KNOW THE CAREER WORLD

Architecture and Construction Careers

By Dr Charles Mugaviri

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Purposeful Career Planning

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DEDICATION

I dedicate this book to the millions of teenagers in and from the African continent. May your lives be consumed by a deep desire to build leadership legacies that will unlock Africa's potential and greatness. Africa is too rich to be poor. You were born for a purpose. You were born to leave Africa a better continent than you found it. Don't disappoint and don't settle for less.

Acknowledgements

No task of this magnitude can ever be achieved without divine wisdom and knowledge. I would like to first and foremost acknowledge the LORD Almighty for granting me the love to inspire and empower my generation.

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I would like to also acknowledge the inspiration and motivation that I have received over the years from the legacy building individuals that I have worked with in the Church community, at the University of Zimbabwe and at LASOF Leadership Institute. Our journey together of inspiring and empowering thousands of learners to make purposeful career choices and become character based leaders ignited the desire and vision for this career guidance series.

Each learner, parent, school, company, government department, Church or NGO who came through our career and leadership programs in Zimbabwe and the wider African region has inspired us to continue the journey and they deserve special acknowledgement. You each made me believe this was a worthwhile cause.

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Introduction

The career world is diverse and dynamic. Before you make a career choice, it is important that you have an appreciation of the width and depth of the career world in terms of options that are available.

A career is a chosen pursuit, a profession or occupation requiring special training, followed as one's lifework. It is a path or course one chooses to follow to earn a living. It is the progression of one's working life or one's professional achievements, for instance a soldier or a teacher. A career is a course of successive situations that make up a person's occupation. A career is therefore doing what one does as a permanent occupation.

The term career is derived from the Latin word *carrera,* which means race. The verb was first attested in 1594 from the notion of a horse "passing a career" on the jousting field. A career is usually considered to pertain to remunerative work and formal education. One can have a sporting career or a musical career without being a professional athlete or musician, but most frequently "career" in the 20th century referenced the series of jobs or positions by which one earned one's money.

Career Cluster is a broad group of related career majors within an occupational interest area. They represent groupings of occupations and industries based on shared traits. There are sixteen (16) career clusters that cover all occupations.

This book focuses on the Agriculture, Food and Natural Resources career cluster.

Perspectives on career planning

One of the most important choices you have to make in your life time is selecting a career. This choice has far reaching implications and it has to be an informed choice. The quality of information you have determines the quality of decisions you make. This book is a tool designed to empower you to make an informed career choice that you won't regret in the future. In this introduction, we are going to share some perspectives that you need to take into account as you make use of this book.

Purpose perspective to career planning

Take a moment and think of the best footballer in your nation. Think also about your favourite local musician. Can you imagine the two of them switching places? How do you think the footballer would perform on the music stage and the musician in the football field?

We were all created and designed to fulfil a specific purpose in life. None of us was created to do everything. You have a life purpose that will bring out your best. That purpose is your life assignment. You need to choose a career that is aligned to that assignment. In fact your career should be an expression of that assignment. The platforms for expressing your purpose may vary from one season to another but the assignment itself does not change. Its expressions may also change but your purpose will remain a constant factor in life.

Many professionals today are not fulfilled and satisfied with their careers mainly because of a lack of purpose perspective in the manner they selected their careers. Your career should be an expression of who you are and it must be an opportunity for you to utilize your gifts, talents, passions and other latent abilities. This is why you must first know yourself well before you make your career choice. This question of self-knowledge is fully addressed in the book "Know Yourself: A Foundation for Career and Character Development" which is the first book in the Career Education series.

Dynamic perspective to career planning

You also need to appreciate the career world is so dynamic and ever changing. Did you know for example, that the top ten jobs in the world in 2010 did not exist in 2004? You need to be aware that some of the jobs that are on demand today may not be relevant in the future. Can you imagine what is happening to someone who invested all their time in developing a career that has to do with manufacturing or repairing manual type writers?

The dynamism of the career world means you need to be prepared to continuously develop new knowledge and skills that are relevant to the ever changing career world. Multi skilling is also important as you will have to adapt to the changing socio economic and political environment.

Please note the career listing in this book is not exhaustive. There are other careers that are not mentioned in this book under this career cluster. The ones listed here are only samples.

Local perspective to career planning

When making a career choice, invest effort in developing an understanding of the economic environment in your country as it has a direct bearing on the labour markets. You don't want to spend years developing knowledge and skills in an area where there are limited or no employment prospects. You need to have some insights in terms of employment trends in your local job market.

For example, a country like Zimbabwe did not have diamond mining until a few years ago. Today, however, diamond mining is redefining the economic terrain in ways that have far reaching implications in terms of new career opportunities. Diamond cutting, for example, is a new career pathway that had never been explored before but that is becoming a major area of

employment opportunity as Zimbabwe has the fourth largest diamond deposits in the world. We have other examples of countries in countries that have discovered oil deposits like Ghana. Such developments have far reaching economic implications that are reflected in new career opportunities.

Global perspective to career planning

We encourage all learning to also develop knowledge and an appreciation of regional and global economic and employment trends. There is a lot of migration of skills across nations and continents. Developments in other parts of the world will have some bearing on developments in your nation as well. It is wise to have a global perspective even when you are deciding to pursue your career locally.

In this book, we have looked at the Career world from both an African and global perspective. There will be many careers you may see that you have not heard about before. Some of them may be in your country but you have not been aware of it. Other listed careers may not be found in your country. This broad view should help you to appreciate local, regional and global trends in terms of the career world.

Entrepreneurial perspective to career planning

The rate of unemployment has been growing across the nations of Africa and the world. There is need to rethink the traditional approach to career planning and employment. It is important to observe that in most African nations the informal or Small to Medium Enterprises (SMEs) sector is growing rapidly. Many people are creating jobs for themselves and others instead of seeking and waiting for non-existent employment opportunities.

As you plan your career, you need an entrepreneurial perspective where you see yourself as a prospective employer not just an employee.

Contents

Career Pathways and Sample Architecture and Construction Careers

Focus: Careers in designing, planning, managing, building and maintaining the built environment.

Cluster Summary: Careers in the Architecture and Construction cluster design and build things. People in these occupations can work with many different tools to help them do their special jobs. They may build or design houses and buildings out of wood, steel or stone. They build highways and bridges too. You can be an engineer, electrician, carpenter or drafter and be in this career.

Career Pathways	Sample Career Specialties
Design and Pre-construction	Architect • Architectural and Civil Drafter • Civil Engineer (structural, geotechnical, transportation, etc.) • Civil Engineering Technician • Code Official Computer Aided Drafter (CAD) • Cost Estimator • Drafter • Electrical and Electronic Engineering Technician • Electrical Engineer (electronics, security, telecommunications) • Environmental Designer • Environmental Engineer (hydro engineering, acoustical, etc.) •Environmental Engineering Technician • Fire Prevention and Industrial Engineer • Interior Designer • Landscape Designer • Landscape Architect • Materials Engineer • Mechanical Drafter • Mechanical Engineer (HVAC, plumbing, fire protection, etc.) •Modeler (traditional and computer) Planner/Designer • Preservationist • Programmer • Protection Engineer • Regional and Urban Renderer (traditional and computer) • Specificatio Writer • Building Surveying and Mapping Technician • Surveyor •
Construction	Boilermaker • Carpenter • Carpet Installer • Concrete Finisher • Construction Craft Labourer • Construction Engineer • Construction Foreman •Construction Inspector •

	Construction Manager •Drywall Installer • Education and Training Director/Coordinator • Electrical & Power Transmission Installer • Electrician • Electronic Systems Technician • Elevator Installer • Equipment and Material Manager • Estimator • Explosives Worker • Field Supervisor • Floor Layer •General Contractor/Builder •Glazier • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic •Insulation Worker • Iron/Metalworker (structural and reinforcing) • Landscaper/Groundskeeper • Line worker• Manufacturer's Representative •Mason • Millwright •Painter •Paperhanger •Pipe Fitter • Pipe layer •Pipeline Installer•Plasterer/Drywall •Plumber • Preservationist • Project Inspector • Project Manager • Roofer •Safety Director • Sales and Marketing Manager • Scheduler • Security and Fire Alarm• Systems Installer • Service Contractor • Sheetmetal Worker • Specialty Contractor •Specialty Trades Subcontractor •Steamfitter •Subcontractor • Superintendent • System Installer •Terrazo Worker and Finisher •Tile and Marble Setter • **NOTE:** General contractors/Builders and Specialty contractors typically own the contracting company.
Maintenance / Operations	Boilermaker • Carpenter • Carpet Installer • Concrete Finisher • Construction Manager • Construction Engineer •Construction Foreman • Construction Inspector •Cost Estimator • Demolition Engineer •Drywall Installer • Electrician • Electrician • Elevator Installer • Environmental Engineer • Equipment and Material Manager • Estimator • Facilities Engineer • Field Supervisor • General Maintenance Contractor • Glazier • Hazardous Materials Remover • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic •

	Heavy Equipment Operator •Highway Maintenance Worker •Hydro Testing Technician • Insulation Worker • Insulation Worker • Iron/Metalworker (structural and reinforcing) • Landscaper/Groundskeeper •Maintenance Estimator • Maintenance Planner/Scheduler • Manufacturer's Representative• Mason Millwright •Operating Engineer • Paperhanger • Pipe Fitter • Pipelayer•Plumber • Preservationist • Project Inspector • Project Manager • Refractory Technician • Relay Technician•Reliability Engineer • Remodeler • Restoration Technician • Safety Director • Sales and Marketing Manager • Scheduler • Security and Fire Alarm•System Installer • Security Controls Manager •Service Contractor • Sheetmetal Worker • Specialty Trades Contractor • Steamfitter • Subcontractor • Substation Mechanic Superintendent • System Installer • Terrazo Worker and Finisher • Thermal Control Technician •Tile and Marble Setter • Utility Metering Technician Wastewater Maintenance

Career 1: Architects

Architects are professional people who design, plan and decorate buildings, with a view to utility, durability, convenience, and aesthetic appeal. They use their knowledge of construction materials and methods, and architectural techniques to design and oversee the construction of safe, functional and attractive buildings.

They discuss the purpose, requirements and cost with the client and then prepare drawings. If these are accepted, the final design is prepared together with working plans for the use of contractors. The architect may assist the client in selecting a contractor. They may also help in the selection of building sites, preparation of costs, the carrying out of land-use studies and long-range site development planning.

During construction, the architect visits the site to ensure that the design is being followed. Architectural technologists also carry out this supervisory work.

Many architects today are limited by costs to designing rather more mundane buildings, although they do occasionally get the opportunity to branch out into more adventurous fields such as opera houses, skyscrapers, hospitals, railway stations, supermarkets, airports and so forth. Their everyday work is usually the designing of dwellings for their clients and renovations or improvements to existing domestic and commercial buildings.

