

Predicting Stand Magnifier Working Distances

Gregg Baldwin, OD

2020

Using various trial lighted hand magnifiers with the needed distance correction, either via glasses or contacts, the required magnification for a specific task can be found, and a lighted stand magnifier and reading add combination can be predicted that provides the required magnification with the preferred working distance.

Simple hand magnifiers are commonly labeled with the magnification they provide when used by a young person who will focus their eyes by +4D with the target at 25cm. Therefore, the actual magnification they provide for *presbyopes* is one unit less than what is labeled, and is merely *relative* to a focused target at 25cm. For consistency, this discussion will be solely concerned with presbyopes.

By knowing the enlargement factors of several lighted stand magnifiers, (which when multiplied by the reading adds used will specify the magnification produced in each case), and by knowing the maximum focused reading add usable with each of the stand magnifiers, we can determine a list of possible lighted stand magnifiers and reading add combinations that will provide the required magnification.

Because some of these combinations will involve a stand magnifier's maximum focused spectacle add, (used when the stand magnifier is at the spectacle plane), and other combinations will involve an add *less than* a stand magnifier's maximum focused spectacle add, (used when the stand magnifier is not at the spectacle plane), these various combinations will provide various working distances, defined as the distance of the stand magnifier lens to the spectacle plane.

**If clear with 5X hand and distance correction:
4X is required, and provided by:**

ILA 4X stand	+4.00 add	held close
ILA 5X stand	+4.75 add	4.4cm focused working distance
ILA 6X stand	+2.75 add	11cm focused working distance
Coil 4.7X stand	+3.50 add	3.6cm focused working distance
Coil 5.4X stand	+2.50 add	6.7cm focused working distance

**If clear with 6X hand and distance correction:
5X is required, and provided by:**

ILA 5X stand	+6.00 add	held close
ILA 6X stand	+3.25 add	5.8cm focused working distance
Coil 5.4X stand	+2.75 add	3.0cm focused working distance

**If clear with 7X hand and distance correction:
6X is required, and provided by:**

ILA 6X stand	+4.00 add	held close
ILA 7X stand	+4.25 add	3.5cm focused working distance
Coil 7.1X stand	+3.50 add	3.6cm focused working distance

**If clear with 8X hand and distance correction:
7X required, and provided by:**

ILA 7X stand	+5.00 add	held close
Coil 7.1X stand	+4.00 add	held close

In reality, these working distances are actually distance ranges, because while focused magnification occurs at a specific working distance for each specific stand magnifier and reading add combination, clear magnification is determined by how much the image can be out of focus without the person noticing blur. This relates to the refraction, "Just Noticeable Difference," JND, which is measured in spherical diopters of blur. Benjamin Freed, OD, in his 1987 article in The Journal of Vision Rehabilitation, wrote, "The JND is that amount of spherical lens change at which a change in clarity or blur is first noticed. The denominator of the 20 foot Snellen acuity is convenient estimator of the JND for a given eye. For example, a 20/200 eye will be sensitive to a lens change of approximately 2.00D. Using the denominator of the 20 foot acuity to estimate the JND is a rule of thumb and each eye's actual JND is dependent on factors such as pathology and individual sensitivity." *

The estimations this discussion is meant to provide are intended to be simply predictive. It is therefore reasonable to use the JND rule of thumb mentioned by Dr. Freed, and it is also reasonable to predict the denominator of the 20 foot distance acuity based on the required near magnification.

Predicted required near magnification	Predicted distance acuity	Predicted JND
4X	"20/80"	0.8D (+/-0.4D)
5X	"20/100"	1.0D (+/-0.5D)
6X	"20/120"	1.2D (+/-0.6D)
7X	"20/140"	1.4D (+/-0.7D)

When stand magnifiers are combined with their maximum focused spectacle adds, it is reasonable to simply specify their clinically useful positions as “held close” to the spectacle add. However, when stand magnifiers are combined with less than their maximum focusable spectacle adds, the focused working distance is more clinically useful if considered to be the range of predicted clarity using the appropriate JND.

If clear with 5X hand and distance correction: 4X is required, and provided by:		
ILA 4X stand	+4.00 add	held close
ILA 5X stand	+4.75 add	JND range +5.15 — +4.35
ILA 6X stand	+2.75 add	JND range +3.15 — +2.35
Coil 4.7X stand	+3.50 add	JND range +3.90 — +3.10
Coil 5.4X stand	+2.50 add	JND range +2.90 — +2.10
If clear with 6X hand and distance correction: 5X is required, and provided by:		
ILA 5Xstand	+6.00 add	held close
ILA 6X stand	+3.25 add	JND range +3.75 — +2.75
Coil 5.4X stand	+2.75 add	JND range +3.25 — +2.25
If clear with 7X hand and distance correction: 6X is required, and provided by:		
ILA 6Xstand	+4.00 add	held close
ILA 7Xstand	+4.25 add	JND range +4.85 — +3.65
Coil 7.1X stand	+3.50 add	JND range +4.10 — +2.90
If clear with 8X hand and distance correction: 7X is required, and provided by:		
ILA 7X stand	+5.00 add	held close
Coil 7.1X stand	+4.00 add	held close

This can be converted into the following more clinically useful chart for predicting a stand magnifier and reading add combination that will produce a required magnification, as well as for predicting its range of clear working distances.

If clear with 5X hand and distance correction: 4X is required, and provided by:		
ILA 4X stand	+4.00 add (max)	held close
ILA 5X stand	+4.75 add	1.0" – 2.5" clarity range
ILA 6X stand	+2.75 add	2.6" – 6.9" clarity range
Coil 4.7X stand	+3.50 add	0.2" – 2.8" clarity range
Coil 5.4X stand	+2.50 add	0.6" – 5.7" clarity range
If clear with 6X hand and distance correction: 5X is required, and provided by:		
ILA 5X stand	+6.00 add (max)	held close
ILA 6X stand	+3.25 add	0.7" – 4.5" clarity range
Coil 5.4X stand	+2.75 add	0cm – 4.4" clarity range
If clear with 7X hand and distance correction: 6X is required, and provided by:		
ILA 6X stand	+4.00 add (max)	held close
ILA 7X stand	+4.25 add	0.2" – 2.9" clarity range
Coil 7.1X stand	+3.50 add	0cm – 3.7" clarity range
If clear with 8X hand and distance correction: 7X is required, and provided by:		
ILA 7X stand	+5.00 add (max)	held close
Coil 7.1X stand	+4.00 add (max)	held close

* The Journal of Vision Rehabilitation; Volume 1, No. 4, October 1987; Refracting the Low Vision Patient, Benjamin Freed, OD, page 57

