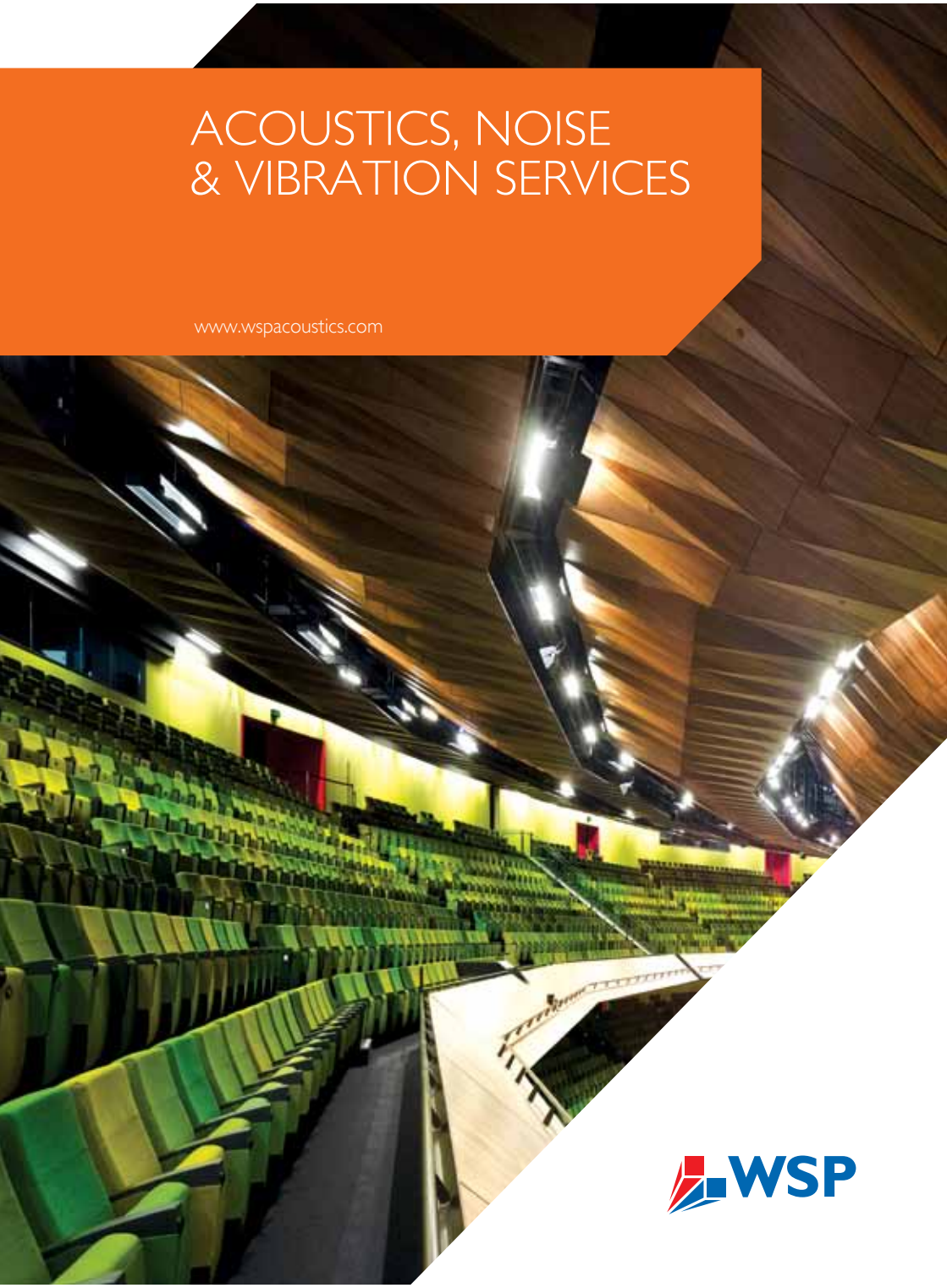
ACOUSTICS, NOISE & VIBRATION SERVICES

www.wspacoustics.com



WSP

CONCEPT-TO-COMMISSIONING

With over 150 specialist acousticians, WSP is one of the largest dedicated acoustics consultancies. Our specialists are based in the major cities around the world ensuring we can quickly mobilise local teams whilst leveraging global best practice and experience.

