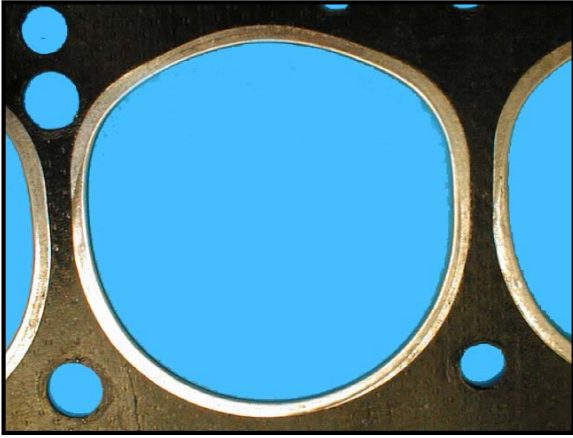


## Fault Finding

### **INCORRECT APPLICATION**



#### **FEATURES:**

Underside of all fire rings (i.e. block side) exhibit distinct impressions where pistons have hit the head gasket.

#### **CAUSES:**

Head gasket incorrect for application.

#### **GENERAL:**

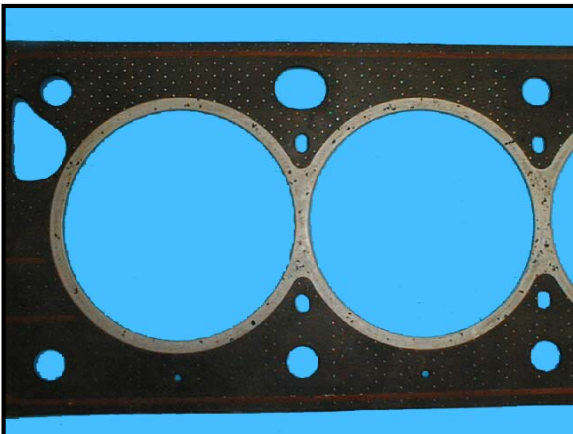
Several Vehicle Manufacturers produce small & large series engines using the same basic engine but with varying size cylinder bores.

It is thus essential that during head gasket replacement the fitter ensures that the gasket fire rings are circumferentially clear of the bore, normally 1mm to 3mm on diameter.

Under no circumstances must the gasket fire ring bores overhang the cylinder bores.

---

### **DIRTY ASSEMBLY**



#### **FEATURES:**

Foreign particles trapped and crushed into the fire ring faces and composite facings.

#### **CAUSES:**

Particles dropping from water galleries during placement of head.

## **GENERAL:**

Since the cylinder head is normally dry when being re-installed it is possible for rust deposits and similar contaminants to detach and fall from the water galleries onto the head gasket. These particles can create gutter paths for combustion gases which will quickly burn back into adjacent bore or water galleries etc.

## **REMEDY:**

We suggest thorough flushing of the head, preferably with detergent and a high pressure washer followed by additional airline cleaning. Only fit the cylinder head when confident that no further media is falling from the water gallery portings.

---

## **PARTICLE ENTRAPMENT**



## **FEATURES:**

Deep trough in fire ring with blackened gutter path into water way.

## **CAUSES:**

Large particle entrapment on assembly.

## **GENERAL:**

As per previous feature "Dirty Assembly". In this example the dirt particle was extremely large promoting the gutter path to form very quickly. Gutter paths can similarly develop if block or head facings have localised low spots. Lack of fire ring clamp at a low spot will allow high pressure / high temperature gases to enter the gasket composite backing material and burn back will quickly occur.

## **REMEDY:**

Ensure cleanliness of assembly. As a minimal precaution have the head refaced and if practical reface block also. Checking a cylinder head / block face with a straight edge is not an effective method of proving flatness.

---

## **POOR LOCATION**



### **FEATURES:**

Two or more stud / bolt holes pulled and galled.

### **CAUSES:**

Poor location of gasket or movement of same during assembly.

