# Wallenpaupack Area School District
# Planned Course Curriculum Guide

## Career and Technical Education

## Building Trades Level 1

Course Description:
Carpentry

This course provides students with a comprehensive introduction to the tools, materials, and methods used in modern residential and light commercial construction. Learners are trained to safely operate and maintain common hand and power tools while following established shop and job-site safety procedures, including consistent use of appropriate personal protective equipment (PPE) such as safety glasses, hearing protection, gloves, and safety footwear, in alignment with OSHA-related best practices. Students study various types and grades of lumber, panel products, fasteners, insulation materials, and other building products, with a focus on how each can be cut, shaped, joined, and applied effectively and safely in the field.

Instruction and laboratory activities emphasize accurate measurement; reading and interpreting basic blueprints, construction drawings, and specifications; and laying out and framing floors, walls, stairs, and roofs in accordance with applicable building codes. Students learn to install windows and doors; install and detail insulation for energy efficiency and moisture control; hang and finish gypsum board (sheetrock); and apply a range of interior and exterior finishes while meeting code and manufacturer requirements.

Through a sequence of structured, hands-on projects and mock-ups, students practice selecting appropriate tools, materials, and fasteners and determining safe, efficient procedures for each task. Emphasis is placed on hazard recognition, safe material handling, code-compliant construction practices, and maintaining clean, organized work areas. The course develops problem-solving, teamwork, and employability skills that prepare students for advanced construction training, pre-apprenticeship opportunities, or entry-level employment in the building trades.

**Initial Creation Date (if applicable) and Revision Dates:**
**9/2025**

| Wallenpaupack Area School District Curriculum | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT 1: Carpentry Introduction** | **TIMEFRAME: 1 week** |

**PA COMMON CORE/NATIONAL STANDARDS:**

**ELA:**

CC.1.2.11–12.F Evaluate how words and phrases shape meaning and tone in texts.

CC.1.2.11–12.J Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**Math:**

CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

13.2.11.D Analyze, revise, and apply an individualized career portfolio to chosen career path.

13.3.11.A Evaluate personal attitudes and work habits that support career retention and advancement.

**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**UNIT OBJECTIVES (SWBATS):**

- Shop Expectations
  - Students will design and maintain a workspace that is safe, organized, and efficient, ensuring clear pathways, proper tool placement, and compliance with safety standards.
- Shop Rules
  - Students will follow established safety protocols, use PPE correctly, respect tools and materials, and contribute to a professional and cooperative shop environment.
- Shop Requirements
  - Students will demonstrate punctual attendance, preparation, workspace cleanliness, and proper care and storage of tools and materials.
- Course Goals
  - Students will develop essential carpentry skills, including blueprint reading, safe tool use, material selection, and be prepared for advanced projects and career pathways.
- Grading and Attendance
  - Students will understand attendance and participation policies that emphasize skill mastery through practical demonstrations and assessments.
- Competency-Based Education
  - Students will engage in hands-on learning that requires demonstrating mastery of skills before progressing, fostering confidence and real-world readiness.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Shop Layout
  - Plan and map a detailed shop layout requiring students to arrange tool stations and work zones for safety and workflow efficiency.
  - Conduct a workshop inspection simulation where students identify potential hazards or inefficiencies and propose layout improvements.
- Shop Rules
  - Role-play scenarios demonstrating proper PPE usage, tool safety, and respectful shop behaviors, followed by peer feedback sessions.
  - Create safety posters or digital presentations highlighting key shop rules and consequences of non-compliance.
- Shop Requirements
  - Implement responsibility logs where students track their attendance, workspace readiness, and tool maintenance.

- Facilitate peer-led inspections to encourage accountability for shop cleanliness and organization standards.
- Course Goals
  - Develop personalized learning plans with self-assessment checkpoints aligned to blueprint reading, tool mastery, and material handling objectives.
  - Engage in project-based learning designing and executing carpentry tasks that integrate multiple course goals.
- Grading and Attendance
  - Use competency rubrics for students to self-evaluate practical skills demonstrations and written work.
  - Employ attendance-linked micro-projects that require consistent participation for completion and mastery validation.
- Competency-Based Education
  - Design tiered skill challenges where students progress through increasing complexity only after proving mastery of foundational skills.
  - Facilitate reflective portfolio development documenting skill acquisition, challenges, and milestones.

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

- Shop Layout
  Plan and draw a detailed shop layout using graph paper or digital tools, strategically positioning tool stations and work zones to optimize safety, material flow, and workflow efficiency.
  Conduct mock inspections of layouts to identify hazards and inefficiencies, then propose redesigns emphasizing OSHA compliance and ergonomic principles.
- Shop Rules
  Perform role-plays simulating proper PPE use, tool safety demonstrations, and respectful shop behaviors, followed by peer and instructor feedback for skill refinement.
  Design and present safety campaign materials, such as posters or digital slideshows, communicating critical shop rules and potential consequences for violations.
- Shop Requirements
  Maintain and submit responsibility logs detailing attendance, workspace readiness, and tool care to foster accountability and professional habits.
  Lead peer-organized shop cleanliness and safety inspections that promote collaborative upkeep and early hazard detection.
- Course Goals
  Develop personalized skill development plans aligned with blueprint reading, tool mastery, and material handling, with regular self-assessment benchmarks.
  Complete integrated projects requiring application of multiple carpentry skills, encouraging synthesis of knowledge and preparation for real-world scenarios.
- Grading and Attendance
  Use competency rubrics for students to evaluate practical skill demonstrations and written work, fostering self-awareness and targeted improvement.