They usually need to design buildings that are durable, functional, suit the needs of the owners, are as pleasing to the eye as possible, given financial constraints, and that fit in with the surrounding terrain as much as possible.

A solid knowledge of how to use a computer is steadily becoming essential as many of the tools of this profession are now computer-aided. Environmental knowledge is often essential when creating new housing developments or industrial projects.

Some fulfilling and satisfying aspects of this career
- the variety of the work
- working with people
- solving problems
- the opportunity to use creativity and artistic ability
- creating something that will last

Some demanding and challenging aspects of this career
- working long hours

- having to change plans to please clients
- working with difficult or unpleasant people
- meeting deadlines

Purpose Orientation

An architect should:
- have interest in new buildings, old buildings, history, design, art, drawing and drafting
- have an intelligent, logical mind
- show attention to detail
- have good grasp of mathematics
- be able to get along with others and work in a team l aptitude for solving problems
- be creative and artistic but practical
- have ability to visualize, particularly three-dimensionally
- have good sense of form and good eyesight
- have good communication skills, oral and written, especially giving clear instructions
- have scientific and technical knowledge
- be healthy
- have a steady hand

School Subjects

Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.
Compulsory Subjects: Mathematics
Recommended Subjects: Visual Arts

Training

Degree in Architecture. The course's duration is five or six years' full-time study. Further training up to doctoral level is possible for those who are interested in an academic career.

Prospective architects must obtain one to two years of experience under the guidance of a registered architect before they can register with their country's Institute of Architects.

Diploma in Architectural Technology

Employer

- architectural companies
- real estate firms
- building contractors
- government departments
- construction companies
- universities
- self-employment, architects are often able set up their own practices

Career 2: Architectural Metalworkers

Architectural metalworkers make steel doors, metal patterns, fixtures, templates and railings for architectural purposes. They may make their own designs and sketches, but usually they work under assignment of architects who supply them with drawings.

They mark cut lines on the metal, which can be brass, copper, steel or alloys. They cut and forge metal to the desired shape by means of various machine tools such as metal band saws, power shears, fly presses and swage machines. The metal is heated in a furnace to make it malleable.

Architectural metalworkers use soldering, brazing or welding techniques to join the different parts of the metal pattern together. They complete their task by fixing the door, pattern or template to the building.

Architectural metalworkers may specialize, such as with iron and steel manufacturers or building contractors. They may specialize in manufacturing specific objects such as steel doors or patterns.

Architectural metalworkers mostly work in workshops equipped with benches, tools and machines. Sometimes, when furnace heating and blacksmithing is done, it becomes extremely hot inside the work area. In the course of their work architectural metalworkers often visit building sites, which allows for variation in the work situation.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- the satisfaction of seeing results of one's work
- the opportunity to become self-employed

Some demanding and challenging aspects of this career
- the possibility of injury while on the job
- limited job availability

Purpose Orientation
The architectural metalworker should
- enjoy working with their hands
- show inventiveness and creativity in the processing of metal
- have patience and persistence in order to execute all tasks with the necessary accuracy
- have mathematical aptitude to cope with drawing and interpreting sketches of three-

dimensional designs
- be a neat, precise worker
- have good health and physical fitness
- have good hearing and vision
- have manual dexterity

School Subjects
Ordinary Level Certificate
Some employers prefer higher qualifications

Compulsory Subjects: None
Recommended Subjects: Mathematics

Training
Apprenticeship training.

Employer
- Building contractors
- Architects
- Iron and steel manufacturers
- Mining companies
- Large engineering concerns
- Self-employed

Career 3: Architectural Model Maker

An architectural model maker builds scale models of buildings drafted by architects. Scale models are necessary for obtaining practical information with regard to what the building will look like when finished, how much sunlight will come in the windows and how the building will fit in with its surroundings.

In the world of architecture, interior design, landscape architecture and town planning, models have been used for ages. Models used to be built in architects' offices by architects and draughtsmen. More recently, model building has developed into a profession of its own, with developers realising the true value and advantage of scale models.

Model makers interpret and transpose architects' drawings into three-dimensional reproductions. Models constructed are to specific scales and the materials used imitate the proposed building materials. The miniature constructions enable architects to present developers or owners with concrete examples of proposed buildings or projects.

Architectural model makers construct different types of models to depict particular features of the building. These include: block models, semi-detailed or working models, fully detailed models and interior models.

Block models show only the external form of the building, to visualize architectural forms three-dimensionally, showing the contours only and model buildings are mainly blocks with no detail.

Semi-detailed or working models represent the plans in concrete form to builders and are used where the scale is too small to show detail, as well as in cases where a developer or architect wants a "quick" model to visualize the effect and position of a building.

Detailed completed models show precisely what the project or building will look like after completion and it is important that the finest detail is depicted.

Interior models show the internal set-up, complete with scale-model furniture and the interior decorating of the building. The model maker is expected to make the furniture to scale.

In the case of a proposed high-rise building intended to house apartments, shops, parking and garaging facilities, each floor of the model would be built separately from the next, but inter-joining. This would allow the designer to study the available space, light, ventilation, types of business premises, exits and entrances and so on. The roof would be detachable, as would fire escapes, escalators and elevators, which might have to be moved to more suitable positions. The

completed model, after examination by all parties concerned, would then be shown to the client for approval or suggestions.

Models are useful because they can help the architect and client decide whether the proposed building should be constructed or not. Developers also make use of models to illustrate precisely what the proposed building will look like. This enables them to sell the buildings before the project has even started.

Models are one of the greatest marketing tools for developers. Potential clients are often confused by drawings and plans alone. The model will show them more or less what the finished project will look like, thus enabling the developer to sell space or time-share before the actual construction of the building has started.

Some fulfilling and satisfying aspects of this career

- the variety of the work
- working with people
- the opportunity to use one's creativity and artistic ability

Some demanding and challenging aspects of this career

- working long hours
- having to change plans in order to please architects, designers or clients meeting deadlines

Purpose Orientation

An architectural model builder should:

- be adept at working with fine detail
- have artistic ability
- have ability to interpret architectural drawings
- have knowledge of maths, to interpret these specifications and drawings
- have ability to visualize two-dimensional drawings three-dimensionally
- have good sense of form
- be accurate and precise worker
- be able to work in a group
- be handy, with excellent manual and finger dexterity
- have good eyesight
- be healthy
- have a steady hand for finer details

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Visual Arts

Training
Diploma: Architecture and Architectural Technology

Employers may offer in-service training. It would be an advantage to have a diploma in Architectural Technology or at least in Art.

Employer
- architects
- architectural model building firms
- large building construction companies
- town planning firms
- large building firms
- property developers
- government departments
- self-employment - with the necessary experience and finance a person can start their own model building business and do work for architectural and building firms

Career 4: Architectural Technologist

An architectural technologist is the practical executor of the architect's conceptual designs. The architectural technologist spends most of the time at the drawing board, but he is also expected to assist the architect in the following areas:

- Site surveying, which includes preparing measured drawings of existing buildings and collection of practical information relating to the proposed project

- Preparation of presentation drawings and models of the design for submission to the client for whom the building is being designed

- Detail and landscape design
- Preparation of working drawings that will serve as legal instructions to the building contractor

- Supervision of the building process to ensure that the building is built according to the working drawings and other legal documents

Architectural technologists are therefore expected to do research, assist architects in the collecting of information and to integrate this information into the design. They are required to do some designing and to be able to translate the architect's conceptual design into a workable building.

Freehand drawing must be learnt to be able to prepare presentation drawings of the building in its environment. A good and broadly based knowledge of building construction and building services is necessary, so that the architectural technologist can ensure that the building is workable. He must be able to communicate the information to the building contractor.

Some fulfilling and satisfying aspects of this career
- the variety of the work
- working with people
- solving problems
- the opportunity to use one's creativity and artistic ability

Some demanding and challenging aspects of this career
- working long hours
- having to change plans to please clients
- frustration with building contractors who might not follow instructions
- meeting deadlines

Purpose Orientation

An architectural technologist should:
- have a strong three-dimensional aptitude;
- be interested in construction techniques and details, design and human habitats;
- be able to work accurately;
- be able to communicate ideas through drawing;
- have ability to work independently and with others
- have aptitude for solving problems
- be creative and artistic, but practical
- have mathematical ability
- be proficient in speech and writing, to give instructions clearly
- have scientific and technical knowledge
- be able to visualize

School Subjects

Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, English and at least one science subject.
Recommended Subjects: Visual Arts, Physical Sciences

Training

The technical training in Architectural Technology is based on communicating with drawings. It includes a theoretical knowledge of building construction technology and the design of buildings, building science, history of architecture, building services, and specification of building products.

Students study full-time for the first year, work in an architect's office for the second year and return for full-time studies during the third year. This system gives students the opportunity to gain practical experience and a small salary while being educated.

Universities offer a basic three-year course leading to a National Diploma in Architectural Technology. Students may select to continue to a fourth year or B. Tech. Architectural Technology degree specializing in either Applied Design, Technology or Architectural Management.

Employer

- architectural companies
- real estate firms
- building contractors
- construction companies
- universities and universities of technology
- government and local government departments
- self-employment, some architectural technologists are able to set up on their own

Career 5: Bricklayers and Plasterers

Bricklayers and plasterers are usually the first tradesmen employed on a building project where they are responsible for the building of the inner and outer walls of the building as well as the finishing of these structures. The bricklaying and plastering trade is one of the oldest trades in the building industry and has not changed much since the early days. The material used has developed and changed to a great extent

Bricklaying still consists mostly of placing bricks and blocks on top on one another whilst following the three rules of plumb, level and straight.

Plastering comprises the artistic and functional covering and finishing of the interior and exterior walls of building according to specifications and design.

Bricklayers are skilled journeymen who construct and repair walls, partitions, steps, free standing piers, arches, fireplaces and other structures made of brick, concrete block or masonry materials. They may specialize in one type of masonry material such as firebrick or cinder block work.

Bricklayers first study the blueprints or building plans to check specifications and determine the most accurate layout. Mortar is then mixed and a layer or bed of mortar is spread as a base, after which bricks are positioned by hand to assure a neat, uniform appearance. Excess mortar is cut off. Mortar joints are then finished off so that moisture cannot penetrate.

Bricklayers must have a thorough knowledge of the different types of bricks that are available, also of the correct mortar mixtures and of how to adapt building methods to different weather conditions. They need to know how to weld metal supports for bricks. In addition, they may supervise helpers.

Bricklaying and plastering is hard but satisfying work. Bricklayers sometimes have to work in harsh weather conditions, for long hours to meet deadlines. Most bricklayers and plasterers work at construction sites that may be dirty and noisy. Others perform building and repair work for industries, business and government concerns. Some work for private homeowners doing small building projects such as fireplaces or patios.