Our scale also enables us to have technical experts across a diverse range of very specific areas of acoustics meaning we can look at all aspects of a project. We have the expertise to provide concept-to-commissioning solutions, ranging from impact and constraint assessments during the planning phase, to detailed acoustical architectural and building services design, through to noise monitoring and mitigation during construction, operation and decommissioning.

Outstanding technical excellence in our solutions is our fundamental, but we have a reputation for challenging the status quo and delivering creative, pragmatic, sustainable and commercially focussed designs.

Integrated services

Having worked on some of the most reputed projects around the world, we have delighted in establishing ourselves as a core member of all multi-firm and multi-disciplinary project teams, regularly working with notable architects and developers such as Foster + Partners and Renzo Piano, as well as engineers, project managers, planners and contractors including Turner & Townsend, Al Futtaim Carillion and Skanska.

In addition, being part of a 15,000 strong design, engineering and environmental consultancy, enables us to provide you with seamless integrated expertise through working with in-house specialists ranging from M&E engineers, structural and civil engineers, fire engineers, environmental planning experts, transportation specialists and many more - an approach proven on projects such as Western Europe's tallest building, The Shard.

Service and sector snapshot:

- Architectural acoustical design
- Commercial property
- Building services noise and vibration control
- Residential property
- Audio-visual services
- Retail
- Environmental impact assessments
- Road, rail and Air Traffic
- Environmental noise mapping
- Workplace Noise and Vibration
- Windfarm Noise Impact
- Industrial noise control
- Stadia
- Road and rail traffic noise
- Government facilities
- Aircraft noise
- Data centres
- Vibration studies
- Hotels
- Product development
- Detention facilities
- Schools and colleges

BUILDING ACOUSTICS

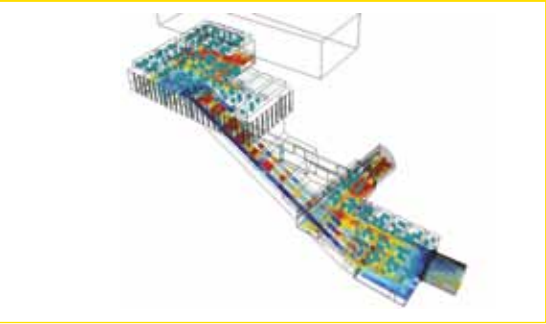
Architectural and Room Acoustics
We assist signature developers, architects, and contractors through;

- Advising on building layout to minimise the need for expensive acoustic countermeasures.
- Building façade acoustics design that minimises excessive road noise break-in.
- Sound insulation design between private spaces.
- Designs that optimise reverberation to enable high levels of speech intelligibility or audibility.

We pride ourselves on technical accuracy and depth to ensure your projects have cost-effective designs that deliver superior comfortable internal acoustics environments.

By computer modelling the relevant rooms using specialist architectural simulation software, our programmes enable clients to hear or 'auralise' a room's acoustics long before designs are finalised and the building has been constructed.

This allows for fine-tuning of the room's sound characteristics, potentially saving time and money on expensive remedial treatments that may otherwise be necessary following project completion.



We also undertake inspections and acoustic measurements within existing buildings. These include electro-acoustic system performance, airborne sound insulation, impact sound transmission, building services noise, and air and structure-borne sound and vibration measurements.

Building Services Noise and Vibration Control
Our Acoustics teams can assess mechanical and electrical building services plant with respect to both internal and external noise breakout and vibration transmission.

Our teams will ensure that noise and vibration specifications and advice are tailored to a client's requirement. This means that the level of quality and performance from noise control hardware is actually what a client needs, rather than what a particular hardware supplier would like to sell.

We help to specify to the M&E plant and systems selected, evaluating their noise and vibration qualities. We design in extra measures to protect user comfort. These include traditional air conditioning system attenuators, plant vibration isolators, rooftop acoustic screens, and occasionally something more innovative such as quiet and sustainable ground water cooling systems as opposed to noisy mechanical chiller plant.

