

INDUSTRY PROFILE

Engineering Services

8.18.2020

NAICS CODES: 54133, 54134

SIC CODES: 7389, 8711

Industry Overview

Companies in this industry apply engineering principles to design and develop structures, systems, and processes. Major companies include AECOM, Bechtel Group, and Jacobs Engineering (all based in the US), along with Abengoa (Spain), Babcock International (UK), SNC-Lavalin Group (Canada), Wood Group (UK), and Worley (Australia).

Construction spending, particularly in emerging markets, drives global demand for engineering services. Annual worldwide spending for engineering services reached \$840 billion in 2016 and will exceed \$1 trillion by 2021, according to Technavio.

The US engineering services industry includes about 65,000 establishments (single-location companies and units of multi-location companies) with combined annual revenue of about \$240 billion.

Competitive Landscape

Success in the engineering services industry requires efficient bidding and cost controls. Customers are more knowledgeable about costs and are breaking up projects into smaller elements -- potentially reducing efficiencies of scale -- and are expecting contractors to take on the bulk of cost risk, according to PricewaterhouseCoopers. Reduced government and commercial spending on infrastructure and construction projects during times of economic or political discord can diminish bidding opportunities.

Small firms, which can effectively compete with larger ones by having expertise in a particular field or region, are often hired as consultants on larger projects if they have applicable expertise. Large firms are advantaged in designing and managing large projects, but may face challenges on smaller projects in fields where they lack specialization. Consolidation among smaller players is common under flat market conditions. The US industry is fragmented: the 50 largest firms account for about 40% of revenue. Large global players have tended to originate in the US and Europe, but engineering and construction firms in China, India, and Korea are working to establish an international presence.

Competitive Advantages:

Efficient Cost Management -- Under fixed-cost contracts, companies bear the burden of cost overruns if estimates are inaccurate. Engineering firms must direct resources toward improved estimation and procurement processes.

Adopting New Technologies -- Emerging design and data tools are allowing companies to increase process efficiencies. The increased use of mobile technology and cloud computing allow large amounts of data to be shared, stored, and accessed from more places.

Identifying Specialization Opportunities -- The ability to successfully win contracts in highly competitive and lucrative market sectors is essential. Companies must target the most profitable market sectors and avoid less cost-effective areas of operation. Specializing in growing fields such as environmental, telecom, or infrastructure engineering can gain companies competitive advantages in winning bids.

Companies to Watch:

AECOM specializes in commercial facilities such as sports centers but also designs for energy, transportation, government, and water projects. The company provides a range of engineering, construction, and management services.

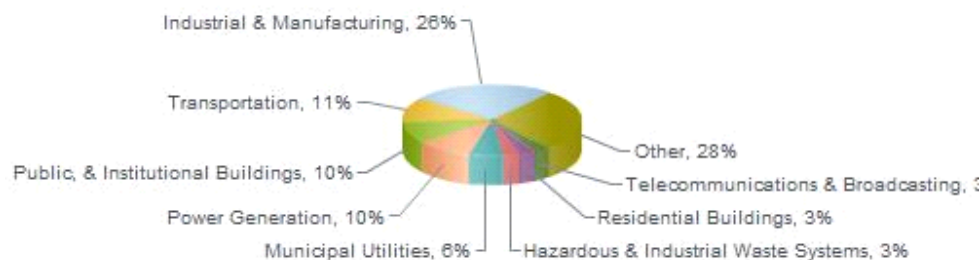
Bechtel Group has offices in about 25 countries around the globe. The company focuses on large energy and mining projects.

Wood Group provides design, consulting, and project management for oil and gas, clean energy, mining, and environmental sectors.

Products, Operations & Technology

Major engineering services include construction design and management, industrial process design, systems engineering, and maintenance and operations. Industrial and manufacturing projects account for about a quarter of industry revenue, followed by transportation, power generation, and commercial building projects (each around 10% revenue). Other fields include municipal utility, residential building, telecommunications, waste management, and power transmission projects.

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Engineering projects require skills in analysis, planning, design, development, project management, and operations. Most firms specialize in a particular field of engineering; companies that provide engineering services to the construction industry tend to be among the biggest in terms of revenue. Larger firms serve a range of industries and may also provide architectural, construction, and maintenance services. Most engineering work is **per project**, such as designing and constructing a highway or formulating an environmental plan for a wetlands area.

