

本文基于PCD&M的2004年设计工程师工资调查，该调查已通过电邮寄给PCD&M的设计工程订户。随着经济继续复苏-或至少试图复苏，印刷电路板设计工程师的基本工资略有提高。我们发现，我们大部分工程订户对他们的工作和职业是满意的，但很多人对在公司内的升迁机会并不满意。设计工程师是PCD&M的订户中增长最快的一部分，但这个群组象印刷电路板行业的大部分一样，在继续老化，因为选择成为印刷电路板设计工程师的年轻人很少。

The PCD&M Design Engineer SALARY SURVEY

As the economy recovers, engineers' salaries edge upward. But many are still unsure about the industry. **by ANDY SHAUGHNESSY**

It's time for the results of our 2004 PCD&M Design Engineer Salary Survey. Yes, you read that correctly. This year's survey is a bit different from previous years' efforts. In the interest of clarity, we decided to break with tradition and survey our PCB designers and design engineers separately. This installment of the survey will focus entirely on our design engineer subscribers. The results of a salary survey devoted solely to PCB designers will appear in an upcoming issue.

Why the change? As longtime readers of *Printed Circuit Design* and PCD&M will note, much of what we learn from these surveys has to do with seemingly intangible entities such as work environment, job and career satisfaction, and the industry in general. Because of the limits of space in the magazine, it hasn't been possible to break down these elusive "respondents" into designers and engineers, except for base salary comparisons among job function and job title.

For instance, in past surveys, we found that a majority of respondents were satisfied with their career choice. But how many of these respondents were designers and how many were engineers? Some readers found it confusing when the narrative kept shifting back and forth between "engineers" and "respondents."

By running separate designer and engineer surveys, we'll be able to cut to the chase and be sure we're always comparing apples to apples. It may be more difficult to compare some of this year's results with those from last year's all-encompassing salary survey, but that's a worthwhile tradeoff in exchange for the more targeted results.

The design engineer portion of our readership is one of the fastest growing segments of our design-oriented audience. The number of design engineer readers has been rising over the past few years, while the number of PCB designer readers

has dropped. This may be the result of EEs taking on more tasks related to design and layout, perhaps after the PCB designers were laid off. Comments in the "remarks" section of the survey seem to bear this out, as do the 11.8% of engineering respondents who checked "PCB design and layout" as their primary job function.

Some of this year's results really stood out. For instance, when we surveyed PCB designers and engineers in the past, males usually made up around 90% of the respondents. But those responding to the 2004 engineers-only survey were 97.2% male. Are there really that few members of the "fairer sex" among our EE subscribers, or was this an anomaly?

And there is good news. The average U.S. base salary (TABLE 1) for design engineer respondents is \$81,817. And only 4.2% of engineers reported being laid off within the last year. (The rate for designers and engineers in the 2003 survey was 8.5%.) As with our combined designer/engineer surveys, most of the engineers surveyed reported being satisfied with their career choice

TABLE 1. Averages at a glance

Average overall age of respondents – 43
Average male age – 43
Average female age – 32
Average U.S. base salary – \$81,817
Average U.S. male base salary – \$82,199
Average U.S. female base salary – \$68,583
Average Canadian base salary – C\$73,125
Percentage laid off in the last 12 months – 4.2%
Paid vacation days offered – 16.18
Actual vacation days – 13.53
Holidays – 9.73
Other paid days off – 16.33

Note: All charts refer to subscribers who indicated they have job functions of "Design/System/Electrical Engineering."

and current job, if not their company's corporate direction.

But the "graying" of the PCB industry continues. The engineers' average age of 43 is in line with the rest of the PCB design world. There just aren't many "newbies" out there: no 2004 engineering respondents had less than one year of experience. And the contributed remarks were all over the map; some engineers are thankful to be doing what they're doing, while others are apparently on a mission to stop others from entering what they consider a dying field.

Each year we try to make the survey more useful to our readers. In the past we've mailed surveys to subscribers and posted them online. Other magazines have mailed surveys to their subscribers in an envelope containing \$1. This year we e-mailed a salary survey link to all *PCD&M* subscribers who indicated that they had a primary job function of "Design/System/Electrical Engineering." The survey was posted on a hidden part of our Web site between Aug. 16 and Sept. 15.