Working with our M&E engineers, we provided architectural and building services noise control designs for the busy Telehouse West data centre in London.

Telehouse West, London

ENVIRONMENTAL SERVICES

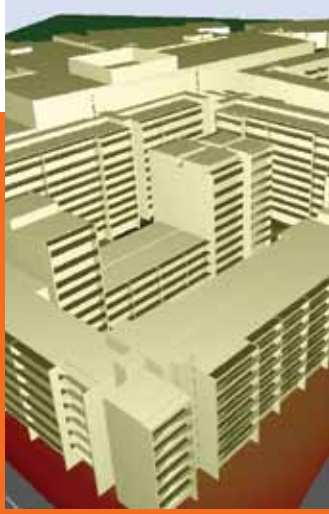
Environmental Impact Assessments
Noise is very often a primary factor in determining the acceptability of a new residential or commercial development, with associated transportation development, within an environmentally sensitive area.

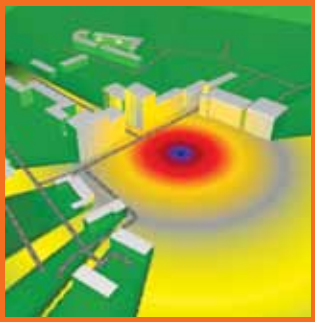
WSP undertake environmental noise impact assessments in line with National Standards, Approved Codes of Practice, Planning Policy Guidance, and Building Bulletins. In addition to generating appropriate noise and vibration evidence to support planning applications, we are able to provide expert witnesses at planning inquiries to support our Environmental Statements.

Environmental Noise Mapping
Noise free or 'tranquil' areas are increasingly hard to find and is a notable environmental factor. For example, in Europe, 20% of the population (80 million people) are exposed to noise levels that could, in the long term, potentially damage their health. Another 170 million people are adversely disturbed by noise.

WSP has undertaken both city and rural noise mapping projects in response to the environmental noise directive (2002/49/EC). These studies have included the provision of guidance to clients, such as the National Assembly for Wales and the City of Helsinki, on what steps need to be taken to satisfy the noise directive requirements.

Noise mapping studies are also often included within our Environmental Impact Assessments to aid the understanding of how noise disperses around a new development. We have a selection of noise prediction software to generate easy-to-read and understandable colour presentations and noise maps.





SPECIALIST SERVICES

Our acoustics teams monitor and assist in mitigating vibration from a number of sources including trains, mechanical services plant and quarry blasting.

Monitoring of roof plant vibration

Public Address/Voice Alarm Intelligibility

The ability to clearly hear and understand announcements over public address and voice alarm systems is a key design consideration within modern public buildings, and evermore emphasis is being placed upon the effectiveness of such systems by means of the requirement to comply with quantitative speech intelligibility criteria.

From retail malls to airports, museums to railway stations, we work closely with architectural design teams and electrical services engineers, building sophisticated 3D acoustic models and incorporating electro-acoustic loudspeaker systems for key internal spaces to achieve highly integrated solutions that optimise speech intelligibility.

Workplace Noise and Vibration

International noise and vibration at work regulations and directives, such as European Directives 2003/10/EC (noise) and 2002/44/EC (vibration), place a requirement on employers to safeguard the exposure of their employees to noise and vibration in the workplace. In most cases, this requires an assessment of noise and vibration related to employees' daily activities to categorise their exposure and to then, where necessary, put in place measures to limit or control the impact while demonstrating best practicable means.

Our acoustics teams have significant experience in undertaking workplace noise and vibration assessments and working with clients to provide noise mitigation plans and solutions. We have secured a number of framework agreements and undertaken multi-site assessments for major utilities companies and commercial organisations.

Vibration Studies

Many buildings are located beside or above sources of potentially significant vibration (such as railways), leading to concerns about the transmission of vibration and structure-borne noise into acoustically sensitive spaces. Our detailed vibration studies address these concerns, whilst our experience ensures we recommend the right solutions for our clients. In some instances, buildings need to be vibration-isolated from the surrounding ground structure. Such 'floating' buildings are becoming more and more common in urban areas. At WSP we offer consultancy services to advise architects and developers when and how to install the complex vibration isolation systems.

