

# ***Item 6.4 Attachment***

## **The Economic Impact of Requiring a Master's in Engineering or its Equivalent as a Prerequisite for Licensure in the Future**

### **NSPE Licensure and Qualifications for Practice Committee Draft #2 December, 2008**

In 2006, the National Council of Examiners for Engineers and Surveyors (NCEES) modified the Model Law to require additional engineering education beyond the baccalaureate degree as a prerequisite for licensure in the future. As of 2008, this Model Law change becomes effective in the year 2020. The NSPE Licensure and Qualifications for Practice Committee has used published salary surveys to estimate the economic impact of this change in the engineering profession.

The Engineering Income and Salary Survey Standard Report dated April 1, 2008 provides data and analysis of salary information gleaned from a survey of about 12,000 practicing engineers in the US of all disciplines and of varying levels of education and responsibility and length of experience. This survey is published annually by the National Society of Professional Engineers (NSPE), the American Society of Civil Engineers (ASCE) and the American Society of Mechanical Engineers (ASME).

The relevant pages of the 2008 survey pertaining to the difference between salary levels of engineers with BS degrees and engineers with MS degrees are attached. The pertinent data summary is presented on Exhibit 11, on page 14. The far right column in that table presents the median income for engineers with BS and MS degrees in engineering, by length of experience.

The difference in median income for engineers with BS and MS degrees from the 2008 NSPE/ASCE/ASME report have been tabulated in the attached table entitled "Career-long Economic Differential by Education Level". This table indicates an average difference in median income throughout a 35 year career of 5.5% for those engineers with master's degrees, with a total increase in income over that period of about \$180,000. The present value of the annual differences in median income were calculated for each year of a 35 year career, using a discount rate of 5%, and without inflating the salary differential in the future, to yield a conservative estimate. The present value of the median salary differentials for engineers with MS degrees compared to engineers with BS degrees is calculated to be about \$75,000.

The salary differentials presented herein are likely conservative for three reasons. First, the data evaluated are median incomes. As such, the data do not reflect the economic advantage of high income individuals who are practicing at the high end of the profession, and who are likely to be managers and/or owners of organizations. Second, the present value calculation was made assuming that the salary differential does not inflate over twenty years. This is a conservative assumption, predicting that the salary differential in current dollars will be significantly lower twenty years out than it is today. Inflating the salary differential at 3% per year results in a

present value relative benefit of a master's degree of \$124,000, rather than the \$75,000 estimate presented herein. Third, the NSPE/ASCE/ASME survey presents lower salary differentials than those reported by the Engineering Workforce Commission of the American Association of Engineering Societies (AAES), which was heavily weighted toward US industry, which appears to reward engineers with advanced degrees more than is the case in the "built environment". Thus, the estimates presented herein of a 5.5% career long salary differential for engineers with master's degrees, having a present value of increased income of \$75,000 over the course of a 35 year career might be considered to be a reasonable, although perhaps understated, estimate of the economic benefit of additional engineering education beyond the baccalaureate level.

The present value increase in earning potential needs to be compared to the cost of obtaining the additional engineering education prior to licensure, for those who currently do not obtain master's degrees. For a bricks and mortar master's degree in full time attendance at a university, these costs include tuition, fees, books and living expenses, as well as foregone growth in personal net worth from not working during the time in graduate school, and foregone increased income for some who might delay obtaining a PE license due to personal reasons. The cost of obtaining the additional engineering education by distance learning modes is far less than full time bricks and mortar options, predominantly consisting of distance learning tuition, fees and expenses. The cost side of this equation, for comparison to the conservative present value benefit of \$75,000, is beyond the scope of this investigation, and is left to the reader. These costs will vary widely, but are likely well within the predicted benefit.

