



Phase II Completed Spotlight on Architecture & Construction

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CTE Director Meeting
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The Revision Process: Data Gathering & Research

- State and national employment trends
- Landscape of the construction industry
- Current enrollment numbers in existing programs of study
- CTE Educator Surveys
- Crosswalked current postsecondary offerings in Tennessee

Construction Job Outlooks

- Nationally, employment in construction occupations is projected to grow by **21.4%** between 2012 and 2022.
- Between 2012 and 2022, **2.3 million** job openings in construction occupations are projected nationally.¹
- In Tennessee, **21,090** openings are projected in construction occupations between 2012 to 2020. (**2,636** openings per year).²



¹ Bureau of Labor Statistics

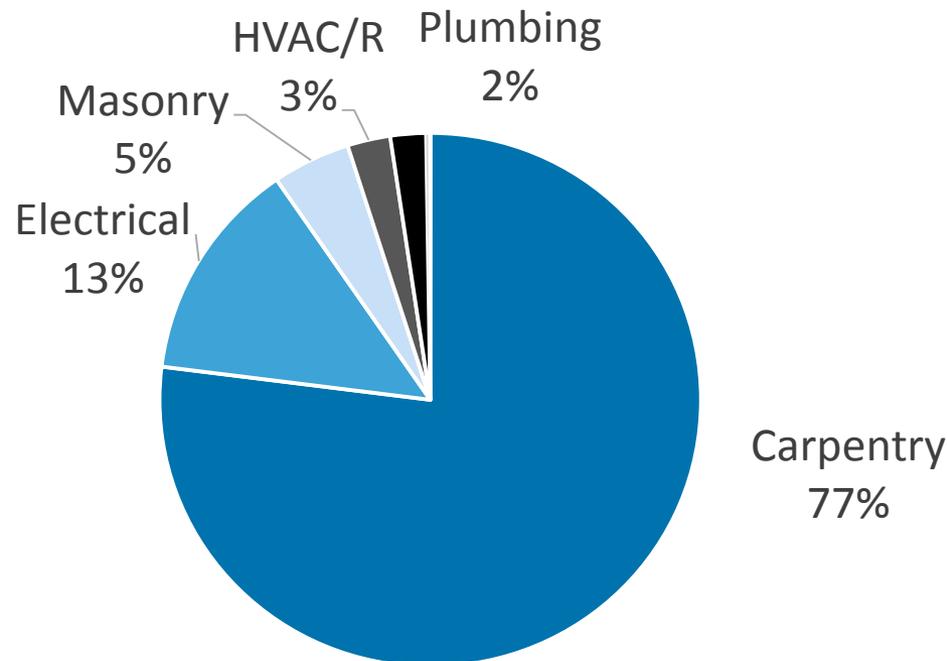
² TN Department of Labor and Workforce Development

Tennessee's Hot Careers in Construction to 2020

2012-2020 Average Annual Openings		Training Needed	Wage/ Yr
Maintenance and Repair Workers, General	845	Moderate-term on-the-job training	\$32,517
Electricians	620	Long-term on-the-job training	\$42,257
Carpenters (Construction)	525	Long-term on-the-job training	\$31,875
First-Line Supervisors of Construction Trades and Extraction Workers	460	Work experience in a related occupation	\$49,925
Plumbers, Pipefitters, and Steamfitters	415	Long-term on-the-job training	\$39,673
First-Line Supervisors of Mechanics, Installers, and Repairers	315	Work experience in a related occupation	\$60,277
Operating Engineers and Other Construction Equipment Operators	265	Moderate-term on-the-job training	\$34,628
Construction Managers	260	Bachelor's Degree	\$62,360
Painters, Construction and Maintenance	220	Moderate-term on-the-job training	\$25,540
Electrical Power-Line Installers and Repairers	190	Long-term on-the-job training	\$56,411
Cost Estimators	150	Work experience in a related occupation	\$54,620
Sheet Metal Worker	145	Moderate-term on-the-job training	\$35,370

2012-13 Tennessee Concentrators in Construction Trades Programs of Study

- In 2013, 1,886 Tennessee high school students concentrated in Carpentry, 329 concentrated in Electrical Systems, and 235 concentrated in HVAC, Plumbing, Masonry, or Concrete.