Incorporate attendance-dependent incremental projects that reward consistent engagement and focus on mastery of course outcomes.

- Competency-Based Education
  Introduce tiered, progressive skill challenges where learners demonstrate mastery at each level before advancing, promoting confidence and individual pacing.
  Compile reflective portfolios documenting skill achievements, challenges overcome, and areas for growth to support ongoing learning and professional development.

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:** Shop layout, tool stations, work zones, safety, workflow efficiency, workshop inspection, hazard identification, layout improvement, personal protective equipment (PPE), tool safety, shop behaviors, peer feedback, safety posters, digital presentations, shop rules, consequences, responsibility logs, attendance tracking, workspace readiness, tool maintenance, peer inspections, accountability, shop cleanliness, organization standards, course goals, personalized learning plans, self-assessment checkpoints, blueprint reading, tool mastery, material handling, project-based learning, integrated carpentry tasks, grading, attendance policies, competency rubrics, self-evaluation, skill demonstrations, written work, micro-projects, participation, mastery validation, competency-based education, tiered skill challenges, mastery progression, reflective portfolios, skill acquisition, learning milestones, professional growth.

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT : Safety** | **TIMEFRAME:2 weeks** |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**UNIT OBJECTIVES (SWBATS):**

- Understand the importance of safety in carpentry.
- Identify common hazards associated with carpentry.
- Learn proper use of personal protective equipment (PPE).
- Gain knowledge of safe tool operation and maintenance.
- Develop emergency response skills.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- **Understanding Safety in Carpentry**
  - Importance of safety protocols
  - Overview of carpentry hazards (e.g., cuts, falls, respiratory issues)
- **Personal Protective Equipment (PPE)**
  - Types of PPE (gloves, goggles, hearing protection, masks)
  - Proper selection and use of PPE
  - Conducting a PPE inspection
- **Hand Tools Safety**
  - Safe handling and storage of hand tools
  - Common hand tool hazards and how to mitigate them
  - Practice: Safe use of basic hand tools (saws, hammers, chisels)

- **Power Tools Safety**
  - Introduction to power tools (saws, drills, routers)
  - Operating procedures and safety features
  - Practice: Safe operation of selected power tools
- **Job Site Safety Practices**
  - Understanding workplace hazards (slips, trips, falls)
  - Importance of organization and cleanliness
  - Emergency exit routes and first aid basics
- **Lifting and Ergonomics**
  - Safe lifting techniques
  - Ergonomic practices to prevent injury
  - Hands-on practice with lifting techniques
- **Emergency Response**
  - Identifying potential emergencies (fires, tool injuries)
  - First aid basics and reporting procedures
  - Creating an emergency action plan

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Understanding Safety in Carpentry

Conduct a Job-Task Analysis (JTA) using bow-tie diagrams or Failure Mode Effects Analysis (FMEA) to map hazards for framing or roofing.

Lead a zero-injury challenge, applying metrics like incident severity ratings and near-miss tracking to measure site performance.

Integrate economics and management by designing a cost-benefit analysis of advanced safety controls versus productivity loss.

Personal Protective Equipment (PPE)

Benchmark PPE innovations by researching smart PPE (sensor-enabled helmets, noise-dosimetry earplugs) and presenting to peers.

Conduct a PPE engineering study, testing material durability under simulated jobsite conditions (abrasion, impact).

Build a training module for team leaders on PPE compliance auditing at industrial scale.

Hand Tools Safety

Reverse-engineer a tool (saw, chisel) to identify design modifications that improve safety or ergonomics.

Collaborate with a local maker space to prototype and 3D print ergonomic tool handles minimizing strain injuries.

Analyze statistical data from OSHA 30-hour datasets to identify correlations between tool misuse and injury trends.

Power Tools Safety

Develop a digital twin simulation of a carpentry workspace to test tool safety scenarios using CAD or BIM software.

Create a “Safety Control Hierarchy Audit” integrating elimination, substitution, and engineering controls for advanced tools.

Write a white paper on power tool automation and AI safety protocols linking human factors, automation, and regulatory compliance.

