

Методические рекомендации по проектированию и организации внеаудиторной самостоятельной работы

Дисциплина: Иностранный язык.

Специальность: 23.02.04 Техническая эксплуатация подъемно-транспортных, строительных, дорожных машин и оборудования

Москва 2018 г.

Уровень образования: основное общее образование

Срок обучения: 4 года

Специальность:

Техническая эксплуатация подъемно-транспортных, строительных, дорожных машин и оборудования

Содержание

1. Пояснительная записка
2. Основные понятия и определения
3. Самостоятельная работа в учебно-программной документации СПО
4. Общая характеристика самостоятельной внеаудиторной работы
5. Особенности организации внеаудиторной самостоятельной работы студентов
6. Проектирование самостоятельной работы
7. Приложения

1. Пояснительная записка

Одной из важнейших проблем, является повышение качества подготовки специалистов. Студент СПО должен не только получать знания по дисциплинам программы, овладевать умениями и навыками использования этих знаний, методами исследовательской работы, но уметь самостоятельно приобретать новые научные сведения. В этой связи все большее значение приобретает самостоятельная работа студентов. Организация самостоятельной внеаудиторной работы в процессе обучения в колледже, формирование умений учебного труда является основой для дальнейшего обучения. Таким образом, в техникуме студенты должны получить подготовку к последующему самообразованию, а средством достижения этой цели является внеаудиторная самостоятельная работа.

Внеаудиторная самостоятельная работа выполняется студентами по заданию преподавателя, но без его непосредственного участия.

Объем времени, отведенный на внеаудиторную самостоятельную работу, находит отражение: в рабочем учебном плане; в рабочих программах учебных дисциплин.

2. Основные понятия и определения

Знание – проверенный практикой результат познания действительности, верное ее отражение в мышлении человека; в педагогике - понимание, сохранение в памяти и воспроизведение фактов науки, понятий, законов, правил, теорий.

Конспект – это систематическая, логически связанная запись, объединяющая план, тезисы, выписки.

Контрольная работа - (письменная) – одна из форм контроля и учета знаний, умений и навыков обучающихся (наряду с устным опросом, лабораторными работами и т.д.).

Различают контрольные работы аудиторные и домашние, текущие и семестровые.

Метод обучения - система последовательных и взаимосвязанных совместных действий преподавателя и студентов, обеспечивающих усвоение содержания образования. Метод обучения характеризуется тремя признаками: обозначает цель обучения, способ усвоения, характер взаимодействия субъектов обучения.

Навык – способ выполнения действий, операций, ставших в результате многократных упражнений автоматизированным.

Приемы обучения - составные элементы метода, определенные особенности выполнения той или иной операции, которая должна присутствовать в обучении.

Проект - уникальная деятельность, имеющая начало и конец во времени, направленная на достижение определенного результата (цели, создание

Тема 1.2 Виды дорожных машин

5. Написание сочинения «Дорожные машины»

Сочинение – это упражнение, когда студенту предлагается письменно выразить свои мысли по предложенной теме в размере 15-20 предложений.

Цель: употребление новых слов при написании сочинения.

Форма отчетности: письменная работа в тетради.

6. Подготовить сообщение по теме «Современная дорожная техника».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

7. Проработать грамматический материал по теме «Наречия».

Цель: подготовка к контрольной работе.

Форма отчетности: самоотчет.

8. Составить список идиом по теме.

Идиомы – это неразложимое, устойчивое сочетание слов, образующих единое целое, употребленное, как правило, в переносном смысле, образное и эмоциональное. Идиомы украшают речь, делают ее более выразительной, гибкой, красивой, меткой. Наличие большого количества идиом в языке свидетельствует о его богатстве и развитости.

Цель: развитие навыков диалогической и монологической речи с использованием эмоционально окрашенных выражений.

Форма отчетности: письменная работа в тетради и устный опрос студентов.

Тема 1.3. Двигатель. Виды двигателей.

9. Составление инструкции «Работа с электрооборудованием дорожных машин» (не менее 10 пунктов).

Инструкция (от лат. instructio — устройство, наставление) - указание о порядке и способах выполнения какой-либо работы, пользования машиной, прибором и т. д.

