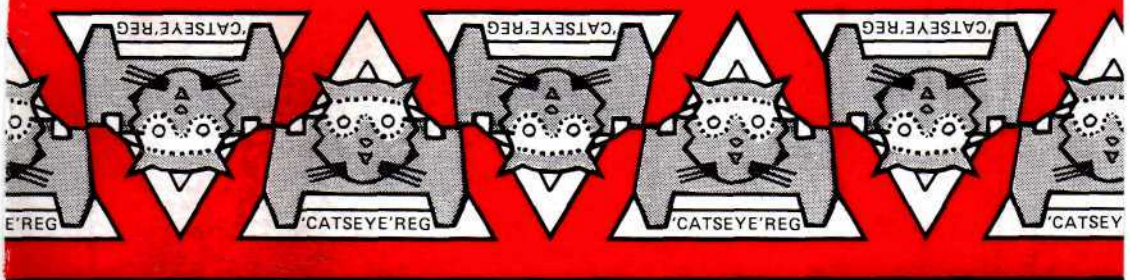

'CATSEYE'
SELF WIPING
REFLECTING ROAD STUDS

Instructions for Paving and General Maintenance

1995 EDITION
1st ISSUE

REFLECTING ROADSTUDS LIMITED
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IMPORTANT

This 1995 edition supersedes the red backed 1984 edition and all previous editions which should be destroyed

REFLECTING ROADSTUDS LIMITED
Boothtown, Halifax, England

THE TWO TYPES OF 'CATSEYE' REFLECTING ROAD STUD

LONG TYPE (RRL 267)

Self-wiping reflecting road stud

Measurements:
254mm x 140mm x 55mm

Weight: 5kg

Designed for roads carrying heavy traffic or subject to snow ploughing in winter.

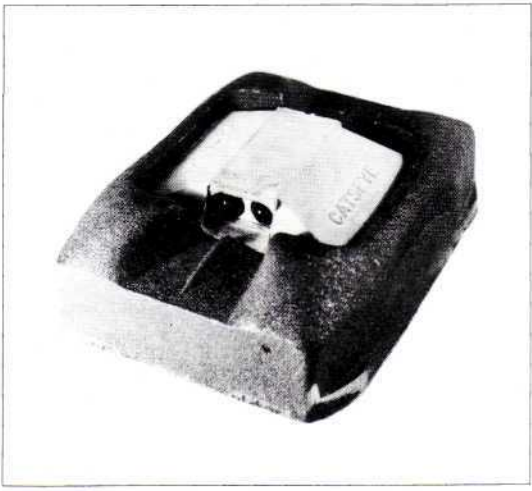
SHORT TYPE (RRL 345)

Self-wiping reflecting road stud

Measurements:
180mm x 140mm x 53mm

Weight: 4.54kg

This model is intended for use on roads with an AADT of less than 5,000 for single carriageway or 10,000 for dual carriageway and free from snow ploughing.



POSITION AND SPACING OF 'CATSEYE' REFLECTING STUDS

The studs are paved in the road surface generally in the road centre or on traffic lane divisions.

The reflected colours of these studs in Great Britain must be in accordance with the Traffic Signs Regulations and General Directions in force at the time.

For spacings currently recommended, see chapter 5 of 'Traffic Signs Manual' obtainable from H. M. Stationery Office.

For overseas usage, 'Catseyes' must be positioned and spaced to conform with existing laws and regulations of that country.

NOTE: Road studs must not be installed within 50mm of any expansion joint.

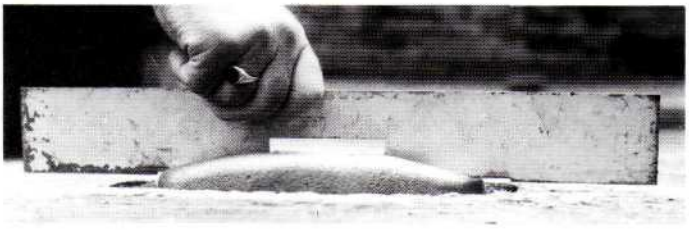
PAVING HEIGHTS

For 'Catseyes' to give perfect night visibility, it is vital that the whole surface of the four reflectors be permanently above road level, so as to receive and reflect the light of vehicle headlamps.

A sunken stud will not reflect and the effective life of both the rubber pad and reflectors will be much reduced.

Regulation 29(2) of the 'Traffic Signs Regulation and General Directions 1994' stipulates the maximum height by which a road stud may project above the carriageway.

Correct use of the paving template will control the maximum height within the prescribed limits but at the same time ensure adequate height for maximum efficiency from the reflectors.