Job Site Safety Practices
Lead a Root Cause Analysis (RCA) on historical accident reports to identify systemic organizational safety failures.
Design and present a Safety Management System (SMS) including KPIs, performance dashboards, and predictive analytics.
Organize a peer-led "Safety Symposium", connecting with industry mentors or OSHA professionals for mentorship exchange.
Lifting and Ergonomics
Use biomechanics software to model and evaluate strain on musculoskeletal systems under different lifting techniques.
Engineer mechanical assist prototypes (hydraulic lift tables, pulleys) applying physics and robotics concepts.
Present a research report on workplace ergonomics innovation comparing global safety standards.
Emergency Response
Design a comprehensive Emergency Action Plan (EAP) simulation for a multi-floor workshop, integrating GIS-based evacuation tracking.
Create and film a high-stakes emergency drill scenario, assessing decisions in real time using post-action analytics.
Develop a digital emergency management app concept to log incident data and automate OSHA reporting workflows.
Acceleration Outcomes
Learners completing these enrichment tasks demonstrate mastery of:
Complex risk modeling and mitigation frameworks (JTA, FMEA, RCA).
Use of data-driven leadership in safety and productivity optimization.
Integration of technology, engineering, and compliance for 21st-century carpentry safety.
These tasks move beyond classroom simulation, aligning with OSHA 30 curriculum's advanced competencies for supervisors and foremen**.**

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:** Safety, protocol, hazard, risk, prevention, incident, inspection, PPE, gloves, goggles, respirator, hearing protection, mask, hard hat, boots, maintenance, storage, tool, hammer, saw, chisel, kickback, guard, grounding, lockout, tagout, trigger lock, housekeeping, signage, fall protection, organization, cleanliness, emergency exit, ergonomics, lifting, posture, strain, fatigue, first aid, evacuation, emergency plan, report, combustion, ventilation, fire extinguisher, toolbox talk, hazard assessment, training, compliance, safety culture, supervision, power tools, controls, electrical, safety guard, material handling, load stability, workspace, stability, certification, injury, safety inspection, corrective action, hazard control, loss prevention, risk management, safe operation, safety awareness.

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE:** | **GRADE/S:** |
| **UNIT:** Structural Support, Fasteners | **TIMEFRAME:** |

**PA COMMON CORE/NATIONAL STANDARDS:**

**UNIT OBJECTIVES (SWBATS):**

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- Understanding Subfloors
    - Types of Subfloors (Plywood, OSB, Concrete)
    - Direct instruction using samples and diagrams to differentiate materials and discuss properties, advantages, and use cases in residential flooring .
    - Hands-on identification lab: Students examine subfloor samples, record observations of texture, thickness, and moisture resistance.
- Subfloor Systems (Beams, Sill Plates, Joists, Bridging, Decking)
    - Interactive lecture showing structural components with diagrams or models .
    - Group model-building activity: Create small-scale floor framing systems using mock lumber to visualize load transfer and joist layout.
- Importance of Subflooring in Structural Integrity
    - Guided discussion connecting subfloor quality to flooring performance and home safety .
    - Demonstration: Compare sound absorption and flexibility between correctly and incorrectly installed panels.

- Materials and Tools
    - Overview of Materials (Plywood/OSB Grades, Adhesives, Fasteners)
    - Visual presentation and short quiz identifying types, specifications, and correct uses .
    - Lab activity: Students test bonding strength of subfloor adhesives and compare fastener hold in wood vs. OSB.
- Essential Tools for Subfloor Installation
    - Teacher demonstration introducing saws, drills, levels, and measurement tools .
    - Tool identification challenge: Match each tool to its task and discuss safe handling.
- Safety Gear and Practices
    - Safety briefing on PPE and cutting practices before project work begins .
    - Role-play exercise: Students identify safety violations in mock jobsite scenarios.

- Preparing the Space
    - Assessing and Preparing Existing Structure
    - Teacher modeling of inspection techniques using scaled floor mock-ups.
    - Student activity: Identify signs of damage, rot, or uneven framing in demonstration models.
- Moisture Barriers and Insulation
    - Guided discussion on the role of vapor barriers and underlayment .
    - Installation simulation: Students place mock insulation and barrier layers under small frame sections.

- Measurement and Layout
    - Accurate Floor Measurements
    - Math integration: Calculate total area and sheet coverage .
    - Students measure a framed floor mock-up and produce a material takeoff sheet.
- Layout Marking and Spacing
    - Demonstrate chalk-line marking and joist spacing setup.
    - Student exercise: Mark layout lines for subfloor sheets on a deck mock-up ensuring proper alignment.

- Cutting and Fitting
    - Cutting Plywood/OSB
    - Instructor demonstration on safe cutting technique and panel orientation .
    - Hands-on practice: Students measure, cut, and fit subfloor panels to scaled dimensions.
- Panel Alignment and Fitting
    - Students dry-fit panels, ensuring staggered seams and square alignment.
    - Peer review: Teams evaluate each other's fit and accuracy.

- Installation Process
    - Step-by-Step Installation Demonstration
    - Show correct adhesive and fastening methods .
    - Practical lab: Students install a small subfloor section using provided materials under supervision.
- Adhesive and Fastener Technique Practice
    - Each student practices applying adhesive beads evenly and using correct screw/nail spacing .
    - Group reflection: Discuss differences in hold strength and alignment consistency.