Цель: употребление новых слов при написании инструкции.

Форма отчетности: письменная работа в тетради.

10. Написание сочинения «Безопасность на дорогах».

Сочинение – это упражнение, когда студенту предлагается письменно выразить свои мысли по предложенной теме в размере 15-20 предложений.

Цель: употребление новых слов при написании сочинения.

Форма отчетности: письменная работа в тетради.

11. Подготовить сообщение по теме «Водитель. Транспорт. Дорога».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

12. Проработать грамматический материал по теме «Временные формы глагола».

Цель: подготовка к контрольной работе.

Форма отчетности: самоотчет.

Тема 1.4. Человек и общество.

13. Подготовить сообщение «Средства массовой информации».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

14. Составление тезисов по теме «Радио и телевидение».

Тезис — это главная мысль какого-нибудь конкретного текста.

Цель: употребление новых слов при составлении тезисов.

Форма отчетности: письменный отчет.

15. Проработать грамматический материал по теме «Страдательный залог».

Цель: подготовка к контрольной работе.

Форма отчетности: самоотчет.

16. Составление сканворда по теме «Дорожные знаки».

Сканворд (от скандинавский кроссворд) — разновидность кроссворда. Это один из самых популярных видов кроссворда. Определения слов даются в ячейках прямо внутри сетки, а слова-ответы вписывают по направлениям, указанным стрелками.

Цель: отработка лексики по теме.

Форма отчетности: письменная работа в тетради.

Вид Внеаудиторной самостоятельной работы на IV семестр (21 час)

Тема 2.1. Молодежь в современном обществе.

1. Написание сочинения-рассуждения «Трудно ли быть молодым?».

Сочинение – это упражнение, когда студенту предлагается письменно выразить свои мысли по предложенной теме в размере 15-20 предложений.

Цель: употребление новых слов при написании сочинения.

Форма отчетности: письменная работа в тетради.

2. Подготовить сообщение по теме «Молодежные субкультуры».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

3. Проработать грамматический материал по теме «Типы вопросов».

Цель: подготовка к контрольной работе.

Форма отчетности: самоотчет.

Тема 2.2. Путешествие. Англоязычные страны.

4. Подготовить сообщения по теме «Известные города Великобритании».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

5.Подготовить пересказ текста «Нью-Йорк».

Пересказ - письменное или устное изложение какого-либо текста.

Цель: развитие навыков монологической речи и умения выявлять главное в тексте.

Форма отчетности: устный опрос.

NEW YORK

New York is a city where all the languages of the world are spoken and where people live on the ground, travel under the ground and work in the sky. New York makes a great impression on all visitors because of its many high buildings, its theatres, museums and

hotels, its beautiful bridges, and its expensive shops with their fabulous (баснословный) prices.

The first permanent white settlers (поселенцы) came to New York from Holland in 1626. These Dutch settlers bought all of Manhattan Island (остров) from the Indians for the equivalent of twenty-five dollars, while today some of this land costs a million dollars an acre. This island is the heart of the city.

It is on Manhattan Island that most of the skyscrapers are located. This island is connected by six long bridges, as well as by tunnels and ferries (паром), with the other four districts that constitute New York City. New York is the largest city in the United States. Today there are more people living in the New York City than in Australia, Peru or Sweden.

For transportation New York depends (зависеть) mainly on buses, the subway, taxis and ferries. The buses are slow because of the crowded streets, whereas the subway train can go as fast as railroad trains, sometimes stopping only at the most important stations. We may go all day by the subway for the same fare, if we only change trains but do not go out of the stations.

New York moves vertically as well as horizontally, taking its people by elevator to their offices on the fortieth, sixtieth, and eightieth floor. New York is the richest and the poorest, the most modern and the most old-fashioned (старомодный) of cities. It is the home of expensive hotels and cheap boarding houses, the home of symphonies and popular jazz, of cathedrals (собор) and night clubs; the home of the famous Metropolitan Opera and the Metropolitan Museum of Art.

6.Проработать грамматический материал по теме «Словообразование».