Note: For the purposes of this survey, "design engineer" will refer to everyone who chose that job function, unless otherwise noted.

Function Before Form

Each year we break down salary survey responses by job function and job title. Job function is generally a more accurate method for identifying what someone actually does for a living, because one company's "senior engineer" may perform the same function as another company's "principal engineer."

First, let's look at who does what. The biggest segment of our worldwide design engineer readership, by job function, is made up of application engineers (FIGURE 1), at 20.8%. PCB engineering is next at 12.5%, followed by engineering management and PCB design and layout, tied at 11.8%. Hardware engineers and R&D engineers brought up the rear, at 1.4% of total respondents. Some job functions in the "other" category included quality assurance, project engineers and test/measurement, measuring below 1% of total responses.

Now let's look at the dollar signs (FIGURE 2). The highest average U.S. base salary by job function belongs to engineering management, at \$108,599, up from \$96,573 in last year's survey. Design/layout management came in at \$99,000, up from \$74,895 in 2003. PCB engineering registered at \$92,505, up from \$63,426 last year. Because PCB engineering also showed a much lower average base salary of \$63,854 in 2002, we may have reached some very fortunate respondents in this category this year. Riding in the caboose is PCB design and layout at \$61,896, up a few hundred dollars from the 2003 survey.

No wonder most engineers aren't too thrilled about designing boards.

As far as average U.S. base salary by job title (FIGURE 3), principal engineers walk away with top honors at \$128,000. This is 50% more than the average base salary of \$81,623 for CEOs, but remember that some of those CEOs are leaders of smaller companies, such as service bureaus. Next comes vice president at \$106,332 (up from \$79,200 last year) and members of boards of directors at \$101,000. Again, since the average base salary for president is a low \$65,413, we can assume that these people head up smaller firms.

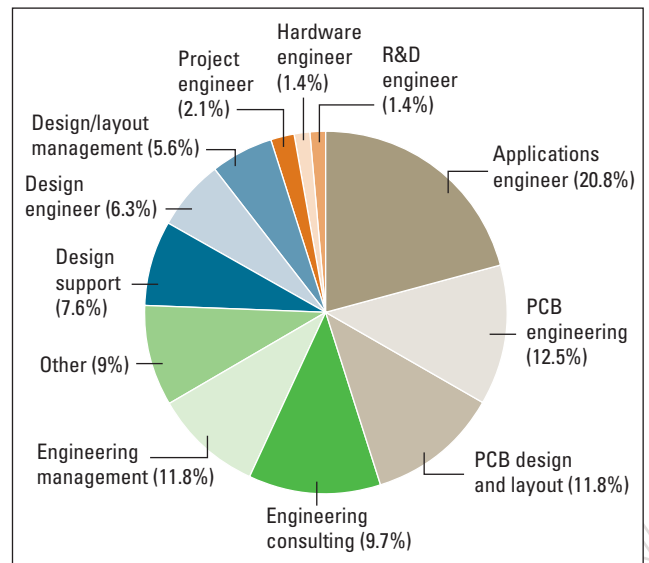


FIGURE 1. Respondents worldwide, by job function.

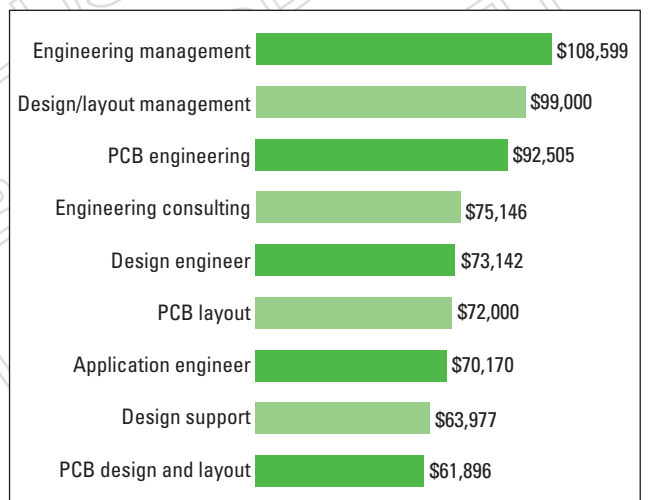


FIGURE 2. Average U.S. base salary by job function.