- Final Inspection and Finishing
    - Inspection and Quality Assessment
    - Guided walkthrough checklist covering spacing, fastening, squeak tests, and seams .
    - Students inspect and document deficiencies in their or peers' subfloor mock-ups.
- Finishing and Flooring Preparation
    - Discuss sealing, sanding, or surface preparation for finish flooring stages.
    - Reflection assignment: Summarize process steps and final subfloor readiness in a project journal.

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Beams/Fasteners

- Structural Analysis Project:
  Students calculate bending moments, shear forces, and deflection in beam examples using simplified engineering formulas and online calculators.
- Advanced Beam Design Challenge:
  Teams design composite or laminated beam prototypes (e.g., glulam, LVL, CLT), document design rationale, and test their models for maximum span efficiency.
- Material Comparison Report:
  Students research and present comparative data on the lifecycle cost, sustainability, and environmental performance of beam materials (timber vs. steel vs. concrete).
- Digital Design Integration:
  Create beam and framing layouts using CAD or BIM software, showing connections, cross-sections, and load paths as per code standards.
- Code Application Case Study:
  Analyze real residential or commercial construction drawings to verify beam spans and support conditions using national or local building codes.
- Load Simulation Experiment:
  Use weights and sensors to graph deflection patterns in various beam materials, discussing elastic versus plastic behavior.
- Failure Mode Analysis:
  After observing a simulated beam failure, advanced students identify the stress point, material weakness, and recommend engineering design improvements.
- Engineering Collaboration Project:
  Partner with local architectural or technical college programs to simulate the role of structural engineers in designing a small structure like a pavilion or shed.
- Cross-Disciplinary Integration:
  Link carpentry lessons with physics and math by calculating load distributions and safety factors for beams under static and live loads.
- Sustainability Assessment:
  Research and evaluate new mass timber technologies (CLT, NLT, PSL) and their carbon reduction potential in construction.
- 3D Modeling & CNC Application:
  Use basic 3D modeling or digital fabrication software to design precision beam components that could be cut using CNC routers or laser cutters .
- Industry Certification Pathway:
  Students pursue additional OSHA or NCCER credentials for advanced carpentry and structural work readiness .
- On-Site Shadowing/Internship:
  Advanced learners participate in short-term placements or job shadows with local builders or framers to observe real-world beam installation and code compliance .
- Technical Report Writing:
  Compile a professional engineering-style report summarizing beam analysis results, code compliance checks, and project learning outcomes

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:**
Beams, Girder, Joist, Rafter, Purlin, Span, Load, Bending Moment, Shear Force, Deflection, Cantilever, Continuous Beam, Overhanging Beam, Fixed Beam, Simply Supported Beam, I-Beam, H-Beam, W-Section, Tapered Beam, Curved Beam, Composite Beam, Glulam (Glued-Laminated Timber), LVL (Laminated Veneer Lumber), PSL (Parallel Strand Lumber), CLT (Cross-Laminated Timber), Reinforced Concrete Beam, Structural Shape, Support Condition, Bearing Wall, Column, Post, Joist Hanger, Mortise and Tenon Joint, Half-Lap Joint, Built-Up Beam, Gusset Plate, Metal Strap, Anchor Bolt, Lag Screw, Carriage Bolt, Hex Bolt, Fastener, Connector, Adhesive, Torque, Shear Capacity, Load Path, Moment of Inertia, Neutral Axis, Span Chart, Building Code, Safety Factor, Fire Resistance, Sustainability

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT : Carpentry Subfloors** | **TIMEFRAME:** |

**PA COMMON CORE/NATIONAL STANDARDS:**

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**UNIT OBJECTIVES (SWBATS):**

- Understand the purpose and types of subfloors.
- Learn materials and tools required for subfloor installation.
- Gain hands-on experience in measuring, cutting, and installing subfloors.
- Develop skills in safety practices and building codes relevant to subfloors.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- **Understanding Subfloors**
  - Types of subfloors (plywood, OSB, concrete)
  - Sub floor Systems
    - wood/steel beams
    - sill plates
    - joist headers; banding
    - floor joist
    - deck bridging
    - plywood decking
  - Importance of subflooring in structural integrity and flooring installation
- **Materials and Tools**
  - Overview of materials (types of plywood/OSB, adhesives, fasteners)
  - Essential tools for subfloor installation (saws, drills, levels, measuring tape)
  - Safety gear and practices
- **Preparing the Space**
  - Assessing and preparing the existing floor structure
  - Importance of moisture barriers and insulation
  - Identifying and repairing any structural issues
- **Measurement and Layout**
  - Measuring floor dimensions accurately
  - Marking layout for subfloor installation

- Understanding joist spacing and alignment
- **Cutting and Fitting**
  - Techniques for cutting plywood/OSB to size
  - Fitting pieces together and ensuring proper alignment
  - Hands-on practice: Cutting and fitting subfloor panels
- **Installation Process**
  - Step-by-step guide to installing the subfloor
  - Using adhesives and fasteners correctly
- **Hands-on practice**
  - Installing a subfloor section
- **Final Inspection and Finishing**
  - Inspecting the installed subfloor for flaws
  - Adding finishing touches (sanding, sealing if necessary)
  - Discussing preparation for final flooring installation

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Subfloor Materials and Systems

Compare and analyze subfloor material performance—design experiments to test strength, moisture resistance, and fastener holding power for plywood, OSB, concrete, and engineered panels (such as AdvanTech or Supafloor).