Цель: подготовка к контрольной работе.

Форма отчетности: самоотчет.

7.Подготовить сообщение по теме «Канада».

Сообщение - это информация, часто краткая, переданная от одного лица другому.

Цель: развитие монологической речи.

Форма отчетности: сообщение приготовить письменно и устная защита.

8.Написать доклад на тему «Австралия».

Доклад - это довольно удобная форма изложения конкретной информации.

Письменный доклад может служить средством выражения оценки той или иной ситуации, а также представления результатов качественного и (или) количественного анализа данных в четкой и сжатой форме.

Цель: совершенствование знаний студентов по теме.

Форма отчетности: защита доклада.

Тема 2.3. Россия. Мой родной город.

9.Подготовить пересказ текста «Моя Россия».

Пересказ - письменное или устное изложение какого-либо текста.

Цель: развитие навыков монологической речи и умения выявлять главное в тексте.

Форма отчетности: устный опрос.

Тема 2.4.Traffic, rules and laws

Подготовить пересказ текста

Traffic

Traffic on roads may consist of pedestrians, ridden or herded animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel. Traffic laws are the laws which govern traffic and regulate vehicles, while rules of the road are both the laws and the informal rules that may have developed over time to facilitate the orderly and timely flow of traffic.

Organized traffic generally has well-established priorities, lanes, right-of-way, and traffic control at intersections.

Traffic is formally organized in many jurisdictions, with marked lanes, junctions, intersections, interchanges, traffic signals, or signs. Traffic is often classified by type: heavy motor vehicle (e.g., car, truck); other vehicle (e.g., moped, bicycle); and pedestrian. Different classes may share speed limits and easement, or may be segregated. Some jurisdictions may have very detailed and complex rules of the road while others rely more on drivers' common sense and willingness to cooperate.

Organization typically produces a better combination of travel safety and efficiency. Events which disrupt the flow and may cause traffic to degenerate into a disorganized mess include: road construction, collisions and debris in the roadway. On particularly busy freeways, a minor disruption may persist in a phenomenon known as traffic waves. A complete breakdown of organization may result in traffic congestion and gridlock. Simulations of organized traffic frequently involve queuing theory, stochastic processes and equations of mathematical physics applied to traffic flow.

Traffic code

Traffic code (also motor vehicle code) refers to the collection of local statutes, regulations, ordinances and rules that have been officially adopted in the United States to govern the orderly operation and interaction of motor vehicles, bicycles, pedestrians and others upon the public (and sometimes private) ways.

The traffic code generally includes provisions relating to the establishment of authority and enforcement procedures, statement of the rules of the road, and other safety provisions.

Administrative regulations for driver licensing, vehicle ownership and registration, insurance, vehicle safety inspections and parking violations may also be included, though not always directly related to driving safety. Violations of traffic code (i.e., a "moving violation") are often dealt with by forfeiting a fine in response to receiving a valid citation ("getting a ticket"). Other violations, such as drunk driving or vehicular homicide are handled through the criminal courts, although there may also be civil and administrative cases that arise from the same violation (including payment of damages and loss of driving privileges). In some jurisdictions there is a separate code-enforcement branch of government that handles illegal parking and other non-moving violations (e.g., noise and other emissions, illegal equipment). Elsewhere, there may be multiple overlapping police agencies patrolling for violations of state or federal driving regulations.

In the United States each state has its own traffic code, although most of the rules of the road are similar for the purpose of uniformity, given that all states grant reciprocal driving privileges (and penalties) to each other's licensed drivers. There is also a "Uniform Vehicle Code" which has been proposed by a private, non-profit group, based upon input by its members. As with many such offerings, some states adopt selected portions as written, or else with modifications, and others create their own versions. Similarly, most states have adopted relevant standards for signs and signals, based upon the Manual on Uniform Traffic Control Devices from the U.S. Department of Transportation. Many of the standard rules of the road involve consistent interpretation of the standard signs and signals, such as what to do when approaching a stop sign, or the driving requirements imposed by a double yellow line on the street or highway. Many federal departments have also adopted their own traffic code for enforcement on their respective reservations (e.g., national parks, military bases).

