Guidelines for Identification

From CCTV Information

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Some time ago the Home Office issued guidelines for the identification of persons and vehicles. This is fine, but many system engineers stumble when trying to find what camera and lens combination will satisfy these guidelines. And what about end users who know even less about camera and lens formats, how can they assess the merits of competing specifications? This month all will be revealed for both groups.

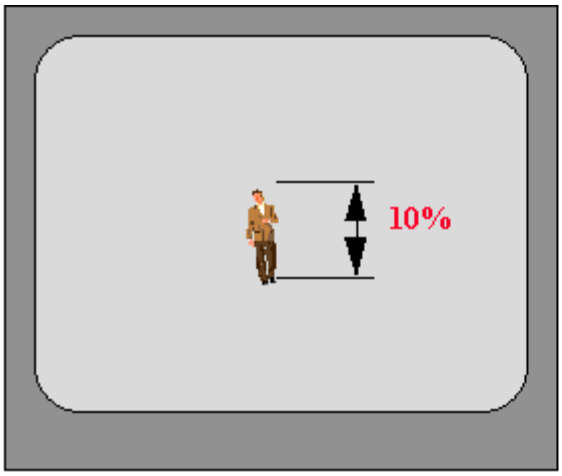
Charts showing the horizontal and vertical fields of view for many lenses and four formats are given in 'The Principles and Practice of CCTV' and were published in the first issue of CCTV Today (Jan '94). They also show the % of the screen height of a 1.7M person. The Home Office guidelines had not been published for general use when I produced the first draft of the book and so the 1.7M was my guess at the average height. The current guidelines use 1.6M as the height.

The values for various degrees of identification are given as the percentage the 1.6M figure would occupy of the monitor screen. I call this the 'screen height ratio'. The complete guidelines are provided in several Home Office publications and so only the basic ratios are given in this article. The publications are available free from the Home Office and provide a lot more information as well.

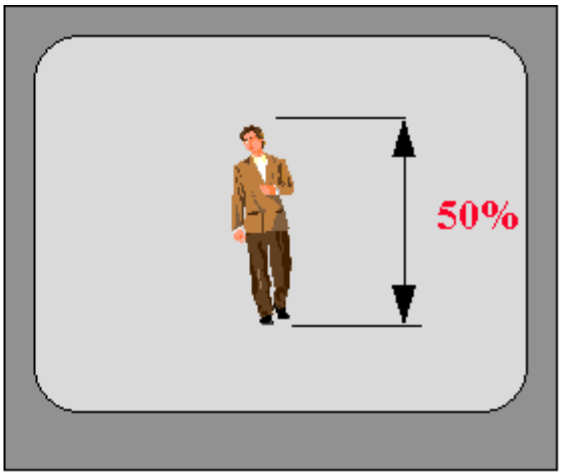
These criteria are now becoming increasingly used as part of the specification for many CCTV systems, particularly in Town Centre schemes. Sometimes the specification will state the distance from the camera for each criterion, sometimes the specification will ask the question, 'at what distances from the camera will the criteria apply'? In either case it involves calculations that are not too difficult but can be tedious to keep repeating for each lens and camera location.

Another problem that many people find difficulty in resolving are the different fields of view obtained from various camera and lenses formats, i.e. what is the result of fitting a 2/3" lens onto a 1/2" camera, and how does this affect the screen height ratio at certain distances?

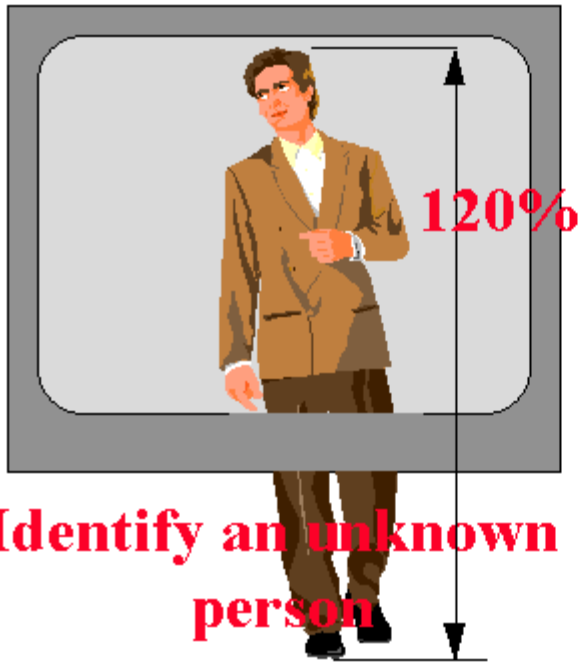
A word of caution, just about all lens manufacturers brochures give the HORIZONTAL angle of view, whereas these calculations require the VERTICAL angles of view. The vertical angle of view is the horizontal angle times 3/4.