Engineering firms sell the knowledge and skills of their employees, so attracting and retaining qualified engineers is an ongoing concern. Due to the complexity of many jobs, engineering firms often hire **subcontractors** and consultants to perform specialized work. Material inputs are provided by subcontractors.

Technology

Technology trends influence how engineers work. The increased use of mobile technology and cloud computing allow large amounts of data to be shared, stored, and accessed from more places. **3D printing** technology has transformed the way new products are modeled and developed, allowing engineers to transform plans into tangible objects more quickly and affordably. The growing ubiquity of the internet of things (IoT) and proliferation of machine-generated data are increasing demand for analytics and storage.

Emerging technologies also create new demand for engineering services. Examples include efforts to improve energy efficiency using "smart grids," electricity delivery systems that better utilize computer networking and automation technologies; investments by manufacturers in robotics and other automation technologies; and integration of composites and other new materials into transportation equipment.

Sales & Marketing

Typical customers include governments; industrial, manufacturing, and commercial enterprises; real estate developers; and construction firms. Some companies rely on government entities for the majority of their business.

Many firms depend on large customers for repeat business. Because **referrals** are an important source of new

customers, firms cultivate relationships with past customers, other engineering firms, architects, and construction companies. Firms may advertise their expertise in trade magazines. Many engineering contracts are obtained after a **bidding process**. In the private sector, a customer typically invites several firms to bid on a particular project. Public sector bids are usually open to all bidders who meet certain basic technical and financial qualifications. The bidding process usually involves preparing a detailed plan of action for a project and a cost estimate. Firms often **collaborate** to bid on large projects that require a range of expertise.

Contracts are awarded to an engineering firm under a variety of **pricing** schemes that assign the **risk of cost overruns**. Under a **fixed-cost** (or lump sum) contract, an engineering firm is responsible for any costs incurred in excess of those forecast, but can also make a bigger profit if costs are less. Under a cost reimbursable (or **cost plus**) contract, the customer pays for all costs, plus a fee that may be a lump sum or a markup on labor costs. Under a **guaranteed maximum price** contract, the customer pays a fee plus all costs up to a maximum amount. Additional terms may be negotiated in any of these contracts to address how costs are handled if the customer changes the project's scope.

Finance & Regulation

Engineering firms typically receive **progress payments** as they work on a project, but cash flow can be highly uneven, especially for smaller firms that work on just a few projects at a time. Final payments are often delayed until well after a project is finished ("retainage").

For the industry in the US, the **working capital** to sales ratio averages about 14%. Accounts receivable are often high -- about 55 days' sales, on average -- and disputes with customers about payments and reimbursable costs are common. Some small and mid-sized companies use factoring, asset-based lending, bank financing or online receivables financing to help fund their businesses.

Typical gross margins for engineering firms in the US are about 60% of net sales. Labor is the major cost for most firms, and is divided between direct (project-related) and indirect (general overhead, marketing, and personal leave) expenses. Costs for liability **insurance** can be high because poor engineering can have catastrophic consequences.

Working Capital Turnover by Company Size

The working capital turnover ratio, also known as working capital to sales, is a measure of how efficiently a company uses its capital to generate sales. Companies should be compared to others in their industry.



Financial industry data provided by MicroBilt Corporation collected from 32 different data sources and represents financial performance of over 4.5 million privately held businesses and detailed industry financial benchmarks of companies in over 900 industries (SIC and NAICS). More data available at www.microbilt.com.

Regulation

Engineering firms must comply with numerous federal, state, and local building codes, safety regulations, hiring practices, and environmental rules. Public projects often entail even more detailed regulations. Companies

generally have to maintain detailed records of many activities associated with a project. Certain engineering specialties may require licensing to practice in a state. Companies working for government agencies must comply with procurement laws and anti-bribery laws.

International Insights

Annual global spending for engineering services reached \$840 billion in 2016 and will exceed \$1 trillion by 2021, according to Technavio. Top engineering companies based outside the US include Abengoa (Spain), Babcock International (UK), SNC-Lavalin Group (Canada), Wood Group (UK), and WorleyParsons (Australia). Global engineering consultancies often are managed regionally, which increases understanding of clients in different markets.

A **construction boom** in developing countries and tough competition at home have prompted many European engineering firms to expand to emerging markets. Despite some significant political and financial risks, most large firms see advantages in overseas markets with strong urban and consumer growth trends. The global construction market is valued at about \$8 trillion, and will be worth \$15.5 trillion by 2030, according to Global Construction Perspectives and Oxford Economics. Over the next decade, growth in emerging markets such as India, China, Indonesia, and Mexico is expected to outpace that in developed countries.