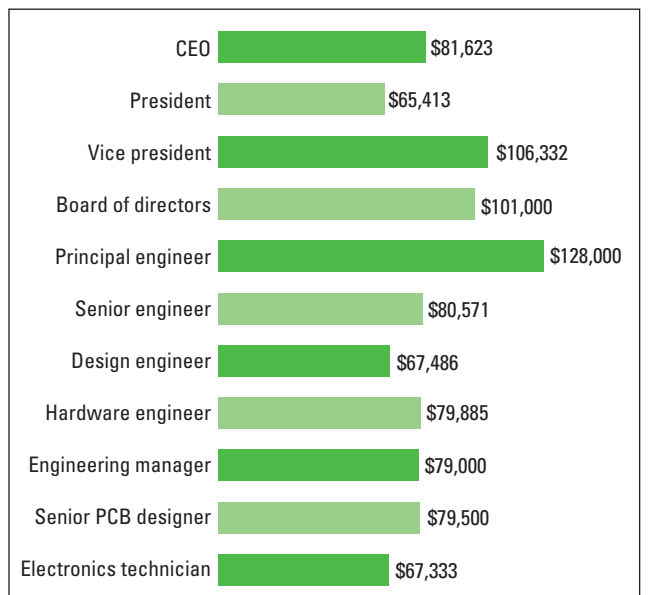


FIGURE 3. Average U.S. base salary by job title.

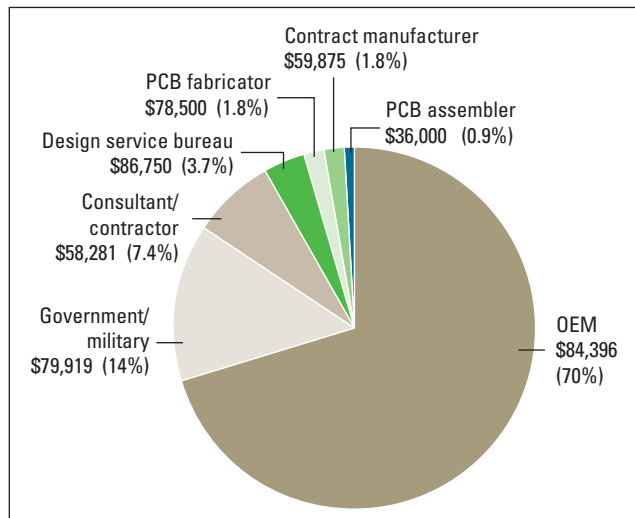


FIGURE 4. Average U.S. base salary by company type.

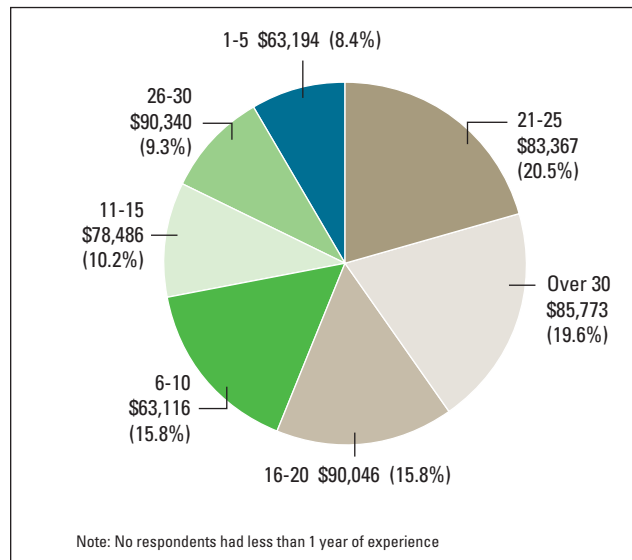


FIGURE 6. Average U.S. base salary by experience.

