INTERNAL SWEATING, PHOSPHIDE SWEAT

All alloys, but especially cast irons.

Metallic inclusions, generally spherical and smooth-surfaced and often shiny. They are found at the interior of blowholes or other internal cavities. Such inclusions usually have a chemical composition different from that of the base metal and approach the eutectic composition. It is this feature which serves to distinguish the defect from G 112 (cold shot).

Possible Cause

The eutectic liquid present at grain boundaries near the end of solidification can be extruded toward free spaces, either toward external surfaces where it causes external sweating (A 311), or toward blowholes or other internal cavities where internal sweating (G 113) may occur. This extrusion force is caused by the pressure of eutectic graphitization, in the case of cast irons, by the release of dissolved gas, or even by the contraction of that portion of the casting which has already solidified. In the case of cast iron, these droplets are often higher in phosphorus than the mass of the casting. They are quite hard and often give rise to difficulties during machining.

Remedy

The best remedy lies in eliminating the primary defects, such as blowholes or other internal cavities, without which internal sweating (G 113) cannot occur.
Irregularly-shaped non-metallic inclusions resembling the slag or dross formed in the melting furnace or in treatment ladles. The inclusions may occur either at the casting surface (where they are sometimes partially removed during cleaning, leaving irregular cavities), or within the walls of the casting, and hence visible only by radiography or machining. In cases where blowholes are present, see defect G 122.

**Possible Causes**

The origin of the inclusions may be either melting or refining slags (such as carboide slags used for desulfurization) or the flux material or dross which is present when treating nonferrous alloys. For steel, the defect is related to reaction between the deoxidation products and other refractory material (see bibliography - ceroxide). These materials become entrapped in the metal during pouring operations.

These non-metallic particles accumulate, as a rule, on the cope surfaces of the casting or may lodge in reentrant corners or against cores, where they become entrapped by the freezing metal.

**Remedies**

Avoid entrainment of slag and dross from the furnace while filling the pouring ladle.

Keep ladles clean; also thicken the slag for ease in skimming by the addition of clean, dry silica sand or lime.

Assure that slag and dross are retained in the ladle during pouring, preferably by use of siphon-ladles, bottom-pour ladles or teapot ladles.

Keep pouring basins and sprues filled during pouring.

Use strainer cores or filters.

Provide slag traps in the gating system, (e.g. tangential whirlgates).

Locate surfaces to be machined in the drag half of the mold.

*(Examples, following pages)*