Qualified workers are a critical need for global engineering service firms. Although developing countries such as India produce plenty of engineers, only half of engineering graduates have employable skills. Engineers that are trained to follow set processes only are not as sought-after as are engineers who have been exposed to global best practices and innovative approaches to engineering, according to Global Services Media.

Engineering services firms are subject to numerous **environmental regulations** worldwide, which vary by country. Firms that create environmental damage from construction and maintenance projects may be liable for remediation costs, which can total millions of dollars.

Regional Highlights

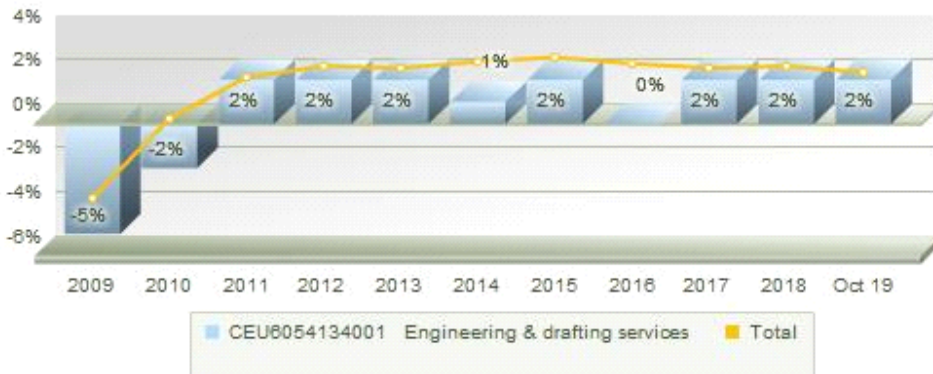
In the US, about 30% of engineering services establishments are located in [California](#), [Florida](#), and [Texas](#) -- populous states with many construction projects. [California](#), [Texas](#), [Florida](#), [New York](#), [Washington](#), and [Illinois](#) typically are the states with the highest-valued commercial construction activity. Smaller companies often work locally. However, large companies prefer to work in a range of markets to reduce exposure to risks that may affect a particular geographic region. Small US firms close to the Canadian border may partner with Canadian engineering firms to bid on projects.

Human Resources

Most employees in engineering services have special technical or engineering skills and are accordingly **well paid**. Average hourly industry wages are significantly higher than the national average. Starting salaries for engineering graduates (most fields require a bachelor's degree) are among the highest in the US, at about \$69,000, according to the National Association of Colleges and Employers. The industry's injury rate in the US is significantly less than the national average for all industries.

Construction growth and the demand for workers with **advanced technical skills** are improving job prospects for all types of engineers. Demand for engineers is also being driven by older engineers reaching retirement age. In addition, the increase in construction around the world is creating new opportunities for engineers. Civil, mechanical, industrial, electrical, and electronics engineers make up two-thirds of the US engineering workforce; growing specialties include petroleum, geological, and industrial engineers.

Industry Employment Growth
Bureau of Labor Statistics



Average Hourly Earnings & Annual Wage Increase Bureau of Labor Statistics



Industry Growth Rating



Demand: Depends on construction and industrial activity
Requires accurate project cost estimating
Risk: Housing slumps and liability lawsuits

Quarterly Industry Update

8.18.2020

Trend: Scenario-Planning Tool Gears Towards Megacity Experience - Following the success of its first fully developed future world - the Floating City, US-based American Society of Civil Engineers (ASCE) sets to launch the Megacity in October 2020 which further proves the viability of its Future World Vision Project across the industry. The project aims to put civil engineers in the position to lead not only in the present times but decades into the future, using data-driven, in-depth scenario-planning analysis, reported by ASCE News. Earlier in 2019, ASCE had identified six future macro trends namely, climate change, alternative energy, high-tech construction/advanced materials, autonomous vehicles, smart cities, and policy and funding to which the future-world scenarios intend to address. Akin to the Floating City, the interactive, immersive Megacity is being constructed in a real-time 4D computer simulation, with the aim of solving challenges arising from a highly-dense megacity, specifically, on how a city would increase its density to accommodate 50 million inhabitants while preserving its historic character,

promoting accessible green space and supporting a plurality of lifestyles and economies.

