

ARCHITECTURE AND CONSTRUCTION IN VIRGINIA

Welcome to the Career Cluster Brief on Architecture and Construction in the Commonwealth. This brief highlights information important to each of the three pathways - Construction, Operations/Maintenance, and Design/Pre-Construction - included in this career cluster.

Though this cluster faced notable challenges throughout the recent recession - namely, low investment and high unemployment - signs point to a healthy recovery as the economy shows improvement. Careers in this cluster are available across all education levels, though a majority of jobs in the construction pathway do not require college degrees, underscoring the importance of strong high school CTE programs.

What trends do we currently see in Architecture and Construction? What trends may we anticipate? In this brief, we address those questions as we share important numbers, discuss state priorities, and talk about emerging technologies in Architecture and Construction.

180,000

Number of people employed
full-time in construction in
Virginia, January 2014.

ARCHITECTURE AND CONSTRUCTION IN VIRGINIA: SKILLED PEOPLE NEEDED EVERYWHERE

The pace of activity in architecture and construction in Virginia is picking up after the blows dealt by the recent recession. In fact, Virginia employers, similar to construction employers across the nation, express concerns about finding enough workers to meet a resurgent demand and to fill positions as older workers in the skilled trades retire.

Three issues emerge for Virginia's CTE programs in meeting the demand for workers in this sector:

1. Growth in jobs in architecture and construction is outpacing the supply of workers
2. "Green" and energy-efficient construction requires new skills and creates new demands
3. Historic preservation creates opportunities for specialized work for those in skilled trades.

Architecture and Construction jobs are located in every region of the Commonwealth, and most are not outsourced or mechanized – making them great opportunities for employment.

Construction Sectors integral to Economic Growth

The health of Virginia's economy depends on a safe and efficient transportation system (roads, bridges, tunnels, rail, airports, ports); adequate housing for our growing population; and health care facilities to meet growing demand. None of these are

possible without a vibrant workforce in architecture and construction. **The Architecture and Construction sector is vital to Virginia's economic future.**

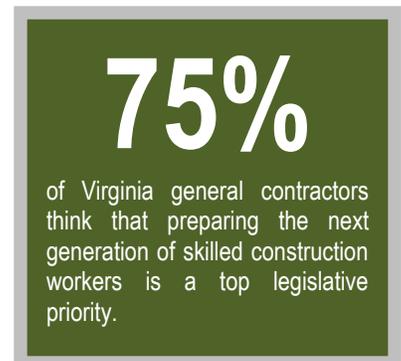
According to the March 2014 issue of Virginia Business Magazine:

- Multifamily housing construction is on the rise in Virginia, particularly in and around urban areas (suburban Richmond, downtown Roanoke, and in Northern Virginia around the expanding Silver Line Metro).
- The four new metro stations along the Silver Line in Northern Virginia have led to more than 45 million square feet in new development and will double the size of Tysons Corner.
- Last year's transportation funding bill is expected to direct more than \$4 billion into transportation construction and repair over the next six years.

Job Growth Outpaces the Supply of Skilled Workers

Nationwide, construction employment in February 2014 reached the highest total for that sector in 4½ years, according to the Associated General Contractors of America. Yet, two-thirds of construction firms reported having a hard time finding enough qualified workers to fill vacant positions. Virginia employers responding to the AGC survey reported:

- 44% added employees; 35% made no change; and 22% laid off employees in 2013.
- 50% reported having a hard time filling all or some key professional positions, specifically project managers/supervisors and estimating professionals.
- More than 75% of Virginia general contractors expect that hiring construction professionals and skilled craft workers will be as hard or harder in 2014 as in 2013.



More than three-quarters of Virginia construction employers consider preparing the next generation of skilled construction workers their top legislative priority.

Construction goes Green

Contributing to energy conservation and efficiency is a growing aspect of architecture and construction in Virginia, as in the nation. Attention to leading trends in insulation, solar power, and modernized water heating systems increased demand for construction professionals with skills in “green energy”. One quarter of Virginia contractors expect the demand for green or energy efficient construction to increase in the next year.

Treasuring the Past – Investing in the Future

A study recently conducted by Virginia Commonwealth University, as reported in January 2014 by Preservation Virginia, quantifies some of the economic benefit of rehabilitating, re-using and preserving historic Virginia buildings. It is estimated that investment in preservation and rehabilitation has contributed \$3.9 billion to the Commonwealth's economy. Furthermore, “rehabilitation expenses and their domino effect have also created more than 31,000 full and part-time jobs during a 17-year period and generated an estimated \$133 million in state and local tax revenues.”

