



HVAC/R Career Pathways

Jobs in design, installation, maintenance, repair, and related green jobs



**AFSCME
AFL-CIO**



WHAT IS HVAC/R?

“HVAC/R” stands for heating, ventilation, air conditioning and refrigeration. This field manages and maintains healthy indoor air quality in residences, businesses, and industrial facilities. There is a shift away from HVAC/R systems that use fossil fuels to more sustainable electric and biodiesel systems, and a focus on improving buildings’ energy efficiency by using renewable energy and automated building management systems that require workers’ comfort with computer interfaces and analyzing data.

AREAS IN HVAC/R

The field comprises occupations with a broad range of educational backgrounds and skills. Technicians or trade workers who construct, install, repair, and maintain HVAC/R systems tend to have the lowest barrier to entry. Some of these workers focus predominantly on HVAC/R systems while others have a variety of responsibilities, one of which is HVAC/R-related work. Engineers and support staff design HVAC/R systems for buildings and typically need at least an associate degree in engineering. With the right combination of education and experience, workers can move across areas and those with either a background in hands-on installation and maintenance work or design can move into business operations or managerial roles.

WORK ENVIRONMENT

Most occupations have full-time schedules. Workers who install, maintain, and repair HVAC/R systems work at all types of buildings and are often required to travel between jobsites, which may be indoors or outdoors, cramped, noisy, and wet. They need to be on call for emergencies, and sometimes work during evenings and weekends. Engineers generally spend most of their time in offices and work standard hours. They visit worksites occasionally to scope out projects, oversee implementation of project plans, and evaluate systems.

EMPLOYMENT OUTLOOK

Given HVAC/R’s universal presence in built structures, the field is thriving and expected to grow. Most occupations in this career map have “favorable” or “very favorable” employment growth prospects from 2018 through 2028 according to the New York State Department of Labor.

HVAC/R JOBS & POSSIBLE ENTRY POINTS

MECHANICAL DESIGN

Mechanical design includes planning, building, and evaluating mechanical equipment and systems. Drafters or engineering technicians are supporting roles; they transform engineers' designs into technical drawings. Technicians also test and inspect systems. Certification from the American Design Drafting Association (ADDA) is generally not required but demonstrates skill. With enough experience or a bachelor's degree, a person can become a mechanical engineer. They investigate and analyze problems, design systems to provide solutions, and test systems, either leading the process or reviewing consultants' work. Mechanical engineers can start as interns or assistants working under a licensed engineer, advancing to the position of quality assurance (QA) specialist who ensures plans are correctly implemented and quality standards and building codes are met. Senior mechanical engineers with a NYS Professional Engineer (PE) license can sign official documents and have managerial responsibilities. LEED certification is not required but employers may prefer it.

Critical skills: math, read schematics, prepare CAD drawings, detail-oriented, knowledge of building codes, basic computer skills, collaboration, writing reports, teachable, creative thinking, problem-solving, critical thinking

HVAC/R SYSTEMS OPERATIONS

High pressure plant tenders and stationary engineers operate, maintain, and repair high-pressure, steam-powered, and electromechanical building systems and related HVAC/R equipment. HVAC technicians also oversee mechanics that manage indoor air quality and temperature, and may install systems. These employees monitor and adjust system controls, inspect hardware and software, record data, and clean, test, and repair systems. Senior stationary engineers also have management responsibilities. These jobs are accessible with a high school education, but some employers prefer candidates with vocational training. Licenses or certifications might be required: NYC High Pressure Boiler Operating Engineer, NYC Oil Burning Equipment Installer, FDNY certifications (including Refrigeration Machine Operator), EPA 608, and a driver's license. HVAC technicians can demonstrate competency with certifications from trade organizations (NATE, ESCO Group, RETA, ACCA).