Industry Impact - Engineering services firms may consider expanding their investment in real-time 4D computer simulation when creating project designs to further gain customer trust and boost sales. Engineering service providers may also need to prepare for these possible future-world scenarios to keep up with the trend arising from this initiative.

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4.20.2020

Challenge: COVID-19 Outbreak Disrupts Supply Chain - The spread of novel coronavirus has affected the global manufacturing and supply chain, which can disrupt the business conditions of engineering companies. The epidemic's impact on travel and logistics restrictions, and industrial production has interrupted the usual operations both of manufacturers and the companies which rely on them for products or service. For one, Germany's export partners in China and Italy hit by the outbreak has already weakened its economy. German mechanical engineering is expected to plummet further in 2020 after a 1.5% drop in 2019, Reuters cites VDMA, an engineering industry association.

Industry Impact - Engineering services firms may need to implement contingency plans and foresight to meet business demands and to maintain operations. One way to address the rising concern of the supply chain is to look for alternative international markets for resources. Companies are also to consider their employees, which may be subjected to public health regulations.

3.23.2020

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Industry Indicators

US corporate profits, an indicator of corporate demand for engineering services, fell 20.1 percent in the second quarter of 2020 compared to the same period in 2019.

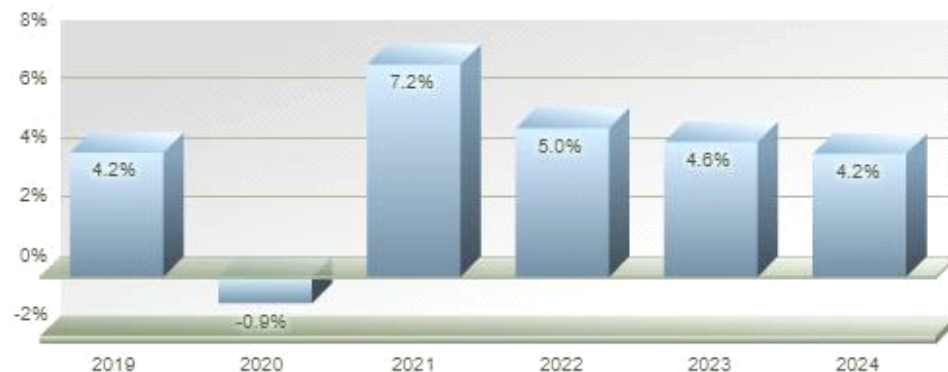
Total US manufacturers' shipments, an indicator of demand for engineering services used in the manufacturing process, fell 8.3 percent year-to-date in July 2020 compared to the same period in 2019.

The value of US nonresidential construction spending, a demand indicator for engineering services used in construction, rose 2.7 percent year-to-date in July 2020 compared to the same period in 2019.

Total US revenue for engineering services fell 11.7 percent in the second quarter of 2020 compared to the same period in 2019.

Industry Forecast

Revenue (in current dollars) for US engineering and R&D services is forecast to grow at an annual compounded rate of 5% between 2020 and 2024. Data Published: July 2020



First Research forecasts are based on INFORUM forecasts that are licensed from the Interindustry Economic Research Fund, Inc. (IERF) in College Park, MD. INFORUM's "interindustry-macro" approach to modeling the economy captures the links between industries and the aggregate economy. [Forecast FAQs](#)

Industry Drivers

Changes in the economic environment that may positively or negatively affect industry growth.

Data provided by First Research analysts and reviewed annually



Construction Spending Change in the overall level of commercial and residential construction spending



Technology Innovation Advances in science and technology, including information technology

Critical Issues

Dependence on Construction, Industrial Production - Demand in major engineering fields such as construction and industrial process design depends heavily on the health of regional economies. During economic slowdowns, when governments and corporations may lack funding to pay for new construction or maintenance projects,

engineering firms are disproportionately hurt. Certain types of engineers, such as petroleum engineers, can enjoy high demand when energy prices are high.

Vulnerability to Project Cost Overruns - Project cost overruns are a primary cause of financial distress for engineering companies. Some firms have incurred heavy losses from underestimating costs, forcing them to divest business units or file for bankruptcy. In addition to paying for cost overruns, engineering firms can be penalized for not meeting deadlines.

