BETHLEHEM AREA VOCATIONAL-TECHNICAL SCHOOL
3300 CHESTER AVENUE BETHLEHEM PA 18020

Masonry
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MASONRY

Course Description:

The Bethlehem AVTS Masonry program is a three-year course. First year students will learn about jobsite safety, proper use and care of tools and equipment, as well as the many types of materials used in masonry construction. From there, they will perform basic skills and practice material applications through a logical progression of tasks and projects. By the completion of their first year, students will have a basic understanding on how to read and layout simple blueprints, estimate materials, and construct various wall systems in a safe manner.

Second and third year students will build on basic skills and knowledge from their first year. They will be introduced to stone masonry (both real and manufactured), learn about and construct more complicated projects (foundations, fireplaces, patios, arches, etc), work with various concrete applications (footers, floors, concrete walls, stamped, and formed), develop

soft skills for employment (teamwork, punctuality, work ethic, adaptability, critical thinking, etc…), and engage in career exploration.

Throughout their time at BAVTS, students will be given the opportunity to gain real-world experience at the school house project. They will also, via co-op (a work study program that places students with an employer), have the opportunity to earn grades as well as wages while learning the trade. Top students will have the opportunity to compete in the SkillsUSA contest (first in the class, then districts, states, nationals and world).

Opportunity for employment in the masonry trade upon graduation is available through union or non-union, and residential or commercial contractors. If a student wishes to continue his/her education, a trade school is a viable option to obtain further training and an associate's degree. Some students find permanent positions with the company that hired them through co-op.

Masonry is a high priority trade. From Concrete finishers to brick layers, stone masons to plasterers, employers in all areas of the trade are struggling to fill positions with young and skilled employees. Each year, these employers have contacted my program to fill these positions. The trade offers a competitive starting salary ($15.00 and $20.00 through a union apprenticeship) and my co-op students (seven students last year) took advantage of the opportunity to gain knowledge and skills, as well as earn a good salary. Opportunities for a young mason to start a successful business are endless in the Lehigh Valley.

A masons Knowledge and skills increase throughout his/her career and their salary will follow. Students that are creative, competitive and possess soft skills will prosper if they choose this trade. Interested students that make it into the Bethlehem AVTS Masonry class will have a big advantage over non Vo Tech students when they apply themselves and discover the many opportunities that await them in this fascinating trade.

Average pay: According to Ziprecruiter.com, the average salary for a mason in the Lehigh Valley is $50,533 with a starting salary for an apprentice around $40,000 (if they work all year) and an area high above $72,635. A non-union mason will start in the low $20s/hr. either path can lead a determined individual to a great job, possible business ownership and endless opportunities.

Two-Year Degree: Associate's degrees can be obtained through post-graduation trade schools.

In demand careers: Concrete Finishers, Brick layers, Stone Masons, Plasterers, Tile Setters, and Landscapers

Reference Material:

Modern Masonry 8th edition Textbook and Workbook by Clois E. Kicklighter- published by Goodheart and Wilcox

Careersafe.com- OSHA 10 hour course

Classroom Tools:

Electric Mortar Mixer
Gas powered Mortar Mixer
Electric Table Chop Saw
Gas Powered Stihl Cut-off Saw
Various trowels
Various pointers and jointers
Wheelbarrows
Many types of hand tools

Course Syllabus Level 1

First Semester (First Marking Period)

Develop safety awareness-- Identify tools-- Learn Basic skills-

Knowledge:

- Introduction to Safety (Textbook Chpt 2)
- Introduction to Tools(Chpt 1)
- Safety test
- tool test
- term test
- estimating test
- SDS sheet

Projects:

- Mix mortar by hand
- Mix Mortar with a power mixer
- Spread mortar for brick
- butter brick head joints
- Brick rack back lead-
- Spread mortar for block
- butter block head joints
- Block rack back lead

Duty and Tasks Covered:

000100 Tools and equipment

000101 Identify masonry hand and lab tools and equipment

000200 Safety Practices

000201 Use personal protective equipment

000202 Use and care of masonry hand tools

000206 Demonstrate knowledge of Safety Data Sheets (SDS) information.

000800 Bricklaying techniques

000820 Perform trowel techniques for brick

000900 Block laying techniques

000912 Perform trowel techniques for block

First Semester (Second Marking Period)

