Capability Statement

# Shielding and Dose Assessment

AREVA
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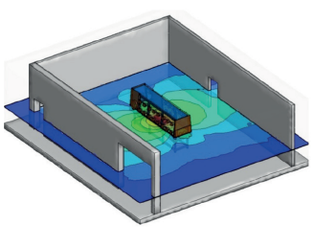
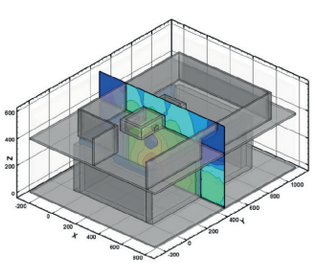
Offering comprehensive Shielding and Dose Assessment services across the entire project life cycle for civil nuclear, defence and research facilities, our team of consultants has over 25 years of experience and are skilled in all aspects of shielding, dose uptake and ALARP assessment.

***Our combination of expertise and shielding methods allow us to efficiently optimise shielding provisions, thus reducing design and construction costs***





### Shielding and Dose Assessment Capability

AREVA RMC is proficient in supporting projects during design, operation, modification and decommissioning phases of a nuclear installation or facility. Our team of consultants have an excellent practical understanding of current regulations, guidance and best industry practices with regards to shielding design and dose minimisation. AREVA-RMC has invested in the best available shielding codes and supporting IT equipment capable of undertaking shielding calculations for complex problems involving neutron, gamma and beta radiation. The shielding team has the tools, skills and experience to compete with the best shielding teams in the UK.

### Shielding Design Basis

We can undertake reviews to identify all of the key assumptions and data to be used as a basis for all shielding and dose uptake assessments for a specific project. This includes outlining radiation dose criteria (regulatory and company dose limits), specific shielding design criteria (such as dose rate targets), source term generation (e.g. neutron and gamma radiation) and shielding material compositions.

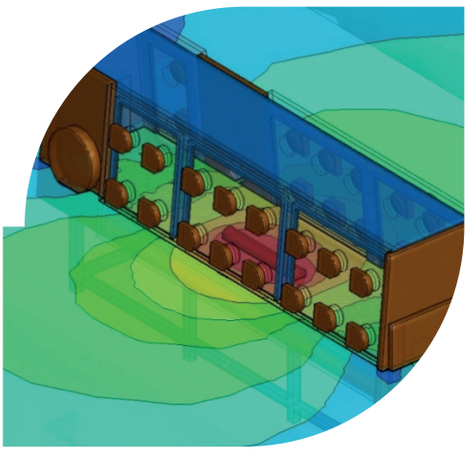
### Radiological Classification of Areas

Our team can conduct radiological classification of areas assessments in order to designate areas within the facility according to the level of hazard from external radiation and/or the potential for surface and airborne contamination. This assessment helps ensure compliance with the legal requirements, assists in the control of radiation dose uptake (both internal and external) and enables a consistent and efficient plant layout to be developed from in the early stages of the design phase.

### Shielding Assessments

Our shielding consultants regularly work closely with plant operators, design engineers and Radiation Protection Advisors (RPA) to develop and optimise cost effective shielding solutions. This often includes, but is not limited to, the following types of shielding assessment:

- **Bulk Shielding Assessments:** This includes assessing the bulk shielding requirements for walls, floors, roof slabs, shielded windows, access labyrinths, gamma gates and shield doors for areas containing sources of radiation.
- **Penetration Assessments:** This considers the potential for radiation streaming through penetrations in the bulk shields such as gaps around doors, service ducts (e.g. ventilation and electrical ducts), shield plugs, drive shafts and wall boxes.
- **Local Shielding Assessments:** This considers the provision of local shielding to protect operators and/or equipment. This can include items such as shielded partitions, internal walls, mobile shields, workstations and gloves boxes.
- **Skyshine:** This considers the doses around facilities due to radiation scattering in the atmosphere, which can be a potential issue for storage facilities without shielded roofs. The team has extensive experience in providing advice on plant layout, storage strategies and shielding provisions to provide cost effective solutions for minimising skyshine doses.



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*We can provide advice early in the project to select the most appropriate shielding solutions preventing the need for more expensive shielding modifications or rework later in the design*

*Specialists in industry standard shielding codes including MCNP, Attila, MicroShield and ORIGEN*

- **Transport:** Shielding design advice for transport packages including assessment of dose rates and doses associated with the loading and movement of transport packages.
- **Emergency Planning:** Criticality dose contour assessments and detector placement assessments for Criticality Incident Detection Alarm Systems (CIDAS).
- **Safety Case Support:** Assessment of dose rates and shielding under fault conditions. Assessment and optimisation of radiation monitor detector placements (e.g. gamma interlock monitors).

### Dose Uptake & ALARP Assessment

Our team is highly experienced in undertaking dose uptake and ALARP (As Low As Reasonably Practicable) assessments for facilities during the design, operation or decommissioning phases. The dose uptake assessment is used to identify high dose tasks and recommend changes to process, operations and shielding provisions to ensure that overall dose uptake is both within the regulatory and company dose criteria and is ALARP.

### Peer Review

We also have experience undertaking peer reviews of shielding and dose assessments for a range of installations.

### Shielding Codes

We are specialists in industry standard radiation transport codes and are licenced to use the following:

**Attila** is a state-of-the-art software suite developed to provide fast and accurate solutions to demanding radiation transport applications. Attila has full CAD integration and produces both visual and quantitative results, which provides engineers with the insightful data needed for informed design decisions.

**MCNP** is a general-purpose Monte Carlo N-Particle code that can be used for neutron, photon, electron, or coupled neutron/photon/electron transport. This code enables detailed shielding calculations to be conducted as well as providing a robust and independent cross check for Attila calculations.

**MicroShield®** is a comprehensive photon/gamma ray shielding and dose assessment program that is used for designing shields, estimating source strength from radiation measurements, minimising exposure to people and teaching shielding principles.

**ORIGEN-ARP** is an isotopic depletion and decay analysis code used to perform fuel depletion, activation and decay calculations, as well as produce both neutron and gamma source terms.

For further information please contact your local office:

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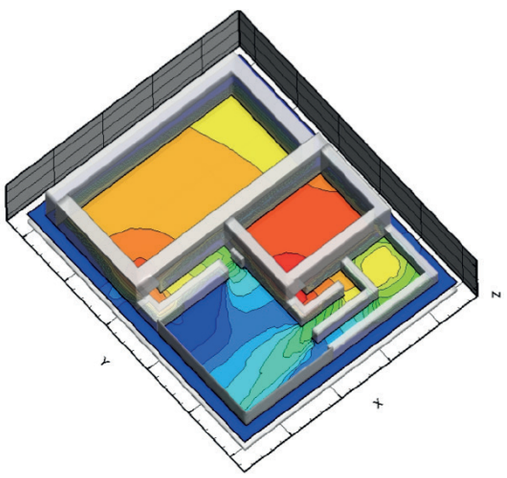
AREVA RMC Ltd is a wholly owned subsidiary of AREVA and is a specialist nuclear consultancy to the UK nuclear industry. With a track record of over 30 years, it is the use of our knowledge and experience which provides the value.



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