EDUCATION, EMPLOYMENT & EARNINGS: ANALYZING DATA FROM ARCHITECTURE AND CONSTRUCTION

Architecture and Construction occupations comprise about 8% of jobs in Virginia. This sector is an excellent indicator of both the condition of the economy and current population trends. As is typical in most recessions, employment in goods-producing industries, such as construction, suffered between 2007 and 2009. In fact, during these years, construction experienced its largest decline since the World War II era.

With the end of the recession, there is expected to be increased demand for buildings, products, and services. As a result, career opportunities in this cluster are expected to grow. The Virginia Employment Commission - the source for data found in this section - projects that the industry will grow by 24 percent by 2020.

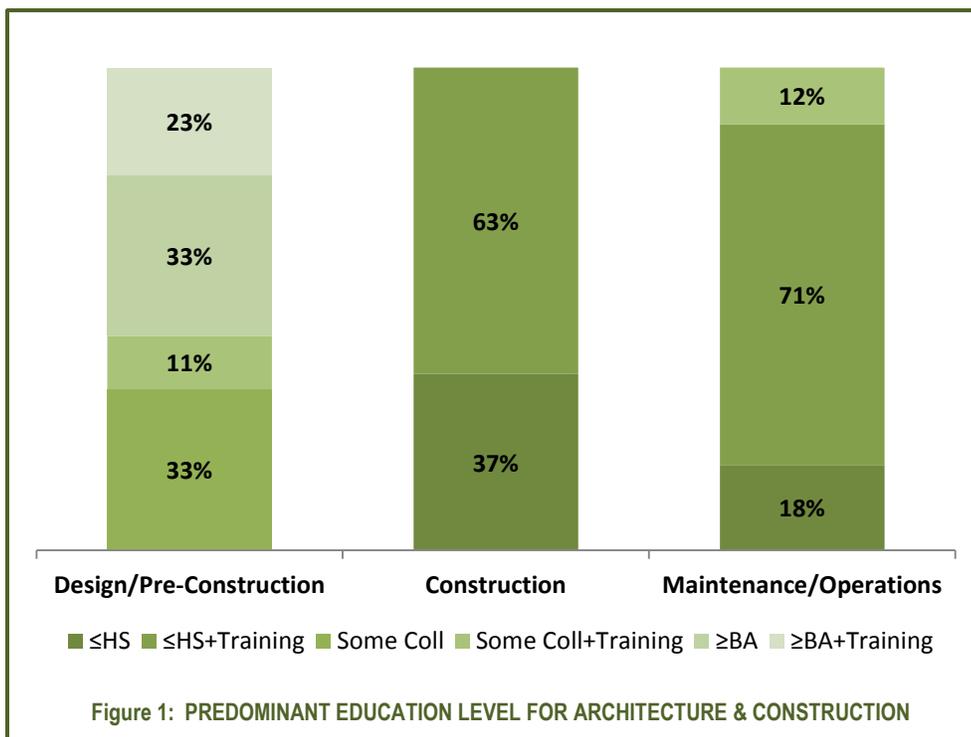
24%

Expected Growth in Architecture and Construction jobs by 2020.

