



# **KULTUSMINISTER KONFERENZ**

## **RAHMENLEARPLAN**

### **for the training occupation of plant mechanic for sanitary, heating and air-conditioning technology and Plant mechanic for sanitary, heating and air-conditioning technology**

(Resolution of the Conference of Ministers of Education and Cultural  
Affairs of 29.01.2016)

Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal  
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## **Part I Preliminary remarks**

This framework curriculum for vocational education and training at vocational schools has been adopted by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder and coordinated with the corresponding federal training regulations (issued by the Federal Ministry for Economic Affairs and Energy or the competent ministry in agreement with the Federal Ministry of Education and Research).

The framework curriculum is basically based on the level of the lower secondary school leaving certificate or comparable qualifications. It does not contain any methodological specifications for teaching. The framework curriculum describes occupation-related minimum requirements with regard to the qualifications to be acquired.

The federal training regulations and the framework curriculum of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder as well as the curricula of the Länder for the inter-occupational learning area regulate the objectives and content of vocational training. On this basis, the pupils acquire a qualification in a recognised training occupation as well as a qualification from the vocational school.

The Länder adopt the framework curriculum directly or implement it in their own curricula. In the second case, they ensure that the specifications of the framework curriculum for subject and time coordination with the respective training regulations are maintained.

## Part Educational mission of the

The vocational school and the training companies fulfil a joint educational mandate in dual vocational training.

The vocational school is an independent place of learning that operates on the basis of the framework agreement on the vocational school (resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder of 12 March 2015). It works as an equal partner with the other parties involved in vocational education and training and has the task of imparting vocational and cross-occupational skills to the pupils. This enables the pupils to fulfil the specific tasks in the occupation and to help shape the world of work and society in a socially, economically and ecologically responsible manner, especially against the background of changing requirements. This includes the promotion of young people's competences

- for personal and structural reflection,
- on lifelong learning,
- professional and individual flexibility and mobility in view of the growing together of Europe.

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Instruction at the vocational school is based on the federally uniform regulations issued for each state-recognised training occupation. In addition, the regulations and school laws of the Länder issued for the vocational school apply.

In order to fulfil its educational mandate, the vocational school must ensure a differentiated educational offer that

- develop action-oriented learning arrangements in didactic planning for the school year that are coordinated with in-company training,
- enables inclusive teaching with appropriate individual support against the background of different experiences, abilities and talents of all pupils,
- sensitised to health maintenance as well as specific accident risks at work, in private life and in society,
- to show perspectives of different forms of employment, including entrepreneurial self-employment, in order to support self-responsible career and life planning,
- is aligned with the relevant scientific findings and results with regard to competence development and competence assessment.

The central goal of vocational school is to promote the development of comprehensive action competence. Action competence is understood as the readiness and ability of the individual to behave in professional, social and private situations in an appropriately thought-out manner as well as in an individually and socially responsible manner.

**Action competence** unfolds in the dimensions of professional competence, self-competence and social competence.

### **Professional competence**

Willingness and ability to solve tasks and problems in a goal-oriented, appropriate, methodical and independent manner on the basis of professional knowledge and skills and to assess the result.

### **Self-competence<sup>1</sup>**

Willingness and ability, as an individual personality, to clarify, think through and assess development opportunities, requirements and restrictions in family, work and public life, to develop one's own talents and to make and develop life plans. It includes qualities such as independence, critical faculties, self-confidence, reliability, sense of responsibility and duty. It also includes, in particular, the development of well thought-out values and the self-determined attachment to values.

### **Social competence**

Willingness and ability to live and shape social relationships, to grasp and understand attentions and tensions, and to engage and communicate with others rationally and responsibly. This includes in particular the development of social responsibility and solidarity.

Methodological competence, communicative competence and learning competence are immanent parts of professional competence, self-competence and social competence.

### **Methodological competence**

Willingness and ability to proceed in a targeted, planned manner when dealing with tasks and problems (for example, when planning work steps).

### **Communicative competence**

Willingness and ability to understand and shape communicative situations. This includes perceiving, understanding and presenting one's own intentions and needs as well as those of the partners.

### **Learning competence**

Willingness and ability to understand, evaluate and classify information about facts and contexts in mental structures on a continuous basis and together with others. Learning competence also includes, in particular, the ability and willingness to develop learning techniques and learning strategies at work and beyond the workplace and to use these for lifelong learning.

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<sup>1</sup> The term "self-competence" replaces the previously used term "human competence". It takes greater account of the specific educational mandate of the vocational school and picks up on the systematisation of the DQR.

### **Part III Didactic Principles**

In order to fulfil the educational mandate of the vocational school, young people are enabled to independently plan, carry out and assess work tasks within the framework of their occupation.

Learning in vocational school aims at the development of comprehensive action competence. With the didactically justified practical implementation - or at least the intellectual penetration - of all phases of a vocational action in learning situations, learning is carried out in and from work.

Action-oriented teaching within the framework of the learning field concept is primarily oriented towards action-systematic structures and represents a changed perspective compared to primarily subject-systematic teaching. According to learning theory and didactic knowledge, the following points of orientation must be taken into account when planning and implementing action-oriented teaching in learning situations:

- Didactic reference points are situations that are significant for professional practice.
- Learning takes place in complete actions, preferably carried out by oneself or at least mentally reproduced.
- Actions promote a holistic understanding of professional reality, for example technical, safety-related, economic, legal, ecological and social aspects.
- Actions draw on learners' experiences and reflect on them in terms of their social impact.
- Actions also take into account social processes, for example the declaration of interests or conflict resolution, as well as different perspectives on career and life planning.

## **Part IV Job-related preliminary remarks**

This framework curriculum for vocational training as a plant mechanic for sanitary, heating and air-conditioning technology and as a plant mechanic for sanitary, heating and air-conditioning technology is coordinated with the Ordinance on Vocational Training as a Plant Mechanic for Sanitary, Heating and Air-conditioning Technology and as a Plant Mechanic for Sanitary, Heating and Air-conditioning Technology of 28 April 2016 (BGBl. I p.1025).

The framework curriculum for the training occupation of plant mechanic for sanitary, heating and air-conditioning technology (resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 16 May 2003) is repealed by the present framework curriculum.

The competences required for the examination area of economics and social studies are taught on the basis of the "Elemente für den Unterricht der Berufsschule im Bereich Wirtschafts- und Sozialkunde gewerblich-technischer Ausbildungsberufe" (Elements for teaching economics and social studies at vocational schools for industrial and technical occupations) (resolution of the Conference of Ministers of Culture of 7 May 2008).

In addition to the occupational profile (Federal Institute for Vocational Education and Training at <http://www.bibb.de>), the following aspects are important in vocational school teaching:

Plant mechanics for sanitary, heating and air-conditioning technology bear special responsibility for safeguarding the foundations of human life in connection with the sustainable use of energy and resources and have advisory skills with regard to techniques for saving energy and resources, efficient energy use and the use of renewable energies. In doing so, they consider the building as an overall energy system and take into account interdisciplinary interrelationships. They are service providers for the customer and orient their actions and appearance to the expectations and wishes of the customer. As far as possible, the orientation towards customer orders and wishes is to be assumed, even where it is not explicitly mentioned in the presentation of target formulations and contents.

