



EXPERT WITNESS SERVICES IN MATERIALS AND STRUCTURES

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RSK

RSK IS AN INTERNATIONAL MULTIDISCIPLINARY CONSULTANCY THAT INCLUDES COMPREHENSIVE CAPABILITIES IN ALL ASPECTS OF MATERIALS AND STRUCTURES.

Our work covers all new and traditional construction and building materials and their properties, performance, application and installation; and buildings and civil engineering structures and their design, behaviour, condition, maintenance and repair. The scope of our work ranges from the detailed technology of construction materials through to practical engineering solutions. Our experienced senior staff and specialist consultants are frequently instructed as expert witnesses and are ready to assist you with appropriate cases.

Materials consultancy

RSK provides a professional materials consultancy with allied technical services that are relevant to all stages in the life cycle of buildings and civil engineering structures worldwide. We cover all the structural, constituent, fixing and finishing materials used in modern projects and historic works.

Our strengths lie in a combination of fully integrated consulting and testing facilities with extensive project experience of traditional and innovative materials in the UK and about 60 countries worldwide. We maintain a wide range of UKAS-accredited analytical and testing techniques within the company, which are supplemented by resources at some of the UK's leading universities.

Our comprehensive services in construction materials include

- resource surveys, quarry and borrow pit studies, and product evaluations
- value engineering and buildability
- condition and performance surveys
- special investigations into concrete, cladding, flooring and external paving
- defect and failure investigations and associated expert witness services
- stone and slate technology.

RSK's materials and structures teams include many highly qualified individuals with long experience, including chartered professionals. Many of them combine practical involvement, where they endeavour to use their knowledge of failures or disappointing performance to avoid similar occurrences on new projects, with using their expertise to assist courts and arbitrators to resolve disputes in construction and the built environment.





Dr Ian Sims
CEng, FIMMM, CGeol, FGS,
FRSA, MICT, MCQI, MEWI

Director, materials consultancy

Ian is an RSK director with overall responsibility for materials consultancy and expert witness services, including the panel of specialist consultants. He has given oral evidence in courts, arbitrations, mediations and enquiries on many occasions. He is also available as a single joint expert.

Ian has authored and co-authored more than 200 conference and journal papers, books, articles, working party reports, presentations and lectures.

Principal areas of expertise

- Geomaterials
- Aggregate and fill (natural and synthetic) quality and suitability
- Durability and performance of cement and concrete
- Conversion and chemical alteration of high-alumina-cement concrete
- Alkali–aggregate reactions in concrete
- Performance and durability of building stones
- Mortar, floor screed, plaster and render
- Roofing, flooring and wall cladding materials and performance
- Historic and traditional building materials
- Forensic work in criminal cases

Recent projects

Potential alkali–silica reaction in two dams, Uganda, 2016: Expert assessment following a visit to two dams in Africa. Reviews of various documents provided by the client, discussions concerning the causes of the concrete cracks, comments on the durability and the various remedial options

Fire station defects, UK, 2010–2016: Investigation and testing following a dispute over work undertaken at a fire station. The project evolved to become a legal case against the contractor.

Dispute relating to grout at a leisure facility, UK, 2014–ongoing: Investigation overview and expert interpretation. Mediation attempted, but case not yet resolved

Murder case, Milton Keynes, UK, 2010–ongoing: Body parts were found encased in a concrete ‘grave’. Specialist expert advice for the defendant in respect of the concrete materials at Reading Crown Court. Defendant found guilty, but retained Ian’s services for planned appeal

Failed diaphragm wall, UK, 2009–ongoing: Investigation overview and expert interpretation of concrete diaphragm wall issue on a major site near London. Ian participated in the attempted mediation. Case not yet resolved

Failure of insulated render system, UK, 2008–ongoing: Investigation and expert advice regarding blistering of proprietary render for a tower block refurbishment

Slate roofs, Birmingham, UK, 2006–ongoing: Expert opinion and investigation regarding artificial slate roofs

Proprietary insulated cladding renovation system, Glasgow, UK, 2009–2015: Expert investigation and opinion Glasgow. Successful mediation

Failed plasterwork, London, UK, 2013: Failure of new plasterwork in a Victorian terraced townhouse in Notting Hill, London, caused by improper work on behalf of the defendant (a developer) in the adjoining property. Expert for the claimant (the owner/occupier), county court, London. Went to judgement in claimant’s favour. Ian participated in ‘hot tubbing’ in court

Petrographic services

Petrography, the detailed and systematic description of rocks in hand specimens and thin sections using high-power microscopy, can also be applied to the various man-made materials used in the construction industry. It is typically used to identify the mineralogy of natural materials and any potentially deleterious components or features, whereas man-made materials are typically examined to identify the constituents and determine the overall quality and condition and evidence of deterioration and its causes.