Critical skills: assembling and disassembling equipment, hand-eye coordination, troubleshooting, problem-solving, detail-oriented, math, interpersonal skills, physical strength, basic computer skills

BUILDING TRADES AND MAINTENANCE WORKERS

Mechanical systems' components may be installed, tested, maintained, and repaired by specialized trade workers. Helpers or apprentices learn from journey workers while providing support. With enough training, workers independently execute tasks, prepare drawings and reports, and instruct and supervise junior employees. Maintenance workers perform upkeep and repair of buildings and their systems, including HVAC/R. Maintenance workers, supervising trade workers, and heating

plant technicians can become maintenance supervisors who do both hands-on and managerial work (oversee staff, manage resources, scheduling, reporting). Inspectors ensure equipment is in good operating condition and is designed and installed according to specifications, laws, and regulations. Depending on the job, licenses or certifications may be needed, including Master Electrician, Master Plumber, Certificate in Competence in Plumbing, High Pressure Boiler Operating Engineer, EPA certifications, energy management certifications, and a driver's license.

Critical skills: physical abilities (strength, good vision, hand control), read schematics, detail-oriented, analytical, troubleshooting, problem-solving, knowledge of electrical and building codes, spoken and written communication, interpersonal skills

BUSINESS OPERATIONS AND SENIOR SUPERVISORS

Cost estimators calculate expenditures and resources needed for a project. They may negotiate with contractors and vendors, and senior estimators have supervisory responsibilities. Construction project managers also estimate costs, plus prepare work scopes, manage contractor work, recommend and approve change orders, coordinate team members, and liaise with the community. Senior supervisors with "administrative" titles in construction management, building maintenance, and engineering combine technical expertise and leadership qualities to strategically direct divisions. They consult on major projects, resolve challenges, and plan, organize, and have responsibility for the work of their staff.

Critical skills: detail-oriented, math, analytical, problem-solving, communication, interpersonal skills; team leaders also need to take initiative, exercise sound judgment, make decisions, organize, delegate, set goals, motivate others

RELATED GREEN JOBS

PV installers configure, assemble, test, and maintain solar panel systems that can provide electric power to HVAC/R systems. Certification from the NABCEP or ETA International may be preferred. In NYC, plumbing and electrical work to connect PV and HVAC/R systems must be done by licensed tradespeople.

Critical skills: assembling and disassembling equipment, physical abilities (strength, climbing, hand-eye coordination), troubleshooting, detail-oriented, math, communication

Energy modelers use knowledge of sustainable design, engineering, and building systems to minimize buildings' energy usage and carbon footprint. Certifications are beneficial to enter the field and advance within it, including LEED, ASHRAE's Building Energy Modeling Professional, and Certified Energy Manager or others from the Association of Energy Engineers (AEE).

Critical skills: energy modeling software, engineering knowledge, analytical, problem-solving, math, detail-oriented, communication, project management

Education and experience levels reflect the typical worker's background for each job. Years of experience can be substituted for college credits or a degree, and vice versa.

Energy Modeler
\$63K-\$118K

Administrative Engineer
\$120K-\$208K

Facilities Manager
\$98K-\$185K

Construction Project Manager
\$80K-\$186K

QA Specialist
\$66K-\$120K

Licensed Engineer
\$66K-\$120K

Mechanical Engineer
Unlicensed Engineer

Job titles can vary across agencies, and there may be opportunities for advancement within a job title. For example, someone who wants to be a construction project manager could start as an intern and eventually advance to a leadership role as an administrative construction project manager.