List of some standard Rules of the Road:

- Entering and leaving roadways.
- Right of way at marked and unmarked intersections under various conditions.
- Observing and interpreting traffic signs (especially **warning, priority or prohibitory** traffic signs)
- Keeping to right side (or left side) except to pass others, where passing is allowed.
- Direction of travel and turning (one way, do not enter, no U-turn, etc.)
- Speed, height, width and weight limits.
- Bicycle and pedestrian priority.
- Yielding to special vehicles (emergency, funeral, school bus).
- Vehicle lighting and signalling.
- Stopping if there has been a collision

Driving laws

A driver is subject to the laws of the jurisdiction in which he or she is driving. The rules of the road, driver licensing and vehicle registration schemes vary considerably between jurisdictions, as do laws imposing criminal responsibility for negligent driving, vehicle safety inspections and compulsory insurance. Most countries also have differing laws against driving while under the influence of alcohol or other drugs. Aggressive driving and road rage have become problems for drivers in some areas.

Some countries require a vision screening test for individuals to acquire or renew a driver's license. A 2010 systematic review found insufficient evidence to assess the effects of vision screening tests on subsequent motor vehicle crash reduction. The review concluded that there is a need to develop valid and reliable tools of vision screening that can predict driving performance.

Motorists are almost universally required to take lessons with an approved instructor and to pass a driving test before being granted a license. Almost all countries allow all adults with good vision and health to apply to take a driving test and, if successful, to drive on public roads. Saudi Arabia, however, bans women from driving vehicles (whether pedal or motor powered) on public roads. Saudi women have periodically staged driving protests against these restrictions.

Winter driving can pose serious hazards in countries with colder climates. In many countries, even after passing one's driving test, new motorists are initially subject to special restrictions. For example, in Australia, novice drivers are required to carry "P" ("provisional") plates, and are subject to alcohol limits, and other restrictions, for their first two years of driving. Many U.S. states now issue graduated drivers' licenses to novice minors. Typically, newly licensed minors may not drive or operate a motorized vehicle at night or with a passenger other than family members. The duration of the restriction varies from six months to until the driver is 18 years old. This is due to the mental aptitude of a young or unexperienced driver not being fully developed.

Rules of the road

Rules of the road and driving etiquette are the general practices and procedures that road users are required to follow. These rules usually apply to all road users, though they are of special importance to motorists and cyclists. These rules govern interactions between vehicles and with pedestrians. The basic traffic rules are defined by an international treaty under the authority of the United Nations, the 1968 *Vienna Convention on Road Traffic*. Not all countries are signatory to the convention and, even among signatories, local variations in practice may be found. There are also unwritten local rules of the road, which are generally understood by local drivers.

As a general rule, drivers are expected to avoid a collision with another vehicle and pedestrians, regardless of whether or not the applicable rules of the road allow them to be where they happen to be.

In addition to the rules applicable by default, traffic signs and traffic lights must be obeyed, and instructions may be given by a police officer, either routinely (on a busy crossing instead of traffic lights) or as road traffic control around a construction zone, accident, or other road disruption.

These rules should be distinguished from the mechanical procedures required to operate one's vehicle.

Traffic signs



Regulatory Signs

One type of **regulatory signs** are traffic signs intended to instruct road users on what they must or should do (or not do) under a given set of circumstances. Other types may be signs located on streets and in parking lots having to do with parking, signs in public parks and on beaches or on or in architectural facilities prohibiting specific types of activities. The term regulatory sign describes a range of signs that are used to indicate or reinforce traffic laws, regulations or requirements which apply either at all times or at specified times or places upon a street or highway, the disregard of which may constitute a violation, or signs in general that regulate public behavior in places open to the public.

Examples of non-traffic types of regulatory signs might be tow-away signs for vehicles without disabled parking stickers or no-smoking signs where there are laws prohibiting smoking.