Some fulfilling and satisfying aspects of this career

- working with one's hands
- working on different projects
- usually good employment opportunities

Some demanding and challenging aspects of this career
- doing strenuous work
- lay-offs during cold or rainy periods
- the possibility of injury or accidents on the job
- working in noisy and dirty environments
- sometimes having to travel to find work

Purpose Orientation
Bricklayers should:
- enjoy working with your hands
- enjoy working with others
- enjoy performing accurate, detailed work
- be healthy and strong
- have stamina
- have the ability to understand the drawings of architects and engineers
- have the ability to visualize a finished project
- have manual dexterity
- have potential entrepreneurial aptitude
- some artistic ability is very useful

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics

Training
Apprenticeship training

Employer
- building trade, general contractors
- government concerns
- construction businesses
- self-employment, with the necessary experience can trade on a private basis or start own business

Career 6: Building Contractors

Building contractors are independent construction specialists who bid on specific assignments within major construction projects. The construction of one large building might involve many contractors and subcontractors working together towards its completion.
A contractor first analyses the work specifications, determines the materials, personnel and related costs required to complete the assigned task and then submits a quotation. If the tender is accepted, the contractor purchases materials and works according to the job specifications and makes use of various skilled artisans and labourers who are assigned to the project.

Some fulfilling and satisfying aspects of this career
- seeing a completed assignment or project
- solving problems and helping to make advances in all areas of technology
- the challenge and variety of the many specialities
- working in a field that offers high salary, good advancement opportunities
- the respect of the community

Some demanding and challenging aspects of this career
- a lot of competition.

Purpose Orientation
A building contractor should:
- enjoy solving problems;
- be able to make decisions;
- be innovative, able to think about old problems in new ways;
- be accurate and persistent;
- show good judgement;
- have a business inclination;
- be able to work with people of all levels from managers to labourers.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Ordinary Level Certificate for learnership training

Compulsory Subjects: Mathematics
Recommended Subjects: Accountancy, Economics

Training
Apprenticeship training.

Most building contractors begin their careers as artisans: carpenters, painters, bricklayers, plumbers and electricians. They then gain a contractor's licence to register as a building contractor.

Degree: Construction Economics / Management

Diploma in Building

Employer
- Private construction companies
- Public utility companies
- Partnerships
- Self-employed

Career 7: Building or Construction Managers

Building or construction managers use their knowledge of all aspects of building and construction to plan and oversee building projects and advise architects, engineers, and quantity surveyors.

Building managers organise subcontractors and materials, manage time, contracts and regulations, and serve as liaison between architects and building contractors.

There are five main, important functions that building managers perform: purchasing; calculation of expenses; planning; building surveying; and control management. Although they do not necessarily carry out these tasks themselves, they have to ensure that these aspects of the building process run smoothly.

Building managers may work in various positions including: project managers of large building projects or building controllers for large municipalities or contract or financial managers. They may also act as technical advisers when buildings are planned and constructed.

Some fulfilling and satisfying aspects of this career
- organizing people for teamwork
- variety of work
- being involved in erecting huge building complexes

Some demanding and challenging aspects of this career
- working and overseeing in dusty conditions
- climbing ladders and scaffolding
- the pressure to keep within time and money constraints of contracts

Purpose Orientation
A building manager should:
- have an interest in building and construction;
- be able to think logically;
- be able to coordinate team work;
- be prepared to work outdoors;
- get along well with people and have good communication skills;
- be able to motivate people at all levels.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Economics

Training
The Diploma in Building and the BTech. degree in Construction Management

Degree: A BSc undergraduate degree

Employer
- government departments
- building contractors and subcontractors
- construction companies
- municipalities
- financial institutions
- retailers and manufacturers in the building industry
- own building contractor business

Career 8: Building Surveyors

Building surveyors are mainly concerned with building materials. They apply their measuring and surveying skills to various tasks required by building contractors and quantity surveyors.

Building surveyors measure the building work already completed on sites by means of a very specific system. The information obtained from measuring the work is used to issue monthly certificates and also to determine whether the company is running at a profit.

Before commencement of building projects, professional quantity surveyors make cost estimations. These estimates are presented in the form of complete lists of all items necessary to complete projects and are known as 'bills of quantity'. Building surveyors then analyze these bills of quantity and price all items such as materials, labour and plant. In this way they arrive at tender amounts, which are submitted as offers for building contracts.

When the building project is started, building surveyors prepare budgets and do the necessary financial planning for various projects within the larger overall project. They negotiate with manufacturers and suppliers of building materials for the best prices, while keeping the costs for the completion of each separate project in mind.

Building surveyors also need to ensure that the flow of materials to building sites runs smoothly to ensure that the right quantities are available where and when needed. When certain parts of buildings have been completed, building surveyors are responsible for surveying the completed work and issuing payment certificates, so contractors can be paid.

Building surveyors are responsible for the correct and timeous settlement of account of contractors, sub-contractors and suppliers of building materials.

Building surveyors can also work for, and assist, quantity surveyors; for example, in measuring the builders' work and help to compile bills of quantity. They may also issue monthly valuation certificates, measure variations and help with the preparation of final accounts.

In large companies senior building surveyors mainly perform management functions. They advise the company on aspects such as legal documentation and the financial implications regarding the use of particular materials.

The building industry is continually being further mechanized and computers are therefore essential tools to building surveyors. This occupation requires both being indoors, as well as outdoors. They work mostly in offices, making calculations and compiling reports. However, it

is also necessary to visit building sites.

Some fulfilling and satisfying aspects of this career
- taking part in the creation of architectural masterpieces
- variety of work
- being able to work in various locations

Some demanding and challenging aspects of this career
- many different areas to supervise and control
- pressure due to time constraints
- frustrations with uncooperative and unreliable staff

Purpose Orientation

A building surveyor should:
- have an interest in figures, computers and people
- be able to work quickly and very accurately
- be able to maintain good interpersonal relations
- be reliable and responsible
- have perseverance
- be able to visualize building work that still needs to be done
- have aptitude for figure work
- be an organized, methodical worker
- be able to work well under pressure

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Accounting

Training
Diploma in Building; Higher National Diploma in Construction Management

Employer
- quantity surveyors
- building contractors
- construction companies
- property developers
- government departments
- local government

- mining houses
- financial and insurance institutions
- self-employment, as a consultant in the industry

Career 9: Cartographer

Cartographers draw up and revise maps of the earth's surface, and make this information available to the user in a format that is easy to use.

Cartographers work closely with surveyors and geologists and make use of a number of sources for their work including aerial photographs, field reports, historical manuscripts and other charts and statistical reports. They produce charts using photolithography, drawing and etching techniques.

They also work with computer programs and photogrammetry (the science of accurately plotting maps and plans from photographs taken with calibrated cameras, usually from the air, but occasionally also from ground stations), which gives a three-dimensional perspective of the landscape.

Cartography is concerned with four different map processes:

- Line work: sketching lines and engraving
- Colour separation: the preparation of different masks for each separate colour for multi-colour maps)
- Positioning of letters and symbols
- Reproduction of maps

The types of maps produced depend on the purpose for which the maps are required. These may include:

- topographical maps
- maritime charts
- cadastral maps that show farm boundaries
- climatic maps indicating variance in climatic parameters
- road maps, street plans and tourist maps
- geographical and geological maps
- town and regional structure plans.
- aeronautical charts and maps, which indicate routes and provide navigational information

Cartographers usually work in well-equipped offices. The sophistication and standard of the equipment depend on the financial resources of the employer.

Some fulfilling and satisfying aspects of this career

- the original nature of one's work
- variety of work
- working with pens, inks and printing materials
- producing works of art

Some demanding and challenging aspects of this career
- having always to be accurate and precise
- getting smudged with ink in the course of one's work

Purpose Orientation
A cartographer should:
- be not necessarily artistic, but at least able to put ideas on paper
- be precise and neat
- be able to work patiently and accurately
- have manual dexterity and good eye-hand coordination
- have good colour discrimination
- have a flair for figures
- have an interest in Geography.

School Subjects
Ordinary School Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Geography

Training
Aspirant cartographers apply for posts as learner drawers with potential employers. If accepted, they undergo theoretical training at a university of technology and practical training with the employer concerned, under the supervision of an experienced cartographer.

National Diploma in Cartography is a 3-year course

Employer
- Various government departments
- Large municipalities
- Private concerns
- Mining companies

- Photogrammetric enterprises
- Universities and universities of technology
- Research institutions

Career 10: Civil Engineer

Civil engineers are responsible for the planning, designing, maintenance and management of projects to do with the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. Civil engineering may be the oldest of the all the engineering disciplines and today, civil engineering encompasses a range of specialized fields which include structural design, marine, environmental, construction, hydraulic engineering, transportation, and geotechnical engineering.

Many civil engineers hold supervisory or administrative positions, from supervisor of a construction site to a city engineer. They may supervise the work of surveyors, draughtsmen, technicians and other workers and may also carry out research, lecture or serve as consultants for engineering, construction or architectural firms. Others may work in design, construction, research and teaching.

The work environment, therefore, ranges from quiet modern offices to remote areas in rugged terrain. They may have to travel or move from place to place to work on different projects. The actual work setting depends on the speciality chosen and on the size, location and financial resources of the employer.

Engineering graduates usually begin work under the supervision of experienced engineers and are gradually given more responsibilities as they gain experience. Some engineers with experience and additional education move into administration or management. Many high-level executives in industry began their careers in engineering.

For civil engineering technicians and technologists, see Engineering Technicians and Technologists.

Some satisfying aspects of this career
- solving problems
- wide variety of specialities available
- knowing that your work is of benefit to society
- working as part of a team
- good salaries, with benefits

Some demanding and challenging aspects of this career
- having to travel
- sometimes having to work long hours
- the long period of preparation and study required to register as a professional civil engineer

- having to continue your education throughout your career to keep up with the latest technological advances in your field

Purpose Orientation
A civil engineer should:
- have an aptitude for science and mathematics;
- be able to visualise objects three dimensionally;
- be creative and have initiative;
- be accurate and persistent;
- be able to make decisions;
- show good judgement;
- work well with others;
- express ideas clearly;
- have good health and stamina
- have managerial qualities
- be able to manage and organize projects

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Information Technology, Geography, Engineering and Technology

Training
Degree: Civil Engineering. The engineering degree requires a minimum of 4 years of study at a recognised university.

B Tech degrees and Diploma Courses in Civil Engineering

A person who has obtained a recognised BSc (Eng) or BEng degree is then eligible for registration as an Candidate Engineer. After gaining at least 3 years of appropriate practical experience, a civil engineer may register as a Professional Engineer.

Employer
- Government departments
- Municipalities
- Construction companies
- Engineering or architectural firms

- universities of technology and universities
- self-employment, the necessary experience and initiative, as a consultant

Career 11: Crane Operator

Crane operators control a crane in order to hoist or transfer heavy objects from one level to another. They manoeuvre the crane in such a way that the load comes to a standstill in the required place.