Business Challenges

Vulnerability to Litigation - The nature of engineering work leaves firms open to liability lawsuits, both for poor work and inattention to regulations, as poor engineering work can result in injury and death. The increasing complexity of many engineering projects increases the likelihood of errors. Engineering service firms must comply with a large number of regulations, the improper handling of which can result in criminal fines and penalties.

Dependence on Skilled Personnel - Because expertise is their major asset, engineering firms depend heavily on employees' skills. Knowledge, particularly client-specific knowledge, is very difficult to replace. Many small firms say that finding good employees is the most difficult management issue. Technical advances are rapid in many engineering specialties, making finding and training qualified engineers more difficult.

Uneven Workload, Cash Flow - Because work in the industry is on a project basis, work demands can be very uneven, especially for smaller firms. Cash flow is also uneven, even for firms with continuous work, because the bulk of payments are made upon a project's completion. Small firms can't usually afford to cut their workforce when activity is slow because they need to retain the expertise.

Status of Guest Workers - Demand for engineers is robust. In order to fill some of those roles, many in the engineering industry are pushing for immigration reform that could help guest workers stay in the country on a permanent basis. Many US engineering master's and doctoral students are foreign nationals, according to the National Science Foundation. Many leave the US after graduation due to US immigration policies. Immigration reform could make it easier for science, math, and engineering graduates to become permanent residents. However, some argue that the US produces plenty of engineering graduates and that an influx of highly skilled guest workers could lead to lower wages in the industry.

Business Trends

Consolidation - To broaden the types of services they provide and enhance geographic coverage, engineering firms have grown through acquisitions. The largest firms are the most likely to be involved in M&A activity. Consolidation in customer industries, among construction and chemical companies, for example, is encouraging consolidation among the engineering firms that serve them.

Greater Project Complexity - The increasingly technical nature of the US economy has, and will continue to, increase demand for engineering services. More technological equipment, crowded urban areas, government regulation, heightened environmental concerns, and a greater emphasis on product durability, all place more demand on designers. Even small projects often require a high engineering content, and large projects may be so complex that engineering costs surpass actual construction expenses.

Design/Build Contracts - While the design and construction phases of a project, in many cases, are still handled by different companies, more contracts are being awarded to firms that can handle both. To compete for design/build contracts, firms must have both design and construction skills. Under so-called EPC contracts (engineering, procurement, construction), engineering firms must also have a procurement function.

Expanded Engineering Applications - Engineering is a key part of emerging sciences like nanotechnology, biomedicine, and computer technology. The lines between engineers and other scientists and designers are blurring, reshaping the entire engineering industry. These changes are influencing the licensing processes for professional engineers, including the type and format of engineering licensing exams.

Industry Opportunities

Increased Security Concerns - Concerns over terrorism affect engineering requirements on numerous projects. Structural safety, security, evacuation, and air circulation systems of buildings are likely to become a critical part of engineering design. More attention will be paid to building upgrades, such as improved structural supports and impact-resistant stairwells.

Cross-Marketing Engineering Capabilities - To diversify, firms are focusing on a "one-stop shopping" marketing approach. For example, if a new manufacturing facility is being considered, a single engineering firm may seek to handle background, permitting, land acquisition advice, building design, and machine and assembly line flow.

Electricity Infrastructure Investments - Civil engineering firms may benefit from an increase in electricity infrastructure investments. The cumulative investment gap for electricity infrastructure between 2016 and 2025 is estimated to be \$177 billion, according to the American Society of Civil Engineers. The group argues that these funds are needed to prevent problems such as equipment failures, voltage surges, and power quality irregularities that can cause blackouts and brownouts.

3D Printing Technology - Smaller-scale 3D printers are changing the way products are designed and manufactured. The printers allow items to be created instantly from a digital model. The process, which is also called additive manufacturing, can speed up the product development process and create substantial cost savings.

