



SPECS
A CHAIN STORE AGE EVENT
2 0 0 5

Reduce Your Energy Costs by 30%

SPECS/2005

HOW TO SAVE 30% IN LIGHTING ENERGY

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Eliminate Standard Metal Halide In Hibays

- But don't automatically jump on the T5HO or T8 bandwagon. 90 – 95 CRI (color rendition index) Ceramic MH with electronic ballasts can often be better.
- Details available in Stan Walerczyk's 'Hibays – It's all about the Details' and upcoming 'MH vs. Fluorescent – 10 Rounds in the Hibay Arena'.

HOW CAN FLUORESCENTS WITH HALF THE INITIAL LUMENS REPLACE HID?

Following are some examples



lamp & hibay fixture type	initial lamp lumens	BF	actual lamp lumens	EOL lamp lumen maintenance	EOL lamp lumens	luminaire efficiency	EOL luminaire lumens	system watts	EOL luminaire lumens per watt	S/P ratio	EOL lamp luminaire task modified lumens	EOL lamp luminaire task modified lumens per watt
spun aluminum reflector with 400W 41K 65-CRI standard MH	38,000	1.00	38,000	45%	17,100	75%	12,825	458	28	1.65	18,953	41
spun aluminum reflector with 400W 22-CRI standard HPS	50,000	1.00	50,000	72%	36,000	75%	27,000	465	58	0.62	18,596	40
enhanced aluminum reflector with (4) 850 85-CRI F54T5HOs	20,000	1.00	20,000	93%	18,600	92%	17,112	234	73	1.90	28,231	121
enhanced aluminum reflector with (6) 3100 lumen 850 85-CRI F32T8s	18,600	1.15	21,390	92%	19,680	91%	17,909	220	81	1.90	29,546	134

Notes

BF stands for ballast factor and EOL stands for end of life.

Fluorescent lamp lumens are based on optimal temperatures & can be adjusted with lumen/temp tables provided by manufacturers.

Luminaire dirt depreciation could be included if you know it.

HID have magnetic ballasts.

Fluorescents have electronic ballasts.

End of life luminaire task modified lumens = end of life lamp luminaire lumens x (S/P)^{.78} [.78 exponent]

Prepared by Stan Walerczyk of Lighting Wizards www.lightingwizards.com

HIGH PERFORMANCE MH, T5HO & T8 HIBAY COMPARISON

Following are some examples

lamp, ballast & dome/reflector type	lamp life	CRI	initial total lamp lumens	BF	actual initial lamp lumens	EOL lamp lumen maintenance	EOL total lamp lumens	lumin- aire eff- iciency	EOL lamp lumens	sys- tem watts	EOL lamp lumens per watt	Kelvin	S/P ratio	EOL lamp lumens task modified lumens	EOL lamp luminaire task modified lumens per watt
	hours at 10 hour cycles														
320W quartz PS MH lamp, magnetic reactor ballast, high performance dome	20,000	65	32,000	1.00	32,000	65%	20,800	92%	19,136	345	55	4000	1.65	28,280	82
320W quartz PS MH lamp, electronic ballast, high performance dome	20,000+	65	32,000	1.00	32,000	70%	22,400	92%	20,608	333	62	4000	1.65	30,456	91
high Kelvin quartz 375W PS MH lamp, electronic ballast, high performance dome	20,000+	90+	28,000	1.00	28,000	80%	22,400	92%	22,608	391	58	5000	2.10	36,759	94
400W quartz PS MH lamp, electronic ballast, high performance dome	20,000+	65	43,000	1.00	43,000	70%	30,100	92%	27,692	413	67	4000	1.65	40,925	99
250W ceramic MH lamp, electronic ballast, high performance dome	15,000+	94	24,000	1.00	24,000	80%	19,200	92%	17,664	260	68	4200	1.86	28,662	110
400W ceramic MH lamp, electronic ballast, high performance dome	20,000+	92	34,000	1.00	40,000	80%	32,000	92%	29,440	413	71	3700	1.82	46,967	114
4 F54T5HO lamps, electronic ballasts, enhanced aluminum reflector	24,000	85	20,000	1.00	20,000	93%	18,600	92%	17,112	234	73	5000	1.90	28,231	121
6 F32T8 lamps, electronic ballasts, enhanced aluminum reflector	28,000	85	18,600	1.15	21,390	92%	19,680	91%	17,909	220	81	5000	1.90	29,546	134

Notes

BF stands for ballast factor and EOL stands for end of life.