Quotes from Teacher Survey

- *“More emphasis should be placed on teaching and reinforcing the basics of these trades. Students need a firm foundation in their trades, and leave the specifics for on-the-job training (OJT).”*
- *“We really need a complete building program that covers all aspects of construction, site layout through finish where students can see how all disciplines are connected. Its almost impossible to do one trade without knowing something about all others.”*
- *“Students need to learn about basic contracts, building forms, bid sheets, etc., needed to run a small business. A lot of construction workers end up subcontracting and need to have a basic understanding of the paperwork needed.”*

Postsecondary Landscape

- Various apprenticeships
- Tennessee Colleges of Applied Technology offer a range of related programs. Most common offerings include:
 - Building Construction Technology
 - HVAC/R
 - Industrial Maintenance Electricity
- Four year universities:
 - Construction Management
 - Concrete Industry Management

On-the-job Training

- “However, regardless of education, most workers employed in infrastructure occupations rely on skills developed through on-the-job training. In total, 73 of the 95 infrastructure occupations, covering 10 million workers, call for short or long-term on-the-job training, or an apprenticeship, as general requirements for competency. Electricians, plumbers, and other traditional trade occupations are the most common in this respect.”

- Beyond Shovel-Ready: The Extent and Impact of U.S. Infrastructure Jobs, Joseph Kane and Robert Puentes, Brookings Institute

New Programs of Study

Architecture & Construction

Program of Study	Level 1	Level 2	Level 3	Level 4
Residential & Commercial Construction	Fundamentals of Construction (6073)	Residential & Commercial Construction I	Residential & Commercial Construction II ¹	Construction Practicum
Structural Systems	Fundamentals of Construction (6073)	Structural Systems I	Structural Systems II ¹	Construction Practicum
Mechanical, Electrical, & Plumbing (MEP) Systems	Fundamentals of Construction (6073)	MEP Systems	Electrical Systems (6075) -and/or- HVAC (6077) -and/or- Plumbing Systems (6082)	Construction Practicum
Architectural & Engineering Design	Architectural & Engineering Design I (6037)	Architectural & Engineering Design II (6039)	Architectural & Engineering Design III ¹ (5927)	Engineering Practicum (6141) -or- AP Calculus (3127, 3139, or 3128) -or- AP Physics (3238, 3239, 3234, or 3240)
Interior Design	Foundations of Interior Design (6014)	Residential Interior Design (6006)	Commercial Interior Design (6122)	Advanced Interior Design (6121)

¹ May be taught for 1 or 2 credits.

Available courses for elective credit in this cluster: *Introduction to Geographic Information Systems (GIS) (6142), Welding I (6078), Work-Based Learning: Career Practicum (6105)*

Construction

Architecture & Construction

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Residential & Commercial Construction

RESIDENTIAL & COMMERCIAL CONSTRUCTION	
COURSE SEQUENCE:	
1	Fundamentals of Construction
2	Residential & Commercial Construction I
3	Residential & Commercial Construction II
4	Construction Practicum

- Covers the entire building construction process
- Students develop basic skills in major trades: carpentry, electrical, masonry, concrete, and plumbing.
- Level 2 covers site layout, concrete, basic carpentry (framing), and basic electrical.
- Level 3 includes focus options:

A

- Principles of Carpentry (Roofing & Exterior Finishing)
- Introduction to Masonry

B

- Plumbing Systems
- Principles of Electrical Systems
- Introduction to HVAC

Residential & Commercial Construction

RESIDENTIAL & COMMERCIAL CONSTRUCTION	
COURSE SEQUENCE:	
1	Fundamentals of Construction
2	Residential & Commercial Construction I
3	Residential & Commercial Construction II
4	Construction Practicum

Ideal Application:

- This POS works well in schools or districts with the capacity to offer only one construction pathway, as it focuses on basic skills useful in many construction career pathways.

Teacher Endorsements:

- To teach Residential & Commercial Construction I & II, teachers must hold the 580 Construction Maintenance Trades endorsement or a minimum of three of the following endorsements: 522, 523, 524, 527, 598, or a minimum of three of the following endorsements: 701, 702, 703, 706, 707.