Equipment Safety---- Housekeeping---- Intro to print reading---- Identify masonry materials---- Intro to estimating----

Knowledge:

- Chapter 3- Print Reading
- Chapter 4- Math for masons
- Chapter 5- Clay Masonry materials
- Estimate/Print reading Test
- Clean up/housekeeping test
- Math/estimating test
- Masonry term test
- Mixer Test
- Clay Masonry materials test

Projects:

- Job 1 worksheet- Identify Common Masonry Materials
- Job 2 worksheet- Identify types of clay bricks
- Job 3 task and worksheet- Arranging brick in the five basic structural bonds
- Job 20- Lay a 4" running bond wall with leads (Team wall)

Duty and Tasks Covered:

000200 Safety Practices

000203 Use and care of a mortar mixer

000300 Print Reading

000301 Identify types of blueprints

000302 Read and interpret blueprints

000400 demonstrate safe and proper use of masonry hand tools

000403 demonstrate the ability to secure mason's line to line blocks line stretchers and line pins

000404 Discuss and set a trig properly.

000405 Demonstrate the use of a hammer and chisel to cut block and brick.

000406 Demonstrate proper trowel techniques.

000407 Demonstrate proper use of masonry jointers.

000800 DEMONSTRATE PROPER BRICKLAYING TECHNIQUES

000801 Identify brick types and bonds.

000802 Lay out proper dry bond of a brick wall

000803 Lay brick to the line.

001300 ESTIMATE MASONRY WORK

001301 Estimate mortar, number of units, and material costs for brick work.

Second Semester (Third Marking Period)

Develop bricklaying skills- Understand safe practices for masonry saws- Lay out using a builder's level and the Pythagorean Theorem

Knowledge:

- Chapter 10-laying brick
- Project estimation sheet
- Math/estimating test
- Masonry term test
- Masonry Saw Test
- Saw blade identification test-

Projects:

- Cut MUs with masonry saws
- Cut MUs with hammer and chisel
- Cut MUs with brick hammer
- Job 21 lay an 8" common double wythe brick wall with leads
- Job 22 lay an 8" running bond, two wythe intersecting brick wall
- Job 23 build a corner in flemish bond with quarter closures
- z-corner/inside and outside corner

Duty and Tasks Covered:

000400 demonstrate safe and proper use of masonry hand tools

000405 Demonstrate the use of a hammer and chisel to cut block and brick.

000408 Identify the various cutting blades for a masonry saw.

000500 PREPARE A BUILDING SITE

000501 Lay a building out using a builders level.

000502 Square a building using the 3-4-5 Pythagorean Theorem.

000600 DEMONSTRATE THE SAFE USE OF POWER TOOLS

000601 Safely operate a portable, masonry gas cut-off saw.

000603 Safely operate a stationary or portable masonry saw.

000800 DEMONSTRATE PROPER BRICKLAYING TECHNIQUES

000801 Identify brick types and bonds.

000802 Lay out proper dry bond of a brick wall.

000803 Lay brick to the line.

000804 Install window and door openings in brick walls (jambs).

000807 Demonstrate industry standards for laying bricks.

000814 Demonstrate cleaning a brick wall.

000817 Construct a brick rack back lead.

000818 Construct a 4" brick inside corner.

000819 Construct a 4" brick outside corner.

Second Semester (Fourth Marking Period)

Knowledge:

- Chapter 11-laying block
- block laying test
- block pier test
- block corner test
- builder’s level Test
- block toothing test
- buider/s level activity sheet

Projects:

- Job 15 Cut concrete block with a brick hammer and a blocking chisel
- Job 16 Use a mason’s line
- Job 33 Handling Concrete Blocks
- Builder’s level/transit
- Job 34 Run an 8” running bond block wall
- Job 35 lay a 10” concrete block cavity wall
- Job 36 lay an 8” composite wall with concrete block backup
- Job 37 Cleaning concrete block masonry
- Job 76 Using a corner pole

- 6 course corner project
- Masonry toothing project

Duty and Tasks Covered:

000900 DEMONSTRATE PROPER BLOCK LAYING TECHNIQUES

000900 Identify and construct various block types and bonds.
000902 Lay block to the line.
000903 Construct a brick ledge using various size block.
000904 Discuss and install a control joint.
000905 Install window and door openings in block walls.
000906 Set lintels.
000907 Construct block piers.
000908 Clean a block wall.
000909 Parge a block wall.
000910 Construct a jamb block lead.
000911 Construct a corner block lead.