Research innovative subfloor systems: evaluate the advantages and installation strategies for engineered decking, advanced moisture barriers, and integrated insulation.

Develop technical presentations detailing the impact of joist spacing, blocking, bridging, and beam selection on structural integrity and floor performance.

Materials, Tools, and Safety

Create a comparative guide on adhesives, fasteners, and advanced tools (cordless auto-feed screwdrivers, sledgehammers, stand-up feed systems) for subfloor installation, documenting pros and cons based on jobsite experiments.

Organize a safety workshop assessing risk factors for subfloor work: noise, dust, lifting, and slip hazards. Design PPE compliance checklists and conduct peer safety audits.

Preparation and Inspection

Lead site assessment simulations using digital moisture meters and laser levels, then propose solutions for subfloor preparation (structural repairs, insulation strategies, vapor barriers).

Develop moisture mitigation plans for different climates and propose multi-layered insulation systems for energy efficiency.

Measurement, Layout, and Fitting

Plan layouts using CAD or advanced drafting tools, incorporating best practices for joist spacing, alignment, and panel orientation. Analyze the effect of errors on structural performance and finish quality.

Create step-by-step guides for precise cutting and fitting, emphasizing tight tolerances, gapping for expansion (maintaining 1/8" gap between panels), and tongue-and-groove panel assembly.

Installation Techniques

Simulate installation using adhesive and fastener types, timing the process to match product working windows (such as the 20-minute open time for subfloor adhesives).

Experiment with staggered panel layouts to maximize strength and minimize the risk of squeaks and movement. Develop troubleshooting guides for real-world installation challenges (swelling, edge damage, interlocking issues).
Quality Control and Finishing
Use inspection cameras, digital moisture meters, and straightedges to perform post-installation quality control and document flaws. Develop protocols for sanding swollen edges and sealing subfloors prior to final flooring.
Create finishing plans that detail how to best prepare subfloors for hardwood, carpet, tile, and specialty flooring systems.
Integration and Review
Design a multi-room subfloor installation project integrating best practices: material selection, layout planning, installation, inspection, and finish prep. Document findings in portfolios and present recommendations for improving workflow, safety, and long-term durability.

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:** plywood, OSB (Oriented Strand Board), concrete subfloor, engineered panels (AdvanTech, Supafloor), joist spacing, blocking, bridging, wood beams, steel beams, sill plates, joist headers, banding, floor joist, deck bridging, plywood decking, structural integrity, flooring installation, adhesives, fasteners, cordless auto-feed screwdrivers, sledgehammers, stand-up feed systems, moisture barriers, insulation, digital moisture meters, laser levels, vapor barriers, CAD layout, panel orientation, cutting techniques, fitting techniques, expansion gaps (1/8 inch gap), tongue-and-groove assembly, staggered panel layouts, subfloor adhesives, fastener types, inspection cameras, straightedges, sanding, sealing, hardwood flooring preparation, carpet installation, tile flooring preparation, multi-room subfloor installation, workflow optimization, safety audits, quality control, reflective portfolios, skill mastery, and long-term durability

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT : Carpentry Stairs** | **TIMEFRAME:** |

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**UNIT OBJECTIVES (SWBATS):**

- Understand the fundamentals of stair design and construction.
- Learn about materials and tools used in stair building.
- Gain hands-on experience in measuring, cutting, and installing stairs.
- Develop skills in safety practices and compliance with building codes.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- **Stair Design Fundamentals**
  - Overview of stair types (straight, L-shaped, U-shaped, spiral)
  - Understanding stair components (treads, risers, stringers, handrails)
  - Introduction to building codes and regulations (rise/run ratios, headroom)
- **Materials and Tools**
  - Overview of materials (types of wood, composite materials)
  - Essential tools for stair construction (saws, levels, measuring tapes, square)

- Safety gear and best practices
- **Planning the Staircase**
  - Site assessment and determining stair placement
  - Calculating rise and run for stairs
  - Creating a stair plan or blueprint
- **Measuring and Cutting**
  - Techniques for accurate measuring and marking
  - Cutting stringers, treads, and risers
  - Hands-on practice: Measuring and cutting materials
- **Assembling the Staircase**
  - Installing stringers: techniques and tips
  - Attaching treads and risers securely
  - Hands-on practice: Building a staircase frame
- **Handrails and Finishing Touches**
  - Designing and constructing handrails and balusters
  - Installing handrails for safety and compliance
  - Hands-on practice: Installing handrails
- **Inspection and Adjustments**
  - Inspecting the finished staircase for safety and quality
  - Making necessary adjustments (leveling, tightening)
  - Discussing finishing options (stains, paints)

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

- Practical assessment: Demonstrating stair construction skills
- Final discussion and feedback session

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Stair Types and Structural Analysis

Analyze and compare the design and spatial impacts of multiple stair types (straight, L-shaped, U-shaped, spiral, floating, and helical). Lead a design challenge where advanced students must propose and model staircases that maximize space utilization, aesthetic appeal, and safety per current architectural trends.