Construction

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Structural Systems

STRUCTURAL SYSTEMS	
COURSE SEQUENCE:	
1	Fundamentals of Construction
2	Structural Systems I
3	Structural Systems II
4	Construction Practicum

- Content focuses on building framing and interior and exterior finishes.
- Prepares students for carpentry and related careers.
- Level 2 covers basic building framing, framing materials, tools, & equipment.
- Level 3 includes focus options:

- | | |
|----------|--|
| A | <ul style="list-style-type: none">• Structural Loads• Steel Framing• Exterior finishing & Roofing |
| B | <ul style="list-style-type: none">• Drywall Installation & Finishing• Trim & Cabinet Installation• Doors & Door Hardware |

Structural Systems

STRUCTURAL SYSTEMS	
COURSE SEQUENCE:	
1	Fundamentals of Construction
2	Structural Systems I
3	Structural Systems II
4	Construction Practicum

Ideal Application:

- For schools or districts where two construction programs are feasible, this POS works well when offered alongside MEP Systems, allowing students to select an area in which to develop specialized skill.

Teacher Endorsements:

- 522, 575, 580, 592, or 706 is required for Structural Systems I & II.

Mechanical, Electrical, & Plumbing (MEP) Systems

MECHANICAL, ELECTRICAL, & PLUMBING SYSTEMS	
COURSE SEQUENCE:	
1	Fundamentals of Construction
2	Mechanical, Electrical, & Plumbing (MEP) Systems
3	Electrical Systems -and/or- HVAC -and/or- Plumbing Systems
4	Construction Practicum

- Content focuses on the installation, servicing, and maintenance of building equipment.
- Level 2 covers basic electrical systems, plumbing systems, and intro to HVAC.
- Level 3 includes three separate course options in Electrical Systems, HVAC, or Plumbing Systems.

Mechanical, Electrical, & Plumbing (MEP) Systems

MECHANICAL, ELECTRICAL, & PLUMBING SYSTEMS	
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1	Fundamentals of Construction
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3	Electrical Systems -and/or- HVAC -and/or- Plumbing Systems
4	Construction Practicum

Ideal Application:

- For schools or districts where two construction programs are feasible, this POS works well when offered alongside Structural Systems, allowing students to select an area in which to develop specialized skill.

Teacher Endorsements:

- Teachers must hold at least one of the following endorsements to teach each course:
 - MEP Systems- 501, 502, 523, 527, 532, 567, 580, 592, 598, 701, 703, 707
 - Electrical Systems- 523, 532, 567, 580, 592, 701
 - HVAC- 501, 502, 523, 532, 567, 592, 598, 701, 707
 - Plumbing Systems- 527, 567, 580, 592, 703

Consistent for All: Level 1 Course

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Level 1 Course: Fundamentals of Construction

- Over 6,000 students each year.

Revisions include:

- Greater emphasis on real world math
- Greater emphasis on career exploration and a big picture understanding of the construction industry.
- Continued focus on fundamental skills in safety, using tools & equipment, and interpreting construction documents.
- Includes project opportunities.

“Core should be the building block for the work place. A greater emphasis should be placed on real world math, using proper grammar in both written and verbal form and the basics of character development and inter-personal skills to be an effective wage earner.”

“More time for safety and construction math and less time on rigging and material handling.”

Consistent for All: Level 4 Course

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Level 4 Course: Construction Practicum

Construction Practicum

- Student-led projects, working in teams
- Work-based learning opportunities
- Further practice of advanced skills
- Preparation for certification
- Flexible standards, maximize time in classroom and lab

Consistent for All Programs of Study

Embedded in course content:

- Career Exploration
- Principles of the Construction Industry
- Business & Project Management

Teacher Reviewers

- *“I did like the added standards on electrical, plumbing, etc. I believe this will allow the students an opportunity to explore careers in other areas of construction. It is also important for the carpenter to understand the basics of each of these areas, as we have to frame for electrical and plumbing fixtures, etc.”*
- *“Overall, I appreciate the rigor and adherence to higher thinking and a more challenging curriculum.”*
- *“Demonstrating ability seems present throughout, as well as the opportunity for creative thinking and mechanical creativity. Being able to improvise mechanically is a very valuable skill.”
(Postsecondary reviewer)*

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- Higher job growth is projected for Architecture & Engineering occupations which require a bachelor's degree.
- Revised courses place emphasis on the design process along with developing skill in technical drawing.
- Capstone options include Engineering Practicum, AP Calculus, or AP Physics.

Cluster Electives

- *Introduction to Geographic Information Systems (GIS)*
- *Welding I*
- *Work-based Learning: Career Practicum*

Questions?

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