How to select the Right Magnifier & Magnification Terms

Definitions:

Diopter (d): A term used to identify the refractive (light bending) capacity of a lens. In magnifiers, there is a direct correlation between focal length and diopter. To find the diopter of a magnification lens, follow these steps. With the eyes 10" above the lens, move the object to be viewed to the point the greatest distance below the lens where it remains in sharp focus. Measure this distance and divide into 1 meter (39.37"). The result is the diopter of the lens - e.g., if the object is at a 13" distance then it is a 3-diopter lens (39.37/13 = 3d). Each diopter increases the size of the viewed object by 1/4 (25%) when the object is at its full focal length from the lens.

Field of View: The distance across the lens surface to which the viewer brings both his eyes (note: eyes should be 10" above the lens). It is important to note that as magnification increases, meaning the lenses used are stronger, viewing areas and focal length decrease.

Magnification: The degree to which the viewed object is enlarged. Magnification is usually expressed by a number followed by an "x", the symbol used to express power or the size of the object in relationship to its actual size. The formula for calculation Magnification Power is:

$$MP = \frac{d\ (\text{diopter})}{4} + 1$$

Example: $\frac{20d}{4} = 5x + 1 = 6x,$

or the object is 6 times itself.

Common diopter/power relationships			
Diopter	**Power**	**% Bigger than object**	**Focal Length**
3	1.75X	75%	13"
4	2.00X	100%	10"
5	2.25X	125%	8"
7	2.75X	175%	5.5"
8	3.00X	200%	5"
9	3.25X	225%	4.5"
11	3.75X	275%	3.75"
13	4.25X	325%	3"
16	5.00X	400%	2.5"

18	5.50X	450%	2.25"
20	6.00X	500%	2"

If a dime was this small unmagnified ...

3 diopter

5 diopter

10 diopter

15 diopter

Selecting The Right Magnifier:

1. Determine the desired magnification for your needs. Remember, as you increase magnification, you decrease both the focal length and the viewing area.
2. Check to find out the correct diopter you need to achieve that magnification.
3. Note the focal length and lens diameter that correspond to the magnification and lens diopter you have chosen, and make sure they are suitable for your task.
4. As a general rule, because the working distance will be less than 8" above 5 diopter, **stereo microscopes** are recommended for rework purposes.

Tips on Proper use of a Magnifier

To take best advantage of the comforts built into **illuminated magnifiers**, please keep these points in mind:

1. Use both eyes. Magnifiers are designed as "working tools". They can be used as comfortably as a pair of glasses.
2. Position the lens so that it is a proper distance from the work area, yet close enough for your eyes (8" to 10") so that you have the maximum magnification without distortion. Do not lean back away from the lens to increase magnification.
3. Chair height and work surface should be positioned so the operator can maintain good posture while working.