**Career-long Economic Differential by Education Level  
All Engineering Disciplines - MEDIAN Salary Differentials  
2008 NSPE/ASCE/ASME Engineering Salary Survey**

Discount Rate: 5%      Salary Differential not inflated

Sample Sizes          BS: 8,581                  MS:3,798

Present Values calculated from data presented on Exhibit 11, page 14

Career Year	Percent Difference	Salary Differential (median)	Present Value	Cumulative Present Value
1	3.6	\$1,900	\$1,810	\$1,810
2	5.6	\$3,318	\$3,010	\$5,329
3	5.3	\$3,658	\$3,160	\$8,489
4	5.1	\$3,550	\$2,921	\$11,409
5	5.1	\$3,550	\$2,782	<b>\$14,191</b>
6	5.1	\$3,550	\$2,649	\$16,840
7	5.1	\$3,550	\$2,523	\$19,363
8	5.1	\$3,550	\$2,403	\$21,766
9	5.1	\$3,550	\$2,288	\$24,054
10	7.1	\$5,964	\$3,661	<b>\$27,715</b>
11	7.1	\$5,964	\$3,487	\$31,202
12	7.1	\$5,964	\$3,321	\$34,523
13	7.1	\$5,964	\$3,163	\$37,686
14	7.1	\$5,964	\$3,012	\$40,698
15	3.8	\$3,684	\$1,772	<b>\$42,470</b>
16	3.8	\$3,684	\$1,688	\$44,158
17	3.8	\$3,684	\$1,607	\$45,765
18	3.8	\$3,684	\$1,531	\$47,296
19	3.8	\$3,684	\$1,458	\$48,754
20	4.9	\$5,050	\$1,903	<b>\$50,657</b>
21	4.9	\$5,050	\$1,813	\$52,470
22	4.9	\$5,050	\$1,726	\$54,196
23	4.9	\$5,050	\$1,644	\$55,840
24	4.9	\$5,050	\$1,566	\$57,406
25	6.3	\$7,000	\$2,067	<b>\$59,473</b>
26	6.3	\$7,000	\$1,969	\$61,442
27	6.3	\$7,000	\$1,875	\$63,317
28	6.3	\$7,000	\$1,786	\$65,103
29	6.3	\$7,000	\$1,701	\$66,803
30	6.3	\$7,000	\$1,620	<b>\$68,423</b>
31	6.3	\$7,000	\$1,543	\$69,965
32	6.3	\$7,000	\$1,469	\$71,435
33	6.3	\$7,000	\$1,399	\$72,834
34	6.3	\$7,000	\$1,332	\$74,166
35	6.3	\$7,000	\$1,269	<b>\$75,435</b>
		\$180,666		

5.5% Average



# Salary Survey 2008

The Engineering Income  
and Salary Survey

*Learn The Value of Engineers in Today's Market*





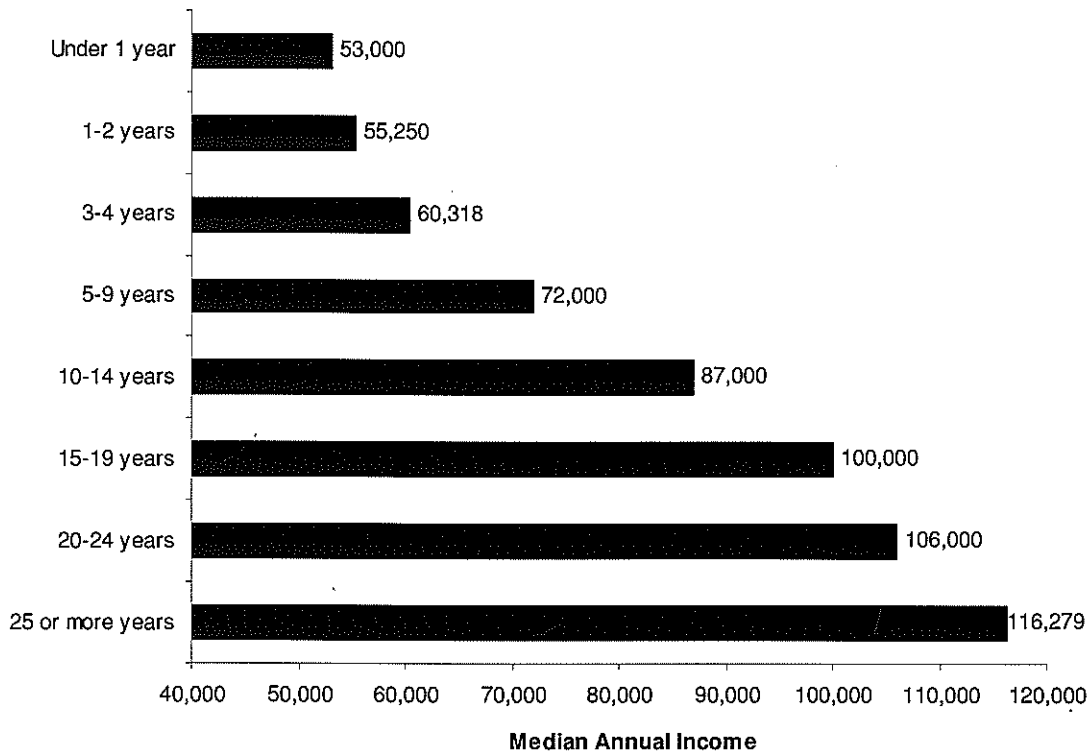
# **The Engineering Income and Salary Survey Standard Report**

