopted and used to guide development of the necessary engineering solutions.

Monthly meetings were held between all parties, during which emerging defects were highlighted and appropriate repair methods discussed prior to the development of final details. The works were divided into a series of packages to suit the work programme and to facilitate statutory application for listed building consent in a timely order. In all, 21 listed building applications were submitted over the seven years of the works.

This collaborative working meant that there were no surprises and consent progressed efficiently. The principles of conservation are illustrated in Figure 4 and these are explained in greater detail below.

- (a) *Do nothing.* This statement cannot apply when there are safety issues to correct or a need to allow full and continued use of a bridge structure. Doing nothing is hopefully the outcome of investigation and research into a defect or problem—careful analysis of the strength of members that have suffered decay may prove that intervention is not necessary. This outcome is obviously the best outcome in heritage terms.
- (b) *Reversibility.* As far as possible, engineering modifications should not prejudice options for the future.
- (c) *Sympathetic.* The character of necessary new work should aspire to a quality of design and execution that may be valued both now and in the future. This neither implies nor precludes working in traditional or new ways, but should respect the significance of a place in its setting.

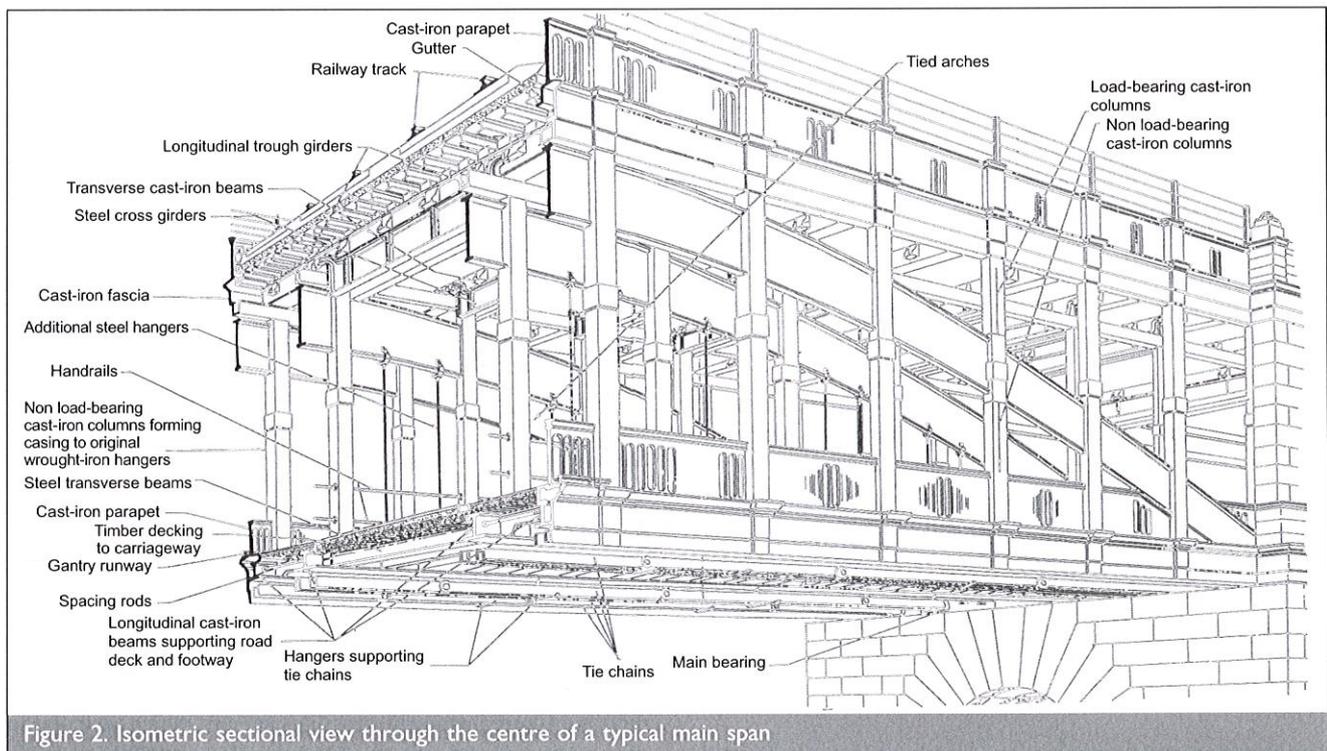


Figure 2. Isometric sectional view through the centre of a typical main span