Warning Signs

Warning signs are used to alert highway, street or road users to unexpected or dangerous conditions ahead that might call for a reduction of speed, situations that might not be readily apparent, or an action in the interest of safety and efficient traffic operations such as a curve, detour, sideroad, etc. They usually have a yellow or orange background with black symbols or letters on a diamond-shaped or rectangular sign. Yellow pennant-shaped signs caution motorists where passing is unsafe. Round yellow warning signs alert motorists that there's a railroad crossing ahead.

Warning signs are available in three material grades (engineer grade, high intensity, and x diamond grade) and in various sizes.

A traffic **warning sign** is a type of traffic sign that indicates a hazard ahead on the road that may not be readily apparent to a driver. If you don't see the signs you need we can make any standard or custom reflective sign.



Parking Signs

At Traffic sign Corp. our goal is to offer you the best prices, quality products & fast service on your parking signs, no parking signs, custom parking signs, handicapped signs, posts, hardware and so much more. All standard signs meet State and Federal MUTCD guidelines. Please give us the opportunity to help you with your church, school, shopping center or business parking signs. Put our many years of experience in the sign business to work for you.

Figure 2B-24. Parking and Standing Signs and Plaques (R7 Series) (Sheet 1 of 2)



Construction Signs

Construction signs are used to alert motorists to the dangers that new or temporary construction poses and how to maintain reasonable safety. These signs are identified by a bold orange color with black text or black symbols. This fluorescent orange material is built in a way to provide even higher visibility to help ensure the safety of the crews performing the construction.

Construction signs are available in three material grades (engineer grade, high intensity, and x diamond grade) and in various sizes.

Street signs

Street signs or **road signs** are signs erected at the side of or above roads to give instructions or provide information to road users. The earliest signs were simple wooden or stone milestones. Later, signs with directional arms were introduced, for example, the fingerposts in the United Kingdom and their wooden counterparts in Saxony.

With traffic volumes increasing since the 1930s, many countries have adopted pictorial signs or otherwise simplified and standardized their signs to overcome language barriers, and enhance traffic safety. Such pictorial signs use symbols (often silhouettes) in place of words and are usually based on international protocols. Such signs were first developed in Europe, and have been adopted by most countries to varying degrees.



School Signs

A school zone refers to an area on a street near a school or near a crosswalk leading to a school that has a likely presence of younger pedestrians. School zones generally have a reduced speed limit during certain hours. School Area Signs will help you direct school traffic, parking and keep kids safe. Many signs now available in Fluorescent Yellow Green Sheeting.



Guide Signs

Signs used to indicate locations, distances, directions, routes, and similar information.



Тема 2.5 Подготовить рассказ о двигателе, видах двигателей и системах автомобиля

How cars work

Cars are very complicated machines and all systems in them work together. They power a car, control and steer it and make it comfortable for people to drive in.

The engine. The heart of every car is its engine. It produces the power that turns the wheels and electricity for lights and other systems.

Most automobiles are powered by an internal combustion engine. Fuel, usually gasoline or petrol, is burned with air to create gases that expand. A spark plug creates a spark that ignites the gas and makes it burn. This energy moves through cylinders in which pistons slide up and down. They are attached to rods that move a crankshaft.

Normal car engines have four to six cylinders but there are also models with eight and sixteen cylinders. The turning movement is passed through the drivetrain to the drive wheels.

Fuel system. The fuel system pumps petrol from the tank to the engine. Older cars used to have carburetors that mix fuel with air and send the gas to the engine. Some cars have a special fuel injection system that sprays petrol into the engine. Modern cars have turbo chargers that suck in extra air and therefore create more power.

Drivetrain. The engine and all parts that carry power to the wheels are called the drivetrain. It includes the transmission, drive shaft, differential, the axles and the drive wheels that move the car. While most cars have drive wheels in the front, some have them in the back. Cars that need to drive over all kinds of ground have a four-wheel drive.

The transmission controls the speed and torque. When a car travels at a normal speed on a flat road it does not need so much torque to keep it moving, but when you want to start a car from a hill the engine must produce more power. Gears control speed and power of the engine in different driving conditions.

In cars with manual transmission you have to change gears by pressing down the clutch with your foot and moving a lever. Cars with automatic transmission change gears without control by the driver. Lower gears give the car more torque and speed. When the car moves faster the transmission shifts to higher gears.