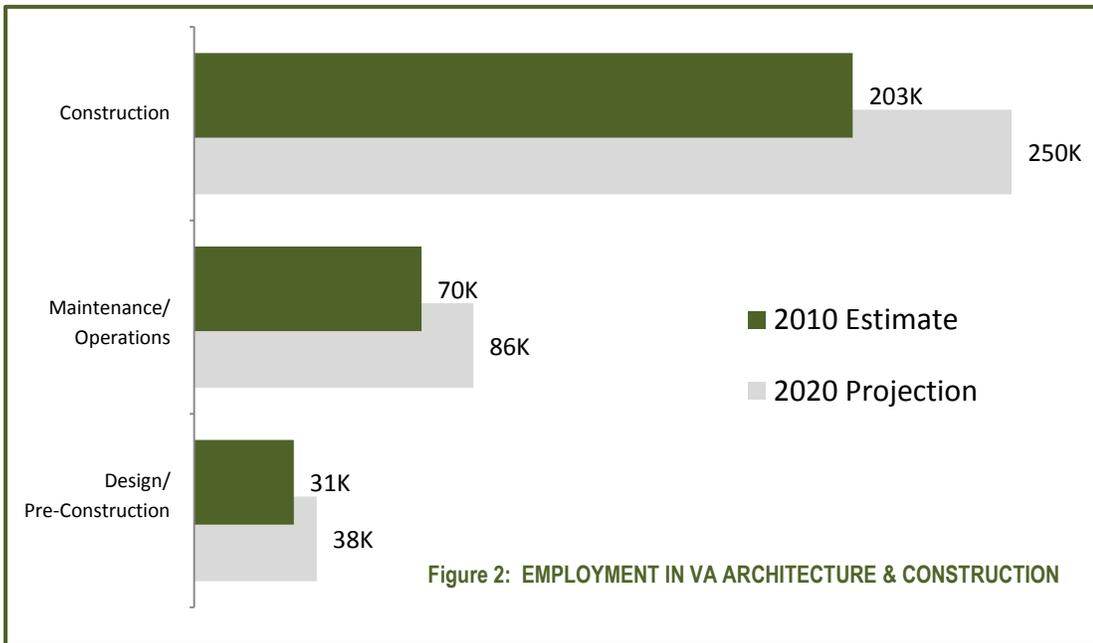
What follows is a snapshot of the pathways within the Architecture and Construction Cluster in terms of the three E's: **education**, **employment**, and **earnings**.

Education

Though formal educational attainment for most is below the post-secondary level (84%), 64% of the careers require preparation beyond secondary education, such as on-the-job training. Figure 1 shows the predominant level of education in the three pathways within Architecture and Construction.



Design/Pre-Construction has the most variation in terms of educational requirements, and more than half of the specializations in this pathway require a Bachelor's degree or more. On the other hand, most occupations in construction (as well as maintenance/operations) do not rely on advanced academic degrees. Because of the variety of occupations available to individuals with post-secondary degrees, workers with college diplomas may benefit from more opportunities to move up the industry ladder.



Employment

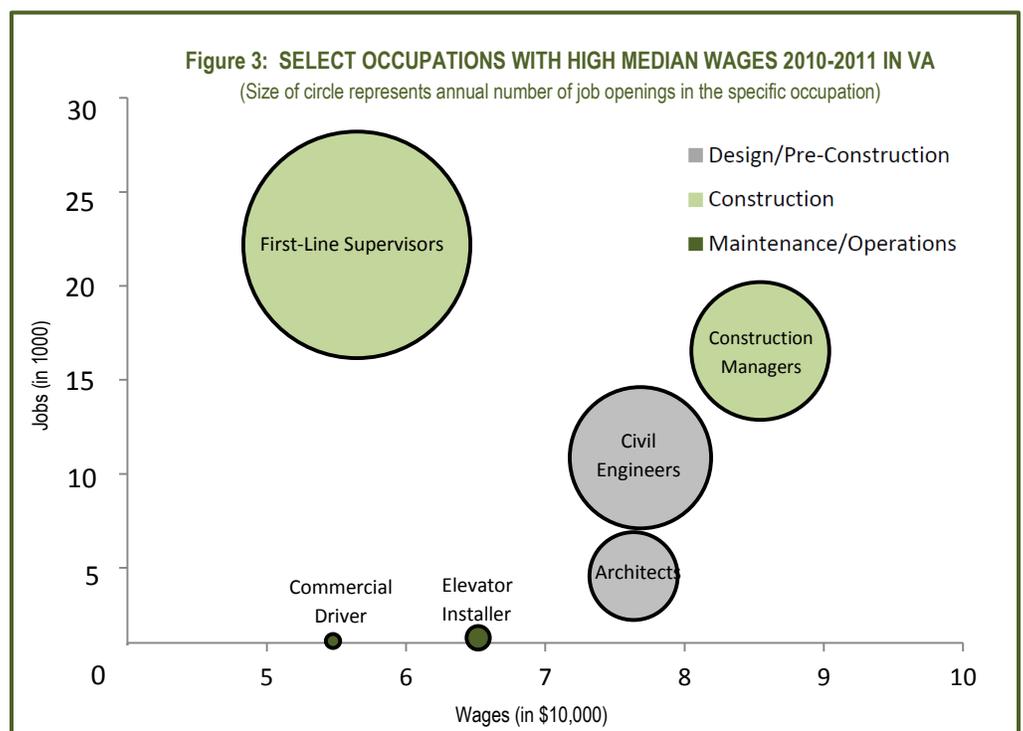
Comparing employment estimates of 2010 to 2020 projections shows that all pathways (Construction, Maintenance/ Operations, Design/Pre-Construction) will grow in this decade. More than 250,000 workers will be employed in construction in 2020, which is projected to experience the fastest growth (24%) among the three pathways.

