

# Radiation Shielding

Cerberus Nuclear was created to approach technical consultancy with an emphasis on creativity and innovation. We bring together highly specialist skills and industry-wide experience to offer comprehensive Radiation Shielding, Criticality Safety, Nuclear Characterisation, Data Science and Software Development services for Nuclear, Medical, Research, Defence and Fusion sectors.

Our highly experienced in-house team provide radiation shielding design, dose assessment and peer review services covering the full project design life-cycle. We utilise the latest calculation methods combined with high-power computing to efficiently deliver detailed, accurate and reliable results. This includes using MCNP®, FLUKA® and TEMPEST™, the powerful new monte carlo radiation transport code from Orthrus Software.

Our team are skilled in communicating complex data to stakeholders and regulatory bodies. The specific techniques we have developed allow projects to make intuitive and informed decisions, which gives greater confidence and reduces overall project risk during the design process.

## Case Studies

### Shielding Design Process Support

We are providing full shielding design process support to a facility for the ISIS Neutron and Muon Source at the STFC Rutherford and Appleton Laboratory. Cerberus Nuclear are supporting the Concept and Detailed design phases, initially defining the Shielding Design Basis and Bulk Shielding, with further calculations being completed as the design progresses. Finally, Cerberus Nuclear will attend the site following construction to test that the shielding has been built as designed.

### Spherical Tokamak Bioshield

Radiation shielding support to develop concrete bioshield specifications for a new spherical tokamak design. This involved shielding assessments that accounted for neutrons and secondary gamma generation for deuterium-deuterium and deuterium-tritium experimental campaigns. This work also looked at the contribution of skyshine in addition to the direct radiation contributions through the bioshield walls and roof.

### Brighton 3Ts Shield Testing

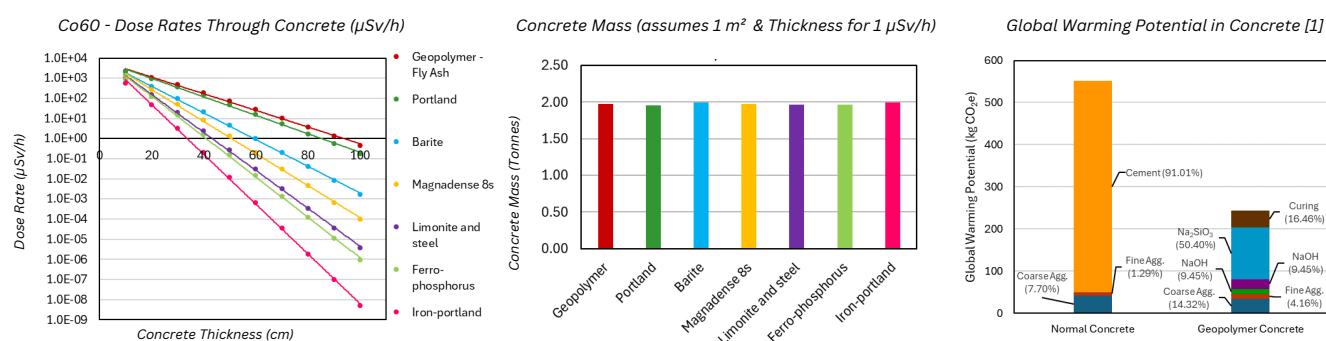
Cerberus Nuclear has provided shield testing and substantiation services for the Brighton 3Ts project at the Royal Sussex Count Hospital. We provided RPA advice, risk assessments and all the relevant documentation for this work, along with the inspection of the installation of this shielding to ensure that it fulfilled design intent. The shielding in 40 rooms, across 5 levels were tested to verify that the correct level of lead shielding had been installed. This was done using a sealed source and a portable X-ray betatron.

### STEP Reactor Central Column Shielding

Cerberus Nuclear provided radiation shielding to support the UKAEA on the development of their STEP spherical tokamak design. The project involved optimising the radiation shielding within the central column section of the reactor to protect the inboard toroidal field coils. This included the optimisation of shielding to prevent neutron damage to the magnets and maximise their operational lifetime.

## Sustainability Focus

Sustainability is a core priority for us, our optimised shielding designs not only reduce costs but also align with environmentally responsible practices. Traditional shielding materials can have a significant environmental footprint, we are committed to reducing material usage in partnership with our customers, and we are exploring more sustainable alternatives through ongoing research. Such examples are geopolymer concretes, which use alternatives to the more environmentally impactful cement as used in Portland concrete.



[1] Agustinus Agus Setiawan et al 2023 IOP Conf. Ser.: Earth Environ. Sci. 1195 012031