The road stud (either type) must be paved so that, with the height gauge resting on the casting flanges (as shown in the photograph) the ends of the gauge should also be in contact with or just clear of the road surface.

The clearance between the ends of the gauge and the road surface shall be between 3mm and zero.

GENERAL INFORMATION ON PAVING REQUIREMENTS

THE ESSENTIALS FOR PAVING ARE:

The formation of a cavity in the road surface to accept the road stud. This must be of a minimum area to accept the appropriate type of road stud.

The cavity may be formed by either:

1. Pre-forming in the case of concrete carriageway at the time of construction by means of removable inserts.
2. By power drilling with special profiling equipment as described on page 5.

The depth of the cavity should, for installation of the long type stud, be 38mm and for the short type stud 34mm.

By controlling the cavity depth to these dimensions, the necessity for a bedding foundation is avoided as the normal road construction materials will provide a quite adequate foundation.

For bedding the road stud in the cavity and for sealing around the road stud there must be a material which will prohibit the entry of water and hold itself and the stud in position against thrust imposed by traffic. The same material may also be used for filling the underside recesses of the stud base.

MATERIALS REQUIRED

A filled bitumen material is suitable and the full specification for such a material is given on page 9.

INSTALLATION

BY POWER DRILLING PROFILE EQUIPMENT

The introduction in 1984 of the power drilling rig has given a most satisfactory method of stud installation in asphalt surfaces and with the percussion head attachment, the rig gives excellent results with C40 concrete surfaces.

The procedure for installation with this equipment is:

After stabilising the rig on its hydraulic jacks, the boring head is lowered to the road surface and the required hole depth gauge (38mm for the long type stud, 34mm for the short type stud) set on the depth gauge. A flat bottomed hole 152mm diameter is then drilled to this preset depth, and having attained this depth, the cutter is raised. The head is then indexed forward by hydraulic jacks on guides provided within the rig a specific preset distance. (This distance for the long type stud shall be 130mm and for the short type stud 86mm.) A second hole to the same preset depth as the first hole is drilled. On reaching full depth, the cutter is traversed between the two holes to mill a cavity to precise width, length and depth with vertical side walls and level base. No disturbance to surrounding road surface is caused.

FILLING IN RECESSES IN CASTING BASE

The recesses in the base of the casting must be pre-filled with FILLED BITUMEN (see specification page 9) poured in hot to within 3mm of the casting bottom and then be allowed to chill.

CAVITY PREPARATION

After formation of the cavity as on page 5, the drilled and disintegrated road material must be removed from the cavity, either manually or by vacuum suction. The dust and fines must be completely removed with an airblast from a small compressor or flame gun. If the cavity is in asphalt of more than one year old, the sides of the cavity must be lightly primed with a spirit based bituminous primer (see specification page 9) brushed or sprayed on. If the road surface is of concrete, the sides and the bottom of the cavity must be similarly treated. *Under no circumstances must* excess primer be allowed to lie in the cavity.

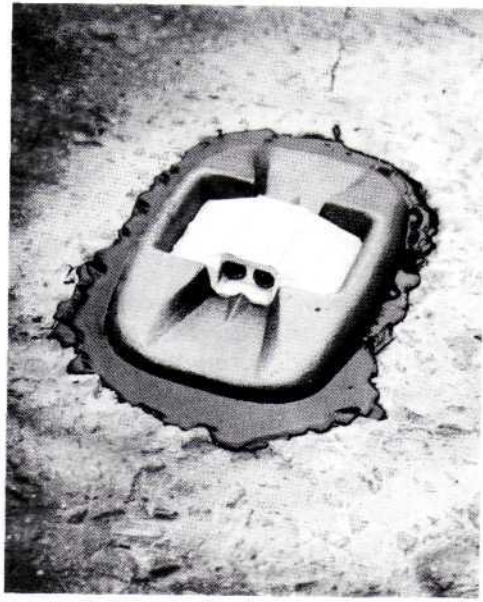
In frosty or wet conditions the cavity walls and base must be preheated by flame gun to dry off any dampness and to raise the temperature of surrounding road surface to a minimum of 5°C before applying the prime coat and before bedding and grouting the stud. Excess heat to the surrounding asphalt should however be avoided, as this will damage the material and failure of the installation may result.

Filled bitumen (see specification page 9) at the correct pouring temperature and thoroughly agitated in the heater (see specification page 9) must be poured into the cavity to a depth of approximately 6mm.

Immediately position the stud on the molten bitumen and squeeze down to displace the molten bitumen from underneath the stud and up the casting sides. This procedure, in addition to bedding the road stud, will pre-heat the body of the casting and, in winter, so prevent excessive chilling effect on the bitumen side grout which is poured later.