Petrographic examination is augmented by the wide range of complementary expertise available in RSK, including chemical analysis to determine, for example, the mix proportions of mortar, the sulphate content of concrete and the chloride content of aggregate; physical testing, for example, compressive strength testing of cementitious products and aggregate durability testing; and specialist mineralogical and elemental composition, and textural analyses using, for example, scanning electron microscopy and X-ray diffraction and fluorescence.

Petrographic examination is essential in the laboratory investigation of concrete or any other cementitious material, including mortar, render, screed and grout.

The usefulness and reliability of the information obtained depend on the sampling adequacy and the availability of high-standard equipment and appropriately qualified and experienced personnel. RSK has a team of geomaterials scientists with unprecedented experience in the petrographic examination of concrete from the UK and worldwide. We offer a comprehensive professional service in accordance with a wide range of national and international procedures.

Concrete petrography can be used for various investigations, including constituents, quality and condition:

- constituents
 - aggregate type
 - aggregate constituents
 - aggregate contaminants
 - matrix characteristics
 - mineral additives/additions
 - cement and binder type
- quality and condition
 - air void content
 - water–cement ratio
 - compaction
 - microporosity
 - carbonation extent and depth
 - Portlandite
- signs of distress or deterioration
 - fire damage
 - delayed ettringite formation
 - sulphate attack (ettringite and thaumasite)
 - secondary deposits and leaching
 - alkali–aggregate reaction
 - chemical attack
 - cracking.

Physical testing laboratories

Construction materials

RSK provides a comprehensive range of UKAS-accredited tests on concrete, aggregate and other construction materials for quality assurance and structural investigation, including

- material condition
 - visual description and photography
 - petrographic examination
- material properties
 - compressive and flexural strength testing and other physical testing of cubes, cylinders and prisms
 - drying shrinkage
 - chemical analyses
 - presence of high-alumina cement and its condition
- modes of failure and deterioration
 - durability analysis
 - sulphate attack, alkali-silica reaction potential and diagnosis
 - structural load testing.

RSK site engineers and technicians have the expertise and ability to take samples on-site and to provide quality control of site practices.

Stone and slate technology

RSK has experience of providing consultancy, inspection and testing services for the natural stone, slate and related products that are used in all aspects of construction. These services are as relevant to the proper selection and approval of stone for new builds as to the assessment of materials used in historic buildings and heritage restoration works. Our specialists can assist in disputes by providing expert witness services.

- Specification: materials and fixing methods
- Material suitability: new builds
- Assessment: historic buildings and restoration
- Failure investigation: suspected and actual
- Resource evaluation: feasibility
- Expert witness

The dedicated stone and slate technology team at RSK has a UKAS-accredited laboratory that provides investigative, type and approval testing in accordance with the full range of British and European standards. American and other in-house bespoke methods are also available. Please contact the team for professional advice and for the design of economically appropriate test programmes.



Dr Ian Blanchard

Principal consultant, materials consultancy

Ian is responsible for testing building materials, particularly natural and artificial stone and roofing slate, to British, European and American standards, and for consultancy, managing projects, reporting and quality control. Ian has given oral evidence in court.

Principal areas of expertise

- Investigation of construction materials and building defects
- Consultancy services during the design and construction phases of building work, and for remedial and refurbishment work
- Expert witness services, including presenting evidence in court and participating in arbitration and mediation hearings. Ian's principal areas of expertise are in the assessment of natural and artificial stone and slate materials, flooring materials and construction defects, the assessment of slip risk and slip accident investigations
- Laboratory testing of various construction materials, particularly natural and artificial stone and slate
- Investigation of staining and discoloration of construction materials, cleaning and long-term maintenance solutions

Recent projects

Luxury apartment hotel, wall and floor tiling, London, UK, 2014/2015: Expert witness services on behalf of the architect relating to staining and discoloration of basalt stone tiling used on walls of the foyer and walls and floors of the guest bathrooms