**Trends Analysis, Policies, and Practices**

As of April 1, 2008

ISBN: 978-0-7844-0998-5

**EXHIBIT 7: INCOME BY LENGTH OF EXPERIENCE  
(FULL-TIME SALARIED ONLY)**



**Level of Education**

The following table shows graphically median income by level of education attained. As is obvious, increased education in the engineering field results in higher earnings.

Full-time salaried respondents holding doctoral degrees in engineering have a median income of \$104,500. Those with an M.S. in engineering earn a median of \$88,934. Finally, those with a B.S. in engineering earn a median income of \$78,200

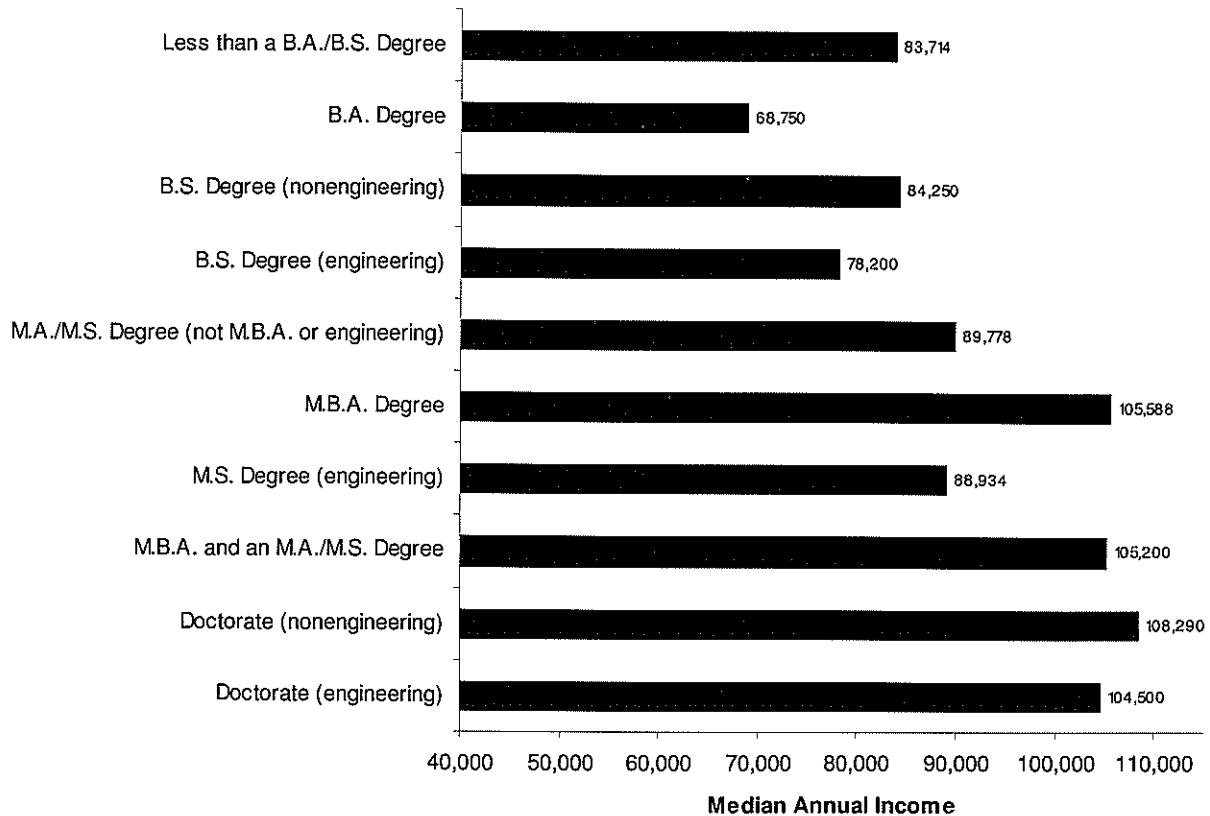
Those holding a doctorate in engineering earn a median 34% more than those with a B.S. in engineering.