Plant mechanics for sanitary, heating and air-conditioning technology carry out work in inhabited buildings in sensitive areas of privacy. Particular attention is paid here to order processing. This begins with adherence to deadlines, appearance in the form of work clothing and company vehicle, reliability and cleanliness during and after completion of the contract work, ends with proper handover of the work to the operator and includes confidentiality about the personal life situation of the user.

In principle, the implementation of the framework curriculum in learning situations is to be based on occupationally typical activities that occur in the construction of technical supply and disposal installations and systems in detached and semi-detached houses. The content of the learning situations must also be adapted beyond typical occupational activities in detached and semi-detached houses in accordance with the operational fields of activity.

Installation in the sense of activities typical for the occupation can include not only new installation but also the expansion or renovation of technical supply installations and systems as well as maintenance measures.

Occupational safety and health protection are explicitly mentioned in some learning fields. In addition, the relevant measures for occupational safety and health protection are to be taught at suitable points during the lessons.

The generally recognised rules of technology are to be used as a basis for teaching.

The foreign language content is integrated into the learning fields with 40 hours.

Within the scope of its possibilities, the school decides independently on the content of the learning situations in cooperation with the training providers. The individual schools are thus given more creative tasks and greater didactic responsibility. There is a close factual connection between the framework curriculum and the training framework plan for in-company training. It is recommended that the design of exemplary learning situations in the individual learning fields be based on both plans.

The objectives of learning fields 1 to 6 are coordinated with the required qualifications of the Ordinance on Vocational Training for Plumbing, Heating and Air Conditioning Mechanics for Part 1 of the final examination.

The training to become an electrician for defined activities, which is integrated into the vocational training, requires the teaching of specialist theoretical and practical competences. A total of 120 hours of theoretical content is integrated into the learning fields and forms the basis for teaching the required practical content in in-company training.

The occupation-homogeneous composition of specialised classes is to be aimed at already in the basic level in order to enable the implementation of the framework curriculum in occupation-specific learning situations throughout. Learning fields 1 to 4 of the framework curriculum correspond to learning fields 1 to 4 of the framework curricula for craft and industrial metal occupations. Joint training is therefore possible in the first year of training. If joint training takes place with other occupations in the metal technology occupational field, the occupation-specific requirements of the plant mechanic for sanitary, heating and air-conditioning technology and the plant mechanic for sanitary, heating and air-conditioning technology must be taken into account appropriately in the selection of learning situations.

## Part V Learning Fields

<b>Overview of the learning fields for the training occupation of plant mechanic for sanitary, heating and air-conditioning technology</b>					
<b>Learning fields</b>		<b>Time guidelines in lessons</b>			
<b>No.</b>		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
1	Manufacturing construction elements with hand-held tools	80			
2	Manufacturing components with machines	80			
3	Manufacture and assemble assemblies	80			
4	Maintain technical systems	80			
5	Install drinking water systems		80		
6	Install drainage systems		60		
7	Install heat distribution systems		80		
8	Equip sanitary rooms		60		
9	Install drinking water heating systems			80	
10	Installing heat generation systems for gaseous fuels			60	
11	Install heat generation systems for liquid and solid fuels			40	
12	Install resource-saving systems			40	
13	Installing ventilation and air conditioning systems			60	
14	Adjusting supply systems and optimising energy efficiency				80
15	Maintaining technical supply systems				60
<b>Totals: 1020 hours in total</b>		<b>320</b>	<b>280</b>	<b>280</b>	<b>140</b>



**Field of study 1: Manufacturing components with hand-held tools**

**1st year of training**  
**Time reference value: 80 hours**

**The pupils have the competence to produce construction elements according to design, technological and qualitative specifications with hand-held tools.**

The pupils **plan** the production of typical construction elements with hand-held tools. To do this, they evaluate *part, assembly and general drawings in order* to record workpiece-related data (*dimensions, tolerances, semi-finished product and material drawings*). They create, modify and supplement technical documents (*drawings, parts lists and work plans*), also with the aid of application programs.

They plan the work steps on the basis of the theoretical principles of the manufacturing processes to be used. They prepare the use of tools by comparing the *material properties* for the different material groups (*ferrous, non-ferrous and plastic materials*) and selecting suitable *tools*. They calculate the *component mass*.

They decipher material designations and specifications for semi-finished products such as *sheets and profiles*. They explain the wedge effect during chip removal, determine the suitable tools and the material-specific tool geometry (*clearance, wedge and rake angle*). They apply standards and determine the manufacturing parameters.

The pupils establish the connection between the material properties and the forming behaviour of the material during bending. They determine and establish the technological data (*stretched length, springback, bending angle and bending radius*).

The pupils select suitable *tooling and workpiece clamping equipment* and auxiliary materials, prepare the manufacture of the components and **carry out** the machining operations in compliance with the regulations on occupational health and safety. They roughly calculate the *material, wage and tool costs*.

The pupils distinguish between the different test methods (*measuring and gauging*), select suitable test equipment, apply it, draw up the corresponding test reports and **evaluate** the test results.

They document and explain the execution of the assignment, **reflect**, evaluate and present the work results. They optimise their own learning and work processes.

**Field of study 2: Manufacturing**

**components with  
machines1 . Training year  
Time reference value: 80 hours**

**The pupils have the competence to manufacture construction elements with machines according to constructive, technological and qualitative specifications.**

They **analyse** technical documents such as *part, assembly and overall drawings and work plans* with the aim of evaluating production-related data (*tolerances, fits, surface specifications, semi-finished product and material designations*).

The pupils **plan the** sequence of manufacturing processes. They create and complete individual part drawings and work plans, also with the help of application programs.

They compare selected manufacturing processes and determine the required manufacturing parameters taking into account functional (*functional and quality specifications*), technological (*manufacturing processes*) and economic (*manufacturing time, manufacturing costs*) aspects.

They carry out the corresponding calculations. To do this, they use technical documents such as *table books and manufacturer documents*, also in a foreign language. They plan the use of tools by determining the specific material properties and taking the cutting material properties into account.

The pupils determine the suitable tools and the tool geometries. They select material-specific and cutting material-specific *coolants and lubricants*.

They analyse and describe the tool movements, the structure and the mode of operation of machine tools and their mechanical components. The students determine the required machine data, evaluate them and present the results in a clear manner.

The pupils prepare the tools and machines for the production of the components. They assess the safety of operating equipment, set up the machines and **carry out** the processing in compliance with the regulations on occupational health and safety.

They analyse the influences of the manufacturing process on dimensional and surface quality and **evaluate** the product quality.

The pupils select the test equipment according to the qualitative specifications and draw up test plans and test reports. They determine the usability of test equipment, test the components, document and evaluate the test results (*test and production-related defects*).

They document and explain the execution of the assignment, **reflect**, evaluate and present the work results (*presentation techniques*) and optimise their own learning and work processes.

**Field of study 3: Manufacturing and assembling subassemblies1 . Training year  
Time reference value: 80 hours**

**The pupils have the competence to assemble components into modules, taking into account functional and qualitative requirements.**

The pupils evaluate technical documents, such as *part, assembly and overall drawings, parts lists, technology schematics* with the aim of recording and describing the functional relationships. On this basis, they **analyse** the flow of forces in the assembly.

They **plan** the assembly of sub-assemblies by gaining an overview of the correct *assembly sequences*. The pupils create an *assembly plan* and use different structuring and presentation variants (*structure tree, table, flow chart, exploded view*).