Design/pre-construction and maintenance/operations are not far behind, with an anticipated 23% growth each. More than 375,000 jobs are expected across the entire cluster by 2020.

Earnings and Growth

As shown in Figure 3, **career growth for construction seems to be the most promising** in terms of current employment, wage-earnings and job openings. Construction managers are recorded to have the highest median wage of more than \$85,000; followed by architects (except landscape and naval) and civil engineers, each having median salaries of more than \$76,000.

While job growth for workers in Architecture and Construction varies across sub-specialties, almost all occupations are expected to expand by 2020; the most notable exception being among highway maintenance workers, whose numbers are projected to shrink. Overall, the industry will offer a lot of opportunities for workers in Virginia with over 13,000 annual job openings between 2010 and 2020.



THE ROLE OF TECHNOLOGY IN ARCHITECTURE AND CONSTRUCTION

The Architecture and Construction industry, like the Health Sciences field, is **adopting new technologies with the goals of reducing overhead cost, improving efficiency, and better meeting client needs and demands**. Though construction and architecture projects continue to require on-site labor and management, new technology is increasingly supplementing the work done by human hands. Career and Technical Education students with confidence and practice in new tech techniques will prove increasingly valuable to architecture and construction firms.

Three notable tech trends in the Architecture and Construction cluster include:

- Growth of **“big data”** in engineering, design, and building modeling,
- Related application of **building information management** software to model and design projects at a distance, and
- Increasing use of **three-dimensional (3D) printing** for prefabricating building components.

Big Data

“Big Data” is an increasingly common term in day-to-day language, and describes the extensive information we are able to capture—with increasing ease—about individuals, organizations, and communities. For example, a building superintendent of the 1990s who wanted to know whether individuals were using the building’s drinking fountains would probably have been limited to an infrequent in-person survey. Today, however, some drinking fountains come equipped with built-in sensors measuring the volume of water dispensed and how many times the fountain was in use, among other data points.

Information about drinking fountain use, frequently used entrances, most populated times of day, etc., can allow architecture firms to determine the most efficient building designs. Such designs may reduce utility costs to the building’s owner, or simply make individuals more likely to enjoy the physical space. The architecture and construction industry, though reportedly slow to incorporate Big Data into modeling and design, is paying increasing attention to the benefits it brings. As a result, Construction and Architecture projects are increasingly in need of effective data management.

Building Information Modeling

Good and plentiful data is necessary for effective use of Building Information Modeling (BIM), the industry term for virtual modeling of a construction project. The more accurate the data on building specifications and use, the better able designers are to develop good virtual models. BIM allows architects, engineers, and construction personnel to experiment with design, model building usage, and project the need for various utilities before committing time, money, and materials to a design. Equally as important, these virtual models may be shared between designer(s), contractor(s), and client(s), ultimately containing cost and improving client satisfaction.

Three Dimensional Printing

Though 3D printing is not yet a mainstream technique within the construction industry, the option to remotely produce building components to assemble on-site at a later time is increasingly viable. While current constraints on 3D printing (such as the trade-off between speed and precision) limit the technology’s current use, prefabricating building components—such as individual walls, or interior vents and grates for a ventilation system—is hypothesized to become a more popular practice in coming years.

Implications for CTE

Interactive mapping or energy modeling programs, like MyBuilding® or Autodesk®, are becoming important tools for the Architecture and Construction industry. In addition, data management skills are becoming increasingly important, even for construction employees not directly involved in information technology (IT). However, acquiring software licenses and the necessary hardware can be prohibitively expensive.

Though small, locally-operated architecture and construction firms may be less likely to use these technologies, mid-size and larger firms may implement BIM systems, 3D printers, sophisticated software or other tools to leverage Big Data. In addition, schools such as Virginia Tech incorporate BIM in various construction and engineering curricula. CTE programs may benefit from partnerships with such local firms or universities. But even without product-specific knowledge, the **students who are most familiar with the importance and use of Big Data, as well as software programs that can harness it, will be most likely to thrive in this increasingly technically-oriented field.**