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ODBORNÉ VÝRAZY STROJÍRENSTVÍ

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S anglickým jazykem do dalších předmětů

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Úvod

Tento výukový text slouží jako podpůrný materiál při výuce předmětů zaměřených na strojírenství a anglický jazyk.

1. Screw joints and assembly



1/1 Check the pronunciation before you watch. Watch the video and put the tool names into the order you see them.

<https://www.youtube.com/watch?v=XAqmd8ScIQ4>

screwdriver battery screwdriver* tool box* safety gloves* hammer* safety glasses* knives* tape measure* pliers* levels**

1/2 Read and listen to the following text:

Once the individual components are machined they come to the room where appropriate workers **assemble** them. Assembly includes any activities necessary to put individual components together into one finished product. The assembly is in fact the final phase of production, but it must be already planned at designing. The design engineer is responsible for the whole assembling process that would allow simple and smooth assembly and **disassembly** of the product, which is the reverse process. Product designing must solve in what way a particular component should be **mounted on** what part, in what **slot** it should be **inserted**, or how to **fix** it for example in a clamp. There are also further mechanical acts to be performed, such as screwing components with **bolts** and **screwdrivers** or **centring** them. The tightness of connection points is ensured with **sealing rings**.

Assembly is a production process during which an assembler can use a number of various tools. We are going to speak about hand tools used for the assembly of smaller products. The most widely used ones: **a hammer** is a tool meant to deliver an impact to an object, usually a **nail** or **pin**. A pin is a machine element that secures the position of two or more parts of a machine relative to each other. For example the **adjustable spanner** with a movable jaw that adapts to different sized objects or the **Allen key** used to turn screw or bolt heads designed with a hexagonal socket. Sometimes we need **clamps** or **pliers** to fix the work-pieces. It helps to assemble the product easily.

A **rivet** is a permanent mechanical fastener consisting of a smooth cylinder with a head on one end. On installation, the rivet is placed in a punched or pre-drilled hole and then the opposite end is forged into the shape of head and thus the rivet is held in place. A **vice** is a mechanical screw apparatus. It usually has one fixed jaw and another parallel jaw is moved towards the fixed jaw by the screw, a spanner is a tool used to hold and turn objects, usually **fasteners** such as **nuts and bolts**. A nut is a hardware fastener with a threaded hole. Nuts are used opposite bolts with external threads to fasten parts together..

1/3 Choose the correct term from the text and match it with one of the definitions.

centre disassemble* insert* fix* slot* sealing* ring* bolt* mount on* assemble**

- a) Umístí součásti tak, aby byly ve středu jiné součásti
- b) Vložit součást do jiné součásti nebo mezi dvě součásti
- c) Kovový spojovací prvek, jehož hlavní částí je závit a doplňkovou součástí je matice
- d) Umístí nebo upevniť součást ve správné poloze na jiné součásti
- e) Sestavit jednotlivé součásti do hotového výrobku

- f) Kroužek nebo proužek materiálu, který zajišťuje těsnost spoje
- g) Dlouhá úzká štěrbina, do které se vsunují či jinak montují součásti
- h) Pevně umístit součást tak, aby se nehýbala
- i) Rozebrat jednotlivé součásti hotového výrobku na součástky

1/4 Choose the correct term from the text and match it with one of the definitions.

centre* disassemble* insert* fix* slot* sealing ring* bolt* mount on* assemble*

- a) A ring or strip of material that ensures the tightness of a joint
- b) To place or attach a component onto another one in proper position
- c) A long narrow opening into which a component is put
- d) To place a component inside another component or between two components
- e) To take apart a machine so that it is again in separate components
- f) To move a component so that it is in the centre of something else
- g) A type of fastener characterised by an external thread, used together with a nut
- h) To put individual components together into one finished product
- i) To put a component firmly in a designated place so that it will not move

1/5 Sort the expressions to the right column

Bolt* assemble* vice* nail* Allen key* screw* mount on* disassemble* nuts* bolts* adjustable spanner* insert* rivet* fix* hammer* centre* screwdriver* sealing rings* pin* spanner* pliers*

Verbs

Fasteners

Tools

1/6 Match the tool names with the pictures

vice* hammer* nuts* rivet/pin* adjustable spanner* Allen key* pliers* clamps*



1/7 Work out the dictionary No. 1

Work out a dictionary for each bold expression in this unit. Put it into alphabetical order. Find phonetic transcription

[illegible]

2. Cranes



2/1 Watch the video and answer the questions:

<http://www.youtube.com/watch?v=BmFLw1RGVTU>

- | | |
|--|-----|
| a) The operation cabin is on the ground. | T/F |
| b) Tower cranes can be built up as they are modular. | T/F |
| c) Robots are used for welding the parts of cranes together. | T/F |
| d) The completed parts of the cranes go to paint shop. | T/F |
| e) The parts dry in the paint shop in temperatures above 90 degrees Celsius. | T/F |
| f) There are 3 concentric rings: stationary ring, inner ring and outer ring. | T/F |
| g) The seat is not comfortable as the operator can step out and stretch his legs. | T/F |
| h) The only way to check what the crane is doing is the huge windows in the cabin. | T/F |

2/2 Read and listen to the following dialogue:

Andy: John, I would like to be a **crane operator** as you are.

John: Really? I operate a **mobile crane** with a **telescopic boom** that is elevated by an **elevating cylinder**. We move from a job site to a job site. One of my most important responsibilities is a pre-operation inspection. I have to make sure all hydraulic systems are working properly, sure the machine is **stable**, fixed with **outriggers** and able to operate safely.

Andy: Have you ever operated any other cranes?

John: Many of them. The tallest **tower crane** I have operated was used for constructing an 80 meters high building. The long **horizontal jib** is the part of the crane that carries the **load**. The **counter-jib** carries a **counterweight**, usually of **concrete blocks**, while the jib suspends the load to and from the centre of the crane. I sit in a **cab** at the top of the tower or control the crane by radio **remote control** from the ground. My cab is most usually located at the top of the tower attached to the turntable, but can be mounted on the jib, or partway down the tower. I operated the **lifting hook** using electric motors to manipulate **wire rope cables** through a system of **sheaves**. The hook is located on the long horizontal arm to lift the load which also contains its motor.

Andy: Wow! It can be dangerous. Such a height! Are there any inside cranes?

John: Yes, the **overhead cranes** are usually in machine shops. It is also known as a **bridge crane**, this is a type of crane where the hook-and-line mechanism runs along a **horizontal beam** that itself runs along two widely **separated rails**. Often it is in a long factory building and the crane runs along rails along the building's two long walls.

Andy: I need to learn so much to be a crane operator. But it is the job of my boy's dreams.

2/3 Choose the correct term from the dialogue and match it with one of the definitions.

crane operator* remote control* lifting hook* cabine* load* tower crane* outrigger* sheave* bridge/overhead crane* counterweight*

