

ROPS Test Rig

You prove it by bending it. The pass mark is the space that survives.

THE PASS MARK IS GEOMETRIC, NOT STRUCTURAL

A roll-over protective structure exists to keep a machine off its operator, so the test does not ask how strong it is. It asks whether a notional volume around the seated operator stays clear. The structure may bend as far as it likes, provided nothing ever enters that space - which inverts the usual logic: a stiff structure that cracks and folds inward FAILS, while a softer one that deforms a long way and stops short PASSES. Clearance is therefore tracked throughout the loading, not inspected at the end, because steel springs back and a structure that intruded under load can look acceptable afterwards.

IT IS RUN TO AN ENERGY, NOT TO A FORCE

The requirement is that the structure absorb a specified energy, and energy is the area under the load-deflection curve. So the rig is displacement-controlled and integrates live, stopping at the target rather than at a load. Both channels must be accurate, because an error in either scales the integral directly, and the loading must stay quasi-static - anything dynamic puts energy into the specimen that the integral never sees.

THE RIG MUST BE STIFFER THAN THE SPECIMEN

Any flex in the reaction frame, the anchorage or the load train is recorded as specimen deflection, and the error runs in the unsafe direction: it inflates the apparent energy absorbed AND understates the intrusion, so a marginal structure is made to look compliant. The frame is sized by deflection rather than allowable stress, the anchorage is designed on the assumption the floor will lift, and the rig's own compliance is characterised at commissioning and subtracted.

THE SPECIMEN IS CONSUMED

Loads come in a prescribed order and each stage inherits the last stage's damage, so no stage can be re-run and every test costs a cab. Fixturing, instrumentation and abort logic have to be right first time - on this rig an overshoot does not spoil a reading, it destroys the article.

THE MACHINE

- Reaction frame and anchorage - stiffness first, strength second
- Load train and actuation - high force, long stroke, fixturing that holds
- Measurement and integration - rig deflection subtracted, clearance monitored
- Control, safety and reporting - displacement ramp, abort logic, test record

VARIANTS

ROPS static test rig · Falling-object drop test · Combined cell · Retrofit of actuation and instrumentation to an existing frame

SCOPE

Ours: rig design and integration, reaction frame and anchorage design, load train and actuation, load-point fixturing, measurement and rig-deflection compensation, energy integration and clearance monitoring, control, abort logic and guarding, installation, commissioning, correlation, training and AMC. Bought-in certified: hydraulic actuators and power pack, load cells and displacement transducers, control hardware. The customer's: the specimens, the applicable standard and the test programme.

STATUS

Engineered to order. Equipment of this class has been quoted against a roll-over protective structure test rig requirement for an automotive certification authority; no delivered roll-over protective structure test rig is claimed.