

**From:** Doug Wilgis  
**Sent:** Monday, March 03, 2014 8:23 AM  
**To:** Gordon Boulton (gboulton@aol.com); daikens@savvyoptics.com  
**Cc:** Mike Nofi; Amando Ramos; Mary Boyce; Katy Dodson; Jerry Church; Jennifer McIntosh; Robert Moreno; Connie Sisson  
**Subject:** Classic 40W Illumination

Gordon/Dave,

I believe this provides a solution to the obsolescence of the classic 40W inspection bulb. Please review and comment.

The International Commission on Illumination (usually abbreviated CIE for its French name) is the body responsible for publishing all of the well-known standard illuminants. Each of these is known by a letter or by a letter-number combination.

Illuminants A, B, and C were introduced in 1931, with the intention of respectively representing average incandescent light, direct sunlight, and average daylight. Illuminants D represent phases of daylight, Illuminant E is the equal-energy illuminant, while Illuminants F represent fluorescent lamps of various composition. - CIE, *Technical Report (2004) Colorimetry, 3rd ed., Publication 15:2004, CIE Central Bureau, Vienna* - [http://en.wikipedia.org/wiki/Standard\\_illuminant#Illuminant\\_A](http://en.wikipedia.org/wiki/Standard_illuminant#Illuminant_A)

I find that the CIE standard "Illuminant A" is intended to represent typical, domestic, tungsten-filament lighting. Has two compatible light sources('F' & 'A'). Light source 'F' I would say is Also Known As (AKA) the 40W Incandescent, while 'A' is the Halogen that is still available today.

CIE Illuminant 'A'							
Light Source	Name	Lamp Description	C.R.I.	Length	Watts	Diam	Product Code
'F'	Tungsten Filament	Tungsten Filament Lighting. Approximate colour temperature of 2800K. Required by BS 950: Part 1 as a test for metamerism (approximating CIE Illuminant 'A'). Typical light source used within domestic environments.	100	Globe Globe Round Clear- 284mm Opal-284mm	40w 60w 150w 60w 60w	45mm 45mm - - -	40G450 60G450 150FILO 28460CL 28460OP
'A'	Tungsten Halogen	Tungsten Halogen Lighting (CIE Illuminant 'A'). This represents incandescent A (inc-A) with a colour temperature of 2856K. Typical light source used within domestic environments. Used to check for metamerism.	100	-	35w	-	HALO/12V /35WLP

<http://www.verivide.com/start/en/products/lamp-options-and-paint>

Included in this CIE Illuminant 'A' specification is also a Halogen bulb with a colour temperature of 2856K, Light source 'A'.

So the CIE allows these two bulbs to be used for the Illuminant 'A' standard.

Given the above we have tested the Obsolete GE 13255 – 40A A19 (tungsten Filament 40W bulb) against the New Compliant GE 63002 – 29A/W/H-2PK (Halogen – A-line) and find no real difference in the inspection accept/reject results.

We do notice it has a more consistent white light to the Human eye compared to some of the Obsolete 40W bulbs. Although some of the Obsolete 40W bulbs are identical in color to the Halogen. Reinforcing the huge variation in lighting results for the classic 40W incandescent bulb.

To us this makes sense as the Obsolete 40W has a wide range of Colour temperature 2700K to 2850K while the Halogen has a much narrower range 2800K to 2856K.

The only remaining issue is the relative lumens as 'A' allows different wattages/lumens depending on the area being lighted.

So I conclude that for our "area" we would want a similar volume of lumens since the MIL specifications don't recognize the need for brighter lights for larger areas.

The bulbs seem to come with two "lumen" specifications:

Initial Lumens – This is when the bulb is new

Nominal Lumens – This is the average Lumens over the life of the lamp.

While the classic 40W starts with a higher initial lumens ~505 compared to the Halogen ~430 lumens. The nominal Lumens over the life of the bulbs is much more closely matched.

Based upon published lumen loss information I could find I have compiled a chart (attached). I believe the chart shows that the two bulbs overlap significantly over the lives of the two lamps.

The 40W replacement Halogen through its entire estimated 2000 hour life span is 100% of the time within the lumen output of the Classic 40W incandescent.

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