We are also able to undertake investigations and risk analysis of vibration associated with demolition and construction and demolition works, including from blasting, piling, and tunnelling. Excessive vibration and the resultant structure-borne noise from such sources can be controlled through good planning, appropriate plant and methodology selections, supervision and monitoring. Our expertise enables us to liaise effectively with the main relevant contractors to ensure the disturbance from such sources, and any effect on budget and programme, is minimised.

Our acoustics teams also have significant experience in the monitoring and mitigation of vibration and air overpressure (airborne vibration) associated with blasting from aggregate quarries, and are able to advise on thresholds for property damage and human discomfort in this regard.

SECTOR SERVICES

Industrial Noise

Large industrial sites can be very complex. There are often a multitude of noise sources contributing to the overall noise environment. WSP are able to undertake detailed 3D computer modelling of industrial noise sources to determine likely causes of noise complaints, and develop suitable and cost effective remedial measures. At complex industrial sites, and where noise sources are inaccessible, we use 'acoustic cameras' to visualise the dominant sources of noise. And through our Norwegian affiliate Multi-consult we have extensive expertise in the special noise and vibration requirements for oil and gas projects, including engineering, quality control and verification of Public Alarm Systems, both offshore and onshore.

We provided noise and vibration surveys along the Paisley Rail Corridor prior to improvement works with post completion surveys at sensitive locations along the route.

Road and Rail Traffic Noise

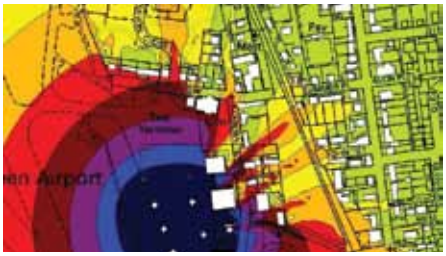
Road and rail traffic noise impacts are one of society's major environmental problems, with many people exposed to noise levels 20-30 dB higher than are considered acceptable in the World Health Organisation Guidelines for Community Noise. Many sound attenuation techniques are available to reduce noise from roads and railways. These include; acoustic screens or barriers along the transportation corridor; consideration of route planning; use of 'low noise' road surfaces and lower speed limits. We provide assessments of noise exposure within an environment and assess the effect of mitigation measures using three-dimensional colour-coded noise maps. Once created, the noise map can be altered and updated as design proposals change, and the final result can be imported into modern GIS applications, which allows further detailed demographic data analyses to be undertaken.

Aircraft Noise

The extent of the impact of aircraft noise is dependent upon the types of aircraft which use a particular airport (the 'fleet mix'), their destination (high fuel loads result in noisier aircraft departures), and the overall level of aircraft activity. Aircraft noise investigations are commonly undertaken in connection with environmental impact assessments of sites around airports. We use specialised software to determine the likely noise effects taking into account land use within the affected area and the number of potentially affected inhabitants in the locality.

Our acoustics teams provide noise modelling and mitigation support for major international airports in addition to architectural and building services design for airport infrastructure.

OUR TRACK RECORD



AkuLite, Acoustics and Vibration in Lightweight structures

Client: SP Wood Technology, Sweden

Our acoustics team in Sweden were commissioned by SP Wood Technology to undertake and manage a research project to better understand low frequency noise and vibration issues in lightweight building structures and to develop new descriptors to correlate perceived neighbour annoyance. This pioneering project involved over 35 industrial partners in Sweden and all Swedish research institutions and Universities. The project will have impact on future ISO standards as well as future design principles for new lightweight building systems to improve acoustic performance.

Shard, London, UK: Western Europe's tallest building

Client: Sellar Properties

The Shard is a unique multi-purpose 310 metre structure dominating the London skyline. WSP has undertaken full acoustic design studies, including environmental, architectural and building services noise and vibration control. We also provided the acoustic design on most aspects of the development, including base build design and the fit-outs of the private residences, the Shangri-La hotel, viewing gallery, restaurants and entrances.