High performance domes include clear prismatic, metal faceted or glass lined metal faceted.

IMPORTANT! Fluorescent lamp lumens are based on optimal temperatures & can be adjusted with lumen/temp tables provided by manufacturers.

Luminaire dirt depreciation could be included if you know it.

All line voltages considered to be 277V.

End of life luminaire task modified lumens = end of life lamp luminaire lumens x (S/P)^{-.78} [.78 exponent]

Prepared by Stan Walerczyk for 'Hibays -It's All About The Details'. 10/10/04 version.

ELECTRONIC BALLASTS FOR MID WATTAGE PS MH

Since this table will probably become outdated very soon, get updated info from manufacturers.

<i>manufacturer</i>	<i>model</i>	<i>lamp wattage</i>	<i>voltage</i>	<i>dimming</i>	<i>website(s)</i>	<i>notes</i>
Advance	Dynavision	320, 350, 400	200 277	Y	www.advancetransformer.com/products/dynavision.asp www.dynavisionatc.com/abc.html	Check with manufacturer about CMH lamps.
AMF Technology	MHL	200, 250, 400	120 277	N	www.amftechnology.com	Check with manufacturer about CMH lamps.
Delta Power	Superballast	200, 250, 350, 400, 450	120 277	Y	www.delta-power-supply.com	Check with manufacturer about CMH lamps. Some ballasts are not available at all line voltages. Working on 480V.
GE	Ultramax HID	250, 320, 350, 400	208 277	N/Y	www.gelighting.com	Can work with CMH. Initial offering is nondimming, but dimming will be available later. Website should be updated 2Q05.
Green Earth	EB	250, 320, 400	277	N	www.greenlightusa.com	Check with manufacturer about CMH lamps.
Holophane	Prismatron	320, 350, 400	200 300	Y	www.holophane.com/product/general/ptron.htm	Check with manufacturer about CMH lamps.
IEPC	Vari-Ballast	250, 320, 350, 400	120 300	Y	www.vb1000.com	Network ready. Check with manufacturer about CMH lamps.
Metrolight	eHID	250, 320, 400	120 277	Y	www.metrolight.net	Check with manufacturer about CMH lamps. Some ballasts are not available at all line voltages.
Romlight	MH	250, 400	120 347	Y	www.rom-light.com	Check with manufacturer about CMH lamps. Some ballasts are not available at all line voltages.
Sylvania	Quicktronic MH				www.sylvania.com	Planned for late 2005
Venture Lighting	Opti-wave HID	200, 250, 350, 400, 450	120 277	Y	www.venturelighting.com	Check with manufacturer about CMH lamps. Some ballasts are not available at all line voltages. Working on 480V.

MERCURY CONTENT

lamp type	mg per lamp	lamps per fixture	mg per fixture	EOL fixture 10K lumens	rated 10K hours	mg of Hg per (10K-EOL-lumen x 10K-hour)
160W induction	8 -- 18	2	16 -- 36	1.440	10.0	1.11 - 2.49
F54T5HO	1.4 -- 5	4	5.6 -- 20	1.860	2.4	1.25 - 4.48
400W ceramic PS MH	12 -- 35	1	12 -- 35	3.200	2.0	1.88 - 5.47
F32T8 (long life)	3.5 -- 8	6	21 -- 48	1.968	2.8	3.81 - 8.71
250W ceramic PS MH	15 -- 25	1	15 -- 25	1.920	1.5	5.21 - 8.68
42W CFL	2.7 -- 5	8	21.6 -- 40	2.560	1.4	6.03 - 11.16
400W quartz PS MH	50 -- 70	1	50 -- 70	2.975	2.0	8.40 - 11.76
250W quartz PS MH	34 -- 41	1	34 -- 41	1.645	1.5	13.78 - 16.61
400W standard MH	50 -- 70	1	50 -- 70	1.710	2.0	14.62 - 20.47
250W standard MH	34 -- 41	1	34 -- 41	0.950	1.0	35.79 - 43.18

notes:

Check with specific lamp manufacturers about specific lamps regarding mercury content.

