

### Background

Shoes fitted to new boats by the boat builder typically comply with the provisions of *RowSafe* and the Rules of Racing. However Umpires and Safety Advisers have observed that some user-modified heel restraints may appear to comply but are unlikely to operate effectively in the event of a boat capsize so are a hazard. Heel restraint failures are more likely if poor (strength/durable) materials such as string or shoe laces are used or where the heel restraints are fitted such that shoes are not individually anchored. The recommended practice is to repair worn-out or broken heel restraints with identical (or manufacturer-approved) materials and fit following the instructions provided by the original boat builder. When this is not possible, this guidance below details the recommended minimum standards and fixing techniques that should ensure the heel restraints operate as intended. Remember that the heel restraint is not the only feature designed to prevent athlete's feet being trapped in a capsized boat. The stretcher, its fittings and the condition of the shoes must all be maintained in full working order.

### Heel Restraint Material

There are a number of suitable marine cords readily available at chandlery or climbing shops. Selection is based on a cord diameter that represents adequate breaking strength, whilst still being small enough to fit through the normal holes in stretchers and tie into knots that will not easily undo. The material selected should be able to withstand UV degradation from sunlight exposure for a reasonable period.

A typical specification that could be adopted is:

- Cord diameter – 3mm
- Typical material – dyneema core with a polyester braided cover
- Minimum breaking load - 400 kg
- UV degradation – 3 years at 60% strength reduction

The UV test is conducted in the worst case scenario i.e. the conditions seen by a boat permanently stored outside. Typically rowing boats are stored indoors or under cover outdoors so the 3 years recommended replacement period is conservative.

Breaking strength is based on the cord remaining undamaged during use. Regular inspection is required to ensure there is no significant chafing caused by repeated heel movement around the fixings. It is recommended that the working load should be no more than 50% of the minimum breaking load quoted by the manufacturer. Hence a 100kg athlete using his body weight to pull out of the shoes would be adequately protected by 400kg cord that has degraded by UV/abrasion to 50% in 3 years (200 kg) with a 50% safety factor.

### Fixing

When fixing the heel restraints make sure that each shoe is securely and independently attached to a fixed point on the stretcher and the cord can not slide up and down the stretcher.

Recommended fixing instructions:

1. A double length of suitable cord.
2. Cord passed through a secured ring or other firm attachment on the shoe heel.
3. Both ends of the cord to pass through a close fitting hole in the stretcher board that is sufficiently far away from the edge to be fit for purpose.
4. The two protruding ends to be tied as one piece in an 'overhand' knot (see diagram). The knot must be large enough not pass back through the hole in the stretcher.
5. The position of the knot should conform with the British Rowing *Rules of Racing* - "the heel shall not be able to rise above the lower fixing point of the shoe". A good setting is to allow no more than 50mm clearance between the stretcher and the sole at the heel.
6. Cut off the excess cord about 10mm beyond the knot. Then heat the cut ends in a small flame so that the surface of the cord fuses sufficiently and upon hardening is effectively sealed and will not fray.



### Maintenance of Effective Heel Restraints

#### Normal Use

Most boats are used by a variety of crews and a threat to effective heel restraints is shoe damage due to use by people with feet larger or smaller than the shoe size. Damaged shoes may easily become the 'weak point' and fail in an emergency. These should be replaced and the heel restraints properly reattached and checked prior to use. People with small feet should not be allowed to wear trainers inside the boat shoes or use additional fixings.

#### Regular Inspection

Heel restraints should be tested by hand as part of the regular pre-outing checks and repaired whenever a potential fault is found. Key points to check:

1. The condition of the cord (no chafing) and the ends are fully sealed.
2. The size and condition of the knot and that sufficient cord extends beyond the knot to prevent it coming undone.
3. The condition (integrity) of the shoe fixing and heel is good enough to perform during a capsize, e.g. the heel is fully attached to the sole, the cord fixing is firmly attached to the heel and there is no damage to the shoes.