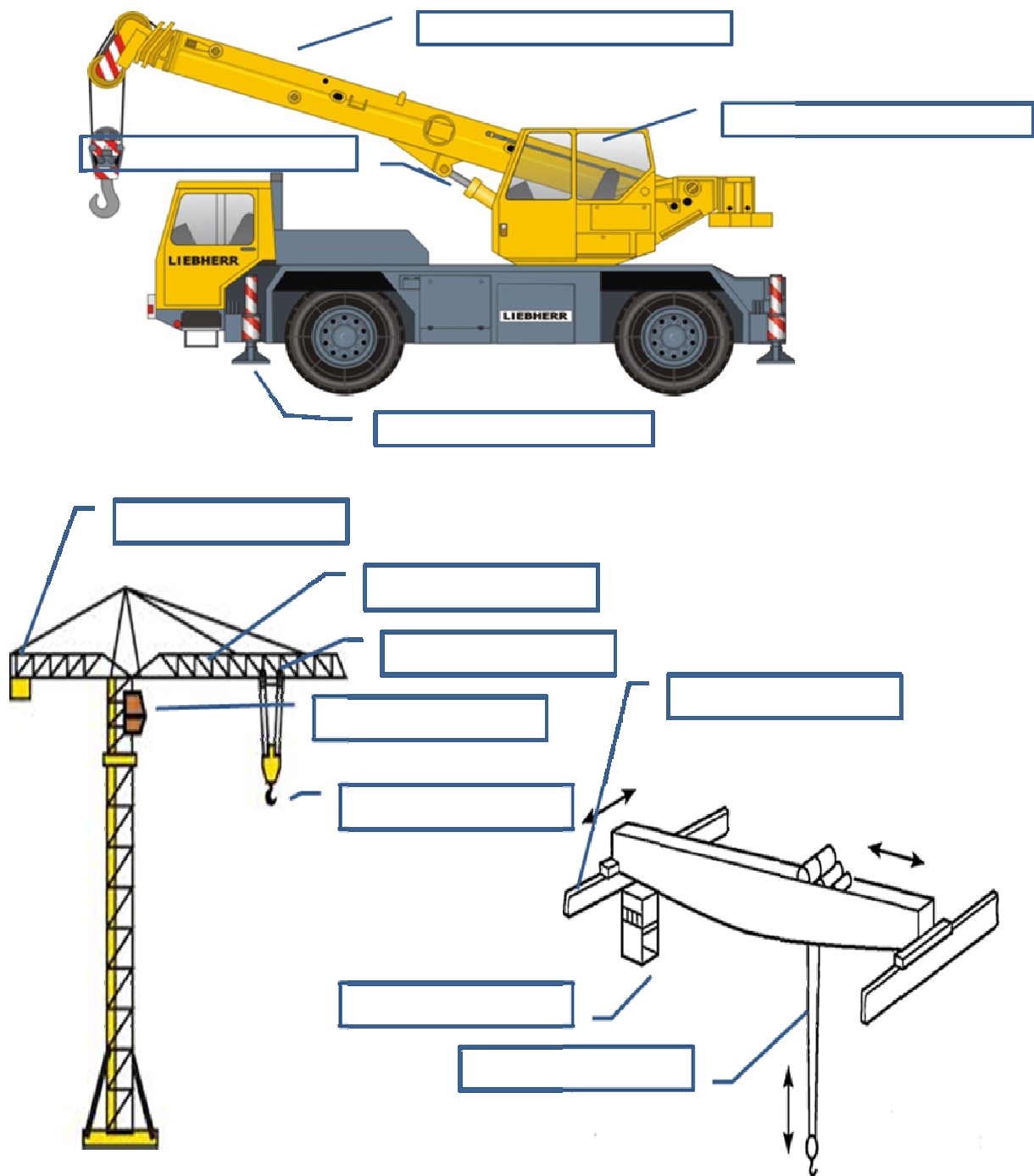
- a) Zdvhací stroj, určený ke zdvihání břemen k vysokým budovám
- b) Místo z kterého se obsluhuje jeřáb
- c) Části jeřábu, kterými se jeřáb stabilizuje na místě
- d) Zařízení, kterým se obsluhuje jeřáb ze země
- e) Část jeřábu, na které je zavěšeno břemeno
- f) Volně otočné kolo s drážkou po obvodě pro vedení provazu nebo lana
- g) Zdvhací stroj používaný i uvnitř dílny
- h) Předmět, který působí svou hmotností na opačné straně než břemeno
- i) Obsluha jeřábu
- j) Přenášžený předmět

2/4 Choose the correct term from the dialogue and match it with one of the definitions.

cabin* crane operator* remote control* lifting hook* load* tower crane* outrigger* sheave* bridge/overhead crane* counterweight*

- a) A wheel or roller with a groove along its edge for holding a belt or a rope
- b) Crane parts used to level and stabilize the crane while stationary
- c) The lifted object
- d) Device for grabbing and lifting loads
- e) Type of crane able to work inside the workshop
- f) An equivalent counter weight that balances a load
- g) A person controlling a crane
- h) A place from which the crane is operand
- i) Device used to operate a crane from the ground
- j) Machine used to lift loads to tall buildings

2/5 Describe the picture with the appropriate words from the text.



More information about working as a crane operator:

<http://www.wisegeek.com/what-are-the-different-crane-operator-jobs.htm>

More information about heavy lifting equipment:

<http://www.wisegeek.com/what-are-the-different-types-of-heavy-lifting-equipment.htm>

Technical diagrams:

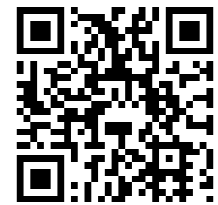
<https://www.google.cz/search?q=how+does+a+crane+work+diagram&tbm=isch&tbo=u&source=univ&sa=X&ei=ELZWU9jlIDYqitAb8i4HQDw&ved=0CCkQsAQ&biw=1333&bih=645>

2/6 Work out the dictionary No. 2

Work out a dictionary for each bold expression in this unit. Put it into alphabetical order. Find phonetic transcription

[illegible]

3. Lifts and Welding



3/1 Watch the video and answer the sentences true/ false.

<http://www.youtube.com/watch?v=RyLvVMg84xs>

- | | |
|--|-----|
| 1. In welding we join metals by adding a third material | T/F |
| 2. The resulting product is not a homogenous unit, but two distinct pieces | T/F |
| 3. Never cut or manipulate with the product – it is not hard enough | T/F |
| 4. There is only one way to weld and it is arc welding | T/F |
| 5. The welder uses oxyacetylene torch and a filler rod to weld | T/F |
| 6. When welding no protective glasses are used | T/F |
| 7. The welder presents laser welding | T/F |
| 8. When the steel is heated it is green | T/F |

3/2 Read and listen to the text.

Welding is a process that joins materials of two **work-pieces** together so that they cool and harden into one piece. This is done by **melting** the work-pieces and adding a filler material, ordinarily the **filler rod**. The filler rod has the **composition** similar to the composition of the metal pieces.

The place of joining two materials that is named a **welding point** is heated by using welding machine.



Many different methods can be used for welding, such as electric arc welding, oxyacetylene welding, pressure welding, resistance welding, energy beam welding and other methods. The individual method is usually chosen according to the material to be welded, purpose of welding and equipment available.

Arc welding uses an electric power supply to create and maintain an electric arc between an electrode and the base material to melt metals at the welding point. In this kind of welding, the gases of **argon**, **carbon dioxide** (CO₂) and their mixtures are used as protective gases. Argon as a protective welding atmosphere is used to prevent porosity and

brittleness. The protective atmosphere is useful because it bars access of oxygen and stabilizes the electric arc.

Oxyacetylene welding, which is also called oxy-fuel welding, generally employs the **combustion** of acetylene in **oxygen** to produce a welding flame temperature of about 3100°C. The welding materials and the filler rod are melted by the flame and welded together. Of course, oxy-acetylene welding is one of the oldest processes. **Welding torch** is the part of the welding machine with the flame which is held and moved by the welder.



Resistance welding involves the generation of heat by passing **current** through the resistance caused by the contact between two or more metal surfaces. The work-pieces are heated to a kind of plastic state and then pressed against each other.

Energy beam welding methods, namely **laser beam** and electron beam welding, are quite new processes becoming popular in industrial production. The two processes are similar, differing only in their source of energy power. Laser beam welding uses a highly focused laser beam, while electron beam welding is done in a vacuum and uses an electron beam. Both processes are extremely fast and easily automated, which makes them highly productive.

3/3 Find the terms to the following definitions

carbon dioxide* resistance welding* welding point* arc welding* oxygen* laser beam* energy beam* welding* filler rod* argon oxyacetylene* welding torch