### **GENERAL:**

If an engine has head locating dowels then this problem will not occur. However, always ensure that dowels are in good condition and correctly located. Many engines rely on the head bolts / studs to locate both the gasket and the head. In this case we recommend the following:

#### **STUDS:**

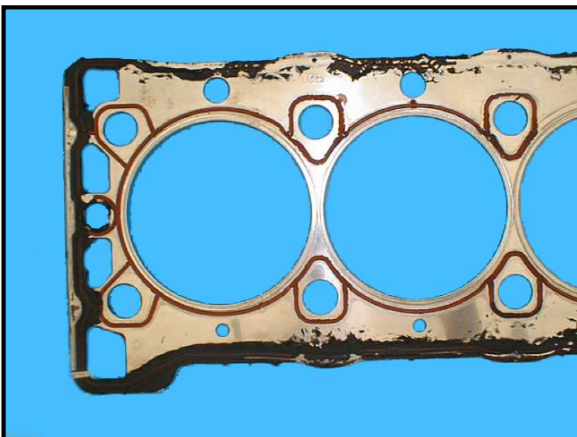
Heads which are located by studs can present problems particularly if "spring" exists when assembled to block. Sliding the head gasket over the studs sometimes creates tight assembly and head gasket distortion and hole galling can occur. Where practical it pays to place the head gasket on the block and screw the studs in through the gasket into the block. A light smear of grease on the assembled studs will help the head slide precisely down into position.

#### **BOLTS:**

If possible it is advisable to make up and employ two diagonally opposed studs in which to guide the head down onto the head gasket. Lightly screw in the remaining head bolts before finally replacing the studs. This is particularly easy if replacing stretch bolts as you simply cut the heads off two old bolts & hacksaw in screwdriver slots for ease of removal. This method is essential when fitting the cylinder head on a Rover "K" Series engine. Any side manoeuvring of these heads can cut & seriously impair the silicone beading on the head gasket.

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## **APPLIED SEALER**



### **FEATURES:**

Unightly and Unprofessionally applied sealer.

### **CAUSES:**

Incorrect application of sealer.

### **GENERAL:**

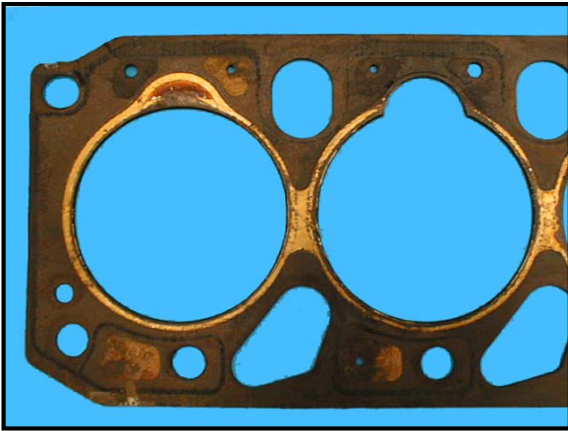
Gaskets should be fitted as supplied. A very light application of non-hardening sealer can be applied around oil gallery eyelets keeping away from actual hole centre, (not Rover "K" Series). We emphasize light application as only a smear should be applied. Assembly of parts should be immediate to prevent solidification of the applied compound. If sealer is applied generally to a gasket then you are actually jacking the block and head faces away from the gasket. Lack of crush / clamp to the fire ring will result and gasket failure will be very quick.

### **REMEDY:**

Follow Gasket Manufacturer / Supplier instructions and use sealers only when recommended.

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## **MISSING PRE-COMBUSTION SUPPORT / PAD / HEAT SHIELD**



### **FEATURES:**

Semi-circular cut out in fire ring bore.

### **CAUSES:**

Loose pre-combustion chamber.

### **GENERAL:**

Diesel engined motor cars in recent years have become common place throughout Europe. Indirect injection engine feature "Ricardo Chambers" or "Pre-combustion Inserts" where the initial detonation charge is fired. These chambers are only an interference fit in the cylinder head face and over a period of time can become loose. Detonation chatter can then cause the loose chamber to cut its way through the gasket to total destruction. Further block face damage & certain damage to the head will result.

### **REMEDY:**

When replacing a head gasket take professional advice as to tightness of pre-combustion chamber. Replacement of same or fitment of oversize units can prevent detonation chatter and the possibility of a complete engine change.

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## SPLIT RICARDO PAD



### FEATURES:

Edge of fire ring / Ricardo pad is burnt through with extending circumferential cracks.

### CAUSES:

Incorrect detonation.