Sydney International Convention, Exhibition and Entertainment Precinct Sydney, Australia

Client: InfrastructureNSW

This project entails the potential redevelopment of a large area of Sydney around Darling Harbour, making it the main destination for leisure and entertainment in the city. WSP are the engineering services advisors, assisting in preparing project design guidelines and outcomes and then monitoring and evaluating throughout the tendering and construction process. Our involvement includes full acoustic and audio-visual services.

Crossrail, London, UK: Europe's largest infrastructure project

Client: Crossrail

WSP is providing a wide range of engineering consultancy services for the £15bn+ Crossrail project cutting through the heart of central London. Our acoustics team is providing design services and noise and vibration control for Bond Street station, supporting the contractor through the construction phase of Tottenham Court Road Station as well as a number of focussed work packages for other stations including Farringdon, Paddington and Liverpool Street.

A Noise Map of the entire Greater Melbourne area, Australia
Client: EPA Victoria
WSP is working with EPA Victoria on developing an accurate computer model of the Greater Melbourne region mapping noise emissions across the area. The model will include noise modelling from road, rail, industry and light rail/tram sources and will assess the percentage of the population of Greater Melbourne exposed to a range of noise levels. This will be used by the EPA to feed into a study on the health burden of noise in the Greater Melbourne area

Zayed National Museum, Abu Dhabi: prestigious 58,698m^2 development
Client: Tourism Development and Investment Company, Abu Dhabi
WSP was appointed as part of a joint venture with Foster + Partners to lead the engineering design for Abu Dhabi's Zayed National Museum. As part of an extensive multi-disciplinary team our acoustics specialists provided advice on room acoustics, internal and facade sound insulation and control of building services and vibration. Complex 3D acoustic modelling was carried out to assess transmission of noise between spaces, enhance acoustics for presentations and performances and assist the PAVA design. Bespoke sound absorbent finishes were developed to meet architectural demands.

Presidential Palace, Abu Dhabi: Acoustical design for the prestigious royal palaces
Client: Presidential Affairs Department
The new Presidential Palace being constructed in Abu Dhabi is a 220,000 m^2 development including the main palace, smaller palaces, villas and related facilities. WSP are providing building design, electro-mechanical and plumbing and structural design services as well as designing the marine works for the palace. Our acoustics specialists carried out a full design of the MEP services and architectural acoustics.

Osisko Mine, Canada: Noise management of Canada's largest open-pit gold mine
Client: Osisko Mining Corporation
From its very inception our acoustics specialists have been conducting studies and monitoring the environmental noise impact of various mining activities. This included characterisation of noise levels in the city of Malartic before mining commenced, noise impact studies of drilling with recommendations for temporary mitigation measures, noise impacts forecasts during construction and continuous noise monitoring at predetermined locations.

Vindplats Göteborg, Sweden
Client: Göteborg Energi
Vindplats Göteborg is an offshore windfarm scheme proposed by Göteborg Energi, the major energy production company in Sweden's western region. The scheme is proposed to provide 200 GWh annual power production and will be located close to land and the shipping lane into Gothenburg port. Our acoustics team has undertaken detailed noise impact predictions and assessments, prepared documentation to support the necessary environmental consents required by the local authorities and taken part in numerous public meetings to support the scheme, which is expected to be operational by 2017.

GET IN TOUCH

Our 150+ acousticians are based in major cities all around the world. We have detailed local knowledge of the areas in which we work, coupled with global mobility and best practice to ensure we can service our clients wherever in the world their projects may take them.

No matter where in the world you work with WSP, you will find us to be attentive and communicative. We will work seamlessly as part of your team. Our technical strength is second to none and matched with creativity and innovation. We love what we do and strive to ensure our clients receive the very best solutions whilst balancing the commercial, legal, budget and time requirements that come with every project.

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ABOUT US

WSP Group is one of the world's leading engineering and design consultancies. We provide services to transform the built environment and restore the natural environment.

Our expertise ranges from land remediation to urban planning, from engineering iconic buildings to designing sustainable transport networks and from developing the energy sources of the future to enabling new ways of extracting essential minerals.

We have c.15,000 employees working in more than 300 offices on every continent. Our global presence includes corporate offices in major cities across 35 countries and project offices in many more.

Find out more at www.wspgroup.com

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Cover image:
PA/VA modelling for Melbourne Convention & Exhibition Centre