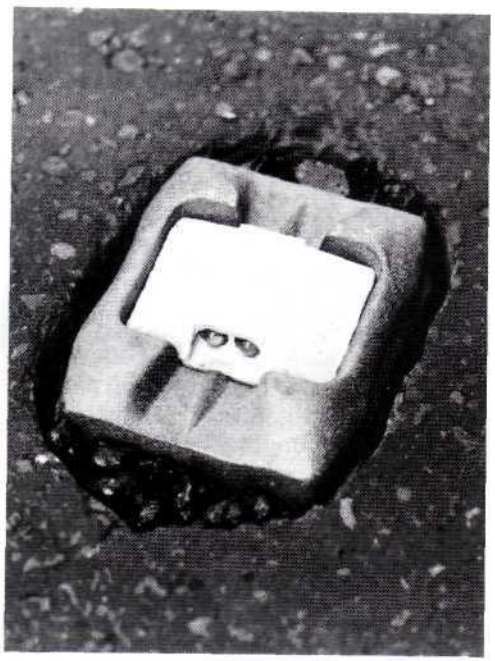
Check the overall height of the stud with the aid of the height gauge. The gauge must be rested on the casting reflector recess platform and should show a gap between the bottom of the gauge and the road surface of between 0 and 3mm (see page 3).

The cavity sides between the stud and the road are then topped up with hot filled bitumen to road surface level. Check and ensure a few minutes later that bitumen is to road surface level and, if not, top up with the same material (normally this is not required except on an inclined road). Ensure that the reflector recess platform of the casting is free of adherent bitumen. The stud can be trafficked immediately the bitumen has chilled.



Short Type 'Catseyes'

The space at each end of the stud should be filled by placing 14mm dry precoated chippings in the spaces after bedding the stud and before applying the final hot poured bitumen side grout.



Oversize Cavities

Cavities with measurements larger than the prescribed dimensions may sometimes be unavoidable. In such instances, the paving procedure should be modified as follows:-

Dry pre-coated chippings to a size appropriate to the degree of oversize of the cavity must be used to fill the extra space either under or around the sides of the stud.

These dry pre-coated chippings must be introduced within the hot filled bitumen grout in such a way as to obviate the formation of voids within the resulting matrix.

PAVING MATERIAL SPECIFICATIONS

FILLED BITUMEN

Comprising:-

Bitumen 60/80 penetration	25-30%
Limestone filler 80-90% passing 75 micron	70-75%

The resultant mixture should have the following properties:-

Penetration at 25°C	23 ± 5
Softening point (R & B)	85°C ± 5°C

The filled bitumen shall be heated in a bitumen heater capable of holding the charge at a constant temperature of 200°C and fitted with a mechanical agitator to ensure the solids are properly dispersed through pouring material at all times. Thermostatic temperature control is essential. Material to be applied to stud cavity at pouring temperature of 190-200°C.

UNDER NO CIRCUMSTANCES SHALL THE GROUT BE HEATED TO OVER 230°C as this will result in hardening and loss of elasticity.

SPIRIT BASED BITUMEN PRIMER

Any thin bodied spirit based bituminous primer of high solvent content.

Viscosity 30-80 secs, No. 4 B.S. cup at 21°C.

Sold under various trade names.

INSPECTION AND MAINTENANCE OF 'CATSEYES'

In the years immediately following the installation of 'CATSEYES' very little maintenance should be necessary, but an organised system of inspection followed by appropriate action is essential.

(a) To check for damaged or worn castings and also on the state of paving, PARTICULARLY FOR LOOSENESS.

(b) To ascertain stud height.

(c) To check on pad wear.

(d) To assess the general standard of efficiency of reflection.

Inspection for (a), (b) and (c) should be carried out at half yearly intervals, or more often as required on heavily trafficked roads.

Inspection for (d) should be carried out at night in the light of car headlamps and the general condition noted.

A night inspection should be made immediately after installation and subsequently at yearly intervals. A more accurate assessment can be made during wet nights.

"WEAR GROOVES"

All long type castings supplied from 1st January 1994 incorporate "wear grooves" on the upper edges of each side wall. These wear grooves are 1mm deep. In addition, the casting carries a small dimple in the "eye socket" for identification purposes.

In the long term it will be possible to examine these new type castings (as indicated by the presence of the dimple) and determine the degree of wear on the side walls. If, for instance, the wear grooves are not visible, then 1mm of metal will have been removed from the side walls and therefore the casting should be replaced as it will not be performing its main purpose, i.e. protecting the rubber insert.