The Mall, Maidstone, and The Mall, Walthamstow, UK, 2014: Assessment of existing terrazzo and ceramic tiled floors of two shopping centres to determine suitability of the existing floor for overtiling as part of refurbishment. Also provided guidance to the designer regarding the specification of suitable materials for the overtiling

School sports hall floor, Enfield, UK, 2014: Investigation into causes of cracking of a composition block floor and associated screed and concrete slab. Site inspection and coring, with follow-up laboratory investigations

Terminal floor, Stansted Airport, UK, 2013/2014: Assessment of existing floor in the terminal for suitability for overtiling during refurbishment

Dampness in anhydrite screed in hospital, Lichfield, UK, 2013: On-site testing by calcium carbide 'speedy' tester and Tramex survey to determine the source and distribution of dampness in the sub-floor

Multistorey car park, Bristol, UK, 2013: Investigation into the cause of slip accidents on tiled floors of pedestrian walkways. Initial on-site slip testing allied with assessment of dampness and condensation conditions. Laboratory follow-up included an assessment of various proposed remedial solutions to enhance the slip resistance of the tiled surfaces

Materials chemistry

Construction materials encompass a wide range of raw constituents and finished products. If a new product is to meet the demands placed upon it, it must be subjected to rigorous testing.

Materials require compliance testing before use or their compliance may be questioned once they are in place and require investigation. In addition, materials may fail in service and require investigation to establish the cause of failure.

RSK can offer an analytical service that is comprehensive yet cost-effective.

The materials we analyse include

- aggregate, cement and concrete
- concrete and mortar admixtures
- mortar, plaster, screed and render
- polymers, paints and coatings
- adhesives and sealants

- bricks and blocks
- potable and non-potable water

We use a variety of techniques, including

- infrared spectroscopy
- atomic absorption spectrophotometry
- UV-visible spectrophotometry
- scanning electron microscopy and energy-dispersive X-ray microanalysis
- gas and liquid chromatography
- differential thermal analysis
- X-ray diffraction of minerals
- traditional wet chemistry.

At RSK, a multidisciplinary team of chemists, engineers and geologists provides expert analysis and interpretation leading to client-based, cost-effective and innovative solutions to a whole spectrum of the problems and challenges encountered in the construction industry.



Dr David Crofts,
MRSC, DIC, ARCS

Director, materials

David specialises in on-site and laboratory investigations involving the chemistry of construction materials, polymers, paints, coatings and adhesives, and the failure or incompatibility of these materials in construction and general use. He has prepared expert reports on various matters and has participated in adjudication and mediation proceedings.

Recent projects

Residential tower, Liverpool, UK, 2016: Investigation of defective membranes and seals

Government building, London, UK, 2015: Contamination investigation on paint, plaster and timber finishes

Leisure facility, UK, 2014/2015: Dispute relating to failed grout. Laboratory testing, expert reports and mediation

Housing estates, UK, 2009–2015: Disputes relating to alleged rendering defects. Testing, expert reports and mediation

Transport project, UK, 2013–ongoing: Expert report on allegedly defective materials

Railway station, Ireland, 2010–2015: Assessment of coatings defects, expert report and attendance at court

New build, City of London, UK, 2013: Investigation of pile grout defects

Personal injury claim, UK, 2012: Assessment of rubber hot water bottle

Hotel, Paris, France, 2011/2102: Investigation of paint defects and supervision of remediation work

Shopping mall, Birmingham, UK, 2012–ongoing: Investigation of water leaks and surfacing defects

School, Bolton, UK, 2012: Investigation of masonry discoloration

Multistorey car park, Norwich, UK, 2011/2012: Investigation of surfacing defects

Power station, Scotland, 2011: Analysis of concrete and coatings

Gas terminal, Ireland, 2011: Investigation of concrete defects

Multistorey car park, Basingstoke, UK, 2007–2012: investigations of surfacing defects and concrete

Housing estate, County Wicklow, Ireland, 2011: Investigation of render defects

Apartment building, Cheltenham, UK, 2011: Investigation of render defects

Commercial building, London, UK, 2010/2011: Review of reports into plaster defects and expert report

Steel structure, Thames Estuary, UK, 2010–2011: Investigation of coatings defects and expert report

Commercial building, London, UK, 2010: Review and opinion on fire damage reports

Hospital, East Anglia, UK, 2010/2011: Investigation of flooring defects and expert report

Structural investigation, testing and monitoring

RSK is a leading specialist structural investigation practice and has the skills and resources in-house to provide preliminary structural assessments and feasibility advice; to design and specify structural investigations; and to carry out a wide range of on-site testing, sampling and investigative techniques.