Fluorescents are low mercury types. T8s are 3100 lumen and rated for 24,000 hours at 3 hour cycles.

All MH lamps are clear. Electronic ballasts drive all PS MH lamps. Magnetic ballasts drive standard MH.

160W induction is a composite of actual lamps.

EOL stands for end of life for all lamps in fixture. 10K means 10,000.

Rated hours are based on 10 hour cycles. This applies to comparing fluorescent and HID

Luminaire efficiency, which is not included, is much lower with basic grade spun aluminum domes.

BFs are 1.0 except for F32T8s, which is 1.15.

Standard MH lamps should not be used because of high mercury and low efficacy.

Prepared by Stan Walerczyk. 10/16/04 version

Eliminate Basic Grade T8s

- High-CRI high-lumen extended-life T8s make colors and textures more realistic, can save wattage and reduce maintenance.
- When include ballast, high performance 32W F32T8s are more efficacious than energy saving F32T8s and T5s.

Include Ballast When Measure Efficacy

4' LINEAR FLUORESCENT EFFICACY TABLE

<i>4' lamp type</i>	<i>lamp lumens</i>	<i>lamp watts</i>	<i>lamp lumens per lamp watts</i>	<i>lamp quant</i>	<i>ballast type</i>	<i>ballast factor</i>	<i>system watts</i>	<i>initial system lumens</i>	<i>initial system lumens per watt</i>	<i>end of life lumen maintenance</i>	<i>end of life system lumens</i>	<i>end of life system lumens per watt</i>
high perform. F32T8	3100	32	96.9	2	EE IS	0.87	53	5394	101.8	92%	4962	93.6
28W F32T8	2750	28	98.2	2	EE IS	0.87	48	4785	99.7	92%	4402	91.7
25W F32T8	2400	25	96.0	2	EE IS	0.86	43	4128	96.0	92%	3798	88.3
30W F32T8	2850	30	95.0	2	EE IS	0.87	52	4959	95.4	92%	4562	87.7
F28T5	2900	28	103.6	2	PS	1.00	64	5800	90.6	94%	5452	85.2
basic grade F32T8	2800	32	87.5	2	EE IS	0.87	53	4872	91.9	90%	4385	82.7
F54T5HO	5000	54	92.6	2	PS	1.00	117	10000	85.5	93%	9300	79.5
F34T12 CW	2650	34	77.9	2	RS M	0.88	72	4664	64.8	78%	3638	50.5

notes: Lumens, lumen maintenance, ballast factors and wattages may vary among various manufacturers.

Although efficacy can be improved with IS and RS ballasts with T5s and T5HOs, lamp life can be greatly reduced and lamp manufacturers may not warranty the lamps.

93% is used as an average EOL lumen maintenance for T5HOs. 90% - 94% range among manufacturers.

All wattages based on 277V. EE IS is extra efficient instant start. PS is program start. RS M is rapid start magnetic.

Prepared by Stan Walerczyk of Lighting Wizards www.lightingwizards.com 10/25/04 version

4' T8 LAMP LIFE

LAMP	WATTS	LAMP LIFE HOURS WITH VARIOUS BALLASTS & CYCLES					
		INSTANT START		RAPID START		PROGRAM START	
		3 HR	12 HR	3 HR	12 HR	3 HR	12 HR
BASIC GRADE	32	15,000	20,000	20,000	24,000	20,000	24,000
MID GRADE	32	18,000	24,000	24,000	30,000	24,000	30,000
GE XL & HL	32	24,000	30,000	24,000	30,000	30,000	36,000
PHILIPS PLUS & ADV	32	24,000	30,000	30,000	36,000	30,000	36,000
SYLVANIA XPS™	32	15,000	24,000	20,000	28,000	30,000	34,000
SYLVANIA XP®	32	18,000	26,000	24,000	30,000	24,000	30,000
GE WM	30	20,000	24,000	NA	NA	NA	NA
GE XL WM	30	24,000	29,000	NA	NA	NA	NA
PHILIPS ADV EW	30	20,000	25,000	NA	NA	NA	NA
SYLVANIA 30W SS	30	18,000	26,000	NA	NA	24,000	TBD
SYLVANIA FO28 SS	28	18,000	26,000	NA	NA	24,000	TBD
GE F28	28	18,000	24,000	NA	NA	NA	NA
PHILIPS ENERGY ADV	25	20,000	25,000	NA	NA	NA	NA
F34T12 & mag ballast	34	NA	NA	20,000	27,000+	NA	NA
F28T5	28	*	*	*	*	20,000	25,000
F54T5HO	54	*	*	*	*	20,000	25,000

notes

Most rated hours provided by Amy Brown at GE, John Wilson at Philips, and Jeff Waymouth at Sylvania during January.