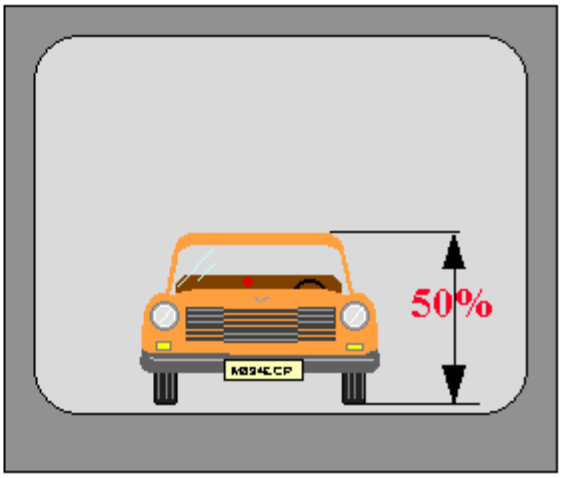
Detect a person



Recognise a known person



Identify an unknown person



Car Number Plate

Field of view

The field of view is the ratio of the sensor size to the focal length and the distance to the subject. This is shown in diagram1. The 'width to height' ratio of the sensor is 4:3. The

horizontal and vertical angles and therefore fields of view are different and must be considered separately.

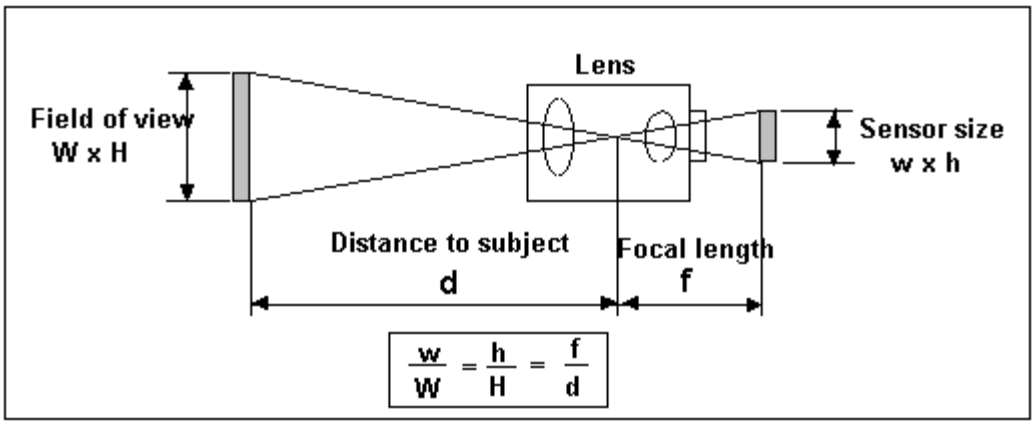


Diagram 1 Field Of View

Note when using these ratios all the units must be the same, i.e. millimetres or Metres.

Sensor Sizes

Diagram 2 shows the sensor sizes to be used when calculating fields of view and angles of view.

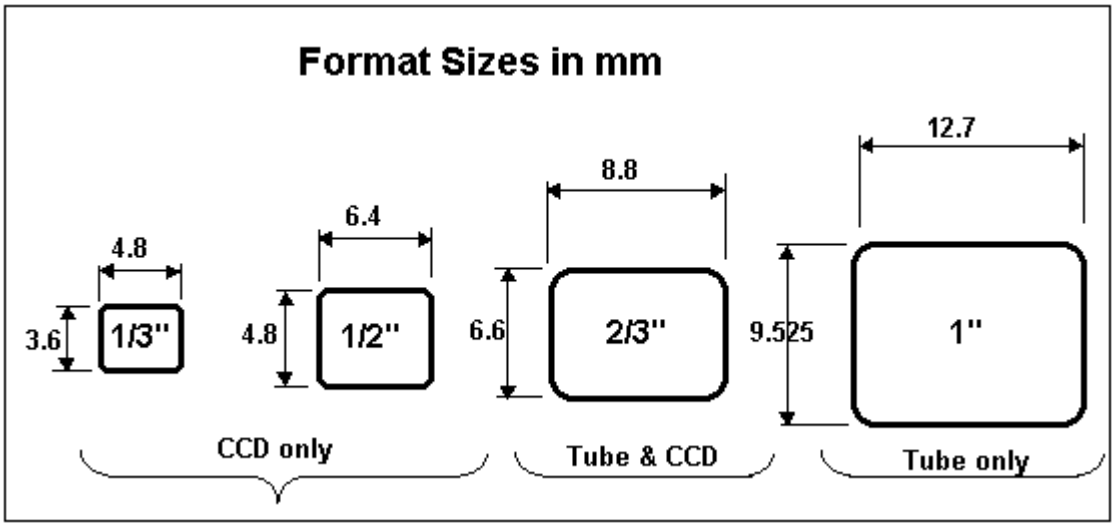


Diagram 2 Sensor Dimensions

Example

Supposing it required to recognise a known person at 50M, using a 2/3" lens, the following is the calculation.

The scene height at 50M needs to be twice the standard height, 2 x 1.6=3.2M. Therefore:

$$\frac{h}{H} = \frac{f}{d} \therefore f = \frac{h \times d}{H} = \frac{6.6 \times 50{,}000}{3200} = 103125mm$$

The nearest standard would be a 10.5:105mm zoom lens to satisfy this requirement.

The formula can be worked backwards to find the scene height for a given lens. It is a simple matter to put all these criteria into a spreadsheet program and find the result for any combination. However, this may not be very convenient for the many salespersons on the road.