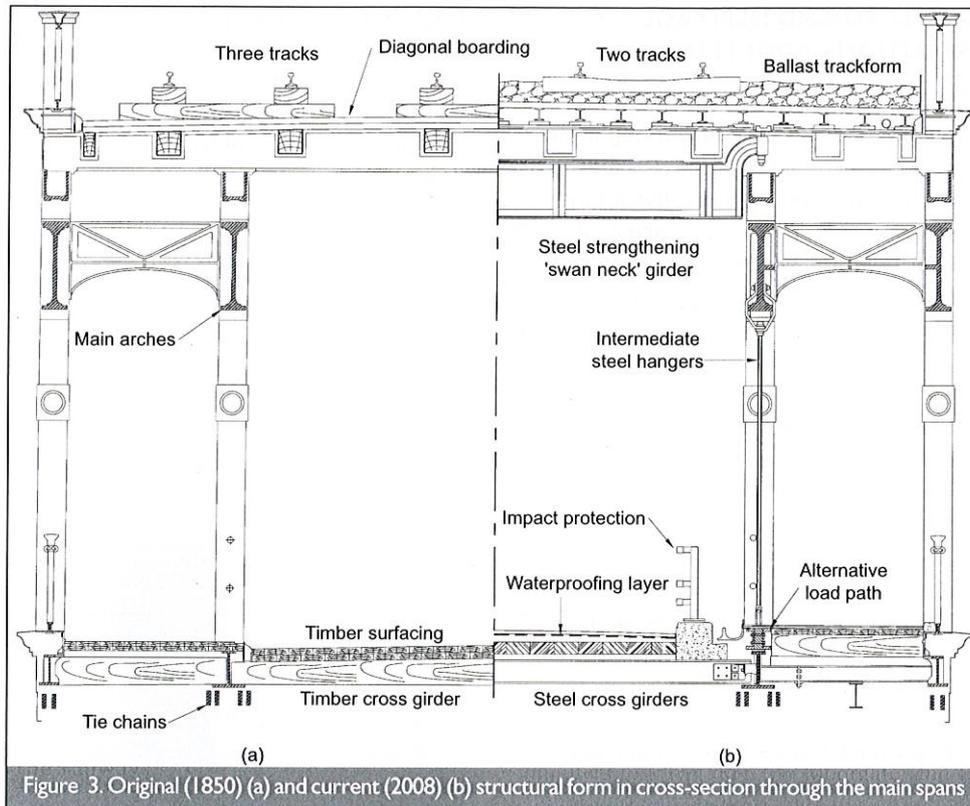


Figure 3. Original (1850) (a) and current (2008) (b) structural form in cross-section through the main spans

Date	Elements	Modifications made	Reason for modifications
1890s	Rail deck cast iron cross-girders	Supplementary 'swan neck' cross-girders added within main spans; intermediate support columns added under bifurcated areas	To accommodate increase in train weights
1920s	Road deck	Replacement of timber cross-girders with steel rolled sections; additional intermediate steel suspension hangers between columns	To accommodate two tram tracks
1950s	Rail deck	Timber weigh beams and decking removed and replaced with steel trough deck panels that supported new ballasted tracks	To reduce maintenance liabilities
1990s	Rail deck	Three tracks reduced to two	To reduce maintenance liabilities and allow electrification

Table 1. Noteworthy modifications to High Level Bridge during its lifetime

- (d) *Retain historic fabric.* In retaining the value of place and value of fabric, necessary changes can result in loss of the worked fabric, the quality of castings and machined parts or loss of the form of the original.
- (e) *Addition not replacement.* Significant life-expired or decayed elements should be retained by the introduction of additional reinforcing systems wherever possible rather than be replaced, even with like-for-like replacements.
- (f) *Minimum intervention.* While sufficient work should be undertaken to achieve a lasting repair, the extent of the repair should normally be limited to what is reasonably necessary to make failing elements sound and capable of continuing to fulfil their intended functions.