001300 ESTIMATE MASONRY WORK

001302 Estimate mortar, number of units, and material costs for block work.

Course Syllabus Level 2 and 3 (curriculum for levels 2 and 3 will alternate from year to year. MP 1 through 4 one year MP 5 through 8 the following year.)

First Semester (First Marking Period)

Stone Masonry:

Knowledge:

- Chpt 12- Stonemasonry
- Job 38 review on handling stone
- Job 39 review stone masonry joints
- Job 40 review Splitting and shaping stone
- Job 41 review Setting rubble stone veneer
- Job 42 review 12” thick ashlar stone wall
- Job 43 review limestone panel
- Job 44 review pointing cut stone wall
- Job 45 review cleaning new stone masonry
- Job 46 review applying manufactured stone
- Worksheet on drop lines
- Stone masonry tool test
- Cultured stone test
- Real stone test
- OSHA- safety for scaffolding

Projects:

- Job 38- handling stone
- Job 39- stone mortar joints
- Job 40- Splitting, shaping and cutting stone
- Setting up drop line
- Job 41- rubble stone veneer
- Job 42-12’ thick ashlar stone wall
- Job 43- setting a limestone panel
- Job 44- Pointing cut stone veneer
- Job 45- Cleaning stone masonry
- Job 46- Applying Manufactured stone
- Scaffolding project
- Cultured stone project and assessment

- Real stone project and assessment

Duty and Tasks Covered:

000100 Tools and equipment

000101 Identify masonry hand and lab tools and equipment,

000200 Safety Practices

000202 Demonstrate safe use and care of masonry hand tools.

000204 Erect and dismantle steel tubular scaffolding within OSHA guidelines.

000400DEMONSTRATE SAFE AND PROPER USE OF MASONRY HAND TOOLS

000406 Demonstrate proper trowel techniques.

000407 Demonstrate proper use of masonry jointers.

001000 MIX AND SPREAD MORTAR

001002 Mix mortar by hand.

001004 Demonstrate procedures for tempering mortar.

001005 Spread mortar for various masonry units.

001300 ESTIMATE MASONRY WORK

001304 estimating stone veneer

First Semester (Second Marking Period)

Foundation Systems

Knowledge:

- Chpt 13-Foundation Systems
- Builder's level/ transit
- Pythagorean theorem
- Scaffolding set up and safety
- Print reading
- Estimating
- Job Bidding
  - Explain the purpose of foundations and footings.
  - Describe the different types of spread foundations.
  - Identify different types of footings.
  - Explain the functions of foundation walls.

- House Estimation Test

- Builder’s Level Written test
- Foundation systems test

Projects:

- Lab Workbook: Job 57, Damp proofing Concrete Block Basement Walls
- Lab Workbook: Job 58, Building Columns, Piers, and Pilasters
- Construct a small foundation using the builder’s level to maintain proper heights
- Form and pour footings.
- Explain the functions of foundation walls.
- Damp proof basement walls.
- Construct columns, piers, and pilasters.
- Anchor a building superstructure to a foundation.

Duty and Tasks Covered:

000200: DEMONSTRATE PROPER SAFETY PRACTICES

000201 Explain and use personal protection equipment.

000202 Demonstrate safe use and care of masonry hand tools.

000203 Demonstrate safe use and care of a mortar mixer.

000204 Erect and dismantle steel tubular scaffolding within OSHA guidelines.

000205 Place material and stock scaffolding properly.

000206 Demonstrate knowledge of Safety Data Sheets (SDS) information.

000300: READ BLUEPRINTS

000301 Identify types of Blueprint Plans.

000302 Read and Interpret Blueprint Plans.

000400 DEMONSTRATE SAFE AND PROPER USE OF MASONRY HAND TOOLS

000403 Demonstrate the ability to secure mason's line to line blocks, pins, and line stretchers.

000404 Discuss and set a trig properly.

000406 Demonstrate proper trowel techniques.

000407 Demonstrate proper use of masonry jointers.

000500 PREPARE A BUILDING SITE

000501 Lay a building out using a builder's level.

000502 Square a building using the 3-4-5 Pythagorean Theorem.

000600 DEMONSTRATE THE SAFE USE OF POWER TOOLS

000601 Safely operate a portable, masonry gas cut-off saw.

000602 Safely operate a mortar mixer.

000900: DEMONSTRATE PROPER BLOCK LAYING TECHNIQUES

000902 Lay block to the line.

000903 Construct a brick ledge using various size block.

000904 Discuss and install a control joint.

000905 Install window and door openings in block walls.

000906 Set lintels.

000907 Construct block piers.

000908 Clean a block wall.

000909 Parge a block wall.

000910 Construct a jamb block lead.

000911 Construct a corner block lead.

001300

001301 Estimate mortar, number of units, and material costs for brick work.

001302 Estimate mortar, number of units, and material costs for block work.

001303 Estimate the area, volume and cost of "ready-mixed" concrete.

Second Semester (Third Marking Period)

Masonry wall Systems

Knowledge:

- Textbook: Activities, Chapter 14
- Workbook; chapter 14 review questions
- Job 56, Building Centering for a Masonry Arch- review questions
- Job 59, Building Solid Masonry Walls- review questions

- Job 60, Building a 4″ RBM Curtain or Panel Wall- review questions
- Job 61, Building Hollow Masonry Bonded Walls- review questions
- Job 62, Building an Anchored Veneer Wall and Installing Flashing- review questions
- Job 63, Building a 12″ Composite Brick and Block Wall- review questions
- Job 64, Building Reinforced Masonry Walls- review questions
- Job 65, Installing Steel and Concrete Reinforced Lintels- review questions
- Job 66, Building Reinforced Concrete Block and Brick Lintels- review questions
- Job 67, Building Masonry Sills and Installing Stone Sills- review questions
- Job 68, Building a Brick Masonry Arch- review questions
- Job 69, Forming Movement Joints in Concrete and Masonry- review questions
- Job 73, Building Masonry Garden Wall with Coping- review questions
- Job 74, Corbeling and Racking Masonry Wall- review questions
- Job 75, Building a Mortarless Retaining Wall- review questions
- Composite wall, Cavity wall, and Veneer test
- Wall ties and flashing test
- Arch types and components test
- Wall systems test

Projects:

- Lab Workbook: Job 56, Building Centering for a Masonry Arch
- Lab Workbook: Job 59, Building Solid Masonry Walls
- Lab Workbook: Job 60, Building a 4″ RBM Curtain or Panel Wall
- Lab Workbook: Job 61, Building Hollow Masonry Bonded Walls
- Lab Workbook: Job 62, Building an Anchored Veneer Wall and Installing Flashing

- Lab Workbook: Job 63, Building a 12″ Composite Brick and Block Wall
- Lab Workbook: Job 64, Building Reinforced Masonry Walls
- Lab Workbook: Job 65, Installing Steel and Concrete Reinforced Lintels
- Lab Workbook: Job 66, Building Reinforced Concrete Block and Brick Lintels
- Lab Workbook: Job 67, Building Masonry Sills and Installing Stone Sills
- Lab Workbook: Job 68, Building a Brick Masonry Arch
- Lab Workbook: Job 69, Forming Movement Joints in Concrete and Masonry
- Lab Workbook: Job 73, Building Masonry Garden Wall with Coping
- Lab Workbook: Job 74, Corbeling and Racking Masonry Wall
- Lab Workbook: Job 75, Building a Mortarless Retaining Wall

Duty and Tasks Covered:

000700 USE MASONRY FASTENERS

000701 Identify different types of masonry fasteners and reinforcements.

000800 DEMONSTRATE PROPER BRICKLAYING TECHNIQUES

000805 Install flashing for windows and doors.

000806 Install weep holes/vents.

000807 Demonstrate industry standards for laying bricks.

000809 Lay a brick and block composite wall.

000810 Build brick columns.

000811 Construct a brick veneer wall.

000812 Construct a brick cavity wall.

000814 Demonstrate cleaning a brick wall.

000817 Construct a brick rack back lead.

000818 Construct a 4" brick inside corner.

000819 Construct a 4" brick outside corner.

000900 DEMONSTRATE PROPER BLOCK LAYING TECHNIQUES

000901 Identify and construct various block types and bonds.

000902 Lay block to the line.

000903 Construct a brick ledge using various size block.

000904 Discuss and install a control joint.

000905 Install window and door openings in block walls.

000906 Set lintels.

000910 Construct a jamb block lead.

000911 Construct a corner block lead.

001200 PERFORM ARCH CONSTRUCTION

001201 Discuss arch terminology.

001202 Identify types of arches.

001203 Demonstrate arch construction.

001204 Describe basic types of arch construction.

Second Semester (Fourth Marking Period)

Paving and Masonry Construction

Knowledge:

- Textbook: Activities, Chapter 15
- Workbook- Chapter 15 review questions
- Lab Workbook: Job 70, Installing Masonry Pavers on a Ridge Base- review questions
- Lab Workbook: Job 71, Building Concrete and Masonry Steps- review questions
- Lab Workbook: Job 72, Building a Masonry Fireplace and Chimney- review questions
- Paver Pattern test
- Fireplace test

Projects:

- Lab Workbook: Job 70, Installing Masonry Pavers on a Ridge Base
- Lab Workbook: Job 71, Building Concrete and Masonry Steps
- Lab Workbook: Job 72, Building a Masonry Fireplace and Chimney

- Team patio/hardscaping project

Duty and Tasks Covered:

001100 CONSTRUCT RESIDENTIAL CHIMNEYS AND FIREPLACES

001101 Identify parts of a chimney and fireplace.

001102 Describe how to construct a fireplace, including foundation, firebox, lintel, damper, throat, smoke chamber, hearth, clean-out and mantel.

001103 Construct a brick chimney.

001104 Construct a block chimney.

001105 Discuss and install flashing methods where the chimney meets the roof.

001106 Describe the proper dimensions of a footer or foundation for a chimney or fireplace.

001107 Explain how to determine the proper dimensions of a firebox.

First Semester (Fifth Marking Period)

Concrete Materials and Applications

Knowledge:

- Textbook: Activities, Chapter 16
- Workbook- Chapter 16 review questions
- Lab Workbook: Job 47, Measuring Concrete Materials- review questions
- Lab Workbook: Job 48, Mixing Concrete with a Power Mixer- review questions
- Lab Workbook: Job 49, Performing Slump Test on Plastic Concrete- review questions
- Steel reinforcement test
- Cements, aggregates, and additives test

Projects:

- Lab Workbook: Job 47, Measuring Concrete Materials
- Lab Workbook: Job 48, Mixing Concrete with a Power Mixer
- Lab Workbook: Job 49, Performing Slump Test on Plastic Concrete
- Concrete Placement
- Concrete Screeding
- Concrete Finishing
- Precast Concrete

Duty and Tasks Covered:

000100 DEMONSTRATE KNOWLEDGE OF THE MASONRY TRAINING LAB

000101 Identify masonry lab tools and equipment.

000200 DEMONSTRATE PROPER SAFETY PRACTICES

000201 Explain and use personal protection equipment.

000202 Demonstrate safe use and care of masonry hand tools.

000206 Demonstrate knowledge of Safety Data Sheets (SDS) information.

000400 DEMONSTRATE SAFE AND PROPER USE OF MASONRY HAND TOOLS

000408 Identify the various cutting blades for a masonry saw.

000600 DEMONSTRATE THE SAFE USE OF POWER TOOLS

000601 Safely operate a portable, masonry gas cut-off saw.

001000

001001 Describe various types of mortars and their characteristics.

First Semester (Sixth Marking Period)

Knowledge:

- Textbook: Activities, Chapter 17
- Workbook- Chapter 17 review questions
- Lab Workbook: Job 52, Building Footing Forms for Concrete- review questions