STUD REPLACEMENT

Abnormal traffic such as unsprung caterpillar tracked vehicles may cause fracture of the base of either type of road stud, or failure of the anchorage of the stud within the road surface.

Similar damage may be caused by inadvertent use of the **short type** stud in situations where snow clearance by ploughs is prevalent.

Wear over a long period (generally 10 to 20 years) affects the efficiency of the **long type** base to protect the rubber insert (wear on the short type base will not be significant owing to its intended use on lightly trafficked situations).

The above defects can only be remedied by removal of the damaged stud and replacement by a new stud in a **newly excavated cavity. In the event of broken or loose castings, remedial action must be taken immediately.**

By use of the height gauge, correct initial installation can be verified. By the same means, the height of studs on carriageways which have been surface dressed (see page 12) may also be checked. If the studs are low it will be necessary to lift them and after examination re-install in a **newly excavated** cavity.

Any new cavity must be excavated at least 300mm away from the old cavity.

PAD REPLACEMENT

A pad replacement programme to renew worn inserts or restore reflective performance becomes necessary when the rubber pad becomes so worn that the reflectors are liable to leave their sockets, or alternatively the glass reflectors are so pitted that they cease to be effective.

It is generally accepted that once the majority of 'CATSEYES' on a particular highway have become substandard, it is advisable to replace all the pads to avoid patchy marking and to cut down repeated inspections with consequent waste of man hours.

It is not possible to recommend a general standard below which pads should be replaced. A stud with low reflectivity might appear bright against a dark road surface and therefore be acceptable, whilst against a light surface the contrast might be too low; the presence of street lighting might also be relevant. The question to be considered is whether the 'CATSEYES' are sufficiently bright to guide motorists effectively.

REPLACEMENT OF RUBBER PAD

Removal of the old worn pad is achieved by inserting the special changing tool between rubber pad and side of casting, as shown in the figure.

By applying downward pressure on the tool, the pad legs are levered off and the retaining lugs at one side of the casting and the pad may then be completely withdrawn.
Check casting for fracture and ensure the four pad retaining lugs are intact.

The inside of the casting shall be cleared of any debris by blowing with compressed air. Remove any bitumen or other road material located on the casting in front of the eyes, which may affect reflective efficiency.

Replacement of the new pad is effected by:-

Inserting one end of pad in casting and with the changing tool ensuring that the 'lugs' in the base penetrate through the two holes in the pad legs.

By "springing" the pad, the lugs at the opposite side of the base are made to engage the pad which then springs back into position with all the lugs firmly holding the pad.

It is important that the pad be properly seated, otherwise it may work loose. If the lugs have not caught, pressure on top of the pad will make the pad spring into position.

PROTECTION DURING SURFACE DRESSING

SURFACE DRESSING

Prior to surface dressing the road stud installation should be inspected as detailed on page 10 and immediate action taken as necessary.

There should be no necessity to take the stud out of the road when surface dressing, provided that some form of protection against the liquid binder is given. This protection is easily and efficiently given with the aid of the 'TAMASK'.

The 'TAMASK' consists of a piece of strong, pliable, woven fabric, 50mm longer and approximately 12mm wider than the appropriate stud. One side is adhesive. Until required, the adhesive side is protected by a release paper backing.

To apply the 'TAMASK' the backing is removed and the 'TAMASK' pressed and moulded to the contours of the stud.

The 'TAMASK' is placed over the stud so that approximately 6mm down either side and 25mm at each end projects beyond the stud and adheres to the road surface.

Removal of the mask after the chippings have been rolled is easily accomplished with the aid of a simple metal hook.

Removal of the mask carries away all the binder and chippings, leaving the complete stud free from all adhering matter. A clear space is automatically left around the stud. In a short time, the action of the road traffic will carry a fine layer of chippings right up to the stud itself, but this layer will not be thick enough to reduce the performance and life of the 'CATSEYE'.

NOTES

1. 'Tamasks' may be conveniently applied to studs on a full stretch of road prior to commencement of the day's dressing operation. The mask's adhesion with the stud is such as to prevent the mask from being displaced by the pre-dressing trafficking the stud is likely to receive.

2. 'Tamasks' should be removed immediately after the chippings have been rolled. Alternatively, if preferred, the masks may be left in situ on the stud until all loose surface chippings have been cleared. It is recommended however that the masks be left no longer than seven days on the stud, otherwise removal of the mask becomes more difficult.

RESURFACING

Application of a new surface as distinct from surface dressing necessitates stud removal.

The complete stud should be removed before resurfacing. Removal is effected with the aid of a pick.

After the new surface has been laid installation should take place as described by pages 5 to 8.