In cases where the crane is mobile on tracks, the crane operator regulates the backward and forward movement. The operator needs to make sure that the cable does not jerk. The crane operator of an outdoor crane may be assisted by ground personnel by means of telephone or by hand signals.

Working conditions vary from place to place. The overhead crane operator is often exposed to the heat, smoke and gases of factories. Weather conditions have an influence on the outside worker. Modern cranes, however, have comfortable cabins. Overtime work is often required.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- working as part of a team
- working at different sites

Some demanding and challenging aspects of this career
- may have to work overtime
- working conditions may be uncomfortable

Purpose Orientation

A crane operator should:
- be responsible and reliable;
- be alert;
- be unaffected by the height at which he works;
- be patient and have perseverance;
- have good eyesight;
- have good eye-hand coordination as well as good coordination between right and left;
- have manual dexterity;
- be able to judge distances and heights accurately.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: None

Training
In-service training: In most countries, the law requires all crane operators to be formally trained. Most of the larger organizations offer a bridging course after appointment. During this course aspirant crane operators receive a broad knowledge of the general activities in which they might be involved. This in-service training is either done by a training officer, a foreman or an experienced senior operator. During this initial stage crane operators will be under the supervision of a co-operator.

In certain instances crane operator training can only be performed by an organization that has the approval of the chief inspector. When this is the case, the operators must pass a theory and practical test before they receive a valid certificate of training (licence) which entitles them to operate the crane on their own. They are required to be re-tested every two years to ensure they remain competent as crane operators.

Employer
- Building industry
- Transnet
- Manufacturing industry
- Airports
- Construction sites
- Harbours

Career 12: Dealer in Oriental Carpets

Eastern carpets today are much sought after items, and within reach of most people. Hand-knotted carpets come from a very wide area, which makes it impossible to determine exactly where each carpet comes from.
Oriental carpet dealers purchase carpets from all over the world and then sell them again. Buyers also purchase the carpets directly from suppliers from all over the world. The carpets may be stored for a while before being resold.

Carpet dealers need to advise buyers on the proper care of carpets and thus need to know a lot about the carpets they sell. Oriental carpet dealers often travel extensively, in search of carpets to buy. They need to have a good eye for colour, design and texture.

There are several factors that influence the price of a carpet. Buyers examine the quality of the carpet, as well as the colouring agents that were used. The pattern, number of knots, fineness and evenness of the carpet are other factors which have an influence. Many different types of carpets can be purchased such as Persian or Iranian carpets, Caucasian carpets, Chinese carpets, Anatolian carpets, etc.

Some fulfilling and satisfying aspects of this career
- visiting various countries and learning more about their history and culture through the study of carpets
- working with objects of beauty and value
- meeting new people

Some demanding and challenging aspects of this career
- sometimes having to work long and irregular hours
- a lot of travelling can be tiring and being away from home can put a strain on family relationships

Purpose Orientation
- good eye for colour, design and texture, as well as quality
- good sight and normal colour vision
- able to observe detail
- knowledgeable about carpet values
- good business sense
- managerial and sales skills
- good communication skills
- enjoy travelling and working with people

- able to maintain good interpersonal relationships

School Subjects
Ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: History

Training
In-service training under the supervision of an experienced oriental carpet dealer.
The prospective dealer in Oriental carpets obtains his knowledge through years of experience.

Employer
- carpet dealers
- self-employment, with enough experience and capital, can start own business

Career 13: Draughtsman

Draughtsmen and women, or drafters as they are also called, translate the ideas and rough sketches of engineers, architects and scientists into detailed drawings.

Draughtsmen prepare technical drawings and plans used by production and construction workers to build everything from manufactured products such as spacecraft or industrial machinery, to structures such as office buildings or oil and gas pipelines.

Their drawings provide visual guidelines, showing the technical details of the products and structures, specifying dimensions, materials to be used, and procedures and processes to be followed. Drafters fill in technical details, using drawings, rough sketches, specifications, codes and calculations supplied by engineers, surveyors, architects or scientists.

They use various drafting tools, engineering practices and mathematics to complete drawings, including technical handbooks, tables, calculators and computers.

Traditionally, draughtsmen sat at drawing boards and used compasses, dividers, protractors, triangles and other drafting devices to prepare a drawing manually.

Most draughtsmen now use computer-aided drafting (CAD) systems to prepare drawings. These systems employ computer workstations which create a drawing on a video screen. These systems make it easy to prepare many variations of a design and allow it to be viewed from angles not usually available with traditional drafting methods. The drawings are stored electronically so that variations, revisions or duplications can be made easily and quickly.

Although this equipment has become easier to operate, CAD is only a tool. People who produce technical drawings using CAD still function as drafters, and need most of the knowledge of traditional drafters, relating to drafting skills and standards, as well as CAD skills.

Some drafting work, however, continues to be done by traditional manual and tracing methods in addition to using computers to draw designs.

Drafters prepare detailed drawings based on sketches and specifications prepared by architects, engineers or other designers. Projects differ radically and specialization in preparing drawings in the various fields is therefore necessary:

Areas of drafting specialization include:

Aeronautical
Architectural
Civil Engineering
Electrical Engineering
Mechanical Engineering
Structural Engineering
Town and Regional Planning
Geological
Landscape
Cartographical (maps)
Mining
Marine

Some of these in more detail are:

Architectural drafters draw plans for all kinds of buildings

Civil engineering drafters draw plans for bridges, roads, irrigation and construction schemes

Mechanical engineering drafters sketch plans for machines and engine parts, also of such things as: hydrological steelworks and air conditioning systems

Electrical engineering drafters finalize plans for electrical circuits and wiring systems in buildings, etc.

Structural engineering drafters draw designs for towers and steel frames

Town and regional planning drafters draw maps of sewage, drinking water, steam, heating, cooling and conveyor installations, and they may also build models for projects

Cartographical drafters draw different types of maps such as cadastral, topographical and meteorological

Mining drafters draw plans of mines, including three-dimensional plans, which could help, for example, with the upgrading of safety standards

Within the various industries, distinction is made between tracers, detail draughtsmen and design draughtsmen:

- Tracers copy drawings and generally assist draughtsmen

- Detail draughtsmen finalize drawings

- Design draughtsmen handle advanced work

Some fulfilling and satisfying aspects of this career
- doing accurate and precise work
- having good promotional opportunities
- travelling to other offices or work sites to gain first-hand information about a project

Some demanding and challenging aspects of this career
- sitting or standing for long periods of time
- experiencing eye strain as a result of doing close work
- having to work overtime to meet deadlines

Purpose Orientation

A draughtsman should:
- be able to transfer concepts onto paper;
- have patience and perseverance;
- be meticulously accurate;
- enjoy doing detailed work;
- be able to concentrate for long periods of time;
- have three-dimensional perception;
- have good vision;
- have good eye-hand coordination and free-hand drawing skills;
- be interested in and have a flair for computer work;
- have stamina (at times standing is required).

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Some employers prefer higher qualifications

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Engineering and Graphic Design

Training
Diploma: Draughtsmen's training consists of 18 months of academic training, available at most

universities of technology, and 18 months of in-service training at an approved firm. To be accepted for training, candidates must first apply for employment at possible employers. The employer usually pays the tuition fees and also pays the learner draughtsman a salary during training.

Diplomas:
Diploma in Architectural Technology
Diploma in Cartography
Diploma in Surveying
Diploma in Town and Regional Planning
Diploma in Mine Surveying

These courses take three years to complete.

Employer
- Architectural and engineering firms
- Municipalities
- Construction companies
- Metal manufacturing companies
- Machinery construction companies
- Mining companies
- Contract draughting firms
- Government departments, such as Water, Agricultural Economics, Mineral and Energy
- Self-employment, doing freelance work or with enough experience and capital, can start own business

Career 14: Earth-moving Equipment Mechanic

Earth-moving equipment mechanics specialize in the mechanical work required on heavy machinery used for the construction of highways, dams, airports, pipelines and in mining operations.

They perform routine maintenance on the machinery and, if an operator reports a fault, search for its cause. Equipment is first inspected to see whether the problem can easily be detected. If not, the mechanic partially dismantles the engine to check parts for damage or excessive wear. The necessary repairs are then made, which may also require the organization of replacement parts.

They also repair or replace various fuel systems and need to be able to maintain and repair all these systems.

Sometimes, specific parts have to be manufactured or adjustments made to the machine. In such instances, it is up to the mechanic to design the part to be manufactured. Micrometre's, tachometers and engine dynamometers, as well as transmission dynamometers are used for this purpose.

Earth-moving equipment mechanics are responsible for looking after all the parts and components of the construction equipment, including the tyres, mechanical components, hydraulic systems, power shift transmissions, electrical and fuel systems.

The work involves travelling at times, as some of the earth-moving equipment is on site or in rural areas. Otherwise the work is usually carried out indoors in workshops.

Some fulfilling and satisfying aspects of this career
- working with your hands
- keeping machines working properly and safely
- being able to detect faults in good time

Some demanding and challenging aspects of this career
- time constraints, as repairs are usually urgent because down-time is very expensive
- sometimes getting very dirty
- having to travel to remote areas on occasion

Purpose Orientation

An earth-moving equipment mechanic should:
- able to work independently, quickly and efficiently;
- think analytically;
- have a practical and mechanical aptitude;
- have manual strength and dexterity;
- good hand-eye coordination;
- good communication skills.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Mechanical Technology

Training
Diploma in Mechanical Engineering

Apprenticeship or in service training

Employer
- companies that sell and service earth-moving equipment
- large earth-moving contractors
- large construction companies
- large civil engineering firms
- the irrigation machine industry
- tractor manufacturers
- government departments
- self-employment; with enough experience and capital, can start own business

Career 15: Environmental Engineer

Environmental engineering is the field of engineering concerned with local and worldwide environmental issues. Environmental engineers use the principles of Biology and Chemistry to provide practical solutions to problems related to the environment.

Environmental engineers are concerned with assessing and managing the effects of human and other activity on the natural and built environment. They apply their engineering knowledge and skills to such things as environmental impact assessment, natural resources management and pollution control.

Problems relating to water, air pollution control, recycling, waste disposal, and public health issues are increasingly becoming high on the agendas of government and businesses around the world. As pressure continues to mount over environmental issues, so the need for expertise in this area will continue to grow.

Environmental engineers provide practical solutions to some of these problems, most significantly in the planning, design, repair and construction of public infrastructure systems such as water and sewage treatment plants, landfills, storm water and river control works.

Environmental engineers conduct hazardous-waste management studies, evaluate the significance of the hazard, make recommendations on treatment and containment, and develop regulations to prevent mishaps. They design and operate processes to treat waste to a standard acceptable for discharge and/or recycling, for example, wastewater treatment and waste solidification. They also work with occupational health experts to ensure a hazard-free working environment.