### GENERAL:

This type of failure is normally attributed to inefficiency of burn. Many factors can be responsible and the advice and attention of a diesel specialist should be sought.

- (A) Faulty Injector
- (B) Faulty injector pump
- (C) Incorrect pump timing
- (D) Added factor of overheating

Applies to diesel engines only

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## CIRCUMFERENTIAL SPLIT



### FEATURES:

Fire ring split on the immediate inner circle. Sometimes accompanied with a radial split as per photo.

### CAUSES:

- (a) Lack of clamp.
- (b) Incorrect diesel detonation.

## **GENERAL:**

(a) Lack of clamp allows the fire ring to expand and contract beyond the control clamp of the head and block. This excess movement promotes work hardening and a brittle fatigue crack results. Burn back and ingress of combustion / compression gases into neighbouring ports soon develops to engine failure.

(b) Incorrect detonation on diesel engines can result in this type of failure. A combination of excess heat, extreme pressures and ultra-sonics result in this brittle fatigue crack.

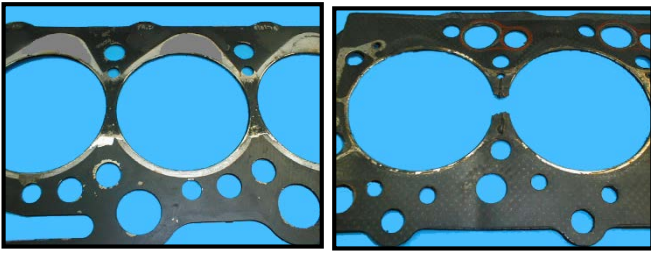
## **REMEDY:**

(a) Ensure head and block faces are flat and to the correct surface finish. If required fit new stretch bolts and strictly follow tightening procedures. Cooling systems must be checked and efficiency proven.

(b) Excess smoking or suspect performance of a diesel engine should be addressed by a diesel specialist.

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## **CENTRE BRIDGE BURN**



## **FEATURES:**

Note blackening between bores which progress to burn through failure as in second photo.

## **CAUSES:**

(a) Inherent distortion of head or block denying lack of clamp between bores.

(b) Distortion due to overheating.

## **GENERAL:**

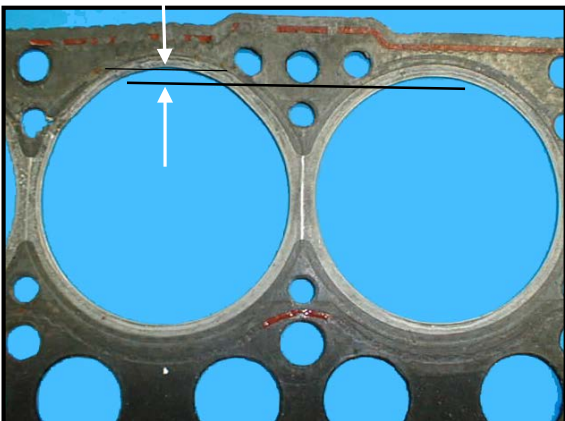
Cylinder heads normally distort forming longitudinal low bridge between all bores. Combustion gases escape into the adjacent cylinder and vice versa on the next stroke. This concentrated heat flow burns the fire ring bridge away to point of dramatic power loss.

## **REMEDY:**

Follow gasket manufacturer / supplier fitting recommendations and reface head and block as a matter of course. If called for address any cooling inefficiencies. Always fit new cylinder head stretch bolts and strictly follow tightening procedures.

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## **CIRCUMFERENTIAL SHIFT**



**FEATURES:**

Note outward displacement of left hand bore & rupture of top outer gasket edge.

**CAUSES:**

Isolated lack of clamp.

**GENERAL:**

In this example the left hand bore has distorted and shifted outwards due to lack of clamp caused by a sunken liner. Compression gases have then ingressed into the left hand water gallery at which point overheating has taken place.

**REMEDY:**

Follow basic procedures ensuring flatness of head and block faces. Where a block has wet liners it is advisable to check liner protrusions against manufacturer's specifications. In all cases liners must protrude by the same amount and preferably to the maximum limit. As a general rule liners must protrude by a minimum of 0.002" / 0.05mm or ideally to the manufacturer's recommended highest limit.