Mechanical Engineering Technician
\$43K-\$61K

Drafter
\$44K-\$82K

Electrician
\$48K-\$111K

Sheet Metal Worker
\$36K-\$90K

Stationary Engineer
\$77K-\$121K

Boiler Maker
\$64K-\$111K

Maintenance Supervisor
\$57K-\$106K

VOCATIONAL/ SOME COLLEGE

High Pressure Plant Tender
\$74K-\$83K

HVAC Technician
\$49K-\$88K

Pipeworker
\$41K-\$88K

Inspector
\$53K-\$92K

Solar Photovoltaic (PV) Installer
\$48K-\$69K

Cost Estimator
\$59K-\$110K

Helper - Pipeworkers
\$33K-\$50K

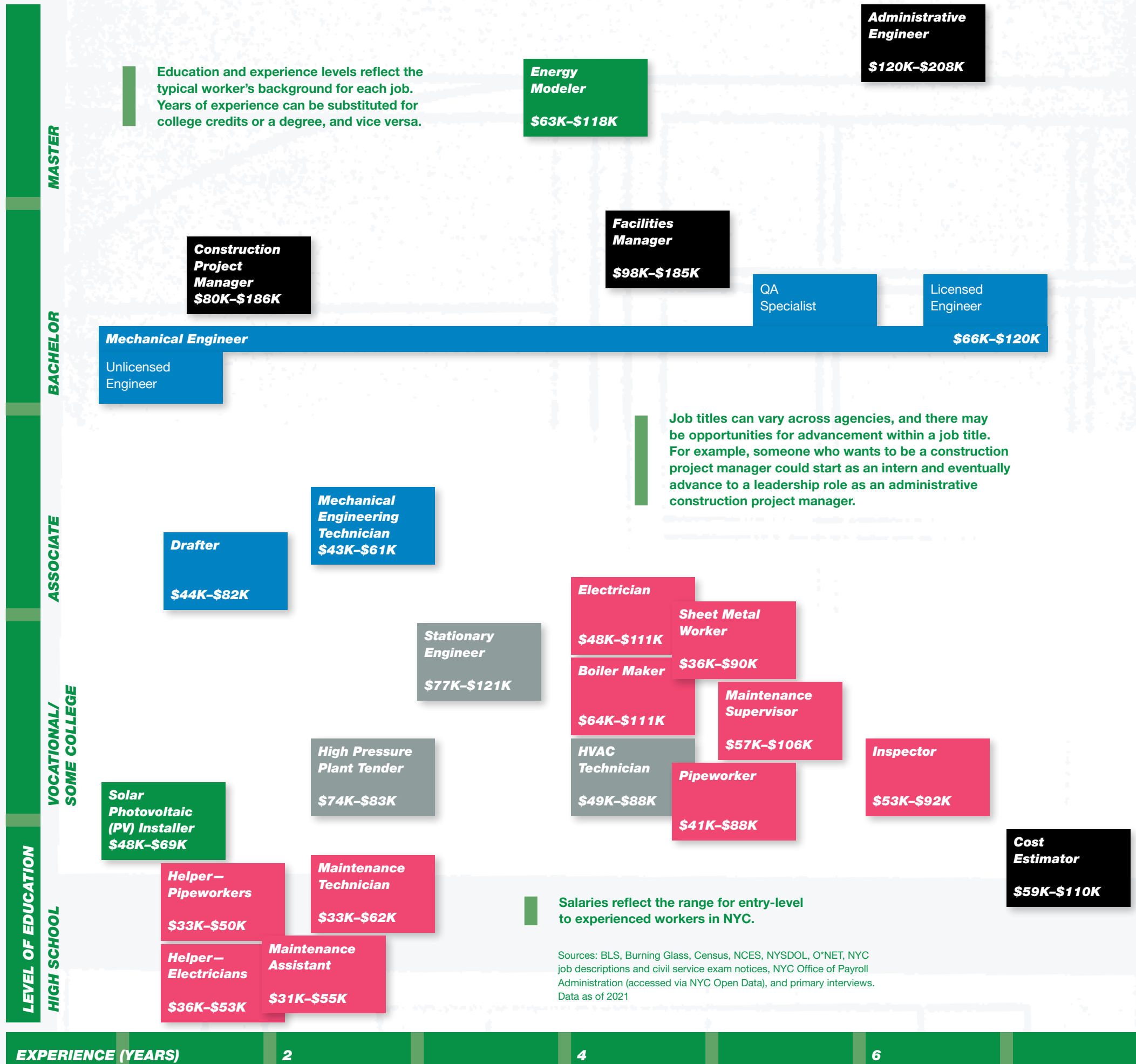
Maintenance Technician
\$33K-\$62K

Salaries reflect the range for entry-level to experienced workers in NYC.