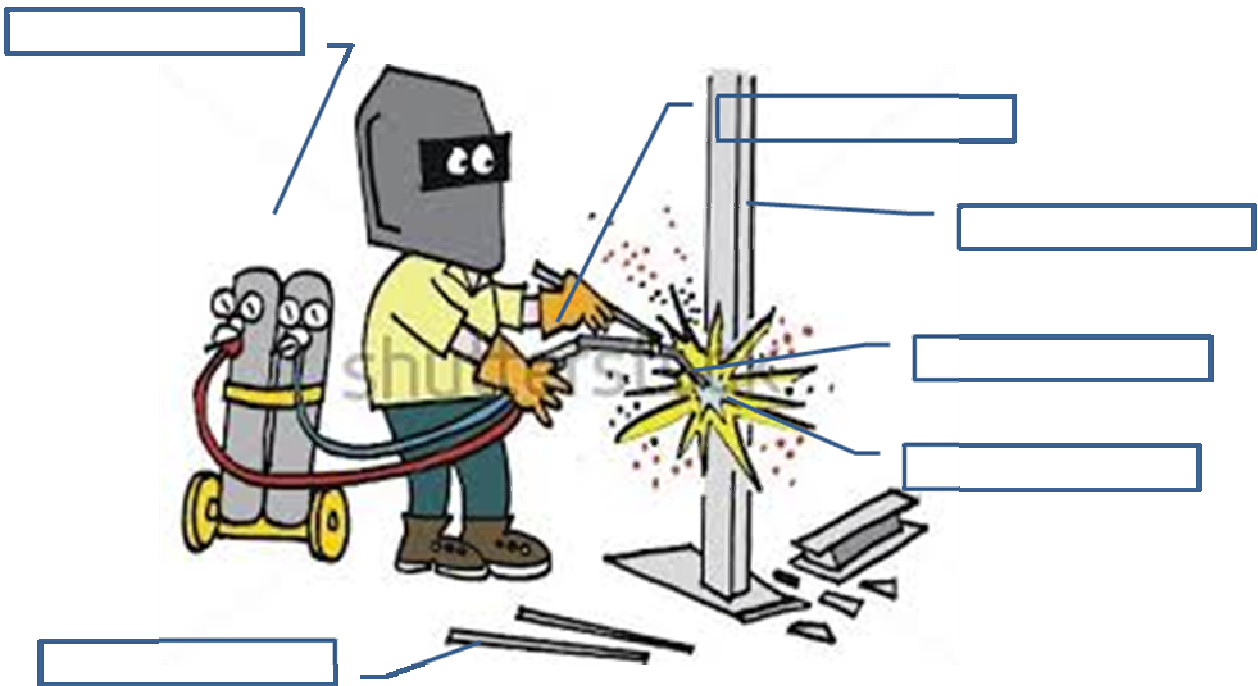
1. Místo spoje dvou materiálů
2. Rychlá metoda svařování využívající přesně zacílené laserové nebo elektronové paprsky
3. Velice výkonný proud světla používaný v moderním, velmi přesném svařování
4. Materiál přidávaný do taveného místa spoje mající podobné složení jako materiály svařovaných dílů
5. Proces využívající elektřinu k vytvoření elektrického oblouku mezi elektrodou a základním materiálem
6. Plyn vytvářející aktivní ochrannou atmosféru při obloukovém svařování
7. Druh svařování využívající vznícení acetylenu ve směsi s kyslíkem, čímž vzniká plamen
8. Základní plyn využívaný při svařování plamenem umožňující vznícení jiných plynů
9. druh svařování, který vytváří teplo tím, že elektrický proud prochází místem spoje a vytváří elektrický odpor
10. Inertní plyn, který se používá jako ochranná atmosféra při svařování
11. Část svařovacího zařízení, ze kterého vychází plamen

3/4 Find the terms to the following definitions

carbon dioxide* resistance welding* welding point* arc welding* oxygen* laser beam* energy beam* welding* filler rod* argon oxyacetylene* welding torch

1. The place in which two materials are joined
2. The process using a power supply to maintain an electric arc between an electrode and the base material
3. The gas forming an active protective atmosphere at electric arc welding
4. The method of welding that generates heat by passing an electric current through the contact point of two metal surfaces and causing resistance
5. The part of welding machine from which the flame comes
6. A very powerful line of light that is used in the modern, accurate type of welding
7. A material that is added to the welding point having a composition similar to the work-pieces materials
8. The welding process employing the combustion of acetylene in oxygen to produce a flame
9. The basic gas used at oxyacetylene welding that allows combustion of other gases
10. The inert gas acting as a protective welding atmosphere
11. The fast method of welding using a highly focused laser beam or an electron beam

3/5 Describe the parts



For more information see:
https://www.youtube.com/watch?v=CoNw_faThgQ

3/6 Work out the dictionary No. 3

Work out a dictionary for each bold expression in this unit. Find phonetic transcription and put it into alphabetical order

[illegible]

4. Tubes



4/1 Watch the video and answer the true/ false questions:

<https://www.youtube.com/watch?v=JDMln5vitgE>

- | | |
|---|-----|
| 1. Pipes are used in constructing buildings | P/N |
| 2. The edges are joined by special glues. | P/N |
| 3. The pipes are quality tested. | P/N |
| 4. The pipes are always round, never any other shape. | P/N |

4/2 Read and listen to the text.

Tubes and pipes

Pipes are long tubes that are used for carrying **liquids** and gases (sometimes loose materials) over long distances (water, oil, gas, steam). A line of connected tubes is called **pipelines**.

They can be produced from various materials: steel - main use is in power plants, nuclear power, high pressure boilers, gas, water and steam transmission lines; **cast iron** used for waste products pipes; plastic for water transmission lines and chemicals transport; copper used in heat exchangers and coolers; glass - pipelines in food and chemical industry and also **concrete** or earthenware for waste products pipes.

There are few parts of pipelines, but the main ones are pipes, **adapting pipes**, **pipe connectors**, **valves**, and **deaerators**. Adapting pipes are various shapes Y shape, T shape, cross shape and others. Valves block or control the flow of liquid, gas, etc., by opening and closing. Deaerator is a device that is widely used for the removal of oxygen and other dissolved gases from the pipeline systems or also heating system boilers etc. Pipe connectors also called fittings help to connect the pipes easily and quickly without welding, bonding or sticking.

4/3 Match the material solution to the pictures:

a) Gas

b) loose

c) liquid



4/4 Choose the correct term from the text and match it with one of the definitions.

Tube* cast iron* pipelines* liquids* concrete* adapting pipes* pipe connectors* valves* deaerators*

- a) jedno ze čtyř skupenství. Je bez pevného tvaru a přebírá tvar nádoby
- b) dlouhý, dutý předmět používaný převážně k transport tekutin nebo plynů
- c) systém propojených trubek používaný k transport tekutin a plynů na dlouhé vzdálenosti
- d) slitina železa o vyšším obsahu uhlíku (více než 2,14%), která byla zkapalněna zahříváním a poté zchlazena do pevného stavu
- e) je směs cementu, vody, písku a šterku, která ztverdne do velmi pevného stavebního materialu
- f) trubky různých rozměrů používané k vytvoření odpovídajícího tvaru potrubí
- g) součásti používané v potrubních systémech ke spojení trubek, k přizpůsobení rozměrů trubek nebo tvarů, take k regulaci nebo měření průtoku
- h) otvíráním a zavíráním se blokuje nebo refguluje průtok
- i) zařízení pro odstranění vzduchu z potrubí

4/5 Choose the correct term from the text and match it with one of the definitions.

Tube* cast iron* pipelines* liquids* concrete* adapting pipes* pipe connectors* valves* deaerators*

- a) used for the removal of oxygen from the pipeline systems
- b) a long, hollow object that is used especially to carry the flow of a liquid or gas
- c) one of the four fundamental states of matter with no fixed shape it conforms the shape of the container
- d) an alloy of iron and carbon of more than 2,14% content in it, which has been heated until it liquefies, and is then poured into a mould to solidify
- e) a line of connected pipes that are used for carrying liquids and gases over a long distance
- f) pipes in various shapes used to create secure appropriate pipelines
- g) fittings used in pipe plumbing systems to connect straight pipe or tubing sections, to adapt to
- h) different sizes or shapes, and also as regulating or measuring fluid flow
- i) a mix of cement, water, sand, and gravel that hardens into a super-strong building material
- j) block or control the flow of liquid, gas, etc., by opening and closing

4/6 Name the pictures with the terms from the text.



- a)..... b)..... c)..... d)..... e).....

More videos about pipes:

<https://www.youtube.com/watch?v=7ITgMXtuMv0> sandik

<https://www.youtube.com/watch?v=ztcEyel47Kg> animace

4/7 Work out the dictionary No. 4

Work out a dictionary for each bold expression in this unit. Put it into alphabetical order. Find phonetic transcription

[illegible]



5. Mechanical transmissions

5/1 Watch the video. Try to catch and understand those terms. What do you think they mean in Czech?

<https://www.youtube.com/watch?v=IKYwZ730JFs>

- a) input
- b) shaft
- c) output
- d) teeth

5/2 Read and listen to the text.