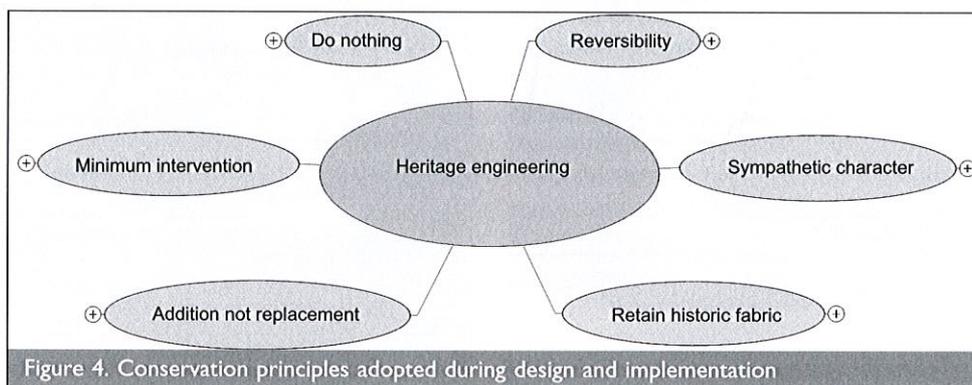


Figure 4. Conservation principles adopted during design and implementation

4. CHALLENGES FACED AND HERITAGE ENGINEERED SOLUTIONS ADOPTED

4.1. Complete replacement of the suspended road deck

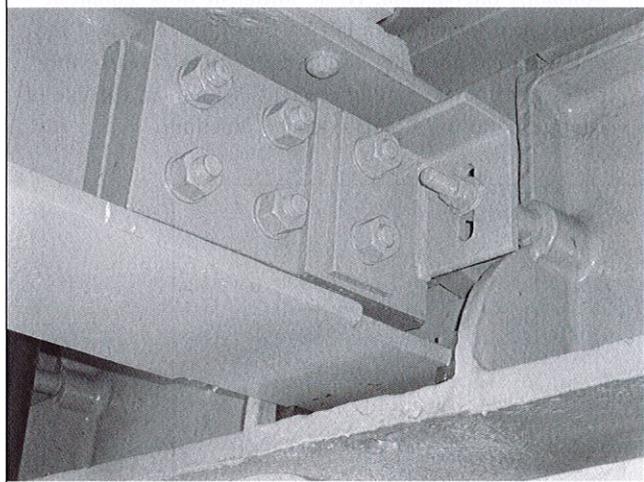
4.1.1. *Re-decking of the road deck.* Due to cracking of the surfacing, the lack of any waterproofing membrane and the use of de-icing salts, the steel cross-girders had suffered heavy corrosion and the softwood timbers that they supported were also badly decayed. The total stock of steel cross-girders (268) was replaced with new higher grade members; although visually like-for-like, a 30% increase in capacity was achieved due to the enhanced strength of the new members (Figure 5).

Although many 'engineering' options were available for the re-decking of the road deck, timber of the same section size was chosen in order to protect the heritage value of the structure. There is evidence that hardwood timbers were originally used for the deck and the use of hardwood was selected once again, bringing further benefits of enhanced durability and load-carrying capacity. The road surfacing was placed on top of the new timbers in three layers with a spray-applied waterproofing system sandwiched between.

4.1.2. *Replacement of wrought iron suspension hangers.* The road is suspended from the arches by way of wrought iron hangers that are concealed within the cast iron columns; each



(a)



(b)

Figure 5. Road deck cross girder ends before (a) and after (b)

hanger is anchored by way of a wedge and key arrangement that bear onto a cast plate at the base of each column. Moisture, dirt and debris had collected within the columns, resulting in a highly corrosive environment; the result was localised loss of section to the untreated hangers hidden within the columns (Figures 6–8).

In order to minimise intervention and maximise retention of original fabric, the decision was made to replace only the lower section of affected hangers. An innovative mechanical coupler was developed that allowed in situ connection between the sound wrought iron hanger above and a new steel replacement below. The work was carried out through a 200 mm by 400 mm hole cut in the footpath face of the columns, all while traffic was still running. The removed plate was later used as a flush cover plate and this successfully hid any evidence of the work carried



Figure 6. Lower section of hanger showing 'necking' due to corrosion

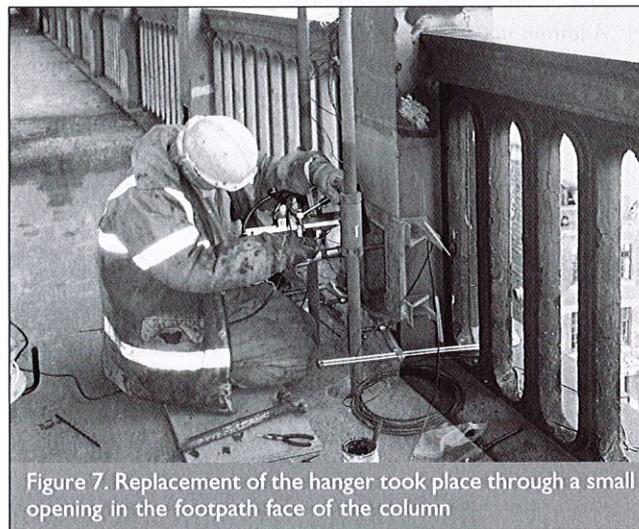


Figure 7. Replacement of the hanger took place through a small opening in the footpath face of the column