TOSHIBA
Leading Innovation

Pixels Per Foot

A beginner's guide to PPF

What is the role of PPF in selecting an IP camera?

Ensuring high quality surveillance IP video can be a challenge — beginning with specifying cameras to achieve the level of quality needed for operational requirements. The traditional way of specifying surveillance cameras was by resolution, for example selecting a 1080p model over a 720p for a critical area. However, this method has proven inexact, resulting in too much or too little quality. A newer, more accurate way is to specify pixels per foot (PPF) density. While some may find this new method confusing or complex, the mathmatics behind it are actually quite simple as this brief will explain.

CALCULATING PPF

The formula for calculating PPF is *Horizontal Pixels divided by Field of View width*. Let's look at an example: the installer has a 2MP IP camera with a resolution of 1920 (H) x 1080 (V). The Horizonal Field of View for the area being monitored is 100 feet wide. Therefore, PPF is 19.2 based on 1920 divided by 100. But is 19.2 PPF enough? Is it too much? Let's look:

19.2 PPF

Image lacks detail with little or no facial feature recognition and a non-readable license plate.

40 PPF

Not all facial features can be made out. Plate numbers can be read but not state.

More than 40 PPF

Clearly can see all facial features, and can read license plate numbers and state.

Obviously, the more pixels, the higher the resolution and the easier it is to recognize faces and license plates. The downside is that higher resolution requires more bandwidth and storage space.

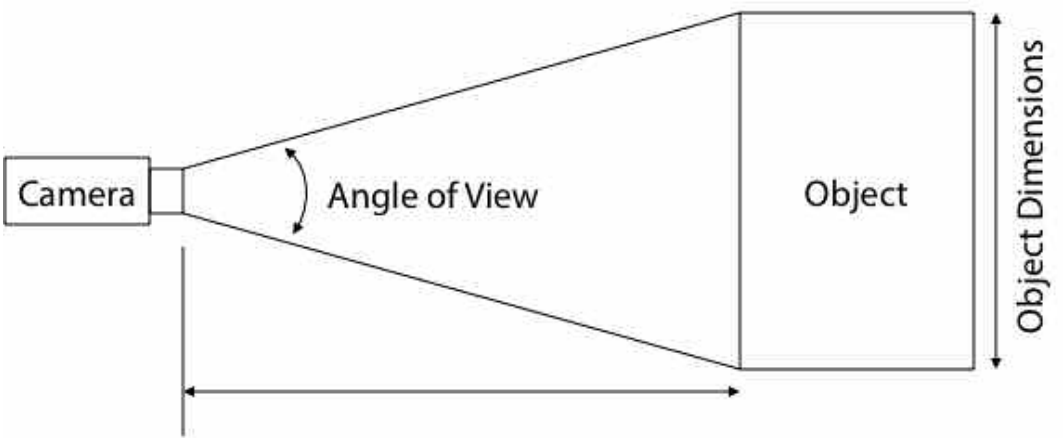
PPF DECREASES AS DISTANCE INCREASES

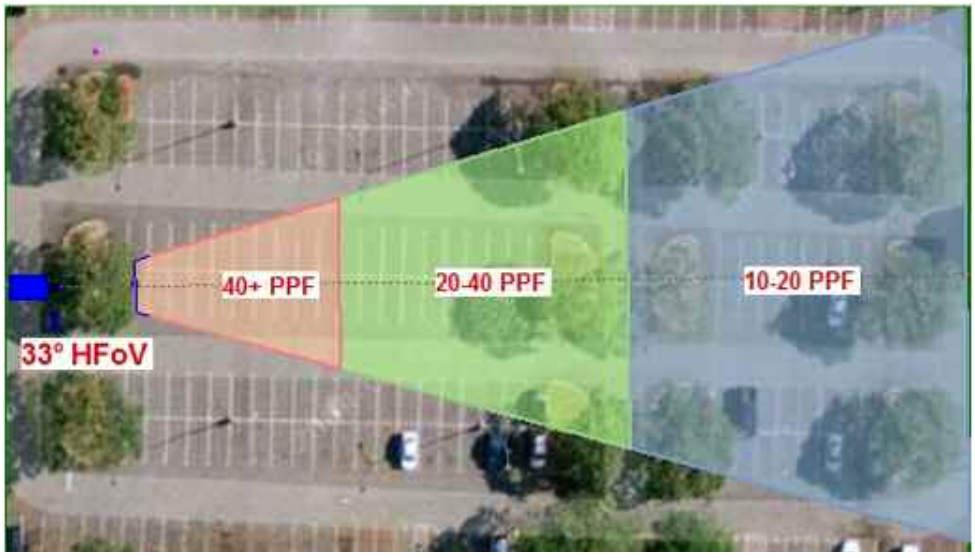
The “field of view” or FOV refers to the physical limits on the visual boundaries you are viewing. In the case of a security camera, the field of view is impacted by two factors:

1. the focal length of the lens
2. the size of the imaging sensor

The lens determines the field of view captured. A wide angle lens will view objects that are close to the camera, while a telephoto lens will see objects further away. The higher the focal length (mm) of the lens, the more magnification. The lower the number, the wider the angle of view. When you use a high resolution camera you must select a high resolution or Mega-pixel lens that will maintain the high resolution. We suggest using one of the many available online lens calculators that will help determine the distance to the object, width of the field of the view and lens focal length (f in mm).