A **machine** or a mechanical device is a tool containing one or more parts usually moving, that uses energy to perform an intended action. The device transforms the direction or magnitude of a force. In mechanics, **transmissions** are used to transmit **turning motion** from a **drive shaft** to an **output shaft**. We change **speed** and **torque**. The most common transmission is the transmission in a car you can also have transmissions in bicycles, machines and mechanical devices. For instance, an electric screwdriver has a very large gear reduction because it needs lots of torque to turn screws,



but the motor only produces a small amount of torque at a high speed. With a gear reduction, the output speed can be reduced while the torque is **increased**.

Another thing gears do is **adjust** the direction of **rotation**. For instance, in the differential between the rear wheels of your car, the power is transmitted by a shaft that runs down the center of the car, and the differential has to turn that power 90 degrees to apply it to the wheels.

On any gear, the **gear ratio** is determined by the distances from the center of the gear to the point of contact. For instance, in a **device** with two gears, if one gear is twice the diameter of the other, the ratio would be 2:1.

Spur gears are the most common type of gears. They have straight teeth, and are mounted on **parallel** shafts. Sometimes, many spur gears are used at once to create very large gear reductions.

Spur gears are used in many devices that you can see all over like the electric screwdriver or the washing machine.

5/3 Choose the correct term from the text and match it with one of the definitions.

machine* transmissions* turning motion* drive shaft* speed* output shaft* torque* adjust* increase*

- a) vzdálenost, kterou předmět urazí za jednotku času
- b) zařízení skládající se z pevných a pohyblivých částí, která přetváří mechanickou energii
- c) je pohyb předmětu, při kterém předmět rotuje
- d) přenáší sílu mezi hřídelemi, často mění točivý moment a otáčky
- e) stát se větším co do počtu, rozměru, síly nebo kvality
- f) je hřídel, která přenáší pohyb z hnací hřídele na potřebné místo
- g) upravit nebo nastavit něco tak, aby to pracovalo jinak
- h) vyjadřuje působení síly na objekt rotující podle osy otáčení (hřídele)
- i) je hřídel, která přenáší mechanickou sílu z motoru na potřebné místo

5/4 Choose the correct term from the text and match it with one of the definitions.

machine* transmissions* turning motion* drive shaft* speed* output shaft* torque* adjust* increase*

- a) a movement of an object during which the object circle or rotate
- b) rotating shaft that transmits mechanical power from a motor or an engine to a point of application
- c) to become greater, as in number, size, strength, or quality
- d) transmissions transference of force between shafts often with changes of torque and speed
- e) to change something in a way so that it works different
- f) distance travelled per unit time
- g) the shaft that transfers motion from the drive shaft to the point of application
- h) is the tendency of a force to rotate an object about an axis
- i) a device consisting of fixed and moving parts that modifies mechanical energy

5/5 Match the term, its definition and Czech equivalent.

rotation	a gear with teeth radially arrayed on the rim parallel to its axis	zařízení
gear ratio	a complete turn around a central point	rotace
device	two lines that never meet. They are always the same distance apart.	převodový poměr
spur gears	is the ratio between input and output speed, changed in the gear	rovnoběžné

parallel

thing made or adapted for a particular purpose, especially a piece of mechanical or electronic equipment

kolo s přímým ozubením

For more animation watch:

<https://www.youtube.com/watch?v=QPaUJfA1KsY>

5/6 Work out the dictionary No. 5

Work out a dictionary for each bold expression in this unit. Put it into alphabetical order. Find phonetic transcription

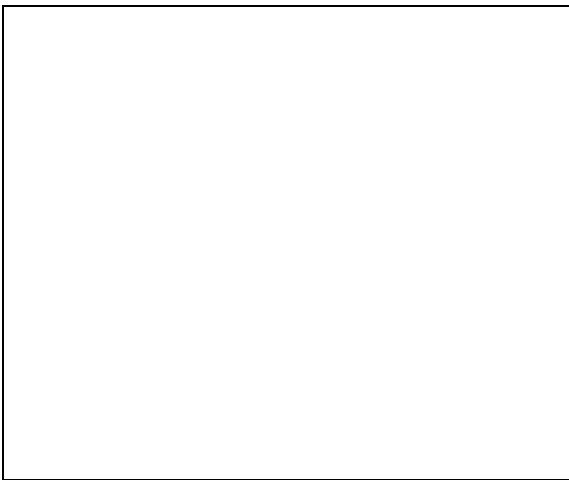
[illegible]

6. Automobile construction

6/1 Read the text.

Vehicles can be categorized in numerous ways. For example according to the vehicle's construction, **engine**, weight, type of **fuel** and emissions, the body, the size, type and equipment of vehicles as well as the purpose for which it is used. A car body is a shell forming the exterior of a car. Among many below mentioned we can also recognize SUVs, Multi-utility vehicle or Multi-purpose vehicle

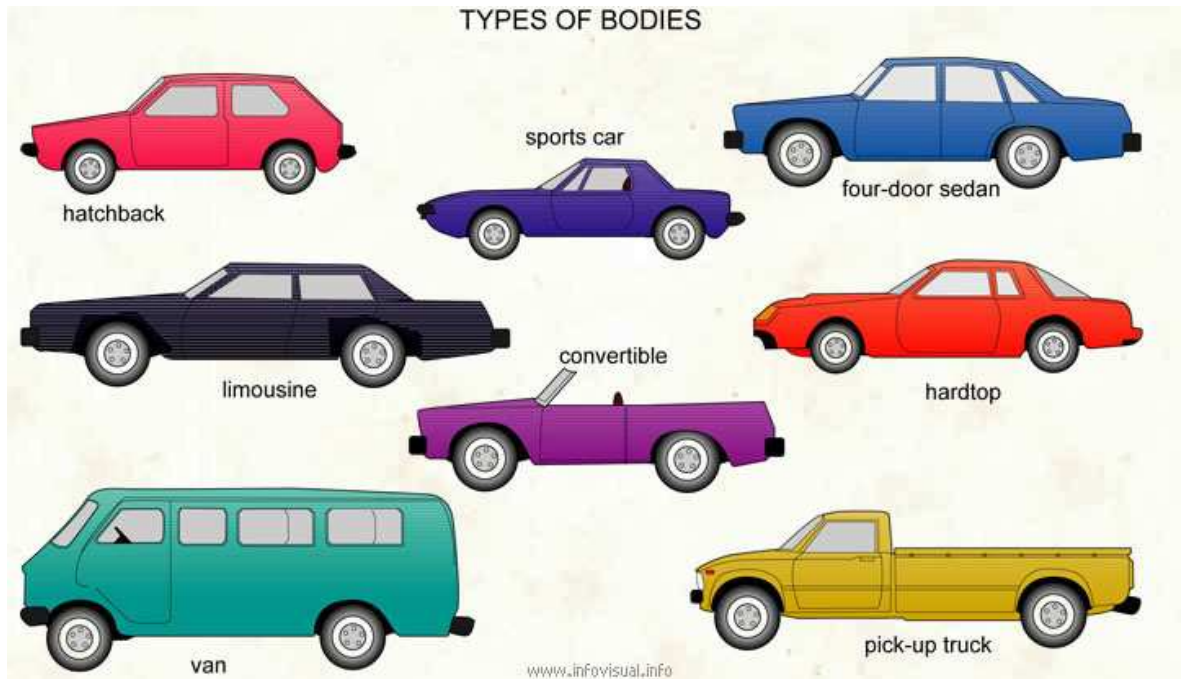
There are two typical **chassis** type used by car manufactures nowadays. Body-on-frame is an automobile construction method. Mounting a separate body to a rigid **frame** that supports the drivetrain was the original method of building automobiles, and its use continues to this day on almost all 4x4 automobiles and some of the crossover SUV. Car bodies are now mostly of frameless monobox construction, usually known as an integral construction.



Body-on-frame 4x4



A typical Uni-body sedan.



6/2 Choose the correct description to the car body types.

Types of bodies:

Hatchback* Sports car* Four-door sedan* Limousine* Convertible* Hardtop* Van* Pick-up truck*

- a) small vehicle used to carry baggage
- b) small, two-seated automobile
- c) passenger compartment with four doors and four side windows
- d) a small truck
- e) two-door passenger compartment with a door at the back
- f) car with a removable roof
- g) large, six-seated passenger compartment
- h) two-door passenger compartment

Finish reading the text.