They analyse scientific data, research controversial projects and perform quality control checks. They study and attempt to minimize the effects of acid rain, global warming, automobile emissions and ozone depletion. They are involved in the protection of wildlife. Environmental engineers research and develop new technologies and techniques to improve the environmental acceptability of engineering projects. They evaluate the environmental impact and the social impact of engineering projects in association with the public, scientists and other engineers.

They prepare reports and studies on the best approach to environmental management in new and existing engineering projects, taking into account environmentally sustainable economic activity and legal, environmental and industrial factors. They communicate relevant issues to other technical staff, managers, regulatory authorities, public interest groups and the public.

Environmental engineers may specialize in particular industry sectors such as the minerals industry, the chemical industry and civil engineering projects. They frequently work closely with other professionals, at times pooling expertise on particular projects. They may work in offices and outdoors when involved in construction projects.

Many environmental engineers work as consultants, helping their clients to comply with regulations and clean up hazardous sites. Environmental engineers are used as key players in the rehabilitation of mine dumps and open-cast mining sites and abandoned urban or industrial sites, that may pose a threat to the environment. Environmental impact studies are required before any development can take place in environmentally sensitive areas.

Engineering graduates usually begin work under the supervision of experienced engineers and are gradually given more responsibilities as they gain experience. Some engineers with experience and additional education move into administration or management. Many high-level executives in industry began their careers in engineering.

Some fulfilling and satisfying aspects of this career
- helping to keep environments safe
- being involved with conservation of nature where possible
- challenging work which is full of variety

Some demanding and challenging aspects of this career
- frustrations when recommendations are not followed
- annoyance with the public's lack of awareness and caring
- sometimes having to work in all kinds of weather conditions

Purpose Orientation
Environmental engineers need to be/have:
- willing to deal with hazardous materials
- good communication skills, both in person and in writing
- good judgement
- interest in conservation environmental issues
- interest in technical and engineering activities
- willing to adhere to safety requirements
- able to identify, analyze and solve problems
- interested in computing and technical design
- practical and creative
- able to accept responsibility
- physically fit

School Subjects
Ordinary Level Certificate meeting degree requirements for a degree course
Advanced Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Information Technology, Geography, Life Sciences and Engineering and Graphic Design

Training
Degree: Environmental Science or Health courses are offered at most universities.
Environmental engineers are part of the larger Civil Engineers occupational group

Diploma: Environmental courses are offered at all universities of technology.

Those who have obtained recognized BSc (Eng) or BEng degrees are eligible for registration as a Candidate Engineer. After gaining at least 3 years of appropriate practical experience engineers may register as Professional Engineers under the auspices of the Engineering Council of their country. Registered professional engineers are entitled to write the prestigious letters PrEng after their name.

Employer
Environmental engineers may work in:
- large construction and mining organizations
- large forestry organizations
- waste management companies
- regulatory authorities and some government departments
- municipalities
- consulting engineering firms and architectural firms
- chemical and petrochemical industries
- academic and research institutes
- self-employment, with enough experience, initiative and capital, can work as consultant

Career 16: Fence and Concrete Wall Erector

Fence and wall erectors work on projects of any size, putting up fences around areas such as small home gardens, or larger areas such as along motorways.

Fences are erected to demarcate the boundaries of properties and to provide security. Fence erectors need to be able to work to precise measurements, between adjoining properties. It is necessary to keep up to date with new techniques and materials available for fencing.

Fence erectors use a variety of materials including split pole timber, wire, steel and concrete. The materials used depends on the purpose of the fence. Fencing used for residential properties usually consists of diamond wire mesh and steel posts or painted palisade fencing. Precast concrete wall panels are also commonly used, as well as brick walling.

After measuring the area, calculating the number of panels / material required and taking these to the site, they prepare the area. They may first have to remove old fencing or walling and clear away any roots that are in the way. Next they erect the steel poles, standards and supporting stays, or precast posts, which are set into concrete bases in the ground. The steel mesh fencing and lengths of supporting wire are stretched taut between the steel posts and attached with wire.

In the case of steel palisade fencing, on the other hand, panels manufactured in the factory to specific dimensions are delivered to site and welded in position between steel posts, at appropriate intervals, which are cast into concrete bases in the ground. This fencing is usually painted with a protective coating. With precast concrete walling, the ends of each precast concrete panel are slid into the vertical grooves in the precast concrete posts and cemented into place.

Some fences are decorative and some may be specially made instead of pre-constructed. Both garden fencing and that used on farmland and estates might be constructed on-site by the fence erector.

Different types of specialised fencing are used where security and safety are of prime concern, for example around industrial premises and prisons or along the edges of roads, motorways and railways. Some fences may have barbed or razor wire fixed along the top. Electric fences are also often used nowadays for security reasons along the top of fences and walls.

Some fulfilling and satisfying aspects of this career
- learning new practical skills
- travelling locally from place to place

Some demanding and challenging aspects of this career
- working outdoors in any weather
- being physically active and on your feet for long periods
- having to lift or carry heavy things
- getting messy or dirty

Purpose Orientation
- have good practical skills
- good with arithmetic and able to measure accurately
- able to work alone or as part of a team
- be efficient and exact in your work
- be physically fit

School Subjects
Entry requirements vary. You do not always need educational qualifications to be able to undertake this work, but a good general standard of education is desirable.

Training
All training is on-the-job carried out by experienced workers. You would probably start out as a labourer to assist experienced workers.

Employer
- landscaping companies
- construction
- environmental protection agencies
- forestry
- self-employment is an option, as is working in a large commercial firm being employed by builders, suppliers or installers.

Career 17: Floor Covering Installer

A floor covering installer lays, replaces, repairs, services and prepares rugs, carpets and flooring made of organic and synthetic materials such as linoleum, vinyl, plastics, rubber, wood, cork and seamless plastic flooring, and they are also responsible for the preparation of the sub-surfaces.

People spend a lot of time indoors, whether it is at work in an office, at the gym, inside a shopping mall or relaxing at home. All kinds of trades to do with the construction and design of buildings have emerged as we continue to erect more structures for these activities. One of the trades that continue to grow to meet the demand is that of the floor covering installer.

To lay carpeting, they need to inspect, measure and mark the surfaces to be covered, measure, cut and fasten the underlay or under padding, and then measure, cut and install the carpeting by hand or with a machine stitcher, seaming iron, bonding tape or other bonding materials. The carpet may be stretched using a power stretcher, and it is secured to the floor or other surfaces using a staple gun or other devices.

Resilient floor coverings are installed using adhesives, rollers and other hand tools. Hardwood floors, such as strip floors, block and plank floors, are installed using glue, staples, nails or by other means.

Floor covering installers also inspect and repair damaged floor coverings of various types and estimate material and labour costs for the work involved. They will deal with customer estimates, mix glue, measure, cut and lay down flooring in the course of a typical day.

Since many of the coverings are expensive and require great care in cutting and shaping, employers look for installers who are careful and methodical workers. Anyone who has ever seen a smoothly polished wooden floor can appreciate the efforts of floor covering installers.

Some fulfilling and satisfying aspects of this career
- pleasure of seeing the final result of the work
- customer satisfaction
- opportunity to work without a lot of advanced education

Some demanding and challenging aspects of this career
- work can be physically challenging
- working for difficult clients
- constant exposure to adhesives, paste, etc.

Purpose Orientation
- need to be physically fit
- strong manual dexterity
- have an eye for detail
- have sufficient mathematical skills to prepare cost estimates for installing or repairing flooring

- need to be focused and self-disciplined
- be a careful and methodical worker
- take pride in your work
- get along well with people

School Subjects
Ordinary Level Certificate, though a higher grade is recommended.

Compulsory Subjects: Mathematics / Mathematical Literacy
Recommended Subjects: Accounting

Training
Floor covering installers receive their training either by informal, on-the-job training or through a learnership programme. Trade certification can be obtained either through a learnership programme or after several years of work experience. While trade certification is not mandatory in all areas to become a floor covering installer, it is a requirement for many employers and can also help secure employment.

Learnership programmes involve a combination of on-the-job training and classroom instruction. A pre-learnership course may also be available. Learnerships vary in duration, however, a typical learnership takes from four to five years. Although paid, wages are less than a qualified floor covering installer would receive. After successfully completing the course, the floor covering installer is awarded a certificate of completion.

Employer
- carpet sales outlets
- building construction companies
- floor covering contractors
- self-employment

Career 18: Heating and Ventilation Fitter

Heating and ventilation fitters install, maintain and repair central heating, ventilation and air conditioning systems. They work on large-scale equipment including boilers, tanks, air ducts and large pipes. They use a variety of tools to carry out their work.

There are some similarities to the work done by plumbers, but heating and ventilation fitters generally work on very large-scale installations which may include refrigeration systems, large pumps and boilers.

Heating and ventilation fitters need to be physically fit because the work involves lifting heavy equipment (although ropes and pulleys are used for the heavier components), as well as bending, kneeling and working in cramped and awkward spaces. They must have a head for heights, as they may also need to work on scaffolding. It is necessary to keep up to date with health and safety regulations.

Installation work is carried out in premises such as office blocks, hospitals, factories and power stations. When the equipment has been installed it must be tested to make sure that it is working efficiently and safely.

Their work mainly consists of fitting pipes to carry hot water, other liquids or gas. Fitters use bending machines to shape the larger pipes and ducts that can be up to fifty centimetres in diameter. Flame-cutting equipment is used to cut these to the correct size. They usually work from drawings showing the planned layout of the whole system. Some fitters offer service and maintenance contracts for clients.

Maintenance and repair work includes routine servicing and emergency repairs. Repair work involves finding faults in the system, replacing or repairing any damaged parts, carrying out tests and making sure that the system operates properly.

Some fulfilling and satisfying aspects of this career
- learning new practical skills
- working as part of a team

Some demanding and challenging aspects of this career
- work can be physically demanding
- exposure to dusty equipment when servicing it
- having to lift or carry heavy objects
- having to work on ladders and high scaffolding

Purpose Orientation
- have good practical skills and the ability to handle tools
- able to work carefully and accurately
- have good numeracy skills so that measurement and calculations are accurate
- be physically fit

School Subjects
There are no academic qualifications required to enter this occupation.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology

Training
People who enter into this career should already have some experience either as a plumber or as a sheet metal fabricator. Training is generally on-the-job. Some companies may offer their own apprenticeships. It is also possible to start as a labourer for experienced fitters and work your way up from there.

Employer
- firms selling and installing ventilation equipment
- building contractors

Career 19: Joiner and Wood Machinist

Joiners and wood machinists are responsible for manufacturing and assembling the woodwork in a building, such as doors, door and window frames, counters and built-in cupboards.

Joiners spend a lot of time in workshops working with machine and hand tools. They design, manufacture and assemble wooden components according to needs and specifications. They are involved in the final finishing of a building as the wooden components are usually the last items to be installed.

They erect panels and picture rails, make built-in cupboards and install carved ornamental woodwork. Work proceeds according to sketches made by draughtsmen or architects.