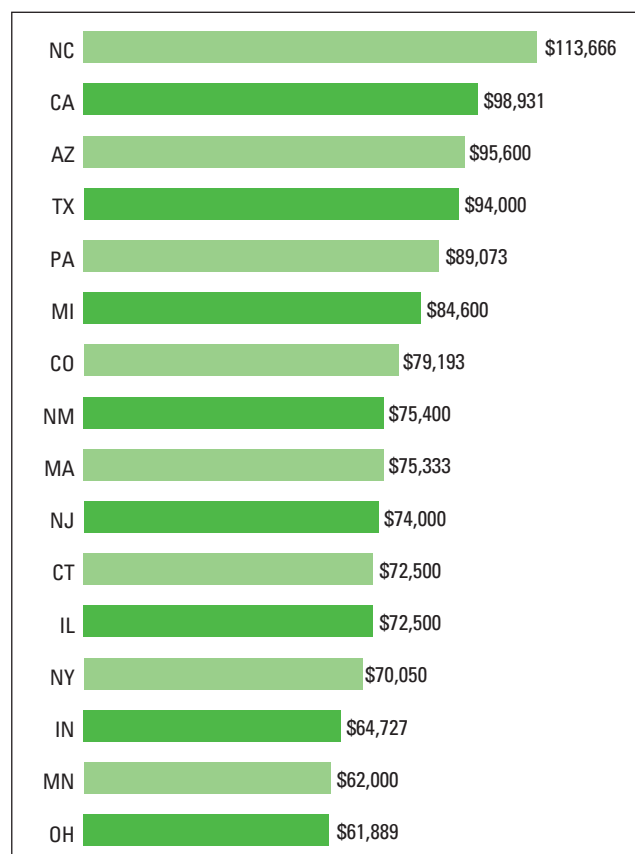


FIGURE 5. Average base salary by state. (All but a handful of respondents live in these states.)

The Workplace

As in past surveys, an overwhelming majority of U.S. engineering respondents – 70% – work for OEMs (FIGURE 4). Government/military firms employ 14%, while consultant/contractors claim 7.4% and service bureaus came in at 3.7%. But engineers toiling away at service bureaus and OEMs earn similar average base salaries, and lead the rest of the pack in pay. How consultant/contractors and contract manufacturers ended up dead last in remuneration is a mystery.

Looking at average U.S. base salary by end-product or

service provided, computers/office equipment wins with \$103,052, but claims only 10.2% of respondents. Communications equipment, at 17.7%, pays \$89,688. (Our salary surveys usually find more designers and engineers involved with communications equipment than any other end-product.) Industrial controls and aerospace/avionics tie at 13%, generating \$69,068 and \$91,628, respectively.

The state in which engineers are employed makes a big difference in base salaries (FIGURE 5). North Carolina takes the lead with \$113,666, while California comes in at \$98,931, followed by Arizona and Texas at \$95,600 and \$94,000, respectively. California is usually the base salary frontrunner when we sample designers and engineers together. The survey’s overall highest-paying city was San Jose, with an average base salary of \$111,371.

As in previous salary surveys, Canadians made up the second-largest nationality of respondents. The Canadian average base salary is C\$73,125. Only one female Canadian engineer responded, with a base salary of C\$45,000, but several of the males had six-figure salaries. Ontario boasted more Canadian respondents than any other province, with a C\$87,125 average base salary.

Education and experience are also fairly reliable indicators of base salary. Among U.S. respondents, the BSEE was the most popular education level, with 39% of respondents checking that box and averaging \$74,412 in base salary. Next come MSEEs at 22% of respondents and \$93,480. Only 4% are MBAs, but they lead the way with an average base salary of \$113,250. Bachelor’s degrees in disciplines other than electrical engineering were claimed by 10% of respondents, who averaged \$64,344. But where are all the Ph.D.s? Only 1% have “the degree,” averaging only \$65,000.