There are two main fuel types used in car engines: gasoline and diesel. These also classify the type of **ignition** in the engine as well. Gasoline engines use **spark** ignition while diesel engines are **compression**-ignited. More recent alternatives to gasoline and diesel include electricity, ethanol, methanol, hydrogen, propane and natural gas.

The number of **cylinders** in a car engine ranges between three and 12. The number of cylinders also determines the amount of power produced by the engine. For example, a six-cylinder engine is more powerful than a four-cylinder engine.

Without a **cooling system**, car engines will quickly destroy themselves due to extreme temperatures. Car engines are either liquid- or air-cooled. Liquid-cooled engines are the modern industry standard and are cooled by a water pump that circulates water throughout the engine. Air cooled engines have **cooling fins** surrounding the cylinders which carry away the heat which surrounds the cylinders.

6/3 Choose the correct term from the text and match it with one of the definitions

chassis* cooling fins* frame* ignition* spark* compression* cylinders* engine* fuel* vehicle* cooling system*

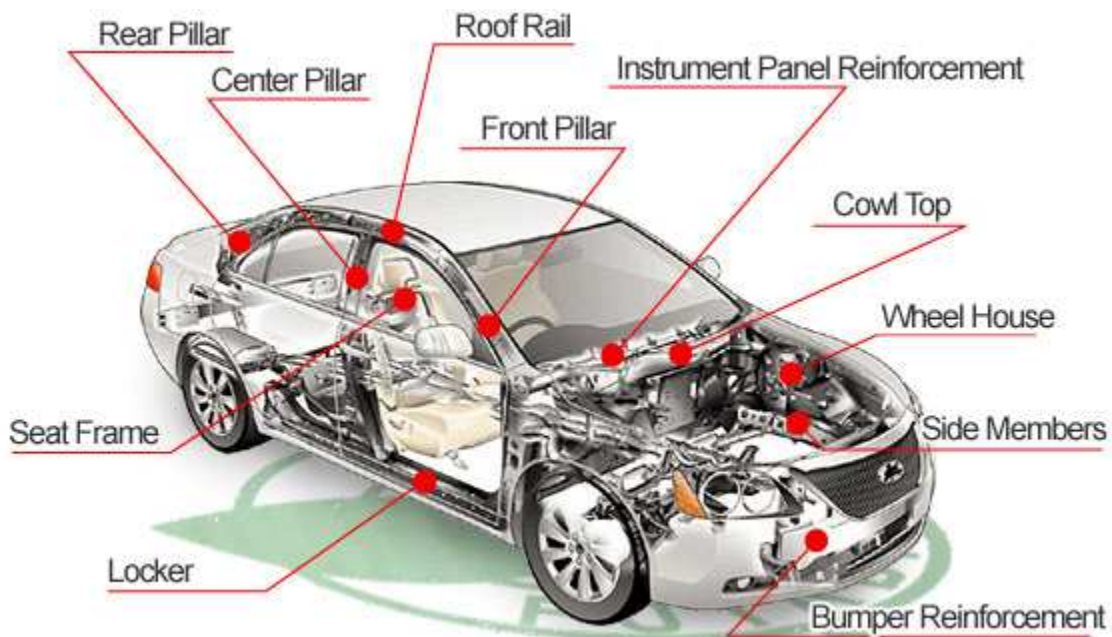
- a) systém v motoru, který zapříčiní, že se palivo začíná spalovat a motor začíná pracovat
- b) dopravní prostředek používaný k přepravě osob nebo zboží
- c) zařízení, které přeměňuje energii na mechanickou sílu nebo pohyb
- d) materiál (např. uhlí, plyn), jehož spalováním se získává teplo nebo síla
- e) obdélníkový, obvykle ocelový rám, který drží karoserii a motor motorového vozidla.
- f) konstrukce, která něco podepírá nebo drží pohromadě
- g) malá část ohně, která se oddělí od hlavního plamene
- h) stav, při kterém je něco stlačeno, zmenšeno, zmáčknuto tak, aby došlo k redukci rozměrů
- i) je část motoru, ve které se pohybuje píst konající práci, nahoru a dolů
- j) zařízení, které udržuje chlad, přenáší teplo z místa na jiné místo
- k) pásy kovu, které zvyšují plochu povrchu a tím zefektivňují chlazení

6/4 Choose the correct term from the text and match it with one of the definitions

chassis* cooling fins* frame* ignition* spark * compression* cylinders* engine* fuel* vehicle* cooling system*

- a) any machine with wheels that is used to carry people or goods from one place to another
- b) a machine that converts energy into mechanical force or motion
- c) a material (such as coal or gas) that is burned to produce heat or power
- d) a rectangular, usually steel frame, that holds the body and motor of an automotive vehicle.
- e) a structure that gives shape or support
- f) an electrical system in an engine that causes the fuel to burn so that the engine begins working
- g) a small burst of fire that comes off of a main fire
- h) a state of being squished down or made smaller or more pressed together order to reduce the size
- i) a mechanism for keeping something cool, that can transfer heat from one place to another
- j) metal strips that effectively increases the surface area to make cooling efficient
- k) working parts of an engine or pump, the space in which a piston travels up and down

6/5 See some other car parts



For a car engine animation see: https://www.youtube.com/watch?v=zA_19bHxEYg
http://www.ehow.com/facts_5471305_types-car-engines.html
http://158.132.154.171/mu_proj/2005/M3M4/Chasis.htm
<http://auto.howstuffworks.com/car-engine-types-channel.htm>
<https://www.youtube.com/watch?v=3-ilzxawUAs>

6/6 Work out the dictionary No. 6

Work out a dictionary for each bold expression in this unit. Find phonetic transcription and put it into alphabetical order

[illegible]

7. CAD designing



7/1 Watch the video and answer the question:

<http://videos.autodesk.com/zencoder/content/dam/autodesk/www/solutions/simulation/videos/simulation-overview-video-896x504.mp4>

What advantages can 3D designing and simulation bring in accordance to the video?

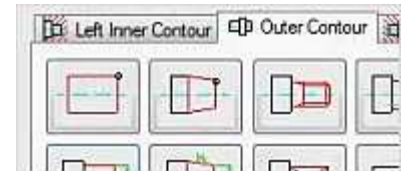
7/2 Read and listen to the text.

CAD, or **computer-aided design** and drafting, is the use of computer technology for design and design documentation. CAD software replaces manual drafting with an automated process.

The structural engineers used 2D or 3D CAD **programs**. These programs can help you explore design ideas, **visualize** concepts through photorealistic renderings, and simulate how a design will perform in the real world. AutoCAD software was the first CAD program, and it is still the most widely used CAD application.

Most 3D CAD programs let you apply multiple light sources, rotate objects in **three dimensions**, and render designs from any angle.

Engineers use Autodesk CAD software **to design** cars, ships, bicycles, prosthetics, and much more. CAD software is also included in Autodesk product suites for building design, product design, factory design, and more.



AutoCAD Mechanical design software is AutoCAD software built for manufacturing. Part of the Digital Prototyping solution, it includes all the functionality of AutoCAD, plus libraries of **standards-based parts** and tools to help automate common mechanical CAD tasks and accelerate the mechanical design process.

Computer-aided design (CAD) is a computer technology that designs a product and documents the design's process. CAD may facilitate the manufacturing process by transferring detailed diagrams of a product's materials, processes, **tolerances** and **dimensions** with specific conventions for the product in question. It can be used to produce either two-dimensional or three-dimensional diagrams, which can then when rotated to be viewed from any **angle**, even from the inside looking out. A special printer or plotter is usually required for printing professional design renderings.

The concept of designing geometric shapes for objects is very similar to CAD. It is called computer-aided geometric design (CAGD).

CAD is also known as computer-aided design and drafting (CADD)

Techopedia explains *Computer-Aided Design (CAD)*

CAD is used as follows:

1. To produce detailed engineering designs through 3-D and 2-D drawings of the physical components of manufactured products.
2. To create conceptual design, product layout, strength and dynamic analysis of assembly and the manufacturing processes themselves.

3. To prepare environmental impact reports, in which computer-aided designs are used in photographs to produce a rendering of the appearance when the new structures are built.

CAD systems exist today for all of the major computer platforms, including Windows, Linux, Unix and Mac OS X. The user interface generally centres around a computer mouse, but a pen and digitizing graphic tablet can also be used. View manipulation can be accomplished with a **spacemouse** (or spaceball). Some systems allow stereoscopic glasses for viewing 3-D models.