Lamp manufacturers may alter rated lamp life specifications, so get updates from manufacturers.

Although one manufacturer may have higher ratings for basic and mid grade T8s, listed numbers are for the majority.

Please be aware that some manufacturers are more conservative than others on some products.

Sylvania lamp life with program start ballast is based on Sylvania PSX ballast, and may be less with other ballasts.

Program start ballasts include fixed output and most dimming ballasts.

All ballasts, except for T12, are electronic.

* is for most manufacturers do not warranty their lamps with rapid or instant start ballasts. Life significantly reduced.

Even though listed as NA (not applicable) some rapid start & program start ballasts can operate some 25-30W lamps.

Prepared by Stan Walercyk of Lighting Wizards www.lightingwizards.com

Eliminate GEB For T8s

- GEB stands for generic electronic ballasts. These are the ballasts that most, if not all, fixture manufacturers install as standard equipment. There are numerous extra efficient electronic ballasts that save 3 – 6 watts while providing the same amount of light.
- Instant Start include Advance Optanium, GE Ultramax, Sylvania QHE, Universal ULTim8

BALLAST EFFICACY FACTOR TABLE - 2F32T8				
<i>general type</i>	<i>further description</i>	<i>ballast factor</i>	<i>system watts</i>	<i>BEF</i>
IS	extra efficient	0.87	53	1.64
	basic grade	0.87	58	1.50
	extra efficient	0.77	48	1.60
	basic grade	0.77	51	1.51
	extra efficient	1.15	72	1.60
	basic grade	1.15	77	1.49
PS	extra efficient	0.88	55	1.60
	basic grade	0.88	62	1.42
	extra efficient	0.71	46	1.54
RS/PS dimming	continuous 0-10V	0.88	64	1.38
		0.05	14	0.36
	continuous powerline	1.00	68	1.47
		0.05	15	0.33
	continous DALI	1.00	70	1.43
		0.54	45	1.20
		0.05	17	0.29
	three stages	0.88	62	1.42
		0.58	45	1.29
0.27		28	0.96	
notes: Wattages based on 277V.				
Values will vary among specific ballasts				

LAMP FOR LAMP TABLE (photopic lumens)

lamp & ballast type	catalog lamp lumens	EOL lumen maintenance	CRI	ballast factor	EOL lamp lumens	# of lamps	EOL lumens	EOL lumens compared to basic & standard	system wattage	wattage savings compared to basic & standard	EOL lumens per watt
F34T12CW & energy saving magnetic	2650	78%	62	0.89	1840	1	1840	83%	44	-47%	42
						2	3680	83%	72	-24%	51
						3	5520	83%	116	-33%	48
						4	7360	83%	142	-24%	51
Basic 32W T8 & Standard	2800	90%	75 - 78	0.88	2218	1	2218	100%	30	0%	74
						2	4436	100%	58	0%	76
						3	6654	100%	87	0%	76
						4	8872	100%	114	0%	78
Option 1 Instant Start & 32W Lamps	3100	92%	82 - 86	0.87	2481	1	2481	119%	28	9%	89
						2	4962	119%	53	9%	94
						3	7443	119%	80	9%	93
						4	9924	119%	107	9%	93
Option 2 Instant Start & 32W Lamps	3100	92%	82 - 86	0.77	2196	1	2196	99%	25	17%	88
						2	4392	99%	48	17%	92
						3	6588	99%	72	16%	92
						4	8784	99%	96	15%	92
Option 3 Program Start & 32W Lamps	3100	92%	82 - 86	0.71	2025	1	2025	91%	25	17%	81
						2	4050	91%	46	21%	88
						3	6075	91%	71	18%	86
						4	8100	91%	91	20%	89
Option 4 Instant Start & 30W Lamps	2850	92%	82 - 86	0.87	2281	1	2281	103%	27	10%	85
						2	4562	103%	52	10%	88
						3	6843	103%	77	10%	89
						4	9124	103%	103	9%	90
Option 5 Program Start & 30W Lamps	2850	92%	82 - 86	0.71	1862	1	1862	84%	24	20%	78
						2	3722	84%	43	26%	87
						3	5583	84%	67	23%	83
						4	7444	84%	86	25%	87
Option 6 Instant Start & 28W Lamps	2750	92%	82 - 86	0.77	1948	1	1948	88%	22	23%	89
						2	3896	88%	44	26%	89
						3	5844	88%	65	25%	90
						4	7792	88%	86	22%	91
Option 7 Instant Start & 25W lamps	2400	92%	82 - 86	0.86	1899	1	1899	86%	21	30%	90
						2	3798	86%	43	35%	88
						3	5697	86%	63	28%	90
						4	7596	86%	82	32%	93
Option 8 Program Start & 32W lamps	3100	92%	82 - 86	0.60	1711	1	1711	77%	20	33%	86
						2	3422	77%	37	36%	92
						3	5133	77%	53	39%	97
						4	6844	77%	70	39%	98