They compare the structuring and presentation variants with regard to their informative value and planning effectiveness. The pupils distinguish between the principles of action (*force-fit, form-fit, material-fit*) and select suitable *joining processes*. They determine the necessary tools, aids and devices for proper assembly and justify their selection.

The pupils select the necessary standard and component parts with the help of technical documents (*table book, standard sheets, catalogues, electronic media, manufacturer's documents*). In order to understand the design and to avoid assembly errors, they carry out the necessary calculations (*force, torque, surface pressure, friction, strength of screws, material parameters*). They determine the parameters, recognise and evaluate the physical relationships and **carry out the** assembly.

Pupils take responsibility for safety at work for themselves and others by understanding the consequences of non-compliance with *health and safety regulations*.

The pupils test the function of the assembly and take into account the order-specific requirements. They develop *test criteria*, draw up *test plans*, use test *equipment* and document the results in *test reports*.

For a high quality level, the pupils **evaluate** the functional and qualitative characteristics of components and assemblies and evaluate test protocols. They derive measures for *quality improvement* and *quality assurance*. They reflect on the assembly process and the procedures used. Possible defects are systematically examined for their causes using the tools of quality management (*cause-effect diagram*).

The pupils work out and present the results in a team. They **reflect on** their working methods, optimise working strategies and their own learning techniques.

**Field of study 4: Maintaining**

**technical systems1**

**. Training year**

**Time reference value: 80 hours**

**The students have the competence to maintain, inspect and repair machines and technical systems within the scope of maintenance and to ensure their operational readiness while observing the safety regulations for electrical equipment.**

The pupils prepare the maintenance of machines and technical systems, in particular of operating equipment. To this end, they **plan** the necessary measures, taking into account safety, availability and economic efficiency.

They read operating *and instruction manuals as well as maintenance plans* for machines and technical systems, also in a foreign language. The pupils determine the influences on the operational readiness of machines and technical systems and describe the work steps for commissioning. They distinguish between the different maintenance measures (*maintenance, inspection, repair, reinstatement*).

The pupils analyse the designations and markings of *lubricants, cooling lubricants, hydraulic fluids and corrosion protection agents*. They describe their mode of action and areas of application. They analyse the *signs of wear* and determine the *causes of wear*. The pupils prepare maintenance, inspection and repair work on machines and technical systems and **carry this out** in compliance with the regulations on environmental protection (*disposal regulations*) and on handling substances hazardous to health.

The pupils describe the connection between maintenance measures, product quality and machine availability in the context of quality assurance. By means of visual inspection and observing the safety regulations for electrical equipment, they identify possible faults on machines and technical systems, check the functions of safety devices and assess their operational safety.

With the help of the basics of electrical engineering and control technology, the pupils explain simple circuit diagrams. They measure, calculate and compare electrical and physical quantities. The pupils **assess** protective measures and types of protection for electrical equipment.

They document the maintenance measures carried out and prepare a *damage analysis*. *They* describe possible causes of faults and derive measures for their avoidance and elimination.

**Learning Area 5:****Install drinking water systems2 . Training year  
Time reference value: 80 hours**

**The students have the competence to plan, create and install systems for domestic drinking water supply according to customer orders.**

The pupils **analyse** customer orders, obtain an overview of the structural and local conditions (*construction drawings*) and use these as a basis for planning a drinking water system (*types of water, identification colours, abbreviations*).

They **inform** themselves about the minimum requirements for the quality of drinking water (*Drinking Water Ordinance*). The pupils work out the pipe structure of the drinking water system of a residential building (*house connection room, water meter system, pressure reducer, filter, pipe designations, potential equalisation*). They select suitable pipe materials, fittings and joining methods (*corrosion, water hardness*), taking into account the water composition and the installation location. They take into account economic and ecological aspects. They select the installation techniques depending on the given conditions and carry out corresponding calculations (*pressure, pressure loss, flow velocity, volume flow*).

The pupils **plan** the production and installation of a drinking water system. They take into account measures to maintain the quality of the drinking water (*safety fittings, protection against condensation and heating*) and sound insulation. They prepare piping diagrams, work plans and material extracts.

The pupils **install** drinking water systems. They observe the regulations on health and safety at work. During transport, storage and processing of the system components, they pay particular attention to measures to maintain the quality of the drinking water.

They use suitable measuring equipment to **check** the drinking water system for function and leak tightness (*leak test, load test, flushing*). They **document** their test results in the acceptance report, evaluate them and take measures to eliminate any quality defects. They put the system into operation and inform the customer of the operator's obligations.

**Learning Area 6:****Install drainage  
systems2 . Training year  
Time reference value: 60 hours**

**Students have the competence to design and install drainage systems in residential buildings according to customer orders.**

The pupils **analyse** customer orders by **informing themselves** about the discharge regulations and the installation, including the materials, pipe and assembly systems to be used, with the help of technical drawings (*construction drawings, installation plans*) and the regulations to be observed.

They **plan** the installation of the house drainage system, distinguishing between sewer networks (*separate and combined systems, rainwater utilisation*) and types of wastewater, taking into account the valid drainage system (*System I*) and observing the basic laws of hydraulics in drainage systems (*gradient, flow velocity, degree of filling*). They dimension the pipes (*connection values, waste water discharge, nominal widths*) taking into account valid application limits (*aeration*) and technical sound insulation regulations.

They **select the** appropriate pipe materials and assembly systems according to the respective function and taking into account customer-specific requirements. You determine work processes, create installation plans, schematic diagrams and material drawings. You develop solutions in case of application limits (*ventilation valve*).

The pupils **install the** drainage systems from the drainage object (*individual connection pipes, collector connection pipes, downpipes, cleaning openings, ventilation pipes, collector pipes, ground pipes, buried pipes, shafts*) to the connection sewer with the help of manufacturer's documents (*pipe falls, fastenings*), taking into account the location (*backflow level*) and the technical necessity (*protection against backflow, small lifting unit*).

The pupils **carry out** leak tests.

They **present, justify** and **evaluate their** work results on the basis of the customer's order.

Field of study 7:Installing

heat distribution  
systems2 . Training year  
Time reference value: 80 hours

**The students have the competence to select, plan and install equipment for heat distribution.**

They **analyse** buildings with regard to their usage requirements, energy properties and condition (*construction drawings, specified design heating load, specific standard heating load*). They **inform** themselves about different heat transfer systems (*system temperatures, heat transfer, heat quantity, heat output, radiators, panel heating*), installation locations, installation types, connection types and heat distribution systems.

They **plan the** necessary system components (*sizes of radiators, installation distances of panel heating systems*) on the basis of specified planning data. They use manufacturer data for this. They plan the installation of the pipe network (*thermal insulation, sound insulation*), the heating pump (*pump types, energy efficiency of circulating pumps*), the control devices (*shut-off valves, control valves, filling and venting valves*) and recording systems for consumption billing. In doing so, they **select** components that enable energy-efficient operation of the heat distribution system and provide a demand-appropriate heat supply. They take into account measures for corrosion protection.

The pupils **carry out** the installation of the heat distribution systems. They use the selected work techniques, tools and machines to assemble the various components. The pupils put the heat distribution systems into operation. To do this, they flush the heat distribution system, carry out a pressure test (*test report*) and fill the system. They vent the heat distribution system and carry out a hydraulic balancing according to specifications.

After completing the heat distribution system, the students **check the** assembled components for their function. They take measurements and document the work carried out.

The pupils document the planning results. They instruct the operator in the operation of the system as well as on control work (*system pressure*) and control parameters.