Most U.S. universities no longer require classes for producing hand drawings using protractors and compasses. Instead, there are many classes on different types of CAD software. Because hardware and software costs are decreasing, universities and manufacturers now train students how to use these high-level tools. These tools have also modified design work flows to make them more efficient, lowering these training costs even further.

7/3 Choose the correct term from the dialogue and match it with one of the definitions.

computer-aided design* programs* visualize* three dimensions* to design* standards-based parts* tolerances* dimensions* angle*

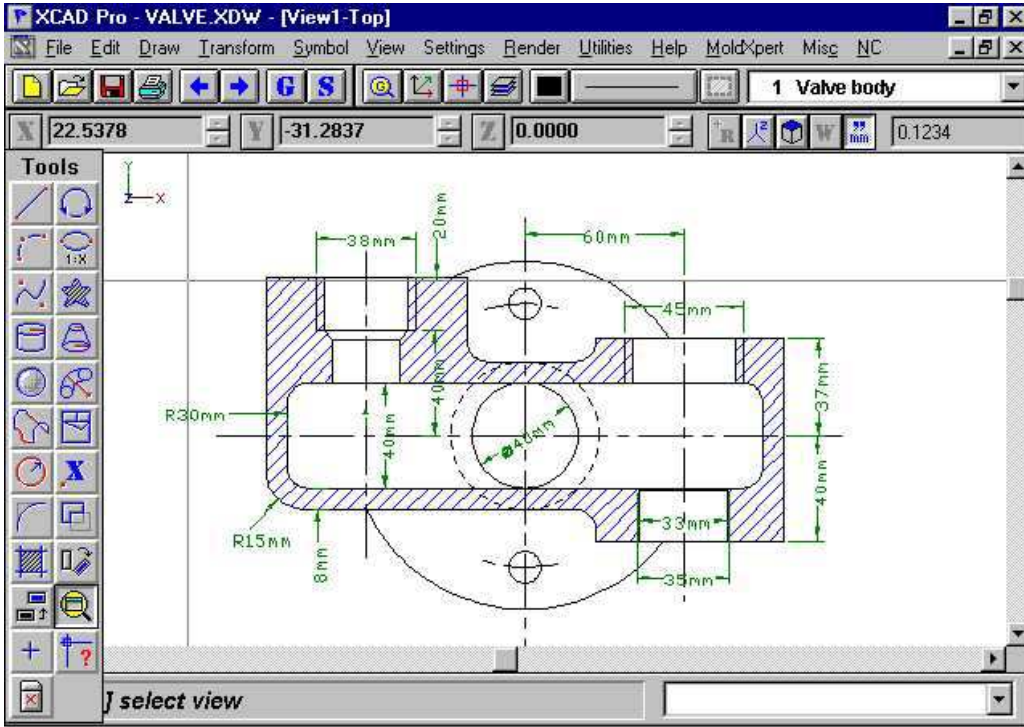
- a) allowed variation in distance or space for any given size in order to get a proper function
- b) to make visible
- c) instructions required by a computer function
- d) software is used by architects, engineers, drafters, artists, and others to create precision drawings or technical illustrations or models
- e) the length, width, height, or depth of something
- f) an object that has height, width and depth, like any object in the real world
- g) to make detailed drawing or a plan
- h) the difference between the direction of two lines or surfaces that come together to meet each other
- i) parts for which technical criteria, specifications, methods, processes and practices are established

7/4 Choose three definitions for each term.

Create designs* Save time and accelerate projects* Create presentations*

- a) Eliminate redundant pencil and paper drawings
- b) Explore ideas with 3D modelling tools
- c) Complete projects with comprehensive tools
- d) Digitize scanned drawings
- e) Re-create as-built environments with point cloud tools
- f) Translate third-party 3D file formats into DWG
- g) Test form, fit, and function variations
- h) Display renderings from AutoCAD designs
- i) Cut rendering times with A360

7/5 Describe and name some parts you use.



Read and see more:

<http://videos.autodesk.com/zencoder/content/dam/autodesk/www/solutions/simulation/videos/simulation-overview-video-896x504.mp4>

http://cs.wikipedia.org/wiki/Computer_aided_design

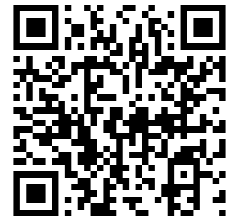
<http://www.autodesk.com/solutions/cad-software>

7/6 Work out the dictionary No. 7

Work out a dictionary for each bold expression in this unit. Put it into alphabetical order. Find phonetic transcription

[illegible]

8. Bearings



8/1 Watch the video and answer the questions:

<http://www.youtube.com/watch?v=ONz6S48QgEk>

1. The balls are made of a) steel b) iron c) wood
2. The water based liquid is there to a) wash the rings b) to cool the rings c) to prevent corrosion
3. The balls are a) made by cutting to small pieces from wires b) made by melting the steel and cooling it c) in a hollow mould
4. The balls are loaded to the rings a) automatically b) handmade c) in another workshop
5. At the end of the production there a) is only a man-made test b) are many quality tests done by various machines c) is no test as the production is high quality.

Go to 8/5.

8/2 Read and listen to the text.

A **bearing** is a machine element that transmits relative **motion** between moving parts to only desired motion. The bearing ensures free **rotation** with minimum **friction**. The bearing supports the **shaft** and holds it in correct position. The shaft is often sealed with a **sealing ring**.

Bearings are classified according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

Rolling Bearing are those where rolling elements, such as **balls, cones, needles or rollers** are introduced between the surfaces that are in relative motion. The rolling elements can be put either in a single row or a double row where two rows of e.g. balls are next to each other.

Standard ball bearing consists of the **outer ring** which has bigger **diameter** and the **inner ring** with a smaller diameter. Between these rings there are balls placed in a **ball cage** not to move any wrong way and sealed by a sealing ring.

For a bearing to operate properly, it needs to be lubricated. In most cases the lubricant is oil or grease. The lubrication also prevent from overheating, corrosion and dirt.

The **lifetime** of a bearing lasts until a bearing failure appears. The failure can be abrasive, corrosive or another. The bearing must be then set aside.

8/3 Choose the correct term from the text and match it with one of the definitions.

lifetime * bearing * shaft * diameter * friction * motion * rotation

1. podlouhlá rotační součást strojí
2. součást technického zařízení, které umožňuje snížení tření při vzájemném otáčivém nebo posuvném pohybu strojních dílů
3. výrobku je doba, po kterou může být stoj používán
4. proces, při kterém pevná tělesa mění svoji vzájemnou polohu
5. jev, který vzniká při pohybu tělesa v těsném kontaktu s jiným tělesem
6. otáčení pevného tělesa kolem své jedné osy
7. úsečka spojující dva body kružnice procházející středem.

8/4 Choose the correct term from the text and match it with one of the definitions.

lifetime * bearing * shaft * diameter * friction * motion * rotation

1. the act of turning around the only axis.
2. rubbing of one object or surface when moving against another
3. the action or process where a solid moves or changes its place or position
4. the long, narrow part a machine which holds or turns other parts
5. the period of time during which a machine exists or functions.
6. a straight line passing from side to side through the centre of a circle
7. is a machine element that constrains relative motion and reduces friction between moving parts when machine parts rotate

8/5 Match the shapes with the pictures of rolling elements

The rolling elements

Balls* needles* rollers* cones

a)



b)



c)



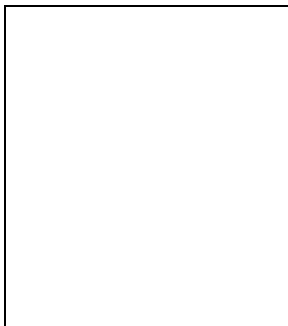
d)



8/6 Match the pictures of the bearings with their types.