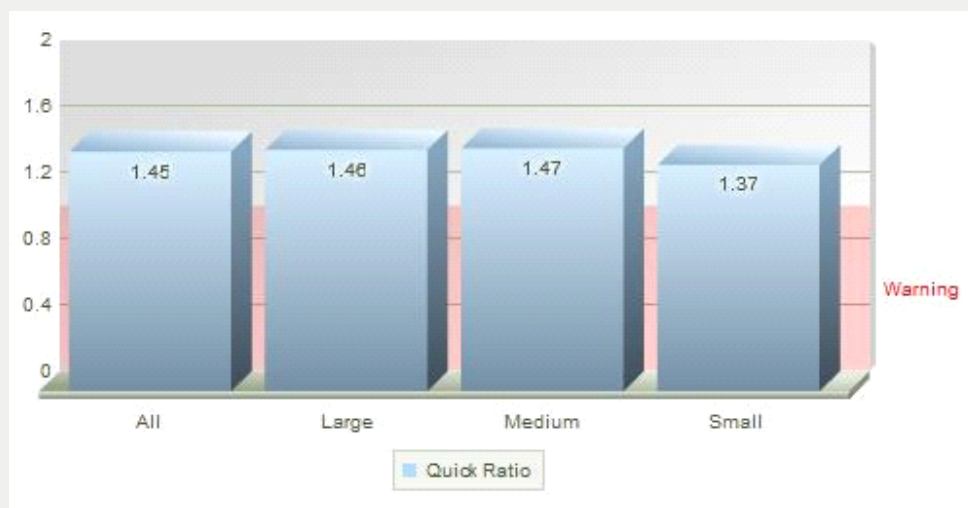
Green Building Growth -

Financial Information

COMPANY BENCHMARK TRENDS

Quick Ratio by Company Size

The quick ratio, also known as the acid test ratio, measures a company's ability to meet short-term obligations with liquid assets. The higher the ratio, the better; a number below 1 signals financial distress. Use the quick ratio to determine if companies in an industry are typically able to pay off their current liabilities.



Financial industry data provided by MicroBilt Corporation collected from 32 different data sources and represents financial performance of over 4.5 million privately held businesses and detailed industry financial benchmarks of companies in over 900 industries (SIC and NAICS). More data available at www.microbilt.com.

Current Liabilities to Net Worth by Company Size

The ratio of current liabilities to net worth, also called current liabilities to equity, indicates the amount due creditors within a year as a percentage of stockholders' equity in a company. A high ratio (above 80 percent) can indicate

trouble.



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COMPANY BENCHMARK INFORMATION

NAICS: 54133, 54134

Data Period: 2018

Last Update February 2020

Table Data Format

Mean

Company Size	All	Large	Medium	Small
Size by Revenue		Over \$50M	\$5M - \$50M	Under \$5M
Company Count	54366	109	1288	52969

Income Statement				
Net Sales	100%	100%	100%	100%
Gross Margin	59.3%	58.8%	60.3%	61.3%
Officer Compensation	5.2%	4.9%	5.7%	6.1%
Advertising & Sales	0.3%	0.3%	0.3%	0.3%
Other Operating Expenses	52.3%	52.1%	52.6%	53.0%
Operating Expenses	57.7%	57.4%	58.7%	59.5%
Operating Income	1.5%	1.5%	1.7%	1.9%
Net Income	0.7%	0.7%	0.8%	1.0%

Balance Sheet				
Cash	16.4%	16.2%	16.8%	17.8%

Accounts Receivable	31.7%	31.2%	34.5%	33.2%
Inventory	3.7%	3.6%	4.6%	4.1%
Total Current Assets	63.5%	62.4%	68.3%	67.8%
Property, Plant & Equipment	15.1%	15.8%	12.1%	12.3%
Other Non-Current Assets	21.4%	21.8%	19.6%	19.9%
Total Assets	100.0%	100.0%	100.0%	100.0%
Accounts Payable	10.5%	10.4%	10.7%	11.4%
Total Current Liabilities	34.2%	33.4%	36.2%	38.8%
Total Long Term Liabilities	19.2%	18.1%	22.5%	25.3%
Net Worth	46.6%	48.5%	41.3%	35.9%

Financial Ratios

(Click on any ratio for comprehensive definitions)

Quick Ratio	1.45	1.46	1.47	1.37
Current Ratio	1.86	1.87	1.89	1.75
Current Liabilities to Net Worth	73.3%	68.8%	87.6%	107.9%
Current Liabilities to Inventory	x9.14	x9.25	x7.93	x9.43
Total Debt to Net Worth	x1.15	x1.06	x1.42	x1.78
Fixed Assets to Net Worth	x0.32	x0.33	x0.29	x0.34
Days Accounts Receivable	55	56	55	53
Inventory Turnover	x22.78	x23.30	x19.86	x21.70
Total Assets to Sales	47.9%	49.1%	43.8%	43.5%
Working Capital to Sales	14.0%	14.3%	14.1%	12.6%
Accounts Payable to Sales	5.1%	5.1%	4.7%	5.0%
Pre-Tax Return on Sales	1.2%	1.1%	1.3%	1.5%
Pre-Tax Return on Assets	2.5%	2.3%	2.9%	3.5%
Pre-Tax Return on Net Worth	5.3%	4.7%	7.1%	9.9%
Interest Coverage	x2.26	x2.10	x2.52	x3.08
EBITDA to Sales	3.7%	3.6%	3.9%	4.1%
Capital Expenditures to Sales	2.4%	2.3%	2.3%	2.5%

