

# RANKERN® Radiation Shielding and Dosimetry

The RANKERN® package assists users with gamma radiation transport problems in shield design, dosimetry and industrial applications.

## The Software

The RANKERN® code provides a rapid method for the design and assessment of gamma ray shielding and dosimetry. RANKERN® is suitable for determining dose-rates through shield materials, in ducts and labyrinths and from skyshine and has a wide-range of applications within the nuclear power industry and other market sectors.

RANKERN® utilises the point-kernel technique coupled with build up factors to correct the un-collided flux for the contribution due to scattering. The code uses a powerful and flexible three dimensional geometry modelling package to enable even complicated geometry systems to be described with minimum effort, or imported directly from CAD files (evaluation feature). The same geometry package is used in the MONK® and MCBEND® codes, allowing easy transfer between them.

RANKERN® can also model any number of source bodies with different shapes, dimensions, orientations and spectra, within a single calculation. The integration of the point-kernel over the spatial

distribution of the source is carried out using a stochastic integration method, which employs an automatic technique for adjusting the source importance function. Another benefit is RANKERN®'s ability to treat penetration paths involving multiple flight scatter or reflection events.

The code has a series of self-contained libraries; these include: a gamma-ray cross section data library for all elements, a set of cross section data for standard materials, libraries of Taylor form polynomial buildup factors and ANS643 build-up factors for common materials, an albedo data library and gamma-ray source library with over 1800 actinide, activation and fission products. A function is available to decay the source inventory prior to the calculation. For multi-layered shields, build-up factors can also be calculated 'on the fly', using diffusion theory.

## Strong Customer Focus

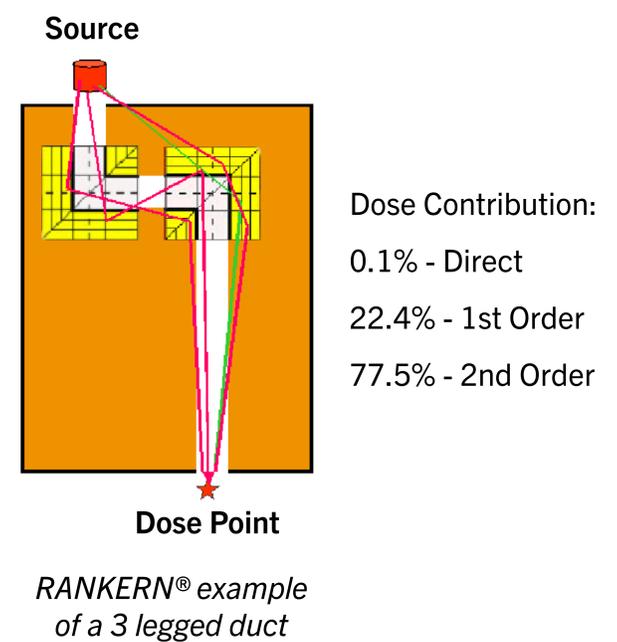
ANSWERS® has a strong global customer base, with clients around the world, including North America, Asia and Europe.

Interaction with our customers, understanding their requirements and listening to their feedback, is an important part of our mission to continuously develop and improve our software.

Customers have access to dedicated hotline support, by telephone and e-mail. Training courses are available, and bespoke/on-site training can be arranged if required.

## Benefits

- RANKERN® reduces costs by optimising resource utilisation and capability.
- The combination of a powerful geometry modelling package, flexible source descriptions and supporting data libraries make for an effective, efficient, yet easy-to-use package.

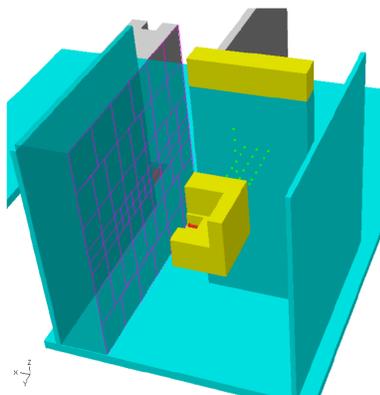


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## Model Verification Code

Visual Workshop is a tool for the RANKERN® analyst to display and verify model geometry, create and modify input data, run calculations and view results. The ray trace displays use the same routines to generate the images as RANKERN® uses to run the calculations.

This gives the analyst a high level of confidence that the model being displayed is an exact representation of the model used for the calculation. As well as results, model features such as source, scatter and reflection bodies and dose points can be overlaid on the geometry.



*Investigation of gamma-ray shine from wall of room.*

## Contact

If you would like more information about Amentum's ANSWERS® Software Service, please contact:

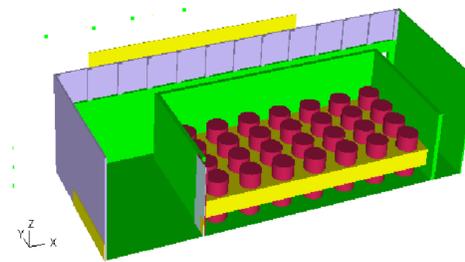
e: [answers@global.amentum.com](mailto:answers@global.amentum.com)

w: [www.answerssoftwareservice.com](http://www.answerssoftwareservice.com)

## RANKERN® Applications

RANKERN® has been successfully applied to such problems as:

- Shield design and optimisation for reactor and process plant.
- Prediction of operational personnel dose levels.
- Fuel storage facilities.
- Indirect penetration of radiation along ducts.
- Design studies for fissile material transport containers.
- New and spent fuel transportation both within countries and between countries.
- Waste packaging and management planning.
- Decommissioning preparation and planning.
- Analysis of the effects of radiation transmission by skyshine.
- Sterilisation of products and food by irradiation.
- Self-attenuation in sealed radiography sources.
- Half thickness values for shielding materials.



*Dose outside of storage facility.*