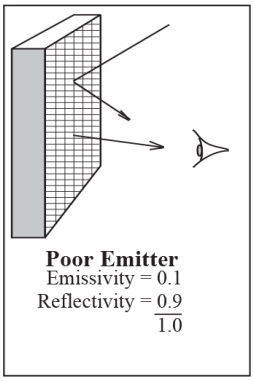
WHAT IS EMISSIVITY?

Emissivity is a surface property which determines how much radiation an object emits at a given temperature compared to a blackbody at the same temperature. Emissivity (along with background thermal radiation) is a primary source of errors in infrared temperature measurement. Emissivity can be more easily understood if it is realized that infrared has similar properties to visible light.

Mirrors figure prominently in the discussion of heat radiation and emissivity*. Since heat and light radiation behave similarly, what we see with our eyes is similar to what the IRt/c sees.
When you look in a mirror with your eyes, you see only reflections, nothing of the mirror itself. If the mirror is perfect, it has 100% reflectivity. Therefore, it emits nothing because it reflects everything. For this condition, the emissivity is zero.

If we consider an imperfect mirror, the eye then sees mostly reflection, but also some of the imperfections on the mirror surface. If, for example, we saw 90% of the mirror as a perfect reflector and 10% as imperfections, 90% of the mirror would reflect; the remaining 10% would emit. Therefore, the emissivity equals 0.1.

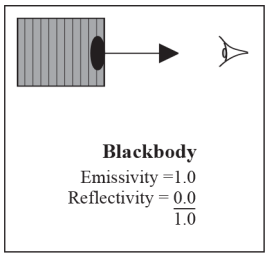


Consider for a moment the exact opposite of a perfect mirror, which is a perfect emitter. The eye looks at a perfect emitter and sees no reflection at all, only the emitting surface. Since 100% of the surface emits, and 0% reflects, the emissivity equals 1.0. This type of object is called a *blackbody*.

Finally, consider a good emitter. The eye sees a small amount of reflection interspersed with the large amount emitting. If 10% of the surface did not
emit, and instead reflected, we would have 10% reflecting and the remaining 90% emitting. Therefore, the emissivity equals 0.9.

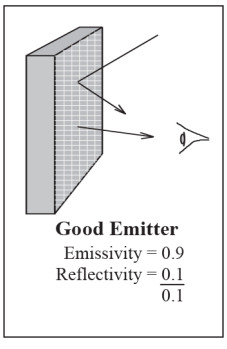
Accordingly, we can state the following rule of emissivity:

The emissivity of a surface is simply the percentage of the surface that emits. The remaining percentage of the surface reflects.



Shiny metal surfaces act like mirrors, with emissivities in the range 0.05 to 0.2. Accordingly, they have only 4% to 25% emitting area compared to reflecting area, and for that reason are difficult to measure with infrared methods. Non-metals, organic materials, and coated metals have emissivities in the range of 0.8 to 0.95 and thus have 400% to 1900% emitting area compared to reflecting area, and thus are much more easily measured successfully.

*See “Through the Looking Glass-The Story of Alice’s Quest for Emissivity” available from Exergen.



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