notes:

EOL stands for end of life.

Lamp life is estimated on 3 hour starts with listed ballast.

System wattages are based on 277V and may be slightly higher for 120V.

Basic and Standard has typical basic 700 series F32T8 lamps and generic standard-power electronic ballast.

All options have F32T8 lamps and extra-efficient fixed output electronic ballasts.

The higher CRI of the options can help offset the less EOL lumens.

Many of above numbers are based on composites and extrapolations, so do not be concerned about small differences, like a difference of one or two in EOL lumens/watt.

Wattage and BF for 0.60 program start ballasts are estimates.

More wattage can be saved with the 3100 lumen 32W F32T8s with delamping. 2 3100 lumen F32T8s with 1.15 BF consumes 73W and can

often replace 3 basic grade F32T8s or 4 F34T12s.

It is highly recommended to do your own calculations with specific lamps and ballasts.

Eliminate Low Efficiency Fixtures

- Many commonly used fixtures are not that efficient and do not shine light where it should go.

Eliminate Standard PAR Halogens

- PAR halogen infrared halogens and PAR ceramic MH lamps save considerable wattage.

Don't Have Too Much Ambient Lighting If Use Accent Lighting

- Because it takes too much wattage in accent lighting for sufficient contrast.

Consider High Kelvin Lamps

- In many applications additional wattage can be saved with high Kelvin lamps, like 5000K. These lamps are considered to be scotopically or spectrally enhanced. These lamps, which are closer to daylight, also work very well with skylights.

S/P Ratio Example of some 32W F32T8s

lamp	initial photopic (catalog) lumens	S/P ratio	brightness	paper	computer
			$P(S/P)^{.5}$	$P(S/P)^{.78}$	$P(S/P)^{1.0}$
735	2800	1.30	3196	3436	3640
741	2800	1.56	3497	3960	4368
835	3100	1.41	3681	4053	4371
841	3100	1.62	3946	4516	5022
850	3100	1.90	4273	5114	5890
Increase of energy efficiency of 850 when considering full field of view compared to		735	34%	49%	62%
		741	22%	29%	35%
		835	16%	26%	35%
		841	8%	13%	17%

notes

Initial lumens can range. For example, some 700 series lamps have 2850 lumens and 800 series T8s are available from 2950 to 3100+ lumens.

S/P ratios vary among lamps and correction factor used.

More Info on Scotopically or Spectrally Enhanced Lighting

- Several reports available in article section of www.lightingwizards.com

Some Stores

Ruud with 6F32T8s and 40% Uplight



Holophane with 94 CRI CMH Lamp and Electronic Ballast (probably better with clear prismatic dome for uplight)



Skylights & Controls (really, lack of controls)

Although good 8' 6F54T5HO hibays, some directly under 4 x 8 skylights, they could be completely turned off during mid day with no reduction in light levels



THE END

- Any questions or comments?
- If any response forms, please fill out.
- Thanks for Coming.