**Field of study 8:Equipping**

**sanitary rooms2.**

**Training year**

**Time reference value: 60 hours**

**The students have the competence to customise sanitary rooms in residential buildings.**

They **analyse** structural conditions on the basis of construction drawings and **inform** themselves about the furnishing of sanitary rooms with special consideration of the customers' wishes.

They **plan** the equipment of sanitary rooms with the necessary connection lines and observe provisions and regulations, in particular those relating to electrical engineering (*electrical connection of fixtures and fittings, electrical protection areas, electrical protective devices*).

The pupils compare different equipment options (*sanitary objects, fittings, accessories*) also under aesthetic, ergonomic and hygienic aspects (*installation suitable for tiling, distance dimensions, movement surfaces, barrier reduction*). They assess fittings and appliances with regard to their function and mode of operation. They select suitable fittings in consultation with the customer. They document their plans, draw up material lists and complete construction plans. They take into account *sound insulation measures* and requirements for the stability of the walls (*permissible slot depths, pre-wall installation*). For this purpose, they use technical documents, also in a foreign language, and electronic media.

Before starting work, they check the preliminary work of the other trades and take the necessary measures. They identify interfaces to other trades, take into account the necessary coordination and **install** the planned equipment.

The pupils **check the** function of the fittings, taking into account the *connection pressure* and *drinking water protection*, make adjustments (*water flow and water outflow limitation, temperature setting*), record the results and **evaluate** them. They present the finished fittings to the customer, explain the operation and give care instructions.



**Field of study 9: Installing** drinking water heating systems

**3rd year of training**  
**Time reference value: 80**  
**hours**

**The students have the competence to select and install drinking water heaters and hot water systems according to customer-specific specifications and energy aspects.**

The pupils **inform** themselves about the different drinking water heating systems (*instantaneous and storage principle, directly and indirectly heated, unpressurised and pressurised*), their structure, mode of operation and possible applications. They **analyse** and compare the operating conditions of the respective heating systems (*change in volume, safety devices and measures, heating times, tapping capacity, costs*). In doing so, they take into account the hygienic and regional framework conditions.

They **plan** the installation of drinking water heaters and drinking water pipes with the necessary connections in residential buildings. In doing so, they take into account the structural conditions and decide on a suitable drinking water heating system according to legal, economic and ecological aspects as well as comfort aspects (*electric, gas-operated and solar thermal drinking water heating, heat insulation, circulation, system expenditure figure*). The pupils present their planning results to the customer.

The pupils **carry out** the connection of selected electrically heated drinking water heaters. In addition to the rules of drinking water installation, they observe the regulations for electrical connection (*electrical connected load, electrical fuses, circuit diagrams and wiring diagrams, protection classes*).

The pupils **check the** electrical and water connections and check the functioning and operational safety of the drinking water heaters. They measure and **evaluate** the tapping capacity.

They hand over the system to the customer and instruct him in its operation and operating duties.

**Field 10: Installing heat generation systems for gaseous fuels**

**3rd year of training**  
**Time reference value: 60 hours**

**The students have the competence to select, plan and install heat generation systems for gaseous fuels.**

The pupils **analyse** customer orders by evaluating technical drawings (*construction drawings, installation plans*) and regulations of the network operators for the installation of gas house connections.

They **learn about** gaseous fuels (*gas families*) and their characteristics (*heat values, relative density, Wobbe index, standard state, operating state*) and the basic principles of combustion (*ignition temperature, ignition rate*).

They select a suitable heat generator (*gas appliance types*) including the safety equipment. The pupils **plan** the installation and commissioning of heat generators and their connection to the heat distribution, domestic hot water and flue gas systems and to the gas supply. For this purpose, they complete technical drawings, produce installation sketches and carry out calculations on fuel consumption.

The pupils **carry out** the installation of heat generating systems using manufacturer's documents, also in a foreign language. In doing so, they observe the regulations for the installation of gas fireplaces (*protection targets*) and the rules for laying gas pipes.

The pupils **check the** gas installation for leaks and record the measurement results (*load and leak test*). They commission the gas installation, check the function of all system components and carry out a performance adjustment of the heat generator. They inform the customer of the prescribed, recurring and precautionary inspections (*operator obligations*) as part of a transfer.

The pupils **evaluate** the results of the exhaust gas measurement and document the measurement results in protocols. They assess compliance with the limit values (*emission, efficiency*). In doing so, they take into account the coefficient of production and the primary energy factor.

**Field of study 11: Installing** heat generation systems**for liquid and solid fuels**

**3rd year of training**  
**Time reference value: 40 hours**

**The students have the competence to select and install heat generation systems for liquid and solid fuels.**

The pupils **analyse** customer orders by using technical drawings (*construction drawings, installation plans*) to gain an overview of the local conditions with regard to the use of liquid and solid fuels.

They **inform** themselves about liquid and solid fuels, their characteristics (*viscosity, density, heat value*) as well as their storage and transport to the heat generator. They decide on a fuel according to regional requirements, taking into account ecological and economic aspects.

They select a suitable heat generator including the safety equipment. The pupils plan the installation and commissioning of heat generators and their connection to the heat distribution, domestic hot water and flue gas systems and to the fuel supply. In doing so, they observe the requirements of fuel storage and supply to the heat generator. They complete technical drawings, produce installation sketches and carry out fuel consumption calculations.

They **carry out** the installation of the heat generation system using manufacturer's documentation, also in a foreign language. In doing so, they observe the regulations on the installation of heat generators and the rules for laying fuel supply lines (*single line system, safety equipment*).

The pupils commission the heat generation system, carry out a power adjustment of the heat generator and **check the** function of all system components. They instruct the customer in the operation of the system during a handover and point out the need for maintenance.

The pupils **evaluate** the results of the exhaust gas measurement, assess compliance with the limit values (*emission, efficiency*) and document the measurement results in protocols.

**Field of study 12: Installing resource-saving heat generation systems**

**3rd year of training**  
**Time reference value: 40 hours**

**The pupils have the competence to install resource-saving systems for heat generation.**

The pupils **analyse** customer-specific wishes, user behaviour and structural conditions. Based on this, they **inform** themselves about alternative energy sources and the function of corresponding heat generators (*heat pumps, micro combined heat and power*).

They **plan** the installation and commissioning of the heat generation systems, their supply with energy and the connection to the existing heat supply and -storage (*buffer storage*). They develop, document and present planning proposals in relation to customer requirements and taking into account security of supply, energy efficiency and environmental protection. In doing so, they observe the regulations for the installation of heat generators and complete technical drawings.

The pupils **install** the planned heat generation system. In doing so, they take into account the interaction of the system components.

They **assess** and **evaluate** the energy utilisation of the heat generation system (*coefficient of performance, annual performance factor*) on the basis of measured values and instruct the operator in the operation of the system.

**Field of study 13:Installing  
conditioning systems3**

**ventilation and air-  
. Training year  
Time reference value: 60 hours**

**The students have the competence to select, plan and install ventilation systems for controlled living space ventilation.**

The pupils **analyse** residential buildings with regard to use and occupancy (*construction drawings, schematic representations, usable space, room volume*).