A joiner may decide on the type of wood required and marks off, saws and joins the pieces together. As soon as the walls are high enough to support doors and window frames they are built into openings left for this purpose by the bricklayer. After the frames have been installed the carpenter fits the doors. The fitting of locks and bolts completes the work.

They may also be required to lay wood and block flooring. They sometimes fit kitchen dressers to walls and do repairs to damaged woodwork in buildings.

Working conditions are normally not very dirty or noisy. They are frequently required to work on ladders or scaffolding, and in this respect as well in the handling of tools, they are required to adhere strictly to safety precautions. Overtime may sometimes be required.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- working as part of a team
- a variety of work tasks and locations
- the opportunity to become self-employed
- a relatively clean work setting
- the satisfaction of applying good workmanship to the finishing of an article

Some demanding and challenging aspects of this career
- the possibility of accidents or injuries on the job
- working long hours or overtime
- having to work in awkward or cramped positions or at great heights

Purpose Orientation
A joiner and wood machinist should:
- be practical and work well with your hands;
- have an eye for line, good spatial and form perception;
- work accurately with regard to details, drawings and instructions
- be methodical, neat and accurate worker
- have interest in woodwork

- enjoy working with others
- have good health and strength
- have good eye-hand coordination

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Engineering and Technology

Training
Apprenticeship or in service training.

Employer
- private building contractors
- construction companies
- mining industry
- government departments
- self-employment, a skilled and entrepreneurial joiner and wood machinist can start up his own business

Career 20: Lift Mechanic

Lift mechanics are involved with the construction, erection, assembly, testing and maintenance of lifts, escalators and hoists, in accordance with regulations as decreed by legislation.

Lift mechanics work as part of the crew that install and repair elevators, escalators and similar equipment. When installing a new elevator, the shaft is constructed and prepared for use. The electrical wiring and controls are connected up. The elevator car is then assembled and installed, together with the hoist that winds and unwinds the lift cable. When the lifting equipment is operational mechanics check, adjust and recheck it to be sure it is working properly and safely.

After the installation of the lifting equipment, lift mechanics have to maintain and carry out repairs when necessary. They may also replace old equipment with newer models in accordance with the requirements as prescribed by law.

Lift mechanics work indoors in buildings under construction and in existing buildings completed. They are required to travel extensively to test the lifts in the area for which they are responsible. The working conditions are rather unfavourable in that dust, oil and grease are part and parcel of the job.

Some fulfilling and satisfying aspects of this career
- working with one's hands
- working as part of a team
- working at different sites

Some demanding and challenging aspects of this career
- having to lift and carry heavy equipment, parts and machinery
- working in awkward or cramped positions
- the possibility of injury or accidents on the job
- working in unfavourable conditions where dust, oil and grease are present

Purpose Orientation
A lift mechanic should:
- be thorough and responsible;
- have a good knowledge of electronics and electricity;
- enjoy working with your hands and using hand-tools;
- have technical and practical aptitude;
- have mechanical ability;
- be in good health and have stamina.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Physical Sciences, Languages, Mechanical Technology

Training
Apprenticeship or in service training.

Employer
- elevator manufacturing companies
- contractors who specialize in the maintenance and repair of lifts and escalators
- government departments
- business firms
- self-employment, with enough experience and capital, can start own business.

Career 21: Painter and Decorator

Painters and decorators in the building industry are dedicated to achieving two main objectives - to provide the final finishes to buildings and to protect surfaces from dirt and damp.

Modern builders can consider painters and decorators to be among their most valued employees. This trade offers a wide spectrum of job opportunities to someone with an artistic inclination.

Painters and decorators put the finishing touches to new buildings, but are also called upon from time to time, to work on existing homes, offices, shops or public buildings that have to be renovated or redecorated. Painters are virtually the last people on site, which means that the actual finish of the building on which they are working is entirely in their hands. As a result, they must be craftsmen of the highest calibre, for they can either spoil or perfect the work of all the other trades that preceded them.

Painters and decorators paint, varnish or stain the indoor and outdoor walls, roofs, doors and window frames of buildings. They measure surfaces to be treated and determine quantities of the materials needed. They prepare surfaces by sanding, scraping or burning away old coverings (sometimes special chemicals need to be used) and fill nail holes, cracks or other problem areas with plaster, putty or other compounds. After applying a primer or sealer coat, they mix paints and match colours and then apply the paint or other coating evenly to the surface.

Painter and decorators may use rollers or spray guns rather than brushes, as these tools allow paint to dry more quickly. They also put up scaffolding or use swinging chairs when working on high buildings or other structures.

Some fulfilling and satisfying aspects of this career
- working without direct supervision
- working with your hands
- being able to take pride in your work

Some demanding and challenging aspects of this career
- possibility of injury and accidents on the job
- the physical demands of bending, lifting and climbing
- being laid off when the building industry is in a slump
- sometimes having to work overtime on holidays and weekends to get a job finished

Purpose Orientation
A painter and decorator should:

- be neat and well organised;
- have good colour sense;
- enjoy working with his hands;
- have numerical aptitude for finalising estimates;
- have some artistic flair;
- have manual dexterity;
- have good eye-hand coordination;
- be in good health and have stamina.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: Mathematics
Recommended Subjects: Civil Technology

Training
Apprenticeship or in service training.

Employer
- Trade, building or general contractors
- Government concerns
- Businesses that do their own construction and alteration work
- Restoration and renovation companies
- Private homeowners
- Self-employment, with the necessary experience can practise this trade on a private basis or start own business

Career 22: Plasterer

Plastering is one of the oldest of the building trades. The walls of the Egyptian tombs constructed 3 000 years ago were plastered with a material very similar to that used on the walls of modern buildings.

Plasterers' work generally entails protecting, strengthening, covering and decorating brickwork and concrete by plastering the surface.

They spread sand-cement plaster on the walls and a sand-cement screed on the concrete sub-floors with a trowel. Walls are finished off until smooth, or may even have a brushed or patterned finish. After levelling the concrete floor with the screed, ceramic tiles or other floor finishes are laid. The wall surfaces in kitchens and bathrooms may then be tiled.

The work includes tasks such as the plastering of concrete ceilings and the cutting and fixing of plasterboard ceilings. Plasterers not only apply but also prepare coatings to walls and other surfaces. Some plasterers also do complex decorative and ornamental work, using mouldings or other design accessories.

Some fulfilling and satisfying aspects of this career
- working with your hands creatively, to some extent
- opportunity to specialize in indoor or outdoor work
- opportunity to work without a lot of advanced education
- seeing the results of your work

Some demanding and challenging aspects of this career
- standing, stooping and lifting all day can be physically tiring
- working in dusty, dirty environments
- lay-offs during bad weather and building industry slumps
- sometimes having to work overtime

Purpose Orientation
A plasterer should:
- work well with others;
- enjoy working with his hands;
- work well without supervision;
- be an accurate and neat worker;
- have manual dexterity;
- have good coordination;
- be in good physical health;
- have good form perception.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics

Training

Apprenticeship or in service training.

Employer
- Trade, building or general contractors
- Government concerns
- Businesses that do their own construction and alteration work
- Self-employment, with enough experience, can practise trade on a private basis or start own business

Career 23: Plumber

Plumbers install water, gas and waste disposal systems in homes, factories and other buildings.

When installing new systems or modernising old ones, plumbers take measurements and make drawings to show where pipes will connect with outside lines and where fixtures will be placed. They then measure, bend, cut and thread pipes according to the drawings. Pipes are joined by bolting, brazing, gluing, screwing or soldering them together.

In some cases, plumbers also repair roof gutters. When doing repair or maintenance work, plumbers must locate the cause of problems and replace broken or worn out valves and clear pipes and waste traps. Qualified plumbers may own their own businesses and employ and supervise other plumbers.

Plumbers may work at considerable heights on the upper floors of office buildings under construction, or in old, dark and damp basements in need of drain repairs. The actual setting depends on the type of work, the type of employer and the skill and experience of the plumber. Overtime and night emergency work are sometimes required.

Some fulfilling and satisfying aspects of this career
- high earnings
- good employment opportunities
- working with one's hands
- a variety of tasks and locations

Some demanding and challenging aspects of this career
- having to work in cramped, uncomfortable positions
- having to lift heavy pipes and fixtures
- standing for long periods of time
- losing work time (and earnings) during bad weather conditions
- working overtime and during emergencies

Purpose Orientation
A plumber should:
- be alert;
- be conscientious and accurate
- have good work habits and perform tasks quickly;
- be able to get along well with others;
- have mechanical ability;

- enjoy working with his hands;
- be practical;
- have good health and stamina.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Civil Technology, Mathematics

Training
If you want to become a plumber you need to register with an employer providing suitable training. The trainee plumber shall complete a minimum of 18 months on-site training under the direct supervision of a qualified plumber. This is a mandatory requirement to become eligible to take the Industry Trade Test.

Employer
- Plumbing and pipe-fitting contractors engaged in constructing new buildings
- Plumbing contractors who do repair, alteration or modernisation work
- Government departments
- Public utilities
- Shipbuilding or aircraft construction companies
- Self-employment, with enough experience, can practise this trade on a private basis or start own business

Career 24: Projector Manager

Project manager is a career which has its roots in the construction industry and is associated with the coordination of large engineering and construction projects. However over the years the value of the skills used in construction and engineering have been applied and developed for most other industries.

Today the career of project manager can be described as the activities or tasks concerned with successfully achieving a set of goals. This includes planning, scheduling and maintaining progress of the activities that comprise the project. Reduced to its simplest project management is the discipline of maintaining the risk of failure at as low a value as necessary over the lifetime of the project. Risk of failure arises primarily from the presence of uncertainty at all stages of a project. An alternate point of view is that project management is the discipline of defining and achieving targets while optimizing the use of resources (time, money, people, space, etc).

Project management is quite often the responsibility of an individual project manager. This individual seldom participates directly in the activities that produce the end result, but rather strives to maintain the progress of various parties in such a way that overall risk of failure is reduced. Project managers are found in all industries and are most often found in consulting or other team-oriented environments. The role certainly requires expertise in the specific project area. It also requires the ability to lead and manage cross-functional teams.

Typical projects might include the engineering and construction of a building, or the design, coding, testing and documentation of a computer software program, or development of the science and clinical testing of a new drug. The duration of a project is the time from its start to its completion, which can take days, weeks, months or even years. There are various stages in a project life-cycle, but all projects follow a similar methodology and course of problem solving such as, defining the problem, weighing options, choosing a path, implementation and evaluation.

Project management tries to gain control over four variables, time, cost, quality and scope

Some fulfilling satisfying aspects of this career

- variety of work tasks
- organizing people for teamwork
- reward of seeing projects come to completion
- good remuneration

Some demanding and challenging aspects of this career
- working with uncooperative people
- the pressure to keep within time and money constraints of contracts
- being let down by subcontractors.

