

10 Safety Rules

for Working at the Schofield Centrifuge Centre

1. Experimental work in this Centre must be covered by a Project Approval Document (PAD) in addition to the CUED Risk Assessment. PADs are assembled by the Research Worker, approved by the Project Leader, and signed by an Authorised Engineer named on a current list approved by the Director. Every draft PAD should be discussed by the Research Worker, Project Leader, Chief Technician, and Authorised Engineer. The Director or Assistant Director must approve permanent modifications to the facilities.
2. Each PAD should refer to a test series, rather than an individual test and will include:
 - names of Project Leader (e.g. supervisor) and Research Worker (e.g. student)
 - description of test series
 - sketch of test package, naming items, showing key dimensions
 - services required - centrifuge, electrical, hydraulic, pneumatic, etc.
 - design of experimental rig, safety checks
 - list of personnel authorised to run the experiment
 - outline centrifuge balance calculations, setting a range of expected values

Reference to pre-existing PADs is permitted if there is no uncertainty about their relevance. A photocopy of another research worker's PAD or balance calculations may be provided by the Senior Engineer or the Chief Technician, who will advise on the correct identification of equipment.

3. Experimental rigs will be designed to show certain minimum safety margins. Critical load combinations during authorised testing will be established. Ductility and continuity will be maximised in the design of the soil containment. An accompanying document "Design of Safe Centrifuge Packages" covers essential information.
4. No experimental work will be carried out by anyone working alone. Shorts, sandals, long hair, loose clothing and ties are not to be worn by people working in the laboratory. Protective clothing and shoes are provided. Great care must be taken climbing in or out of the beam centrifuge pit. Use of cranes, machine tools and the fork lift truck is restricted to technicians. Training will be provided as required to experimental workers on the use of tools, instruments, pressure vessels, computers and centrifuges.
5. Before each centrifuge test, the Research Worker (with the help of an Authorised User, if the Research Worker is not authorised) will create a Balance Calculation to be checked and signed by an Authorised Engineer. Unless the mass distribution is inherently evenly balanced, a sketch of lumped masses and centres of mass of named components will lead to a manifest which demonstrates moment balance (mass x radius) throughout the test. Calculated out-of-balance during long tests is permitted only within these tolerances:

10m beam centrifuge – 5kg at 4m radius at 125 g (or pro rata)

2m drum centrifuge – 2kg at 1m radius at 350 g (or pro rata)

0.8m drum centrifuge – 1kg at 0.4m radius at 350 g (or pro rata)

The drum centrifuges can be filled with soil up to the top of their ring channel. The beam centrifuge can accept a 1000 kg package on a swing, to work at 125 g. An Authorised Technician will record the actual weights of all discrete packages and assemblies introduced on to a rotor, and will check them against the manifest.

6. Two Authorised Users, as named in the PAD, will be present in the beam centrifuge control room to monitor sensors when certain critical operations are carried out:
 - speed is raised
 - water is supplied
 - actuators are operated

One person will act as the Authorised Research Worker responsible for the data and the other as the Authorised Technician responsible to the Director for safe and efficient working of the Centre. A current list of Authorised Users will be posted at the Centre. Students and visitors will not initially be Authorised Users.

The Research Worker will demonstrate to the Authorised Technician, on request, that the data acquisition system facilitates essential monitoring. Significant readings will be output onto digital displays. Significant control switches will be labelled. The Authorised Technician will monitor the speed of the machine, and check the level of noise, vibration, and bearing temperature, where applicable. One Authorised User may be left alone in a control room to monitor safety if no critical operations are carried out; a second Authorised User must be on call in the Centre.

7. The Director may exceptionally give permission for a drum centrifuge to be operated in the absence of personnel. In this case, access to the machine room will be barred, and a warning notice will be posted. A Research Worker desiring to interact with the experiment must be accompanied, as indicated in rule 4.
8. Packages and other critical components which are to be centrifuged for the first time, or which are to be used at a higher acceleration than their previous maximum, should be subjected to a proof test at an acceleration 25% higher than that requested for normal testing. In the case of a proof test the Engineer authorising the PAD will also be present. Items which will be limited to a working acceleration less than the maximum working value listed in rule 5 will be marked clearly with that limiting acceleration.
9. Lasers will be used only as agreed by the Chief Technician - users must register for eye tests, and must wear safety goggles, if instructed.
10. Spillages must be wiped up immediately. Trip hazards such as trailing cables must be prevented or clearly marked. It is the responsibility of everyone at the Centre to work safely, to report apparent hazards or faults immediately to a technician, and to discuss with the Director any concerns that they may have regarding their use of the Centre.

Director: Dr S P G Madabhushi; tel. 68053; e-mail mosp1@eng.cam.ac.uk;

Senior Lecturer: Dr S K Haigh; tel. 68052; e-mail skh20@eng.cam.ac.uk;

Lecturer: Dr G Biscontin; tel. 68044; e-mail gb479@cam.ac.uk

Chief Technician: Mr John Chandler; tel. 37109; e-mail jac44@eng.cam.ac.uk;