Proportions of ferrite and pearlite in as-cast flake graphite irons with rosette-type graphite—estimated from microstructures

Purpose
Many properties of castings are influenced by the proportions of ferrite and pearlite in the matrix. For quality control purposes the amounts of ferrite and pearlite in the structure of as-cast flake graphite cast irons may be estimated by examination under the microscope of sections cut from the castings or from small test blocks attached to the casting.

The accuracy of this visual estimation can be greatly improved by comparison of the structures being examined with standards having a similar graphite structure and in which the relative amounts of ferrite and pearlite are accurately known. The structures in Figs. 1–8 are provided for this purpose, the proportions of ferrite and pearlite having been measured with an image-analysing microscope. These micrographs are provided for comparison purposes only.

How to use the micrographs
1. Any sample of a suitable size may be used. For quality control purposes, castings should be sampled in similar positions and should have been cast and cooled in a similar way. The location of the sample should ideally have been agreed between the foundry and customer. It is best not to examine structures near to the surface of castings, since the structures there may not be representative.

2. Prepare the sample for microscopic examination as described in BCIRA Broadsheet 123. Etch in 4 per cent picral (picric acid in alcohol).

3. Place the etched sample under a microscope and select a magnification so that the graphite flakes are as nearly as possible the same size as those shown in the micrographs.

4. Ignore the graphite phase and compare the amounts of ferrite and pearlite in the sample with each of the micrographs.

5. Note the proportions of ferrite and pearlite in the micrograph that bears the greatest similarity to the sample, interpolating linearly between micrographs if necessary. Record an estimate of the percentage of ferrite or pearlite.

6. Repeat the comparison for at least three different fields of view.

7. Average the results recorded and report as the percentage of ferrite or pearlite in the matrix structure, ignoring the area occupied by the graphite.

RECOMMENDED FURTHER READING
SIMMONS, W. The image-analysing microscope used for quantitative metallography of cast iron. BCIRA Journal, July 1977, vol. 25 No. 4, 397–403. BCIRA Report 1273.†

†Available to BCIRA Members only.

Fig. 1 As-cast flake graphite iron: 97% ferrite and 3% pearlite. Etched in 4% picral. • 80

Fig. 2 As-cast flake graphite iron: 89% ferrite and 11% pearlite. Etched in 4% picral. • 80