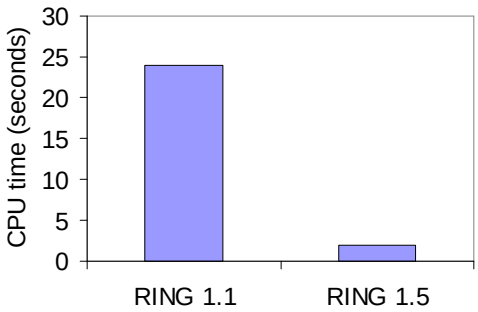
What's new in RING 1.5?

Sheffield, May 2005

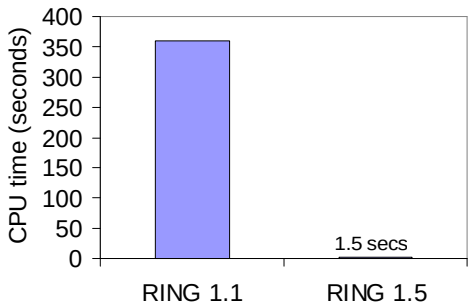
Analysis engine

- Very significantly reduced solution times for problems involving multi-ring arches. This is a direct result of implementing a new sparse matrix problem formulation, optimised for use with the supplied PCx interior point solver. E.g. shown below are results for two sample problems distributed with RING, on a 1.6 GHz Athlon PC:

Twin Span 2.rng:



Bolton_bridge_5-2.rng (masonry strength = ∞):



- Data is now passed to the solver via memory, rather than via disk files, increasing reliability as well as speed.
- For problems involving finite masonry crushing strengths, the reduced solution times have meant that full crushing analyses are now performed for all load cases (i.e. not just the load case assumed to be critical following the first iteration as in RING 1.1; this occasionally led to a non-conservative load factor being computed).
- The different problem formulation used means that for multi-ring arch problems computed load factors from RING version 1.5 are up to approx. 1% higher than from RING version 1.1.

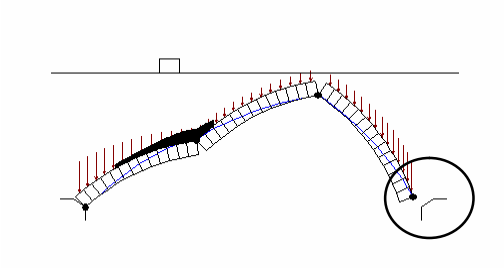
Functionality

- Vehicle management features improved. It is now possible to: rename, export and delete vehicles from the vehicle library.

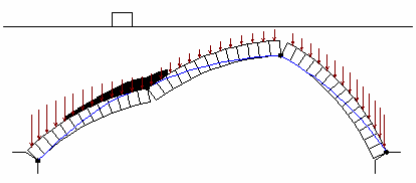
Graphical display

- Improved visualization of collapse mechanisms when infinitesimal displacements magnified by a large amount (no apparent discontinuity at end of spans as in RING 1.1):

RING 1.1 display:



RING 1.5 display:



- Options added to turn on and off the display of: hinges, dead load pressures, live load pressures & contact surfaces.
- Display of thrust line now turned off by default (as this has little meaning in the case of multi-ring arches).

- Zoom all function added to quickly restore initial screen view.

Default parameters

- Changes to a number of the default parameters have been made:

Parameter	New value	Notes
Convergence tolerance	0.5%	Relaxed to reduce the number of iterations required when performing a finite masonry crushing strength analysis (reflecting the fact that other uncertainties often make use of a finer tolerance inappropriate).
Classical earth pressure coefficient	1.0	This value corresponds to 1/3 of the classical K_p value for a soil with an angle of friction of 30°. i.e. reasonably conservative in the absence of other information.
Tangential coefficient of friction	0.5	Previous default value of zero was highly over-conservative in most cases.

N.B. The default masonry crushing strength value has been kept at infinity to keep the default analysis linear (a linear analysis is quick to perform and hence is recommended in an initial analysis study).

Documentation

- User guide fully updated (now renamed 'RING Program Reference').
- New 'RING Modelling Guide' which provides: details of the theoretical basis of RING, validation studies performed and advice on modelling bridges in the field.

Installation

- Use of modern installer fully compliant with Windows 2000 & XP (also works with Win95/98/Me/NT4).

Bug fixes

- Several minor bugs in RING 1.1 were identified whilst RING 1.5 was being developed (refer to the website for details). These have been fixed in RING 1.5 and hence all users are advised to now upgrade.