- Lab Workbook: Job 53, Building Wall Forms for Concrete- review questions
- Lab Workbook: Job 54, Building and Installing a Buck- review questions
- Lab Workbook: Job 55, Installing Round Column Forms- review questions
- Estimating concrete footers test
- Footer forming and set-up test

Projects:

- Lab Workbook: Job 52, Building Footing Forms for Concrete
- Lab Workbook: Job 53, Building Wall Forms for Concrete
- Lab Workbook: Job 54, Building and Installing a Buck
- Lab Workbook: Job 55, Installing Round Column Forms
- Forming a raised concrete slab
- Forming a concrete cap
- Placing and finishing concrete

Duty and Tasks Covered:

000500 PREPARE A BUILDING SITE

000501 Lay a building out using a builder’s level.

000502 Square a building using the 3-4-5 Pythagorean Theorem.

000600 DEMONSTRATE THE SAFE USE OF POWER TOOLS

000601 Safely operate a portable, masonry gas cut-off saw.

000700 USE MASONRY FASTENERS

000701 Identify different types of masonry fasteners and reinforcements.

001300 ESTIMATE MASONRY WORK

001303 Estimate the area, volume and cost of "ready-mixed" concrete.

Second Semester (Seventh Marking Period)

Knowledge:

- Textbook: Activities, Chapter 18
- workbook- chapter 18 review questions
- Lab Workbook: Job 50, Placing Concrete in a Slab Form- review questions
- Lab Workbook: Job 51, Finishing Concrete Slabs- review questions
- Tools used for large concrete pours (laser screeds- riding power trowelers)
- Estimating Flatwork test
- Prepping a concrete slab test
- Flatwork Placing and Finishing test

Projects:

- Lab Workbook: Job 50, Placing Concrete in a Slab Form
- Lab Workbook: Job 51, Finishing Concrete Slabs
- Vibratory Screed
- Power trowler

Duty and Tasks Covered:

000100 DEMONSTRATE KNOWLEDGE OF THE MASONRY TRAINING LAB

000101 Identify masonry lab tools and equipment.

000200 DEMONSTRATE PROPER SAFETY PRACTICES

000201 Explain and use personal protection equipment.

000202 Demonstrate safe use and care of masonry hand tools.

000300 READ BLUEPRINTS

000301 Identify types of Blueprint Plans.

000302 Read and Interpret Blueprint Plans.

001300 ESTIMATE MASONRY WORK

001303 Estimate the area, volume and cost of "ready-mixed" concrete.

Second Semester (Eight Marking Period)

Careers in the Masonry Trade-- Job Performance, Leadership, Ethics, and Entrepreneurship

Knowledge:

- **Textbook- Chapter 19- careers in the Masonry Trade**
- **Workbook- Chapter 19- review questions**
- **Textbook- Chapter 20- Job performance, leadership, Ethics, and Entrepreneurship**
- **Workbook- Chapter 20- review questions**
- **Soft Skills test**
- **Masonry trade and specialties test**
- **Job application and resume test**

Projects:

- Senior Project- Research, Imagine, design, make drawings, estimate, propose to client, and construct a masonry project that involves at least 3 patterns, and three materials.

Supplemental Learning Activities

Students who participate in this program will also have opportunities to participate in the following programs and school-sponsored activities:

SkillsUSA: Two students participate in the Masonry Competition at the SkillsUSA Regional Competition. One student competes as an individual and the other will compete with three students from other trades in teamwork competition.

Cooperative Education: Students who have attended six quarters in their career and technical program are eligible to participate in a paid working experience during the PM session of BAVTS. Positions must be available and the students must be recommended by the CTE teacher to be eligible.

Job Shadowing: Students are eligible to visit business and industry partners for one or more days to view the day-to-day operations of this career area.

OSHA 10 hour course is available for students to prepare them to enter the workforce through the Co-op program, summer jobs and upon graduation.

Internships: Students who have completed six or more quarters of their CTE program are eligible to work for businesses and industry partners with the recommendation of the instructor and the availability of job openings.

Field Trips: Students in this program will on occasion attend field trips that expose them to educational experiences within the career field.

Articulation Agreement: Students can earn college credits by filling out and submitting the application form, successfully completing knowledge and skill projects, and passing the end of year test.