Research structural requirements for specialty stairs (floating, curved, or winder designs), including the engineering principles of cantilevered or steel stringer support systems.

Component Engineering and Building Codes

Develop detailed presentations and digital models demonstrating how treads, risers, stringers, and landings are dimensioned and supported, addressing code requirements for rise/run ratios, headroom, handrail height, and nosing overhang.

Dissect complex code scenarios—such as minimum stair width, landing requirements, tread depth on winder stairs, and multi-staircase mandates for egress—and design compliant solutions for residential or commercial applications.

Materials, Tools, and Technology Integration

Run material experiments comparing wood, composites, metals, and glass for durability, sustainability, and visual effect. Document installation and finishing methods for mixing materials to achieve texture, visual contrast, or environmental benefits.

Practice advanced tool use, such as CNC fabrication, digital templating, and Proliner measurement systems to optimize layout and accuracy in stair construction.
Evaluate and propose best practices for smart stair technology (LED step lighting, touch or motion sensors) and its integration for improved safety and design.
Planning, Measurement & Cutting
Use CAD, parametric, or BIM software to plan staircases incorporating rise/run calculations, landings, and code-compliant components. Model the impact of changing project parameters—height, width, flooring types—on stair configuration.
Perform advanced measurement and cutting exercises for complex stair designs (multi-angle stringers, custom curve treads, metal stair fabrication).
Assembly and Installation
Simulate assembly of stair structures emphasizing precision fitting for stringers, treads, risers, and integration of specialized supports or curves.
Lead group installations of complex handrails and balusters, including those requiring mixed materials or specialty supports, ensuring both safety and code compliance.
Inspection, Adjustment & Finishing
Conduct full code-compliance inspections of finished staircases using digital checklists, performing quality control adjustments for leveling, tightening, and component alignment.
Experiment with finishing options such as stains, paints, and protective coats, considering the best methods for preparing stairs for long-term durability and client specification.
Capstone Review & Portfolio
Design and build a portfolio project featuring a complete stair design from concept to installation, with documentation of code compliance, material choices, engineering calculations, and innovation in form and function. Present findings and design rationale to peer and instructor panels for critique.

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:**
straight stairs, L-shaped stairs, U-shaped stairs, spiral stairs, floating stairs, helical stairs, treads, risers, stringers, handrails, balusters, newel posts, rise and run, headroom, nosing, landing, winder, stair pitch, staircase blueprint, joist spacing, stair components, tread depth, stair width, code compliance, building regulations, wood types, composite materials, saws, levels, measuring tapes, squares, safety gear, site assessment, stair placement, calculation methods, cutting techniques, assembly techniques, fastening methods, safety inspection, finishing stains, paints, structural integrity, ergonomic design, digital stair layout, CNC fabrication, Proliner systems, LED step lighting, motion sensors, cantilevered stairs, steel stringers, curved treads, staircase portfolio, and construction documentation. These terms encompass stair styles, components, materials, tools, planning, construction techniques, safety, finishing, and advanced technology integration.

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT : Carpentry Walls** | **TIMEFRAME:** |

**PA COMMON CORE/NATIONAL STANDARDS:**

**ELA:**

CC.1.2.11–12.F Evaluate how words and phrases shape meaning and tone in texts.

CC.1.2.11–12.J Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**Math:**

CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

13.2.11.D Analyze, revise, and apply an individualized career portfolio to chosen career path.

13.3.11.A Evaluate personal attitudes and work habits that support career retention and advancement.

**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**UNIT OBJECTIVES (SWBATS):**

- Understand wall types, components, and their purposes.
- Learn materials and tools used in wall construction.

- Gain hands-on experience in measuring, laying out, and constructing walls.
- Develop skills in safety practices and compliance with building codes.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- **Types of Walls and Components**
  - Overview of wall types (load-bearing, non-load-bearing, interior, exterior)
  - Understanding wall components (studs, plates, sheathing, insulation)
  - Introduction to building codes and regulations (height, spacing, materials)
- **Materials and Tools**
  - Overview of materials (types of wood, drywall, insulation)
  - Essential tools for wall construction (levels, framing squares, saws, drills)
  - Safety gear and best practices in the workshop
  - **Planning the Wall Layout**
    - Assessing the space and determining wall placement
    - Techniques for accurate measurements and spacing
    - Creating a wall layout plan or blueprint
    - Read Blueprints
    - Layout/ chalk line deck for outside walls
    - Cut and layout sole and top plates
    - Fabricate corners
    - Fabricate partitions
    - Fabricate headers
    - Assemble window openings
    - Assemble door openings
    - Layout and assemble exterior walls
    - Install let ins
    - Erect and brace
  - **Layout and assemble interior walls**
    - Erect and brace
  - **Marking and Cutting Materials**
    - Techniques for marking layout lines on the floor and ceiling
    - Cutting studs and plates to size
    - Hands-on practice: Measuring and cutting wall framing materials
- **Constructing the Wall Frame**
  - Assembling wall frames: techniques for securing studs and plates
  - Installing headers for door and window openings
  - Hands-on practice: Building a wall frame
- **Installing Walls**
  - Techniques for raising and securing walls
  - Ensuring plumb and level during installation
  - Hands-on practice: Installing a wall frame in a mock-up space
- **Sheathing and Insulation**
  - Installing sheathing materials (plywood, OSB) on walls
  - Techniques for insulating walls for energy efficiency
  - Hands-on practice: Installing sheathing and insulation