Full-time salaried survey respondents holding an M.B.A. or an M.B.A. and an M.A. or M.S. have higher median incomes than those holding an M.S. in engineering.

**EXHIBIT 8: INCOME (\$) BY LEVEL OF EDUCATION**

	All Respondents							Full-Time Salaried Only	
	# of Responses	Mean	10th Pctl	25th Pctl	Median	75th Pctl	90th Pctl	# of Responses	Median
Less than B.A./B.S. Degree	120	87,177	46,250	65,000	83,714	103,250	131,800	116	83,714
B.A. Degree	72	87,509	50,080	56,500	69,750	106,000	140,000	70	68,750
B.S. Degree (nonengineering)	102	94,451	53,500	65,000	84,250	111,000	145,000	96	84,250
B.S. Degree (engineering)	8,581	88,108	52,000	61,000	79,000	102,100	132,000	8,394	78,200
M.A./M.S. Degree (not M.B.A. or engineering)	285	101,809	57,500	70,000	89,600	116,500	153,000	279	89,778
M.B.A. Degree	572	114,261	68,790	86,000	106,000	130,817	163,000	556	105,588
M.S. Degree (engineering)	3,798	98,839	58,000	70,000	89,250	115,000	147,000	3,696	88,934
M.B.A. and an M.A. or M.S. Degree	243	120,278	71,000	91,000	109,800	136,400	175,000	233	105,200
Doctorate (nonengineering)	56	118,342	62,000	90,000	108,790	141,750	180,000	52	108,290
Doctorate (engineering)	990	114,132	70,000	83,500	105,000	132,500	166,448	971	104,500

**EXHIBIT 9: INCOME BY LEVEL OF EDUCATION  
(FULL-TIME SALARIED ONLY)**



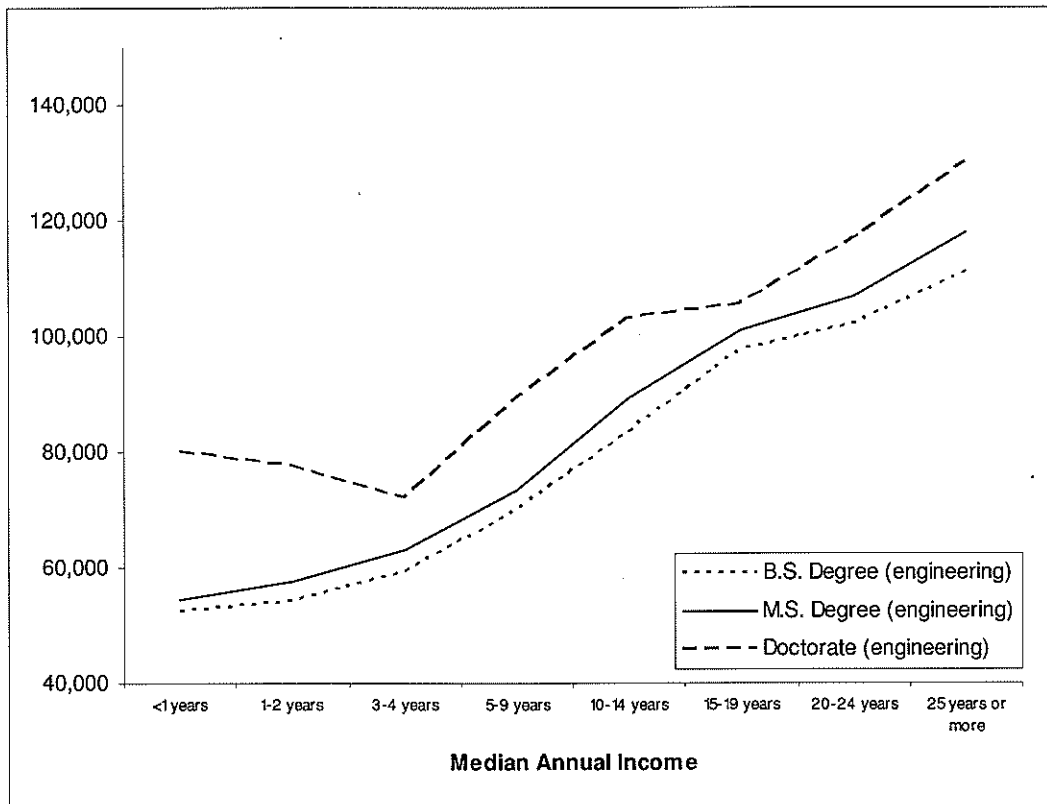
## Level of Education and Length of Experience