Purpose Orientation

- well-developed communication skills
- management and leadership ability
- technical aptitude
- able to coordinate team work
- prepared to work outdoors
- get along well with and motivate people at all levels
- good communication skills

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each institution will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Economics

Training
Degree: Any relevant degree which provides a background towards a specific industry

Diploma: any relevant diploma - most universities of technology

Employer
- oil companies
- mining houses
- civil engineers
- government departments
- building contractors and subcontractors
- construction companies
- IT institutions
- financial institutions
- retailers and manufacturers in the building industry
- self-employment, as a consultant

Career 25: Quantity Surveyor

Quantity surveyors are highly qualified members of a profession that play an indispensable role in building, construction and allied industries, including mining.

They give advice on cost and contractual matters and prepare contract documents. They work with architects and consulting engineers to ensure that their client's interests are safeguarded. As professional advisors they give advice to property developers and investors in fixed property. They also assist with the valuation of property for insurance purposes.

Quantity surveyors can also be described as 'building economists'. The quantity surveyor acts mainly in the area of cost (particularly cost to the client) and is a member of a professional team which may include architects, engineers, and electrical and mechanical engineers, all of whom are appointed to advise their client on various aspects of a particular building project.
Quantity surveyors' training and experience enable them to offer the following services:

- preparation of estimates, feasibility studies and budgets for building projects
- preparation of tender documentation for competitive tendering
- negotiation of contracts
- advice on contractual arrangements and tender procedures
- evaluation of progress on building projects
- exercising of cost control during the design and construction phases
- settlement of the final costs of the project with the contractor and subcontractors.

Quantity surveyors may spend a great deal of time on building sites, checking on things being delivered and being constructed. Their offices are sometimes on site, although in most instances their offices are in buildings similar to those that might house architects or civil engineers, for example.

Purpose Orientation

A quantity surveyor should:
- be proficient in speech and writing;
- work accurately;
- be scrupulous and reliable;
- have mathematical ability and abstract reasoning;
- be practical;
- have perseverance;
- interested in architecture, finances, the building industry and legal aspects of contracts, finance

and building

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Accounting

Training
Degree: BSc Quantity Surveying. Those who have completed their degrees must do 2 or 3 years practical work under the supervision of a qualified quantity surveyor.

After completing a professional ability test, the candidate can register with the Council for Quantity Surveyors in their country.

Diploma: Universities of technology offer a 4-year programme in quantity surveying. A National Diploma in Building is awarded after 3 years (the first and third year full-time and the second year part-time), and a B Tech Quantity Surveying degree after a further year of full-time study. Only students who perform sufficiently well are eligible for the degree.

Graduates from both universities and universities of technology can advance to full registration as professional quantity surveyors.

Employer
- Government departments
- Municipalities
- Private firms
- Self-employment, as a consultant

Career 26: Real Estate Agent

Real estate agents provide an essential service in finding and bringing together the sellers and buyers of all types of immovable property including houses, farms, factories, workshops, shops and offices.

Their work begins with a mandate from a seller or a buyer. A mandate is usually a written instruction to find a buyer or a seller for a specified property within an expected price range and by a defined time or date. A first priority would be to establish a fair market value for the seller's property.

Reputable estate agents are also required to discuss and put together the most effective marketing plan for the seller's property. To do this estate agents need the full and honest cooperation of the sellers.

Estate agents, when offering or advertising a property for sale, point out the merits and strong selling features of such a property including, in particular, its location, the current state of repair of the property and, most importantly, the likely market value of the property.

In negotiations with prospective buyers, estate agents must always adopt an objective approach and find out precisely what the particular buyer requires and if they would be able to meet their financial obligations for the property of their choice.

Estate agents sometimes obtain lists of properties for sale by following leads obtained through newspaper advertisements, the Internet and personal contacts. Once a property is listed, estate agents familiarize themselves with the property and interview potential buyers to determine their needs in the hope of matching them to a suitable property.

Once a buyer has decided to buy a certain property the agent negotiates a price and terms acceptable to both buyer and seller. They help to arrange a mortgage or other method of payment with a bank or building society for the seller and do the follow-up work to ensure that the transactions run smoothly. Estate agents usually work on a commission basis on the sale of a property.

In finding buyers estate agents must, especially where houses are concerned, determine buyers' requirements with regard to such important aspects as schools, universities or universities of technology, churches, shops, public transport and recreation. Estate agents need to know about the zoning of undeveloped land in close proximity to the property being marketed.

In most instances estate agents act as negotiators between sellers and buyers and will bring about agreement as to the price, date of occupation and many other factors that must be agreed upon. All such items of agreement are defined in a written "Offer to Purchase" or a "Contract of Sale". This contract will be submitted to an attorney, usually the seller's attorney, who will attend to the legal aspects of the sale and arrange for transfer of ownership of the property from the seller to the purchaser.

In addition estate agents also perform many other administrative functions, including the completion of application forms for bank or building society bonds, liaising with conveyancing attorneys and other similar duties. This is one of the few professions where earnings are by way of fees or commissions and are only paid on finalisation of the transaction or registration process. If the transaction fails no commission is paid.

Some fulfilling and satisfying aspects of this career
- matching an individual or family to a suitable property
- potentially high earnings
- meeting many kinds of people
- working in your own time and without supervision

Some demanding and challenging aspects of this career
- working irregular hours, sometimes longer than normal hours
- showing houses over weekends
- dealing with difficult clients
- frustration of time wasted when clients do not show up for appointments
- having to cope financially when the market is slow and transactions fail and no commission is paid

Purpose Orientation
An estate agent should:
- have a flair for business;
- be enthusiastic, persuasive and persistent;
- be self-disciplined and motivated;
- have good people-handling and communication skills
- have high integrity
- have a good memory
- be able to handle disappointment
- be in good health and have a neat, well-groomed appearance

School Subjects
No specific educational requirements

Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Languages, Economics, Business Studies, Accounting

Training
All estate agents must be registered with the Estate Agents Board in that country. To gain full status as estate agent all newcomers must participate in the Estate Agents Board Examination that arranges courses at the main cities throughout the year.

Degree: A B Tech in Real Estate

Diploma in Real Estate or Property Marketing

Various organizations and educational colleges in different African countries offer courses, including correspondence courses, in all aspects of property salesmanship.

Employer
- Real estate agencies
- Property developers
- Self-employment, with enough experience, registration and capital, can open and operate own estate agency

Career 27: Rigger

Riggers erect hoisting tackle, assemble and erect derricks or sheer legs for construction purposes and install and maintain steel cables and ropes. They also assist in erecting chimneystacks, large buildings, heavy machinery, etc.

Before objects are handled, riggers calculate their weight and ascertain the best way of securing and moving them. Riggers are responsible for the inspection, lubrication and maintenance of all types of lifting tackle, including cranes, derricks, driving winders, jacks, hoists and manually operated lifting equipment. They need to have a sound knowledge of scaffolding, platforms and tripods.

Riggers can also perform groundwork such as the clearing of tracks after a railway accident, or installing or moving heavy machinery.

They play important roles in all branches of heavy industry. They may work in workshops, underground in mines, on ground level or hundreds of metres up in the air. This job can often be very dangerous. Riggers are seldom stationary while working. They are continually moving about, climbing and working in all possible positions and locations.

Some fulfilling and satisfying aspects of this career
- the non-routine nature of the work
- the challenge each job presents
- varied employment possibilities
- good remuneration

Some demanding and challenging aspects of this career
- an element of danger involved in the work
- dirty working conditions which sometimes prevail
- having to work shifts or overtime, or away from home

Purpose Orientation
A rigger should:
- be mentally and physically sound and healthy;
- possess endurance and stamina;
- not be afraid of heights;
- be responsible and safety conscious;
- be able to work quickly and efficiently;

- be willing to do heavy physical work;
- be willing to move around a lot and work in different positions.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Engineering and Technology, Mathematics, Physical Sciences

Training
Apprenticeship or in service training

Employer
- building industry
- heavy engineering concerns
- government undertakings
- metal industries
- railways undertakings
- explosives and allied industries
- mines

Career 28: Road Construction Plant Operator

Road construction plant operators handle a large variety of road construction equipment used in the construction of new roads and maintenance of existing roads.

Road construction plant operators are responsible for operating vehicles such as bulldozers, front-end loaders, road rollers and heavy lorries. These plant operators need to manoeuvre vehicles safely and efficiently in rough terrain by means of moving levers or foot pedals, operating switches or turning dials.
They are also responsible for inspecting the machinery regularly and making adjustments and minor repairs timeously to avoid expensive repairs at a later stage.

Some fulfilling and satisfying aspects of this career
- working with big and powerful machines
- taking pride in a job well done
- working outdoors
- working with your hands (and feet)
- the challenge of keeping machinery running and avoiding costly repairs

Some demanding and challenging aspects of this career
- the possibility of injury or accidents on the job
- sometimes working in dirty dusty conditions
- dealing with the isolation of working at remote sites

Purpose Orientation
A road construction plant operator should:
- have a heavy vehicle driver's licence
- be prepared to undergo an aptitude test
- be in sound physical health;
- be responsible;
- possess a good sense of balance;
- be able to judge distance;
- have good eye-hand-foot coordination;
- be safety-conscious and diligent about finishing work off neatly as shoddy work can be the cause of road accidents once the road is in operation.

School Subjects
No specific requirements.

Compulsory Subjects: None
Recommended Subjects: None

Training
Most employers offer in-service training.

Promotional prospects for a road construction plant operator are good. On completion of examinations at each step a road construction plant operator can rise through the ranks as follows:
Assistant operator
Operator
Qualified operator
Road foreman
Senior road construction operator
Instructor

Employer
- Government departments
- Municipalities
- Civil engineering companies
- Road construction companies

Career 29: Road Construction Worker

Road construction work is usually performed by unskilled labourers. Workers can specialize in certain types of work or operate various pieces of equipment. Diligent and responsible workers are usually promoted to supervisory positions, where training and supervision of other workers is undertaken.

Several types of work can be distinguished:

General workers: perform general excavations with picks and shovels and clean the side of roads with shovels and brooms.

Machine operators: perform excavations in roads using mechanical or air pressure jackhammers to loosen road material. Machine operators operate vibratory tampers to compact material in layers.

Lorry drivers: transport workers and equipment to sites and carry out all other transport functions.

Tar patchers: receive written orders from foremen. Tar patchers supervise a team to repair holes and trenches in the road and determine the amount of tar and other materials required.

Road makers: receive orders and drawings indicating the road-building programme. Road makers organize the moving of road camps, supervise the work of road construction plant operators and other workers, and control the maintenance of machinery.
The noise level in this type of work is high and conditions are dusty, but employers provide appropriate safety clothing.