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Types of Walls and Components

- Analyze and compare different wall types (load-bearing, non-load-bearing, interior, exterior), focusing on their roles in structural support and design flexibility.
- Develop a technical presentation on contemporary wall systems, including advanced framing/optimum value engineering (OVE), and explain how techniques like 2x6 studs at 24" on center, two-stud corners, and minimal headers impact energy efficiency, strength, and material use.
- Conduct a code-compliance lab analyzing wall assemblies for adherence to height, spacing, and material regulations, using sample blueprints and local code handbooks.

Materials and Tools Mastery

- Create a comparative analysis of wall construction materials—for instance, various wood grades, insulation types, and modern drywall and sheathing options—in terms of cost, R-value, and sustainability.
- Demonstrate hands-on use of advanced construction tools (framing nailers, laser measuring systems, digital levels) and document best safety practices for wall building projects.

Planning and Layout

- Lead layout challenges requiring blueprint reading, chalk line marking, and the use of CAD tools for wall placement in intricate floor plans, verifying measurements against space constraints and code limitations.
- Direct mock-up projects in which learners fabricate corners, partitions, headers, and detailed window/door openings using advanced framing methods; document and present the rationale for each layout decision.

Assembly Techniques

- Simulate complete workflows from cutting and marking sole/top plates to assembling and raising both exterior and interior walls, with emphasis on techniques that minimize waste and maximize structural performance.
- Design jigs or templates for repetitive components like headers and let-ins to increase accuracy and workflow speed in a professional environment.

Sheathing, Insulation, and Energy Efficiency

- Investigate the benefits of continuous sheathing (plywood/OSB) in advanced framing and its effect on wall racking strength and energy performance.
- Implement and test innovative insulation strategies (e.g., exterior foam, dense-pack, blown-in) for optimum R-value and code compliance, using diagnostic tools such as thermal cameras.

Quality Control and Inspection

- Develop detailed checklists and inspection protocols; use digital tools to record wall plumb, square, and level. Critique assemblies for potential improvements before moving to next phases of construction.

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:**
load-bearing wall, non-load-bearing wall, interior wall, exterior wall, studs, plates (sole plate, top plate, wall plate), sheathing, insulation, framing squares, levels, saws, drills, safety gear, blueprint reading, chalk line, sole plate layout, top plate layout, corner fabrication, partition fabrication, header fabrication, window opening assembly, door opening assembly, exterior wall assembly, let-in installation, wall bracing, interior wall assembly, marking layout lines, cutting studs and plates, wall frame assembly, securing studs and plates, door and window header installation, wall raising techniques, plumb and level adjustment, sheathing installation (plywood, OSB), insulation techniques (thermal, sound), safety compliance, and workshop best practices

| **Wallenpaupack Area School District Curriculum** | |
|---|---|
| **COURSE: Building Trades** | **GRADE/S:10** |
| **UNIT : Carpentry Roof Systems** | **TIMEFRAME:** |

**PA COMMON CORE/NATIONAL STANDARDS:**

**ELA:**

CC.1.2.11–12.F Evaluate how words and phrases shape meaning and tone in texts.

CC.1.2.11–12.J Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

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CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Career Education:**

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13.3.11.A Evaluate personal attitudes and work habits that support career retention and advancement.

**Science:**

3.1.12. A. Apply concepts of systems, subsystems, feedback, and control to solve complex technological problems.

Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems.

Apply systems analysis to predict results.

Analyze and describe the function, interaction and relationship among subsystems and the system itself.

Compare and contrast several systems that could be applied to solve a single problem.

Evaluate the causes of a system's inefficiency.

3.2.12. A. Evaluate the nature of scientific and technological knowledge.

Know and use the ongoing scientific processes to continually improve and better understand how things work.

**UNIT OBJECTIVES (SWBATS):**

- Understand different types of roofs and their components.
- Learn materials and tools used in roof construction.
- Gain hands-on experience in measuring, laying out, and constructing roofs.
- Develop skills in safety practices and compliance with building codes.