Income by engineering experience versus level of education for three of the largest groups by degree held appears graphically and in tabular form in Exhibits 10 and 11.

The curves by full-time salaried median income for the B.S., M.S., and doctorate in engineering are fairly smooth and follow the expected relationship, with infrequent, minor anomalies.

The spreads of median income for the full-time salaried respondents with B.S., M.S., and doctorate in engineering between under one year of experience and 25 years or more of experience, are 111.4%, 116.9%, and 62.5%, respectively.

**EXHIBIT 10: INCOME BY DEGREE EARNED AND LENGTH OF EXPERIENCE  
(FULL-TIME SALARIED ONLY)**





**EXHIBIT 11: INCOME (\$) BY LEVEL OF EDUCATION AND LENGTH OF EXPERIENCE**

	All Respondents							Full-Time Salaried Only	
	# of Responses	Mean	10th Pctl	25th Pctl	Median	75th Pctl	90th Pctl	# of Responses	Median
<b>B.S. Degree (engineering)</b>									
Under 1 year	372	53,375	43,500	47,000	52,500	58,000	65,000	371	52,500
1-2 years	876	56,056	44,960	49,000	54,216	60,000	69,000	875	54,232
3-4 years	940	60,738	48,000	52,500	59,372	66,050	75,000	938	59,342
5-9 years	1,770	73,375	55,000	61,500	70,000	81,000	95,000	1,758	70,000
10-14 years	1,267	88,071	63,600	72,000	84,000	97,600	114,821	1,236	83,516
15-19 years	846	101,723	70,600	81,000	97,500	115,000	136,500	813	97,500
20-24 years	928	111,785	72,140	85,000	102,000	126,011	152,000	886	102,000
25 or more years	1,582	125,630	81,000	93,500	111,950	140,000	184,320	1,517	111,000
<b>M.S. Degree (engineering)</b>									
Under 1 year	64	55,673	45,000	50,000	54,400	60,933	66,000	64	54,400
1-2 years	216	59,518	47,500	52,950	57,550	64,200	75,000	214	57,550
3-4 years	366	65,116	52,000	56,500	63,000	71,000	80,000	364	63,000
5-9 years	762	76,378	57,600	65,000	73,557	84,500	97,760	761	73,550
10-14 years	615	94,843	67,475	76,000	89,400	105,500	127,000	602	89,480
15-19 years	426	109,133	75,000	88,000	101,184	123,000	150,000	414	101,184
20-24 years	432	119,280	79,500	91,209	107,976	132,975	165,000	410	107,050
25 or more years	917	131,507	85,000	98,700	118,219	147,000	190,000	867	118,000
<b>Doctorate (engineering)</b>									
Under 1 year	22	78,134	53,000	69,000	80,000	87,000	90,000	22	80,000
1-2 years	51	77,082	54,200	65,000	77,500	88,300	100,000	51	77,500
3-4 years	64	74,077	57,000	63,800	72,000	78,250	96,000	64	72,000
5-9 years	151	91,792	67,000	77,500	89,250	103,000	116,000	148	89,375
10-14 years	149	110,705	73,000	85,200	103,100	124,000	155,000	148	103,050
15-19 years	121	114,774	78,009	93,000	106,943	129,486	165,000	118	105,634
20-24 years	145	122,044	80,000	100,000	117,000	142,000	157,000	143	117,000
25 or more years	287	141,672	89,700	107,000	130,000	161,700	201,000	277	130,000