They **inform** themselves about different ventilation options (*free ventilation, individual room ventilation, moisture protection, nominal and intensive ventilation, central and decentralised ventilation systems*) and interactions with other technical systems such as extractor bonnets and room air-dependent heat generators. In doing so, they take into account ventilation installation systems, the components of a system for controlled residential ventilation (*air heater, air filter, heat recovery, fan, ventilation ducts*) and the regular maintenance measures. In addition, they inform themselves about suitable heating systems and systems for air temperature control and evaluate these with regard to their effectiveness for the given energy requirements of the building.

They **plan the** necessary system components (*ventilation valves, overflow air diffusers, fresh air and exhaust air openings*) on the basis of specified data *and* complete technical drawings. For this purpose, they determine the minimum fresh air volume flow and air exchange rates for various requirements. They take measures against sound transmission.

The pupils **install** ventilation and air-conditioning systems including electrical connections and put them into operation.

They **check the** function of the ventilation and air conditioning system (*frost protection, differential pressure monitoring*), document the measurement results (*air temperatures, flow rates*) and **evaluate** them. They instruct the customer in the operation of the system during a handover and point out the necessity of maintenance.

The pupils carry out maintenance work according to specified maintenance plans.

**Field 14:**            **up and optimising the energy efficiency  
of technical supply systems**

**4th year of training**  
**Time reference value: 80  
hours**

**The students have the competence to adjust technical supply systems and to optimise the mode of operation in terms of energy.**

The pupils **inform** themselves about the structure and function of the installed technical supply systems (*control of heating and solar thermal systems*). To do this, they **analyse** the different hydraulic, electrical and control components for their mode of operation in individual cases and in the interaction of all connected system components (*bivalent systems*).

On the basis of specified data, they **plan** the installation and connection of measuring, control and regulation technology equipment and the safety equipment of technical supply systems. They also include the necessary storage systems in their planning. The students take into account the possibilities of control or building management systems as well as systems for data exchange. They include the use of suitable remote monitoring systems. They determine the data for hydraulic balancing.

They determine the required operating parameters (*operating temperatures, heating curves*) and system settings (*priority circuit*) for the system components to be adjusted and optimised (*controllers, sensors, hydraulic actuators*). In doing so, they take into account the efficient operation of the entire system, recognise intersections between different trades and take these into account.

They **carry out** the assembly and connection of electrical and control equipment on supply systems on the basis of specified data. They use procedures to check electrical and control components and their connections (*function and troubleshooting*). They carry out hydraulic balancing for the entire system.

They **check** hydraulic, electrical and control connections as well as the set operating parameters and document them. They take into account system and customer-specific specifications (*minimum and maximum system temperatures*) and include manufacturer and operating software in the control process in a supportive manner.

They **evaluate** planning, installation and selected operating parameters with the help of ongoing documentation (*customer file*). You instruct the customers in the system and explain the system components and their interaction to them.

**Field of study 15: Maintaining technical supply systems**

**4th year of training**  
**Time reference value: 60**  
**hours**

**The students have the competence to carry out maintenance measures on technical supply systems.**

The pupils **inform** themselves about the scope of the maintenance measures by means of customer orders. They analyse the technical supply system with regard to the necessary inspection, maintenance and repair work (*customer file, checklist, technical documents*).

They determine operating parameters, **plan** the execution of the necessary maintenance work, taking into account economic aspects, and determine the necessary tools, test equipment, auxiliary materials and wear parts (*maintenance plans*).

They **inspect** system parts, recognise signs of wear and faults (*troubleshooting strategies, diagnostic systems*) and **decide** on a repair route.

They **carry out** maintenance and repair work and select the necessary spare parts from the manufacturer's documentation.

The pupils **check the** work carried out by means of function samples and measurements, document them (*test and maintenance protocols*) and evaluate them.

The pupils **explain** the maintenance work carried out to the customers, **advise** them **on the** trouble-free operation of the plant and **point out the** need for regular maintenance.

They **update** the client file with the work carried out.

Part VI Reading notes

consecutive number	The core competence of the superordinate professional action is described in a way that is appropriate to the level.	Indication of the training year; 40, 60 or 80 hours
<p><b>Field of study 8: Equipping sanitary rooms</b></p> <p style="text-align: right;"><b>2nd year of training</b> <b>Time reference value: 60 hours</b></p>		
<p><b>The students have the competence to customise sanitary rooms in residential buildings.</b></p> <p>They <b>analyse</b> structural conditions on the basis of construction drawings and <b>inform</b> themselves about the furnishing of sanitary rooms with special consideration of the customer's wishes.</p> <p>They <b>plan</b> the equipment of sanitary rooms with the necessary connection lines and observe regulations and provisions, in particular those of electrical engineering (<i>electrical connection of fixtures and fittings, electrical protection areas, electrical protection devices</i>).</p> <p>The pupils compare different equipment options (<i>sanitary objects, fittings, accessories</i>) also under aesthetic, ergonomic and hygienic aspects (<i>installation suitable for tiling, distance dimensions, movement areas, barrier reduction</i>). They assess fittings and appliances with regard to their function and mode of operation. They select suitable fittings in consultation with the customer. They document their plans, draw up material lists and complete construction plans. They take into account <i>sound insulation measures</i> and requirements for the stability of the walls (<i>permissible slot depths, pre-wall installation</i>). For this purpose, they use technical documents, also in a foreign language, and electronic media.</p> <p>Before starting work, they check the preliminary work of the other trades and take the necessary measures. They identify interfaces to other trades, take into account necessary coordination and <b>install the</b> planned equipment.</p> <p>The pupils <b>check the</b> function of the fittings, taking into account the <i>connection pressure and drinking water protection</i>, make adjustments (<i>water flow and water outflow limitation, temperature setting</i>), record the results and <b>evaluate</b> them. They present the finished fittings to the customer, explain the operation and give care instructions.</p>		<p>1st sentence contains a generalised description of the core competency (see name of the learning field) at the end of the learning process of the learning field.</p> <p>mandatory minimum contents are marked in italics</p> <p>Open formulations allow for different methodological approaches, taking into account the material resources of the schools.</p> <p>Complexity and interactions of actions are taken into account</p> <p>Foreign language is taken into account</p> <p>The text as a whole provides information on how to design holistic learning situations across the action phases.</p>
Professional, personal and social competence; methodological, learning and communicative competence are taken into account.		open formulations allow for the inclusion of organisational and technological changes



**List of correspondences**  
**between**  
**the framework curriculum for the vocational**  
**school and the training framework curriculum for**  
**the company**

**in the training occupation of plant mechanic for sanitary, heating and**  
**air-conditioning technology and plant mechanic for sanitary, heating**  
**and air-conditioning technology**

The list of correspondences documents the coordination of learning content between the learning venues vocational school and training company.

It is characteristic of dual vocational education and training that trainees acquire their competences at the two learning venues of vocational school and training company. There are different legal regulations for this:

- The curriculum at the vocational school is based on the framework curriculum of the Standing Conference of the Ministers of Education and Cultural Affairs.
- The in-company training is based on the training framework plan, which is part of the training regulations.

Both plans were drawn up by expert teachers and trainers in constant consultation with each other in a procedure developed jointly by the Federal Government and the Conference of Ministers of Education and Cultural Affairs for the coordination of training regulations and framework curricula in the area of vocational education and training ("Joint Results Protocol").

In the following list of correspondences, the learning fields of the framework curriculum are assigned to the positions of the training framework curriculum in such a way that the temporal and factual coordination becomes clear. It can thus be a tool to improve and intensify the co-operation of the learning locations on site.