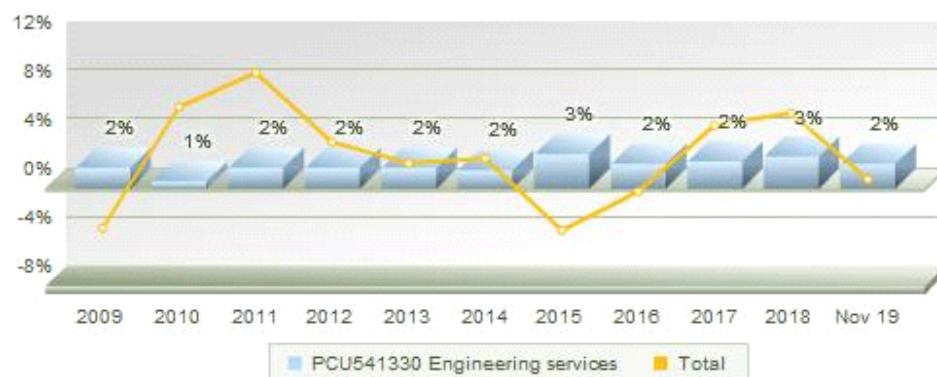
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ECONOMIC STATISTICS AND INFORMATION

Annual Construction Put into Place - Census Bureau



Change in Producer Prices - Bureau of Labor Statistics



VALUATION MULTIPLES

Engineering Services

Acquisition multiples below are calculated medians using at least 3 US private industry transactions completed between 1/2008 and 12/2019 and are based on middle-market transactions where the market value of invested capital (the selling price) was less than \$1B. Data updated annually. Last updated: December 2019.

Valuation Multiple	MVIC/Net Sales	MVIC/Gross Profit	MVIC/EBIT	MVIC/EBITDA
Median Value	0.7	0.8	4.5	3.8

MVIC (Market Value of Invested Capital) = Also known as the selling price, the MVIC is the total consideration paid to the seller and includes any cash, notes and/or securities that were used as a form of payment plus any interest-bearing liabilities assumed by the buyer.

Net Sales = Annual Gross Sales, net of returns and discounts allowed, if any.

Gross Profit = Net Sales - Cost of Goods Sold

EBIT = Operating Profit

EBITDA = Operating Profit + Noncash Charges



SOURCE: DealStats (formerly Pratt's Stats), 2019 (Portland, OR: Business Valuation Resources, LLC). Used with permission. DealStats is available at <https://www.bvresources.com/learn/dealstats>

Industry Websites

American Institute of Chemical Engineers

Conference, publication, education, training, government and industry information.

American Society of Civil Engineers

Up-to-date information on civil engineering.

American Society of Mechanical Engineers

News, links, and more.

Association of Consulting Engineering Companies - Canada

News and publications.

Chemical Engineering

Engineering articles, news, product roundups, seminars and conferences, links, job advice, and more.

Civil + Structural Engineer

News.

Dodge Data & Analytics

Construction forecast.

Engineering News-Record

News by specialized areas.

Institute of Transportation Engineers (ITE)

Legislative and regulatory information, employment opportunities, transportation news and events.

Mechanical Engineering Magazine

News updated three times a week, product trends and literature information.

National Academy of Engineering

Publications, news, events, directories, and research reports.

Society of Manufacturing Engineers

News, education, trade shows. Salary surveys.

The Institute of Electrical and Electronics Engineers (IEEE)

Publications, product and services information, news and conferences.

Glossary of Acronyms

ASCE - American Society of Civil Engineers

BRIC - Brazil, Russia, India, China

CRM - Customer Relationship Management

ENR - *Engineering News-Record*

EPC - engineering, procurement, construction

CAD - computer-aided design

IoT - Internet of Things

ESO - engineering services outsourcing

EPC - engineering, procurement, construction