Double row bearing / Single row bearing

a)



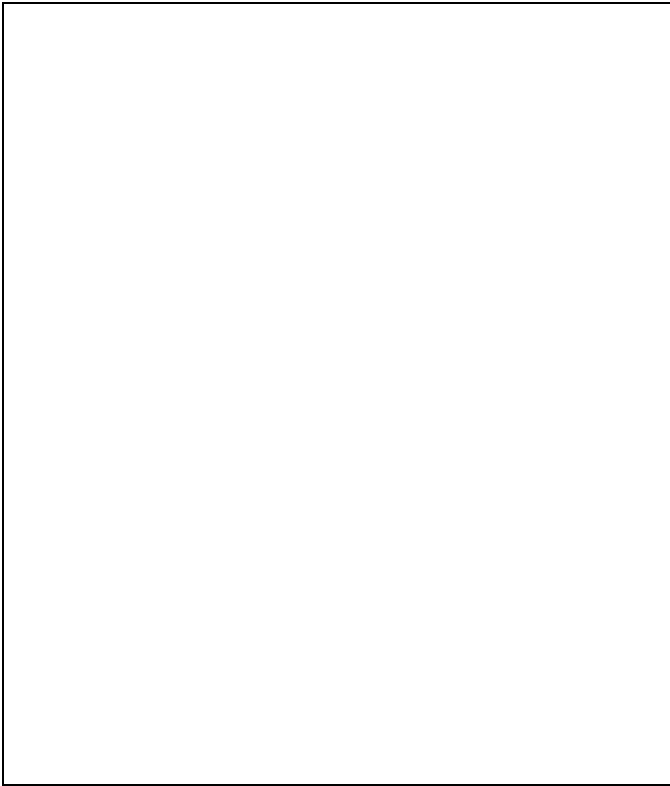
b)



8/7 Match the bearing parts with the numbers.

Parts of a ball bearing

Balls* inner ring* ball cage* outer ring* sealing ring*



For more information see:

Pictures: <http://nelsons-bearing.com/ballbearings.php>

Bearing production: <http://www.youtube.com/watch?v=VOysbd2ZMxE>

Bearing list: <http://www.youtube.com/watch?v=4PEKu61OPGw>
<http://www.youtube.com/watch?v=ONz6S48QgEk>

8/8 Work out the dictionary No. 8

Work out a dictionary for each bold expression in this unit. Find phonetic transcription and put it into alphabetical order

[illegible]

9. Tension testing and surface treatment

9/1 Watch the first part of the video (min 1.25) and choose the correct expression.

<https://www.youtube.com/watch?v=U9Y8xclePOw>

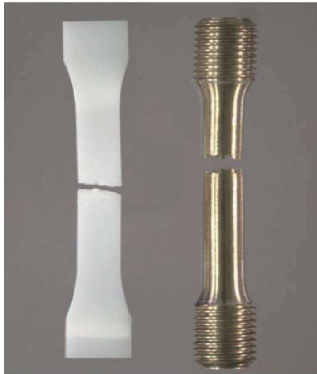
1. Electroplating protects metals from **oxidation/ corrosion**.
2. You need a solution of **copper sulphate/ magnesium sulphate** to electroplate.
3. The process begins when the **current/water** flows from the power supply.
4. There is hydrogen/oxygen on the positive electrode.
5. Copper ions in the solution are attracted **to both electrodes/negative electrodes**.
6. The copper ions give the solution its **green/blue** colour.

Watch the second part of the video and answer the true /false.

- | | |
|--|--------------|
| 7. The electrodes haven't changed their weight. | T / F |
| 8. You can electroplate electrodes and objects as well. | T / F |
| 9. The quality of the copper cover depends on the volume of current. | T / F |

9/2 Read and listen to the text.

Metals tend to corrode. **Corrosion** is the chemical or electrochemical disintegration of metal materials due to external influence like water, slight acids, sea water salts or chemicals. **Oxidation** is the most common chemical reaction of metal surfaces with oxygen.



Tensile Test Specimens

Corrosion may cause large damage, but we can prevent it by anti-corrosive **surface finishing**.

Painting is also a kind of treatment. It can be **applied** as a **solid** or a gaseous suspension. Another type of surface finishing - **powder coating** - it is the application of powder on the surface of material by using compressed air and **curing** in the curing furnace.

Other types of surface finishing include for example electroplating, hot-dip galvanizing, shot-blasting, etc.

Electroplating makes use of electric power for the transfer of cations of one metal to the surface of another metal which process is called electrolysis. The part to be plated is the cathode of the circuit; the anode is made of metal to be plated on the cathode surface.

Hot-dip galvanizing is a finishing technology of coating with a thin zinc **layer** performed by passing the metal through a bath at a temperature of around 460 °C.

Shot-blasting is a very special operation, different from the above mentioned finishing processes, because it is usually applied before any machining of a metal. It is a process performed by a stream of abrasive material against a surface under high **pressure** to smooth a rough surface and remove any possible contaminants. Steel shot is not anti-corrosive paint, but an operation performed in order to clean and prepare a metal for further machining.

Powder coating - the material coated must be **conductive**. To apply the powder, we use **compressed air**. The most common way is to spray it with an electrostatic gun. The powder is charged with electrostatic power and thus can easily adhere to the surface of metal. It is called **adherence**. Then the component must be heated in a **curing furnace**.

9/3 Choose the correct term from the dialogue and match it with one of the definitions.

adherence* compressed air* conductive* shot-blasting* curing furnace* electroplating* hot-dip galvanizing* corrosion* powder coating* paint* oxidation* surface finishing* apply* solid*

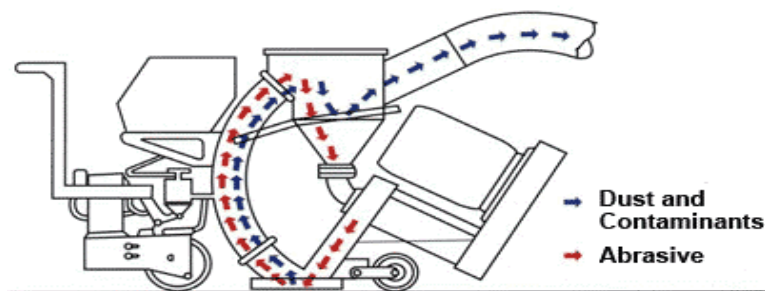
1. Schopný vést elektřinu, která je pro práškové lakování nezbytná
2. Trvalé přilnutí k povrchu
3. Vzduch ve stlačené formě užívaný při práškovém lakování
4. Nanášet barvu na povrch výrobku nebo součástí
5. Zařízení, ve kterém dochází k tvrdnutí nátěru
6. Nanášení prášku na povrch součásti nebo výrobků pomocí stlačeného vzduchu a elektrostatické energie
7. Povrchová úprava před obráběním proudem abrazivního materiálu, zpravidla ocelovými broky
8. Chemické rozrušení kovových materiálů působením vnějších vlivů
9. Ošetření povrchových ploch výrobků nebo součástí
10. Povrchová úprava tenkou vrstvou zinku, prováděná ponořením do vysokoteplotní lázně
11. Hmota, zpravidla antikorozní, nanášená na povrch výrobku nebo součástí
12. Chemická reakce kovových povrchů s kyslíkem
13. Povrchová úprava využívající elektrickou energii pro přenos kationtů
14. Skupenství, při němž těleso drží svůj tvar

9/4 Choose the correct term from the dialogue and match it with one of the definitions.

adherence* compressed air* conductive* shot-blasting* curing furnace* electroplating* hot-dip galvanizing* corrosion* powder coating* paint* oxidation* surface finishing* apply* solid*

1. A body solution with a stable shape.
2. Able to transmit a current necessary to powder coat
3. A stream of air used to powder coat
4. To coat a surface with a material
5. A device used to heat and harden the paint
6. To spray a powder on a surface with compressed air and electrostatic energy
7. A thin zinc layer Surface treatment coated by passing through a hot bath
8. Permanent sticking to a surface
9. Surface treatment using a stream of abrasive material usually steel particles
10. A surface treatment using power to transfer cations
11. Chemical disintegration of metal materials due to external influence
12. Treatment of product or component surfaces
13. Not anti-corrosive liquid laid on a product or component surface
14. Chemical reaction of metal surfaces and oxygen

9/5 Describe the picture with the appropriate words from the text.





For more information see:

https://www.youtube.com/watch?v=Z_fz-61NJsM<https://www.youtube.com/watch?v=qqmWm2f8A08>

9/6 Work out the dictionary No. 9

Work out a dictionary for each bold expression in this unit. Find phonetic transcription and put it into alphabetical order

[illegible]

10. Drawings

10/1 Watch the video and answer the questions from the content of the video.
<https://www.youtube.com/watch?v=z4xZmBpXlZQ>



- a) What is engineering drawing?
- b) Name some drawing instruments.
- c) What are their uses?
- d) Name and draw some lines.