As in previous salary surveys, we don’t see much new blood among the U.S. engineering crowd (FIGURE 6). The biggest demographics have between 21 and 25 years of experience (20.5%) and over 30 years (19.6%). In other words, about half of U.S. respondents had over 21 years of experience. Not surprisingly, the highest base salaries were found among the “gray-

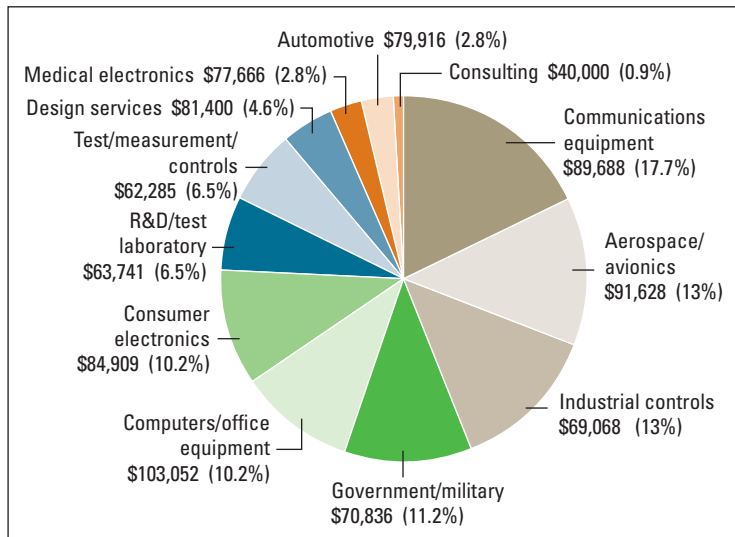


FIGURE 7. Average U.S. base salary by end product or service.

beards.” And as in past engineer/designer surveys, the salaries drop off above 30 years. This seems to be a result of older employees either being laid off and taking whatever jobs they can find or intentionally going into semi-retirement.

Happy Campers?

That might be going a little too far. But nearly 80% of survey respondents report being satisfied or very satisfied with their career choice. A tad over 60% are satisfied or very satisfied with their current job. Still, only 49% are satisfied or very satisfied with their employer’s corporate direction. We also have a statistical tie, with only 41% claiming to be satisfied or very satisfied with their current salary, and a fraction more feeling similarly warm and fuzzy about their advancement potential at their companies. This is borne out by conversations I’ve had with engineers at industry events: they tend to like – or even love – their actual career choice, but don’t get them started about their boss, their employer or their salary.

That leads us to the respondents’ remarks. We asked for comments on the PCB industry in general. Here are some of the more interesting responses:

- I would not encourage young people to pursue hardware engineering as a career.
- In the U.S., corporations see electrical engineers as the Rodney Dangerfields of professions – no respect and expendable.
- My job for each project is design, schematic, PCB layout, software if any, prototype assembly, debug, test, procure parts, and farm out assembly if many units. I am a one-man “do it all” shop and I think there are many others like me out there and I’m not sure you appreciate how many.
- The Chinese are making things difficult, but not impossible. I think that today’s management needs to get a better grip on what is going on.
- This startup business is fun, but it will be nice when some money starts coming in!
- Often the same engineer is involved in product spec, design, schematics, layout, DFT, and test/debug. This requires keeping current and fluent with all of the latest

technologies. Hopefully magazines such as *Printed Circuit Design & Manufacture* will be able to assist in this area.

- The government should start paying its employees a living wage.
- It hurts us all that so many good jobs are going overseas.
- Just wondering when we will see a “recovery” in the high-tech job sector?
- I like my job. PCB industry very, very competitive.
- When will it all go to China?

No one knows what the future hold for PCB design engineers. IEEE USA reported that the number of employed electrical and electronics engineers rose by 24,000 from the first to second quarters of 2004, from 327,000 to 351,000. This figure, however, is still below the 363,000 EEs employed in Q2 2003.

The news from Wall Street is ambiguous; a recovery is clearly underway, but it’s taking its sweet time. As one of respondent commented, “Where is this recovery everybody on the news talks about?”

Still, the results of this salary survey should give you some idea whether you’re being paid a fair wage. If this survey should help you land a raise, it will have done its job.

Visit the *PCD&M* Web site (www.pcdandm.com) for complete survey statistics. **PCD&M**

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