BIBB / Padur  
KMK / Teufel

## List of correspondences between the training framework plan and the framework curriculum

of vocational training

as a plant mechanic for sanitary, heating and air-conditioning  
technology (male / female)

Draft as of 1 December 2015

### Section A Occupational profile skills, knowledge and abilities

Draft training framework Status : 01.12.2015			Draft framework curriculum Status: 17.09.2015						
Apprenticeship training position		Training period in the month		School year				Learning field(s)	
		1 - 18	19 - 42	1	2	3	4		
1.	Testing and measuring of plants and plant components  (§4 paragraph 2,number 1)	a) Shape and dimensional accuracy of workpieces, in particular of Check threads  b) Check surfaces for quality, wear and damage.  c) carry out measurements with different measuring tools, taking into account systematic and due measurement errors.  d) reference lines, hole centres and contours taking into account material properties and Characterise the subsequent processing  e) Checking the position of components and assemblies, determining positional deviations  f) Measure chemical and physical quantities  g) Measure voltage, current, resistance and power in DC and AC circuits and determine their dependence on each other.  h) Recording and evaluating measured values from sensors  i) Measure and test analogue and digital signals, especially signal time behaviour  j) Evaluate electrical characteristics and characteristic curves of assemblies and components.  (k) select methods and measuring	X		X				LF 1, 2
		X		X					LF 2
		X		X					LF 1, 2
		X		X					LF 1, 2
		X		X					LF 1 to 4
		X		X					LF 1, 2, LF 5
		X		X		X			LF 4
			X					X	LF 14
			X			X	X	X	LF 8 to 14
			X				X	X	LF 9 to 15



Draft training framework Status : 01.12.2015				Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		select, set up measuring equipment, determine measured values, identify measuring errors and their causes and arrange for corrections to be made.		X			X	X	LF 10 to15
2.	Fügen (§4 paragraph 2,number 2)	a) Check components for surface finish of the joining surfaces and shape tolerance and fix them in the correct position for assembly. b) Make screwed connections, taking into account the sequence of parts and the tightening torques, and secure them with locking elements. c) join components positively and non-positively, taking into account the nature of the joining surfaces. d) workpieces and components from the same and different Joining materials e) Select tools, solders and fluxes for soft and hard soldering, solder sheets and tubes. f) tack weld components and assemblies and fusion weld sheet metal and pipes made of steel or Plastic welding process, especially for pipes	X		X				LF 1, 2, 3
			X		X				LF 3
			X		X				LF 3
			X		X				LF 3
			X		X				LF 3
3.	Manual cutting, spraying and forming (§4 paragraph 2,number 3)	a) Select tools taking into account processes and materials. b) File and deburr surfaces and shapes flat, angular, parallel and true to size according to general tolerances. c) cut sheet metal, pipes and profiles, in particular made of steel, copper, aluminium and plastic, true to size by hand (d) forming sheet metal, tubes and profiles, in particular of steel, copper, aluminium and plastics e) produce internal and external threads, in particular pipe threads f) determine stretched lengths and heating lengths during bending forming (g) bend tubes and sheets cold and hot with and without fixture h) Straighten pipes cold and hot	X		X	X	X	X	all LF
			X		X				LF 1, 3
			X		X				LF 1
			X		X				LF 1
			X		X				LF 3
			X		X				LF 1
			X		X				LF 1

Draft training framework Status : 01.12.2015			Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position		Training period in the month		School year				Learning field(s)
		1 - 18	19 - 42	1	2	3	4	
			X		X			LF 1
4.	Machining (§4 paragraph 2,number 4)	a) Determine and adjust the machine values of hand-guided and stationary machines, select and use coolants and lubricants.	X		X			LF 2
		b) align and clamp workpieces and components taking into account shape and material properties	X		X			LF 2
		c) Select, align and clamp tools, taking into account machining processes and the materials to be machined.	X		X			LF 2
		(d) grind, drill and countersink workpieces or components using stationary and hand-guided machines	X		X			LF 2
		e) sheet metal, pipes and profiles, taking into account the material, the material surface, the shape of the workpiece and the connection dimensions. Separating and bending dimensions	X		X			LF 2
		f) Cutting pipe threads	X		X			LF 2
		g) drill holes with hand-guided machines	X		X			LF 2
5.	Maintenance of operating equipment (§4 paragraph 2,number 5)	a) Clean, maintain and protect equipment from corrosion.	X		X	X	X	all LF
		b) Change and fill operating fluids, in particular coolants and lubricants, in accordance with the operating instructions.	X		X			LF 2, 4
		c) carry out and document maintenance work, in particular according to plan	X		X			LF 4
		d) Visually inspect electrical connections and connecting cables for mechanical damage.	X		X	X	X	all, especially LF 4
		e) Apply safety measures for electrical machines and devices, observe safety regulations.	X		X	X	X	all, especially LF 4
		f) dismantle and install components and assemblies, in particular according to instructions and documents	X		X			LF 3, 4
		g) mark, systematically file and store dismantled components.	X		X			LF 3, 4

6.	Maintenance of technical supply systems	a) inspect technical supply installations and systems and check for		X	X	X	X	X	LF 4 to 15
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Draft training framework Status : 01.12.2015		Draft framework curriculum Status: 17.09.2015							
Apprenticeship training position		Training period in the month		School year				Learning field(s)	
		1 - 18	19 - 42	1	2	3	4		
and systems  (§4 paragraph 2,number 6)	Check function, in particular								
	aa) Check connections for safety and tightness		X	X	X	X	X	LF 4 to 15	
	ab) Check the components for mechanical damage and Check wear		X	X	X	X	X	LF 4 to 15	
	ac) Movement functions of Check components		X	X	X	X	X	LF 4 to 15	
	ad) electrical connections on Mechanical damage Visual inspection		X					LF 4 to 15	
	ae) electrical conductors on insulati Check for damage		X				X	LF 9, 14,15	
	af) Faults and malfunctions fixed and record the Ways of eliminating them assess the performance of the Initiate standstill		X				X	LF 15	
	ag) Setting values ofmeasuring, Control and regulation Check devices		X				X	LF 14	
	ah) Fittings, measuring and control equipment control and safety systems. safety equipment and Promotion and supply in the operating and Check hibernation state and Er- Document results		X		X	X	X	LF 4 to 15	
	b) Plants and systems according to War- maintenance plans, maintenance Create protocols, plant components and pipelines in an environmentally friendly manner clean		X		X			X	LF 4, 15
	(c) maintain equipment and systems set, in particular		X		X			X	LF 4, 15
	ca) in compliance with safety regulations Technical rules other than Set drive		X		X			X	LF 4, 15
	cb) Components and assemblies Dismantle, mark and systematically file		X		X			X	LF 4, 15
	cc) Operational readiness through Replace and repair zen of non-functional Produce parts		X		X			X	LF 4, 15
	cd) Measures within the framework of the Preventive maintenance initiate							X	LF 4, 15