The driveshaft carries the power to the axle which is connected to the wheels. It has several joints which make the axle and wheels moveable as the car drives on uneven and bumpy roads.

The differential is connected to the rear end of the driveshaft. It lets the wheels turn at different speeds because in curves the outer wheels must travel a greater distance than the inner ones.

Steering system. The steering system controls the front wheels. Turning the steering wheel makes them point to the left or right. Most cars have power steering; a hydraulic system makes it easier for the driver to turn the wheels.

Brake system. The brake system slows down or stops the car. Brakes operate on all four wheels. There are two basic types of brakes: drum or disc brakes. In both cases a friction pad is pressed against a drum or disc with the help of a hydraulic system.

All cars have emergency hand brakes which you use if the hydraulic system fails. It is also called a parking brake because you use it to stop a vehicle from rolling down a hill. Antilock braking systems (ABS) keep the wheels turning when you step on the brakes. This computer controlled system prevents skidding if you are on a slippery road.

Suspension system. The suspension system supports the weight of the car. It has wheels, axles, tires and springs. Most cars have shock absorbers to guarantee a smooth ride. Springs are between the axles of the wheels and the body of the car. They allow each wheel to move up and down on its own. The tires also help to make driving smoother. They are built so that they give the car grip on roads in all conditions.

Exhaust system. When a car burns fuel gases are produced. They must be removed so that new fuel can be burned. The pistons in the engine's cylinders force gas out of the engine. It passes through a muffler into tail pipes. The muffler also keeps the car running quietly. For about thirty years cars have been equipped with a catalytic converter. It reduces pollution by converting harmful gases into carbon dioxide and water

Cooling system. Burning fuel inside a car's engine creates a lot of heat. Most of it has to be removed by a cooling system. Liquid cooling systems have a mixture of water and chemicals. A water pump forces this mixture to flow between the cylinders of the engine. The hot water is then pumped through a radiator where the air carries away the heat.

Lubrication system. Oil is important for an engine to work. It flows through the moving parts so that the metal does not rub against other metallic pieces. Without lubrication the metal would become too hot and the engine would be destroyed.

Oil is stored in an oil tank at the bottom of the engine. From there it is pumped around the engine. A filter removes dirt from the oil so that it won't do any damage to engine parts. After you have driven a certain number of kilometres you must change the oil and the oil filter.

Separating the main parts

The engine must be a rigid structure in order to withstand the heavy loads which are applied to the crankshaft bearings and other internal parts.

It is made of two basic parts that are bolted together: the upper is the cylinder head, the lower is the cylinder block, which contains the crankshaft assembly. Both the head and the block are usually made of cast iron, but aluminium is an alternative material for lightness and good heat dissipation.

The valves of practically all modern engines are incorporated in the cylinder head. These engines are known as overhead-valve engines (OHV).

In the cylinder head there is a combustion chamber, two valve ports and two valves, for each cylinder.

The engine draws in the petrol/air mixture through one set of valves (the inlets) and expels burnt gases through the other (the exhausts). On top of the cylinder head is the valve-operating gear.

The cylinder block is usually in one piece with the crankcase. It contains the cylinders and carries the crankshaft, to which are attached the connecting rods and pistons. It may also contain the camshaft by which the valves are opened and closed.

Sometimes the camshaft may be carried on the cylinder head, in which case the engine is known as an overhead-camshaft (OHC) unit.

Both the cylinder head and the block contain passages that are known as the water jackets through which water circulates and cools the engine.

The sump, which is the reservoir for the engine lubricating oil, is made of sheet steel, cast aluminium or magnesium, and is bolted to the bottom of the crankcase.

A cover, usually of similar material to the sump, is fitted over the valve gear in order to exclude dust and retain oil.

Classification of engines

Engines for automotive and construction equipment may be classified in several ways: type of fuel used, type of cooling employed, or valve and cylinder arrangement. They all operate on the internal combustion principle. The application of basic principles of construction to particular needs or systems of manufacture has caused certain designs to be recognized as conventional.

The most common method of classification is based on the type of fuel used; that is, whether the engine burns gasoline or diesel fuel.