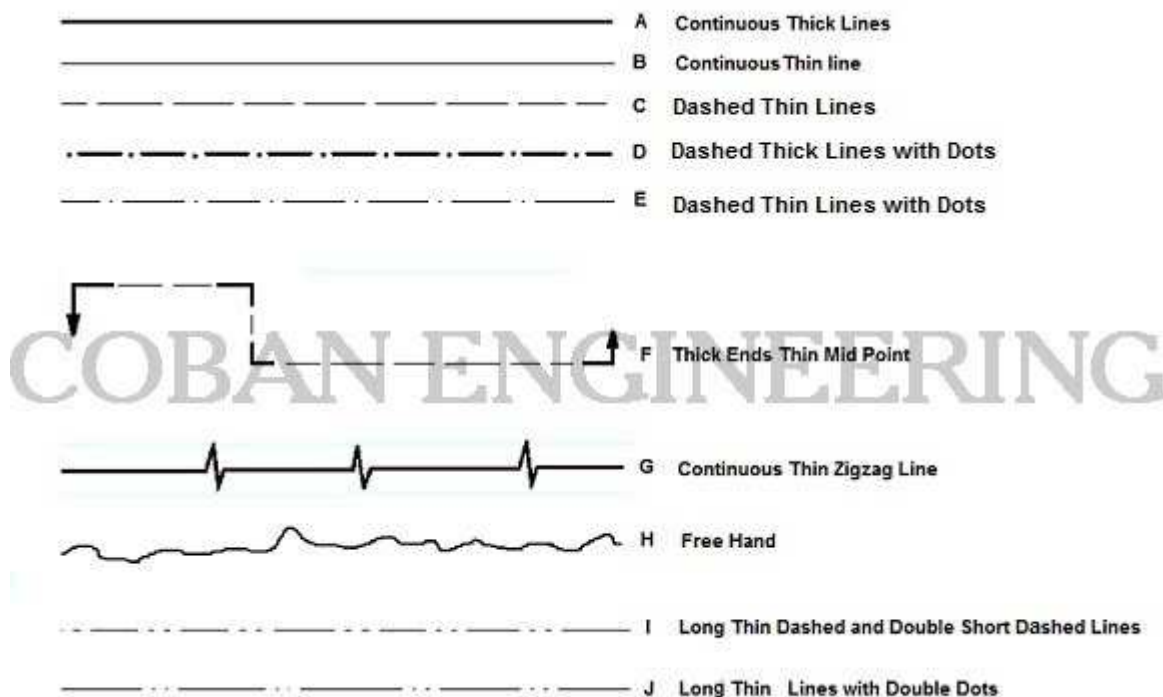
10/2 Read and listen to the text, watch the lines.

Drawing conventions

Conventions are ways of doing things which conform to a common standard, for example, technical drawings. Using conventions saves time and ensures that a drawing means the same thing to anyone who sees it. The BSI standard for drawings is BS8888.

Technical Drawing Line Types

Technical drawing Lines are used for different purposes to provide specific information for designers, manufacturers, etc. looking at the drawing. The person who will read drawings have to learn what they mean. Line types are also a language type to communicate between technical people.



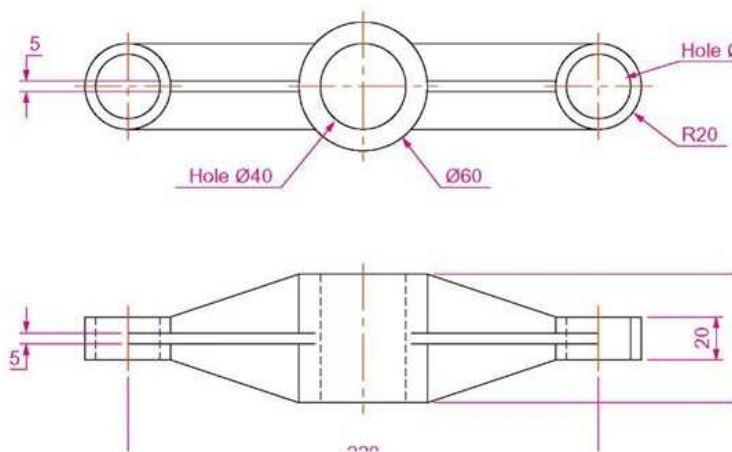
10/3 Choose the correct term from the chart above and match it with one of the definitions

Extension lines* Dimension lines* Continuous Thick Line* Continuous Thin line* Dashed Thin Lines* Dashed Thick Lines with Dots* Dashed Thin Lines with Dots* Chain Thin with Thick Ends* Continuous Thin Zigzag Line* Free Hand Line*

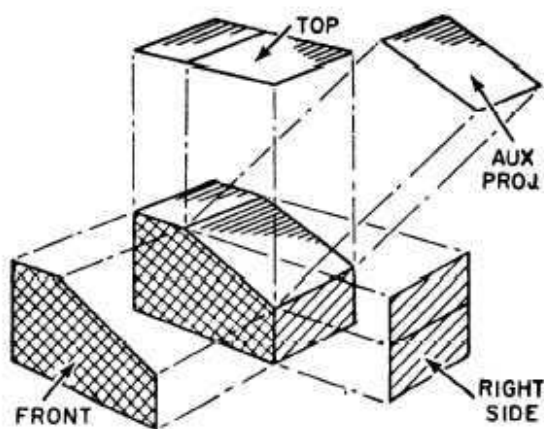
- a) are parallel lines that extend out from two points on the drawing. A small break should be added where the extension line meets the drawing
- b) are drawn with an arrow on either end between two extension lines, with the dimension written alongside. The unit of measurement should also be given
- c) Surroundings and sides of the matters (Outlines of the Edges), End of the Screws
- d) Measure lines, Backside section lines, Implied axis lines, to state the code of the plans, at diagonal lines which are used to state plane surface, Intersection, Leader, Hatching
- e) Invisible/Hidden Lines represents an invisible edges on the on an objects
- f) To state the special places/surfaces which will processed additionally like to coat, to harden etc.
- g) Axis lines of symmetrical drawings, In front of section plans
- h) Cutting Plan, To draw the trace at section plans
- i) It is used when free hand lines are drawn by tools
- j) Limits of partial and interrupted views and sections

Technical Drawing Views

Projected Two View Drawing



Auxiliary View; used to show inclined and oblique surface true size. Inclined and oblique surface do not show true size in the standard views.



Parts of the technical drawing

10/4 Choose the correct term and match it with one of the definitions

title block* The revisions block* The next assembly block* The notes list* The field of the drawing*

- a) is an area of the drawing that conveys header-type information about the drawing, such as:
- b) (rev block) is a tabulated list of the revisions (versions) of the drawing, documenting the revision control.
- c) often also referred to as "where used" or sometimes "effectivity block", is a list of higher assemblies where the product on the current drawing is used. This block is commonly found adjacent to the title block.
- d) provides notes to the user of the drawing, conveying any information that the callouts within the field of the drawing did not. It may include general notes, flagnotes, or a mixture of both.
- e) is the main body or main area of the drawing, excluding the title block, rev block, and so on.

Watch also: <https://www.youtube.com/watch?v=B1x5ghROxTk>

10/5 Work out the dictionary No. 10

Work out a dictionary for each bold expression in this unit. Find phonetic transcription and put it into alphabetical order

[illegible]

ZDROJE:

<http://www.youtube.com>
<http://www.strojirenstvi.studentske.cz>
<http://www.kmstrading.in>
<http://kikiaolaconstruction.com/cranes.html>
<http://4.bp.blogspot.com>
<http://www.allcountyblock.com/e-lifts>
<http://www.cobanengineering.com>
<http://www.techopedia.com/>
<http://www.autodesk.com>
<http://dictionary.reference.com>
<http://www.techterms.com>
<http://www.wikipedia.org>
<http://www.howstuffworks.com>
<http://simple.wikipedia.org>
<http://www.oxforddictionaries.com>
<https://www.coursera.org>
<https://www.howstuffworks.org>
<https://www.technopedia.org>

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- [3] KLETEČKA, J., FOŘT, P. *Autodesk Inventor: Tvorba digitálních prototypů*. Brno: Computer Press, 2012. ISBN 9788025137284