7.	Installing electrical assemblies and components in technical supply plants and systems	a) carry out work on electrical installations in compliance with recognised electrotechnical rules and accident prevention regulations	X		X	X	X		LF 4, 8, 9, 13
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Draft training framework Status : 01.12.2015			Draft framework curriculum Status: 17.09.2015						
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
(§4 paragraph 2,number 7)	b) Carry out equipotential bonding measures	X			X			LF 5	
	c) install and mark components for electrical auxiliary and switching devices	X		X			X	LF 4, 14	
	d) Determine cable routes according to structural, local and safety-related conditions.	X			X	X		LF 8, 9, 13	
	e) select, prepare and install electrical conductors taking into account mechanical, electrical and thermal loading, installation methods and intended use.	X			X	X		LF 8, 9, 13	
	f) attach connecting parts, in particular cable lugs, wire end ferrules and connectors to electrical conductors	X			X	X		LF 8, 9, 13	
	(g) connect electrical conductors and components by means of terminal and plug-in connections, check connections	X		X				LF 4	
	h) distinguish between three-phase and alternating current connections		X			X		LF 9	
	(i) install and mark components for controlling, regulating, measuring and monitoring installations and systems		X				X	LF 14	
	j) Check function, correct errors and document changes		X				X	LF 14	
	k) Wire assemblies and devices according to documents		X			X	X	LF 9, 13, 14	
8.	Assembly and disassembly of pipelines and ducts  (§4 paragraph 2,number 8)	a) Check the location of building connections for supply and disposal.	X			X	X	LF 5, 10	
		b) Check the suitability of the substrate for fastening	X		X	X	X	LF 5 to 13	
		c) select and load pipes and pipe fittings made of different materials as well as valves and other installation parts according to their intended use	X		X	X		LF 3, 5	
		d) assemble and disassemble brackets and fixings	X		X	X	X	LF 5 to 13	
		e) select and apply sealing materials according to the media to be conveyed and the conveying conditions	X		X			LF 3	
		f) prepare and lay pipes and ducts by cutting and forming, taking into account the structural conditions and the media to be conveyed.	X		X			LF 1	

Draft training framework Status : 01.12.2015				Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		gen g) install pipes and ducts made of different materials, apply connection techniques according to the requirements and with reference to plant components and systems h) Fix pipelines and ducts taking into account gradients, distances for heat and sound insulation, fire protection and thermal expansion. i) select, check, prepare and assemble components and assemblies for pipelines and ducts, in particular fittings, for the assembly days, observing the installation instructions j) erect, secure and dismantle auxiliary structures, working and protective scaffolds in compliance with accident prevention regulations k) assemble and disassemble fuel lines, in particular for gas and oil, as well as exhaust gas systems, taking into account the regulations and rules of the media to be conveyed	X		X	X	X		LF 3, 5, 6, 13
				X		X			LF 6, 7 (without fire protection)
				X	X	X	X		LF 3, 5, 6, 8, 13
				X					-
				X			X		LF 10, 11
9.	Mounting, dismounting and transporting of supply Plants and systems  (§4 paragraph 2,number 9)	a) Types of fastening according to the requirements and stresses. Selecting the chesses b) Visually inspect components for acidity and condition before installation. c)Select , distinguish and install safety devices, Connect and check (d) equipment, installations and fixtures The function of the objects to be tested and check tightness e) Working and safety rules during transport and lifting of Hand and with lifting gear turn f) Suitability of the location of Fireplaces, especially under Consideration of the burn-air supply, check the (g) equipment, installations and fixtures The following table shows the compliance with the applicable standards and technical rules and functional assembling and connecting from an onal point of view	X		X	X			LF 3, 5, 6
			X		X	X			LF 4, 5, 6
			X		X	X			LF 1, 3, 4, 5, 6
			X			X			LF 5, 6
			X			X			LF 1, 2, 3
				X			X		LF 10, 11, 12
				X		X	X		LF 7, 8, 9 to 13

		h) distinguish between measuring, control and regulating equipment,		X				X	LF 14
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Draft training framework Status : 01.12.2015					Draft framework curriculum Status: 17.09.2015				
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		Install and connect (i) set up and connect supply and storage facilities for fuels, observe regulations j) Carry out and arrange for the dismantling, removal and environmentally sound disposal of supply and disposal systems. k) Slinging and securing goods for transport l) handle lifting equipment and means of transport m) Carry out transport n) Set down and secure the goods to be transported		X  X  X  X  X  X		X			LF 10, 11, 12  LF 4  LF 5, 11  LF 5, 11 LF 5, 11 LF 5, 11  X
10.	Carrying out insulation, sealing and protection measures  (§4 paragraph 2, number 10)	a) Carry out insulation measures on technical building installations, systems and assemblies to increase energy efficiency. b) Measures for sound insulation and sound attenuation in pipe- and unit fastenings are to be carried out c) Carry out active and passive corrosion protection measures d) Structural measures for preventive fire protection, especially fire barriers, observe and implement  e) prepare and carry out sealing measures for supply and disposal systems as well as fixtures and fittings		X  X  X  X  X		X	X	X	LF 7  LF 5, 6, 7, 8, 12, 13  LF 4, 5, 7  -  LF 8
11.	Application of plant and system technology and commissioning of technical supply and disposal plants and systems  (§4 paragraph 2, number 11)	a) take into account the technological, ecological and economic properties of energy and fuel types as well as of materials and auxiliary materials in planning, construction, operation and disposal b) Apply connection techniques, taking into account specific system requirements and system components. c) classify components and assemblies of technical supply and disposal systems according to their function d) analyse, check and adjust the structure and function of technical building systems		X  X  X  X		X		X	LF 3, 10, 11, 12  LF 5  LF 5, 6, 7, 10 until 13  LF 10 to 15

Draft training framework Status : 01.12.2015				Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		e) Visually inspect plants and systems before commissioning and commission them in accordance with the technical documentation.		X		X	X		LF 5 to 13
		f) Checking and adjusting the function of plants and plant components, in particular valves and fittings as well as conveying and supply equipment.		X		X	X		LF 6, 7, 8, 13
		g) Check protection against direct contact with live parts		X			X		LF 9
		h) check the function of mechanical and electrical safety devices and alarm systems		X		X	X	X	LF 8, 9, 15
		i) Test and commission auxiliary and control circuits for measuring, control and regulating equipment, in particular monitoring equipment.		X					-
		j) Check circuits and rotating field and commission systems step-by-step, measure operating values, set and document setpoints.		X		X	X		LF 6, 7, 8, 13
		k) Check, adjust and commission measuring, control, safety and monitoring equipment, in particular electrically operated equipment, according to customer and system-specific requirements.		X		X	X	X	LF 8 to14
		l) Check the functionality of electrical components, especially of overcurrent protection devices, fault current protection devices and plugs and sockets.		X			X		LF 9
		m) Apply safety rules to avoid hazards from electric current		X		X			LF 8
12.	Functional control and maintenance of technical supply and disposal plants and systems  (§4 paragraph 2,number 12)	a) Evaluate electrical and hydraulic circuit documents		X		X	X	X	LF 5 to 15
		b) Select and use test procedures and diagnostic systems, test electrical variables and signals at interfaces.		X	X		X	X	LF 4, 9, 15
		c) Check control, regulation and monitoring programmes, set control parameters according to specifications, take into account operator-specific requirements.		X			X	X	LF 10 to 15