Helper - Electricians
\$36K-\$53K

Maintenance Assistant
\$31K-\$55K

Sources: BLS, Burning Glass, Census, NCES, NYSDOL, O*NET, NYC job descriptions and civil service exam notices, NYC Office of Payroll Administration (accessed via NYC Open Data), and primary interviews. Data as of 2021



EXPERIENCE (YEARS) 2 4 6

HVAC/R & RELATED PROGRAMS IN PUBLIC INSTITUTIONS

COLLEGE NAME	PROGRAM NAME	Certificate/Training	Associate Degree	Bachelor's Degree	Advanced Certificate	Master's Degree	Doctoral Degree
NYC							
CUNY BRONX CC	Engineering Science		●				
CUNY CITY COLLEGE	Mechanical Engineering			●	●	●	●
CUNY CITY TECH	Construction Management	●	●	●			
	Engineering Technology		●	●			
	Environmental Control Technology		●				
	Facilities Planning and Management					●	
CUNY COLLEGE OF STATEN ISLAND	Engineering Science		●	●			
CUNY HOSTOS CC	Mechanical Engineering		●				
CUNY LAGUARDIA CC	Engineering Science (Mechanical)/Energy Technician		●				
CUNY QUEENSBOROUGH CC	Mechanical Engineering Technology/Engineering Science		●				
HUDSON VALLEY							
DUTCHESS CC	Air Conditioning and Refrigeration Technology (ACR)		●				
	Engineering Science/Construction Technology Management		●				
ORANGE COUNTY CC	Engineering Science		●				
ROCKLAND CC	Computer Assisted Design (CAD)		●				
	Engineering Science		●				
SUNY AT NEW PALTZ	Mechanical Engineering				●		
SUNY WESTCHESTER CC	Computer Aided Drafting (CAD)		●				
	Mechanical Technology/Engineering Science			●			
ULSTER COUNTY CC	Computer Aided Drafting (CAD)		●				
	Engineering Science		●				
	Green Building Maintenance & Management		●				
LONG ISLAND							
FARMINGDALE STATE COLLEGE	Construction Management Engineering Technology			●			
	Mechanical Engineering Technology			●			
	Technology Management					●	
STONY BROOK UNIVERSITY	Mechanical Engineering			●	●	●	
	Engineering Science				●		
SUFFOLK COUNTY CC	Drafting (Computer-Assisted)		●				
	Heating, Ventilation, AC and Refrigeration		●	●			
	Engineering Science/Construction or Electrical Technology		●				
NEW JERSEY							
BERGEN CC	Computer Aided Drafting (CAD)/Construction Management		●				
	Drafting and Design Technology		●				
	Engineering Technology/Engineering Science		●				
BERGEN COUNTY TECHNICAL SCHOOLS-ADULT ED	HVAC/Electrical Technology/Plumbing		●				
ESSEX COUNTY COLLEGE	Computer-Aided Design (CAD) Technology/Mechanics		●				
	Engineering Technology/Engineering		●				
MIDDLESEX COUNTY COLLEGE	Computer Aided Drafting		●				
	Engineering Technology/Engineering Science		●				
NEW JERSEY INSTITUTE OF TECHNOLOGY	Engineering Management					●	
	Engineering or Construction Management Technology			●			
	Mechanical Engineering			●	●	●	
RUTGERS UNIVERSITY	Mechanical Engineering			●	●	●	
UNION COUNTY COLLEGE	CAD-CAM/Photovoltaic (PV)		●				
	Engineering Technology/Engineering		●				
ONLINE							
CUNY COLLEGE OF STATEN ISLAND—CONTINUING ED	HVAC		●				
FERRIS STATE UNIVERSITY	HVACR Engineering Technology & Energy Management			●			
PENNSYLVANIA STATE UNIVERSITY—WORLD CAMPUS	Engineering Leadership and Innovation Management				●		
	Mechanical Engineering/Engineering Management					●	
	Solar Energy					●	
UNIVERSITY OF NORTH DAKOTA	Energy Engineering			●	●	●	
	HVAC		●				
	Mechanical Engineering			●	●		

CC denotes Community College.

Private institutions also offer related programs. Check in your local area or for online programs.