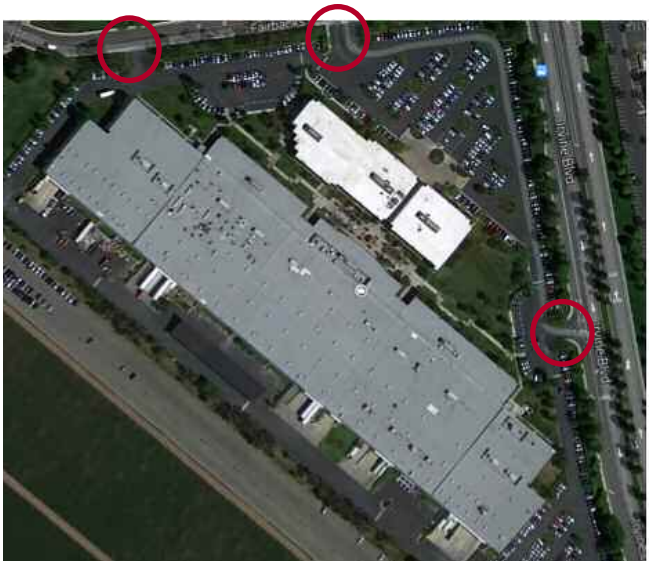
The *horizontal field* is the distance across the image while *vertical field* refers to the height of the image. Typically, the vertical field of view is approximately 70 percent of the horizontal field of view. Therefore, the total field of view is more like an angular field where the further you get from a camera, the wider the field becomes and the lower the PPF. The FOV must be set up so that the widest scene width (furthest away) still gives the correct PPF, especially for good facial images. In general, a PPF of 10 is usable for tracking of motion. A PPF of 20 will work for general security applications, while a PPF of 40 provides forensic level details. A PPF of 60 or above delivers highly detailed images. Identifying a face in some circumstances may require a PPF over 200 to capture minor details like scars, eye color or tattoes, depending on lighting.





PPF CASE STUDY: THEFT AT CAR PARTS WAREHOUSE

A large car parts warehouse located in the Southwest was experiencing a raft of catalytic converter thefts. It hired a video surveillance firm to install Toshiba IP video surveillance cameras to monitor three entrances from its parking lot (marked with the red circles) and to record license plate numbers.



ENTRANCE ONE

At entrance one the FOV is 25 feet, the working distance is 50 feet and the height is 35 feet. To calculate the PPF based on three different camera models: 1902 x 1080; 1280 x 1020; and 640x480, we use these formulas.

1920 x 1080 (2MP) Camera
PPF: 1920/25 = 76 PPF
Result: High detail

1280 x 1024 Camera
PPF: 1280/25 = 51 PPF
Result: Forensic Level

640 x 480 camera
PPF: 640/25=25 PPF
Result: General Security

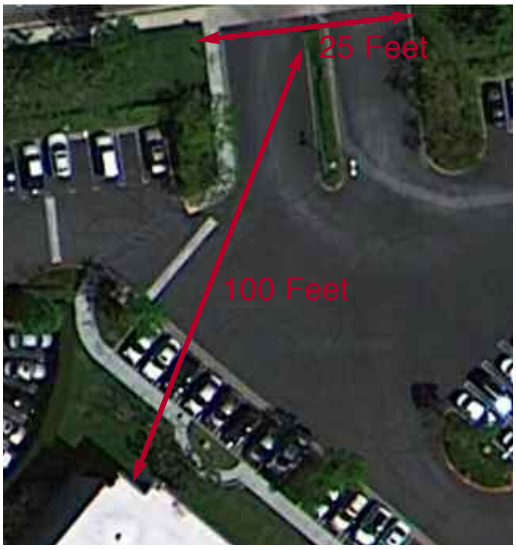
ENTRANCE TWO

At entrance two the FOV is 25 feet, the working distance is 100 feet and the height is 35 feet. To calculate the PPF based on three different camera models: 1902 x 1080; 1280 x 1020; and 640x480, we use these formulas.

1920 x 1080 (2MP) Camera
PPF: 1920/25 = 76 PPF
Result: High detail

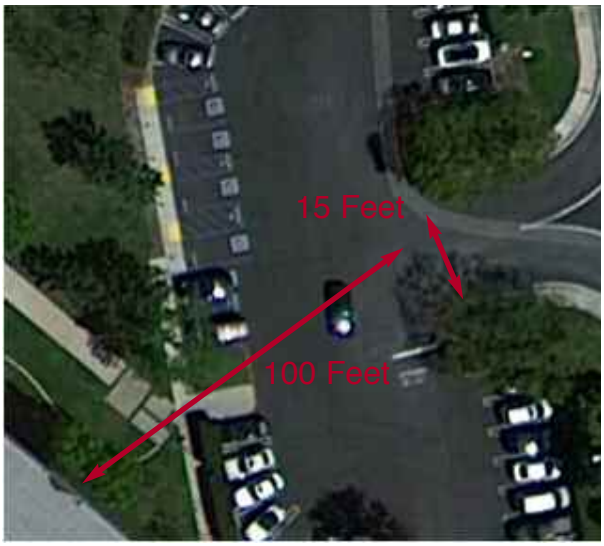
1280 x 1024 Camera
PPF: 1280/25 = 51 PPF
Result: Forensic Level

640 x 480 camera
PPF: 640/25=25 PPF
Result: General Security



ENTRANCE THREE

At entrance three the FOV is 15 feet, the working distance is 100 feet and the height is 20 feet. To calculate the PPF based on three different camera models: 1902 x 1080; 1280 x 1020; and 640x480, we use these formulas.



1920 x 1080 (2MP) Camera
PPF: 1920/15 = 128 PPF
Result: High detail

1280 x 1024 Camera
PPF: 1280/15 = 85 PPF
Result: High detail

640 x 480 camera
PPF: 640/15=42 PPF
Result: Forensic level

ONLINE PPF RESOURCES

http://www.JVSG.com
http://www.theiatech.com/calculator