Draft training framework Status : 01.12.2015				Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		d) Check measuring and control devices for recording motion sequences, pressure, temperature and volume flows. e) Check and adjust devices for recording limit values, in particular switches and sensors. f) Evaluate actual values and set target values of process-relevant variables, document values g) Limit faults and malfunctions by visual inspection, taking into account the interfaces, in particular hydraulic and electrical assemblies, and systematically determine faults and malfunctions with the aid of test systems and test programmes, examine the causes, assess the possibilities for their elimination, carry out repairs, draw up test reports. h) Checking and evaluating the function of protective and safety devices, taking measures for their maintenance.		X				X	LF 14, 15
				X				X	LF 15
				X				X	LF 14, 15
				X			X	X	LF 10, 11, 14, 15
				X				X	LF 15
13.	Distinguish and consider sustainable systems and their possible uses  (§4 paragraph 2,number 13)	a) Distinguish between and take into account the possible uses of non-potable water, in particular rainwater. b) Distinguish between and take into account possible uses of renewable energies c) Distinguish between and take into account the possible uses of energy storage systems. d) Distinguish and consider the sustainability of energy and water supply systems. e) distinguish and take into account resource-saving techniques for energy and water use f) Distinguish between devices with a refrigeration circuit for the use of regenerative energy sources for heating and cooling supply		X		X			LF 6
				X			X		LF 12
				X			X		LF 9, 12
				X		X			LF 5, 7
				X			X		LF 12
				X			X		LF 12
14.	Carrying out hygiene measures  (§4 paragraph 2,number 14)	a) Apply hygiene regulations, especially for drinking and service water systems as well as ventilation systems. b) Recognising hygiene risks, taking measures to avoid them, and	X			X	X		LF 5, 13
			X			X	X		LF 5, 13

Draft training framework Status : 01.12.2015				Draft framework curriculum Status: 17.09.2015					
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		tise and seize c) Observe storage, transport and processing specifications. d) Differentiate between components and assemblies, especially fittings, to ensure hygiene. e) Inform customers about hygiene risks f) Observe inspection obligations and maintenance inter- vals	X			X	X		LF 5, 8, 13
				X		X			LF 5, 8
				X		X	X	X	LF 5, 9, 15
				X		X	X	X	LF 5, 9, 10, 11, 15
15.	Customer-oriented order processing (§4 paragraph 2,number 15)	a) Receive orders and execute them in accordance with economic, ecological and deadline requirements. b) Coordinate and execute interdisciplinary services c) Instruct the system operator in the operation of the system, taking hygiene, safety, energy saving and environmental protection into account. d) Plant handed over to customers, Record handover e) Identify the customer's additional needs, inform the customer about the benefits and costs, record and forward the customer's wishes.		X		X	X	X	LF 5 - 15
				X		X			LF 8
				X		X	X	X	LF 5 to 15
				X		X	X	X	LF 5 to 15
				X			X		LF 8
16.	Consideration of the physical, ecological and economic conditions of construction (§4 paragraph 2,number 16)	a) Set up, maintain and clear construction sites, in particular according to economic, ergonomic and ecological requirements. b) Inform plant operators about the basic principles of building physics and building ecology in the planning, execution and operation of technical supply plants and systems. c) Take into account economic principles with regard to personnel costs and assembly times as well as the use of materials and tools.	X						-
				X		X	X		LF 7, 8, 13
				X		X			LF 2
17.	Building management systems (§4 paragraph 2,number 17)	a) Recognise and take into account interdisciplinary interfaces b) Control and building management systems, as well as systems for data exchange according to usage		X				X	LF 14
				X				X	LF 14



<b>Draft training framework</b> Status : 01.12.2015					<b>Draft framework curriculum</b> Status: 17.09.2015				
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		Distinguish, install and connect for a specific purpose c) Remote monitoring systems distinguish between		X				X	LF 14



Draft training framework Status: 01.12.2015					Draft framework curriculum Status: 17.09.2015				
Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
	(§ 4 paragraph 3, number 4)	Contribute to environmental pollution in the occupational sphere of influence, in particular a) Explain possible environmental impacts of the training company and its contribution to environmental protection using examples. b) apply environmental protection regulations applicable to the training company c) Use the possibilities of economical and environmentally friendly energy and material use. d) Avoiding waste; disposing of substances and materials in an environmentally friendly way.							
5	Operational, technical and customer-oriented communication  (§4 paragraph 3, number 5)	a) Obtain and evaluate information b) Conduct conversations with superiors, employees and in the team in a manner appropriate to the situation, present facts and circumstances c) apply recognised rules of technology and standards d) read and apply technical documentation, in particular maintenance and operating instructions, catalogues, parts lists, tables and diagrams e) use operational information flows and cooperate in operational decisions f) Read and apply assembly drawings, detail and general drawings, piping diagrams and construction drawings. g) Draw up sketches and parts lists of technical supply and disposal systems. h) use German and English technical terms also in communication i) read and apply technical drawings, in particular explosion drawings, circuit diagrams, duct diagrams and schematic string drawings j) Use standard industry software and company-specific communication and information systems.	X		X	X			LF 1 to 6
			X		X				LF 3
			X		X	X			LF 1 to 6
			X		X	X			LF 1 to 6
			X		X	X	X		LF 1 to 15
			X		X	X			LF 1 to 6
			X			X			LF 5, 6
				X		X	X		LF 8, 10
				X		X	X	X	LF 8 to 15
				X		X	X	X	LF 8, 14, 15

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Apprenticeship training position			Training period in the month		School year				Learning field(s)
			1 - 18	19 - 42	1	2	3	4	
		Apply data protection and data security rules k) conducting discussions with customers, explaining technical matters, in particular required maintenance intervals and maintenance work, in a customer- and operation-oriented manner		X		X	X	X	LF 8 to 15
6	Planning and controlling work processes; checking and assessing work results  (§4 paragraph 3, number 6)	a) Set job objectives and define subtasks	X		X				LF 1 to 3
		b) Define and document work steps and processes according to functional, organisational, production and assembly criteria.	X		X				LF 1 to 4
		c) Coordinate the execution of the order with other parties, especially other trades.	X			X			LF 8
		d) Requesting and providing material, tools and aids according to the order	X		X				LF 2
		e) Prepare the workplace taking into account the work assignment.	X		X	X	X	X	all LF
		f) Plan tasks in a team and implement them in a customer-oriented manner, using tools and materials effectively in the process	X		X				LF 3
		g) Recording and evaluating target and actual values of systems	X		X				LF 2
		h) Estimate the amount of time and personnel support needed to complete work assignments.		X	X				LF 2
		i) Define and document work steps and processes according to economic and ecological criteria.		X	X				LF 3
		j) Document the use of materials and the work performed, including the time spent.		X	X				LF 3
		k) Checking, assessing, recording and coordinating work results		X		X	X	X	LF 8, 10 to 15
l) Apply problem solving strategies		X				X	LF 15		
7	Carrying out quality assurance measures  (§4 paragraph 3, number 7)	a) Apply operational quality assurance systems in one's own field of work.		X	X	X	X	X	all LF all
		b) Apply test procedures and test equipment according to requirements.		X	X	X	X	X	LF

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			1 - 18	19 - 42	1	2	3	4	
		the							
		c) Systematically search for the causes of errors and quality deficiencies, contribute to their elimination and document the measures taken.		X				X	LF 15
		d) Observe standards and guidelines to ensure quality.		X	X	X	X	X	all LF
		e) Select test equipment, determine its suitability for use, apply company test regulations		X			X	X	LF 10 to 15
		f) Contribute to the continuous improvement of work processes in their own work area.		X	X	X	X	X	all LF
		g) Document the process of customer orders, quality controls carried out and technical inspections.		X		X	X	X	LF 5 to 15
		h) Inform superiors and customers about deviations in the planned order process and point out alternative solutions.		X			X		LF 10 to 12