Some fulfilling and satisfying aspects of this career
- working outdoors
- variety of work tasks
- working with your hands
- good promotion prospects and taking pride in a job well done

Some demanding and challenging aspects of this career
- working in noisy, dusty conditions
- working in adverse weather conditions
- the physical demands can be tiring
- dealing with the isolation of working at remote sites

Purpose Orientation
A road construction worker should:
- be in good health as the work is physically demanding;
- be willing to work outdoors in all kinds of weather;
- not mind working away from home;
- work as part of a team;
- be able to follows instructions.

School Subjects
No specific requirements.

Compulsory Subjects: None
Recommended Subjects: None

Training
In-service training is offered by all employers.

Employer
- Government departments
- Municipalities
- Civil engineering companies
- Road construction companies

Career 30: Roofer

Roofers are specialist building workers whose skills are used to erect and clad roof structures and install waterproofing, rainwater equipment and flashings.

Roof construction entails the setting out and construction of various trusses; the erection of roofs; and cladding of roof structures with different materials.

Rainwater equipment includes: development of sheet metal components; marking, cutting, riveting and soldering of sheet metal; and the fabrication and fitting of gutters and downpipes.

Waterproofing installation entails: identification of waterproofing materials; measuring and estimating quantities; and the application of reinforced liquid waterproofing.

Roofers work closely with carpenters, bricklayers, plasterers and other tradesmen in the building industry.

Purpose Orientation
A roofer should:
- be able to interpret scale drawings;
- be patient, careful and responsible;
- be able to work at heights on scaffolding;
- have good eye-hand coordination;
- be physically strong;
- be able to use both his hands with confidence.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Recommended Subjects: Civil Technology, Mathematics

Training
Apprenticeship Training

Employer
- Building contractors
- Industrial firms
- Trade and general contractors

- Government concerns
- Self-employment, with enough experience can practise this trade on a private basis or start own business

Career 31: Shop Fitter

Shop fitting is one of the creative trades in the building industry. Shop fitters make, assemble and fit display boards, showcases, counters, shelves and cupboards in shops or businesses.

They interpret interior designers' or architects' drawings to determine the exact specifications and order the required quantities and types of material. They shape the wood and fittings using power tools in a machine shop or with hand tools at the workbench. They build, assemble and fit these components into the required positions. They paint, stain or polish the finished articles and add the necessary trimmings.

Some shop fitters manufacture metal fittings such as grilles, banisters and hand rails in a metal shop, and fit these where required. They are sometimes also required to perform minor repairs on fittings.

Some satisfying aspects of this career
- challenge of each new job
- variety of work situations and projects
- opportunities to be creative
- being able to work independently
- earning more money with overtime
- possibility of setting up own business

Some demanding and challenging aspects of this career
- working overtime or under pressure
- responsibility of cutting materials accurately to avoid waste
- the physical demands of the job

Purpose Orientation
A shop fitter should:
- be versatile;
- have an artistic approach to the work;
- work accurately and neatly;
- be responsible;
- able to work without supervision;
- have deftness and good eye-hand coordination;
- have reasonable physical stamina and strength.

School Subjects
Ordinary Level Certificate
Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics
Recommended Subjects: Mechanical Technology, Engineering and Graphic Design

Training
Apprenticeship or in service training

Employer
- Construction firms in the building industry
- Private companies
- Self-employment, with enough skill and entrepreneurship, can start own business

Career 32: Sign Writer

Sign writers apply the lettering for various signs on windows, building contractor signboards, walls of buildings, trucks, etc.

Sign writers prepare rough sketches from specifications and plan the lettering. They measure the surface onto which the lettering is to be placed and mark the height and position of the letters in chalk to ensure correct spacing. They then paint the sign, spreading the paint evenly and making good outlines and apply a second coat of paint when the first is dry.

Sign writers are frequently called upon to place signs on shop windows. Different techniques are used to paint on glass. Gold leaf is applied for gold lettering, which is usually backed with paint. Sign writers also paint logos and simple illustrations in some cases.

Some fulfilling and satisfying aspects of this career
- working independently and under little pressure
- some opportunity to be creative
- regular working hours
- sometimes challenging work

Some demanding and challenging aspects of this career
- having to work at great heights
- not much opportunity to work overtime and earn more
- often working outdoors, especially in the hot sun

Purpose Orientation
A sign writer should:
- have patience;
- have artistic talent and inventiveness;
- have a good eye for colour;
- work carefully and accurately;
- have good eye-hand coordination;
- have dexterity and a steady hand for painting;
- be able to work at heights on scaffolding.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics
Recommended Subjects: Visual Arts

Training
Prospective sign writers usually undergo a probation period of three months with an employer to demonstrate their aptitude for the task. Training consists of theoretical and practical work:

Theoretical training: At a College

Practical training: In-service training under supervision of a qualified sign writer

Duration of course: 3 years
Final examination: a compulsory trade test

Employer
- Book and magazine publishers
- Building contractors
- Commercial printing plants
- Government departments e.g. Government Printing Works
- Graphic art painters and decorators
- Manufacturers and other firms that do their own printing
- Newspaper plants
- Private signwriting businesses
- Stationery and envelope manufacturers
- Self-employment, with enough experience and capital, can start own business

Career 33: Stone Mason

A stone mason builds and repairs stone structures such as piers, walls and abutments.

The stone mason works predominantly with two types of stone:
- natural stone such as marble, granite and limestone;
- artificial stone made from cement, marble chips or other masonry material.

The stone mason cuts, shapes and cleans these stones to erect structures, lay pavements and paths. The stonemason uses kerbstones and special types of masonry for vats, tanks and floors. The stonemason may work from drawings in which each stone has been marked for placement.

Some fulfilling and satisfying aspects of this career
- working outdoors
- able to use artistic ability

Some demanding and challenging aspects of this career
- requires physical strength and stamina
- must be agile and dexterous

Purpose Orientation
A stonemason should:
- enjoy working outdoors;
- work well with other people;
- be able to work quickly and efficiently;
- have physical strength and stamina;
- have manual dexterity and agility;
- have some artistic ability.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Engineering and Technology

Training
Apprenticeship and in in service training

Employer

- Trade, building or general contractors
- Government concerns
- Businesses that do their own construction and alterations

The stonemason with the necessary experience can practise his trade on a private basis or start his own business.

Career 34: Thatcher

Thatchers cover roofs of buildings with layers of thatching grass or thin reeds, laid vertically over thatching battens or saplings, to make them weather proof. Thatched roofs are used on buildings such as houses, small hotels, game lodges and on lapas. In order to maintain the weather proofness of a thatched roof, periodically if is necessary to remove old or damaged thatch, and then peg the new thatching material on the roof in overlapping layers, fixing it securely with treated twine of special hooks.

The thatcher trims the edges of the thatch at the eaves and sometimes decorative patterns are cut into the roof surface. The thatch is beaten and brushed until it is smooth and may then be covered with protective wire netting to keep out birds and pests.

This skilled work involves activities where hands are used to apply mechanical principles to practical situations.

Some fulfilling and satisfying aspects of this career
- working with your hands
- being outdoors
- using tools, machinery and equipment to build, construct and repair thatched roofs
- creating beautiful thatched roofs, that have a long tradition

Some demanding and challenging aspects of this career
- having to work at roof height much of the time
- being exposed to weather conditions much of the time
- possibility of injury on the job
- unemployment during economic downturns

Purpose Orientation

- be hard working
- enjoy working with your hands
- have a sense of pride in your work
- have a good head for heights
- have good balance
- physical stamina

School Subjects
No special requirements.

Training
In-service training

Employer
- thatching company
- self-employed

Career 35: Tiler

Tilers apply the artistic and functional coverings of interior and exterior walls and floors, according to design specifications.

A tiler examines the design plans, measures and marks the surfaces to be tiled and does the layout of the work. Lathing is fixed to the wall and then a plaster or mortar base is spread over with a trowel and the plaster levelled to a specified thickness.

The tiles, once they have been cut and shaped where necessary, with tile-cutters or biters, are positioned and tapped with a trowel handle to fix them to the plaster or mortar base, or the base is allowed to dry and the tiles then attached with adhesive. The gaps between the tiles are filled with cement and the tiles then cleaned.

A tiler may also measure metal laths and cut them with tin snips to size for walls and ceilings. These are tacked to surfaces with staples or nails, using a staple-gun or hammer.

Some fulfilling and satisfying aspects of this career
- working with your hands
- working with relatively little supervision
- variety of work settings
- taking pride in your work

Some demanding and challenging aspects of this career
- bending, kneeling, stooping and reaching
- possibility of injury on the job
- unemployment during economic downturns in the building industry

Purpose Orientation
A tiler should:
- be neat and orderly;
- work accurately;
- have manual dexterity;
- be able to work alone without supervision;
- have arithmetical and three-dimensional visualization abilities;
- have good health and physical stamina;
- have good eyesight and colour perception.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Mathematics, Civil Technology

Training
Apprenticeship and in service training.

Employer
- Trade, building or general contractors
- Government concerns
- Businesses that do their own construction and alterations
- Self-employment, with enough experience, can practise this trade on a private basis or start own business

Career 36: Town and Regional Planner

Town and regional planners develop, from regional to neighbourhood level, programmes for the most advantageous and purposeful development of towns, cities and rural areas.

Town and regional planners focus on improving the living conditions of people. They estimate future needs for housing, business and industrial sites, community facilities and open spaces to meet the needs of expansion and renewal.

The work also entails further investigating the nature and extent of problems concerning prospective development such as projecting future needs in traffic and transportation. They need to keep up with legal issues involving community development and changes in housing and building codes.

The growing population in all African countries and quick urbanization offers town and regional planners the opportunity to play a role in the development of affordable housing and effective infrastructure. The need to conserve historical and natural environments has also become an important development issue.

Most of the work is done in an office but it is also necessary to go out on site to see whether everything is done according to proposed development plans. Town and regional planners work closely with architects, engineers, economists, sociologists, administrators and management on matters concerning public interest and industry.

Some fulfilling and satisfying aspects of this career
- being creative in solving tomorrow's problems today
- helping improve quality of life for others
- generally good remuneration
- the challenge and variety of work

Some demanding and challenging aspects of this career
- keeping up with the rules, bye-laws, codes and regulations
- meeting deadlines
- ad hoc or piece-meal decision-making

Purpose Orientation

A town and regional planner should:
- have above average intelligence;

- be creative and concerned with improving society and living standards;
- have three-dimensional perception ability;
- have integrity, tact and sociability;
- have a wide general knowledge;
- be original;
- have initiative;
- good planner and can visualize outcomes.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Science
Recommended Subjects: Geography, Economics, Business Science, Life Sciences, Engineering and Graphic Design

Training
Degree: Town and Regional Planning

Postgraduate: For a student to enrol for Postgraduate studies, they have to be in possession of an approved degree (not necessarily in Town and Regional Planning), for example, a BEng (Civil), BSc or B degrees in Architecture or Surveying. Most of the Masters degrees are 2 years in duration.

Employer
- Municipalities
- Property developers
- Private consultants
- Universities, universities of technology and research institutes
- Self-employment, as a consultant