**INSTRUCTIONAL STRATEGIES/ACTIVITIES:**

- **Types of Roofs and Components**
  - Overview of roof types (gable, hip, flat, shed, etc.)
  - Understanding roof components (rafters, trusses, sheathing, underlayment)
  - Introduction to building codes and regulations (pitch, load-bearing requirements)
- **Materials and Tools**
  - Overview of roofing materials (shingles, metal, membrane)
  - Essential tools for roof construction (saws, levels, squares, nail guns)
  - Safety gear and best practices for working at heights
- **Planning the Roof Layout**
  - Assessing the building structure and determining roof design
  - Calculating roof pitch and dimensions
  - Creating a roof layout plan or blueprint
- **Marking and Cutting Materials**
  - Techniques for marking rafters and trusses
  - Cutting materials to size for roof framing
  - Hands-on practice: Measuring and cutting rafters or trusses
- **Constructing the Roof Frame**

- Assembling roof frames: techniques for securing rafters and trusses
- Installing ridge boards and collar ties
- Hands-on practice: Building a roof frame in a mock-up space

- **Installing Roof Sheathing**
  - Techniques for installing sheathing materials (plywood, OSB)
  - Understanding the importance of ventilation and moisture barriers
  - Hands-on practice: Installing roof sheathing
- **Roofing Installation**
  - Overview of different roofing materials and installation techniques
  - Installing underlayment and final roofing material (shingles, metal, etc.)
  - Hands-on practice: Installing roofing material on a mock-up

**ASSESSMENTS (Diagnostic/Benchmark/Formative/Summative):**

**DIFFERENTIATED INSTRUCTION (Acceleration/Enrichment):**

Types of Roofs and Components

- Lead a comparison and evaluation project of roof styles—design and model gable, hip, shed, flat, and complex roofs (e.g., mansard, gambrel, butterfly) using digital 3D software. Analyze how varying roof forms impact structural loads, drainage, thermal performance, and architectural aesthetics.
- Investigate advanced roof framing: calculate and compare rafter and truss systems, including engineered trusses, and present findings on material efficiency, labor costs, and building code requirements.
- Host a building codes seminar: research and present on regional regulations for roof pitch, structural load minimums, ventilation, and weather-resistant barriers.

Materials, Tools, and Safety

- Organize a hands-on lab to evaluate the installation speed, durability, and environmental resilience of different roof coverings (asphalt shingles, metal panels, membranes, synthetic slates).
- Compare the use of specialty roofing tools—demonstrate the advantages of pneumatic nailers, magnetic sweepers, and advanced measuring systems in precision roof construction.
- Facilitate a "working at heights" safety challenge: use fall-arrest systems, scaffold setup, and real-time hazard recognition scenarios to build expertise in best practices on sloped and elevated workspaces.

Planning, Layout, and Marking

- Direct a full-roof planning cycle using BIM or CAD tools: assess building structure, calculate accurate roof pitch, draft construction blueprints, and create detailed takeoff lists for materials.

- Guide real-world mock-ups measuring, marking, and cutting common and custom rafters, as well as trusses for complex roof designs. Emphasize techniques for minimizing waste and improving material yield.

Constructing the Roof Frame

- Assign group projects to assemble roof frames, incorporating ridge boards, collar ties, and blocking for both standard and complex roof types. Incorporate quality control checks to ensure plumb, level, and secure installation.
- Challenge students to design and build a scaled model contrasting the structural performance of different roof forms under simulated wind or snow loads.

Sheathing, Ventilation, and Insulation

- Lead advanced labs testing and comparing sheathing materials (plywood, OSB, SIPs) for spanning capacity, moisture resistance, and integration with high-performance underlayments and ventilation channels.
- Instruct on specialized ventilation and moisture barrier strategies for roofs in different climates, using diagnostic tools (thermal cameras, hygrometers) to evaluate energy and vapor performance.

Roofing Installation and Finishing

- Simulate roof installs using underlayments and a variety of surface materials, documenting optimal installation sequences and performance under weather exposure.
- Review finishing details such as flashing, drip edge, and penetration sealing, emphasizing high-durability options for extreme weather conditions and long-term maintenance.

**RESOURCES (Technology Based Resources, Text Resources, etc.):**

**KEY VOCABULARY:** Key vocabulary terms associated with Types of Roofs and Components include gable roof, hip roof, flat roof, shed roof, mansard roof, gambrel roof, butterfly roof, rafters, trusses, roof sheathing, roof underlayment, pitch, roof load-bearing requirements, asphalt shingles, metal roofing, roofing membrane, roofing saws, levels, squares, roofing nail guns, fall-arrest systems, scaffolding, digital roof layout, CAD software, roof blueprint, roof pitch calculation, rafter cutting techniques, truss cutting, ridge boards, collar ties, roof ventilation, moisture barriers, plywood sheathing, OSB sheathing, roof flashing, drip edge, synthetic slate, solar roofing, thermal cameras, hygrometers, roofing finishing, roof sealants, flashing cement, valley flashing, roof slope, roof square, staggered roofing, fastening methods, roofing safety gear, smart roof technology, LED step lighting, and roofing inspection tools. These terms comprehensively cover roof types, components, materials, tools, construction techniques, safety, finishing, and regulatory compliance