Structural inspection and investigation

- Structural inspections of all types of buildings and civil engineering structures, including bridges, culverts, retaining walls, basements, dams, pipelines, water towers and tanks, shafts and tunnels
- Principal inspection and pre- and post-tension concrete special investigations with tendon inspection of highway and railway bridges and other structures
- Non-destructive testing, including cover-meter surveys for reinforcement mapping, half-cell and resistivity surveys for reinforcement corrosion, measurement of the depth of carbonation, radar surveys, rebound (Schmidt) hammer strength testing, BRE internal fracture testing, ultrasonic pulse velocity testing, in situ permeability testing and waterproof membrane proof testing
- UKAS-accredited coring, dust and lump sampling of concrete, masonry and other materials
- Highway, airport and pedestrian pavement skid resistance assessments

Instrumented load testing

- Full-scale vertical load testing of structural elements and floors
- Horizontal load and proof testing of vehicle and pedestrian barriers
- Pull-out testing of fixings
- Bespoke test rig design, assembly and testing

Laboratory testing and reporting

- Comprehensive UKAS-accredited laboratory examinations, analysis and testing in support of investigations, including rapid turnaround of testing for due diligence and other urgent projects
- Fact-only inspection, investigation and testing reports
- Interpretation and assessment of data and a full consultancy service

Deleterious materials surveys and remediation

- Pre-acquisition surveys for deleterious materials, including high-alumina cement, chloride ions, lead paint, calcium silicate bricks and wood wool formwork
- Inspection and testing for concrete cancer, including sulphate attack and alkali-silica reaction
- Advice, guidance and design and supervision of repair works





Gareth Jones,
BSc, MSc, CEng, MICE

Director, structures

Gareth is the RSK director with responsibility for the structures division, which provides services to a broad range of public- and private-sector clients. These services include structural inspection, investigation, monitoring and associated materials testing; structural condition and durability assessments; load testing; pre-acquisition surveys; and durability assessment of building structures.

Principal areas of expertise

- Civil engineering design and construction
- Inspection, investigation and testing of transportation structures and other infrastructure assets
- Investigative engineering and structural assessment
- Condition assessment of construction materials in service, particularly concrete and steel
- Advice on roofing, cladding and masonry

Recent projects

Building defect surveys, M25 area, UK, 2009–ongoing: Condition surveys of a series of domestic and commercial properties close to driven piling works to assess the extent of any apportioned or relative damage

Structural fire damage investigations, Deans Brook viaduct, M1, UK, 2011: Assessment of the condition (visible and physical damage) of the bridge following a fire that affected the prestressed concrete beams

Deep foundation structure, Battersea, UK, 2010–2011: Extensive site, laboratory and geotechnical engineering assessment of a structure subjected to high water pressures

Various UK building structures: Numerous commissions from consultant surveyors, including Jones Lang LaSalle, DTZ, King Sturge, Donaldsons, CB Richard Ellis and Watts & Partners, to undertake integrity and durability assessments, and to provide associated professional advice before acquisition and/or redevelopment of various structures throughout the UK

Dynamic foundation, Oran, Algeria, 2007 : Back-analysis of a concrete foundation to verify the design of a large reinforced-concrete structure to support a gas turbine and a generator providing power to a desalination plant. The work involved site and laboratory sampling and testing coupled with finite difference analysis using American, French and Algerian design codes.

Beam Reach 8 river wall, River Thames, UK, River Thames, UK, 2011: Project director for the investigation of about 1 km of Thames river wall to determine the extent of corrosion of the sheet piles using non-destructive ultrasonic techniques and selective intrusive sampling for tensile strength laboratory testing. Interpretation of the results in relation to the operating microenvironment at different locations and for different parts of the interlocking sheet pile structures

Special inspection of post-tensioned bridges: Project manager for the special inspection of numerous post-tensioned bridges. Operating as the principal contractor under CONDOM working under a variety of civil engineering conditions of contract, e.g., ICE Minor Works, 5th Edition and ground investigation contracts

Load testing of suspended floors, Colchester, UK, 2010: Full-scale load tests on a modular flooring system to investigate in situ failures of finishes owing to reported excessive deflections

CONTACT

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