Gasoline engines versus diesel engines

Mechanically and in overall appearance, gasoline and diesel engines resemble one another. However, many parts of the diesel engine are designed to be somewhat heavier and stronger to withstand the higher temperatures and pressures the engine generates. The engines differ also in the fuel used, in the method of introducing it into the cylinders, and in how the air-fuel mixture is ignited. In the gasoline engine, we first mix air and fuel in the carburetor. After this mixture is compressed in the cylinders, it is ignited by an electrical spark from the spark plugs. The source of the energy producing the electrical spark may be a storage battery or a high-tension magneto.

The diesel engine has no carburetor. Air alone enters its cylinders, where it is compressed and reaches a high temperature because of compression. The heat of compression ignites the fuel injected into the cylinder and causes the fuel-air mixture to burn. The diesel engine needs no spark plugs; the very contact of the diesel fuel with the hot air in the cylinder causes ignition. In

the gasoline engine the heat compression is not enough to ignite the air-fuel mixture; therefore, spark plugs are necessary.

Arrangement of cylinders

Engines are also classified according to the arrangement of the cylinders. One classification is the in-line, in which all cylinders are cast in a straight line above the crankshaft, as in most trucks. Another is the V-type, in which two banks of cylinders are mounted in a "V" shape above the crankshaft, as in many passenger vehicles. Another not-so-common arrangement is the horizontally opposed engine whose cylinders mount in two side rows, each opposite a central crankshaft. Buses often have this type of engine.

The cylinders are numbered. The cylinder nearest the front of an in-line engine is numbered 1. The others are numbered 2, 3, 4, and so forth, from the front to rear. In V-type engines the numbering sequence varies with the manufacturer.

The firing order (which is different from the numbering order) of the cylinders is usually stamped on the cylinder block or on the manufacturer's nameplate.

Valve arrangement

The majority of internal combustion engines also are classified according to the position and arrangement of the intake and exhaust valves. This classification depends on whether the valves are in the cylinder block or in the cylinder head. Various arrangements have been used; the most common are the L-head, I-head, and F-head (fig. 12-8). The letter designation is used because the shape of the combustion chamber resembles the form of the letter identifying it.

L-Head

In the L-head engines, both valves are placed in the block on the same side of the cylinder. The valve-operating mechanism is located directly below the valves, and one camshaft actuates both the intake and exhaust valves.

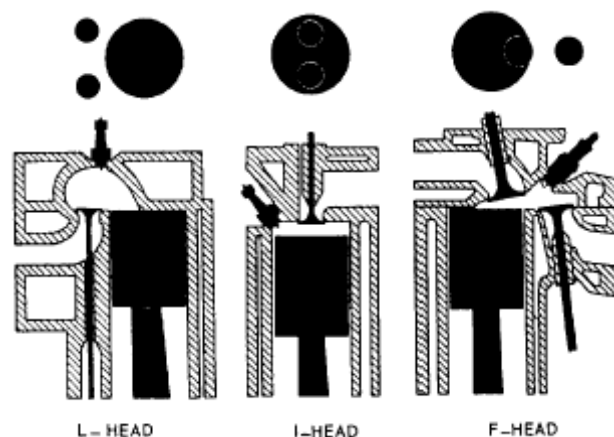


Figure 12-8.-L-, I-, and F-valve arrangement.

I-Head

Engines using the I-head construction are called valve-in-head or overhead valve engines, because the valves mount in a cylinder head above the cylinder. This arrangement requires a

tappet, a push rod, and a rocker arm above the cylinder to reverse the direction of the valve movement. Only one camshaft is required for both valves. Some overhead valve engines make use of an overhead camshaft. This arrangement eliminates the long linkage between the camshaft and the valve.

F-Head

In the F-head engine, the intake valves normally are located in the head, while the exhaust valves are located in the engine block. This arrangement combines, in effect, the L-head and the I-head valve arrangements. The valves in the head are actuated from the camshaft through tappets, push rods, and rocker arms (I-head arrangement), while the valves in the block are actuated directly from the camshaft by tappets (L-head arrangement).