

# VOCATIONAL TRAINING

Environmental Engineering Occupations | Volume 1

## Water Supply Engineering Technician



**Explanatory notes to and practical assistance for the nationally recognised vocational training regulations**

**Environmental Engineering Occupations • Volume 1**

# **Water Supply Engineering Technician**

The National Training Regulations

Comments from Occupational Experts

For Instructors, Apprentices and Those Interested

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**Environmental Engineering Occupations  
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Volume 1**

# **Water Supply Engineering Technician**

Explanatory notes to and practical assistance for  
the (German) Vocational Training Regulations

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## Foreword

Vocational training regulations result in close collaboration between occupational training practice and training research. With this, decisions are made on the acceptance or non-acceptance of contents in the training framework plan and their practical and timely classification, which are the result of detailed, specialist discussions.

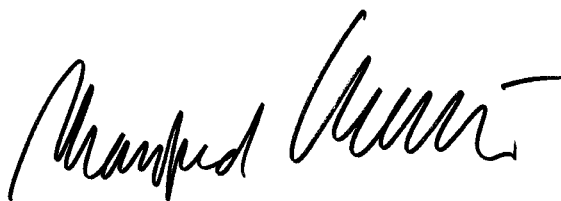
The recognition of these considerations by the "makers of vocational training regulations", their experience from the innovation of occupational practice and the factors which were essential with the decision on content are a significant aid and thus of particular interest for training personnel and instructors in vocational schools with the translation of the new vocational training regulations and the framework curriculum into practice.

With this background those involved have decided to elaborate common explanatory notes and practical assistance for the new vocational training regulations

Within the scope of these explanatory notes, the intentions and results of the new arrangement are presented and commented upon. In addition, operational assistance is offered. With this, one is not concerned with standard specifications but rather with freely applicable help for occupational use, which are also useful for vocational school instruction.

As with vocational training regulations, practice-orientation is the most important development principle with explanatory notes. Therefore they are not created at the conference table but in close collaboration between the Federal Institute for Vocational Education and Training and the specialists who took part in the new regulation process.

I wish this practical assistance a wide distribution both in the circle of occupational training personnel and apprentices as well as instructors in vocational schools and the examiners.

A handwritten signature in black ink, appearing to read 'Manfred Kremer', with a stylized, cursive script.

Manfred Kremer  
President  
Federal Institute for Vocational Education and Training

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# Contents

	Page
<b>Foreword</b> .....	5
1. Intention of the new regulations .....	9
2. Occupational profile and fields of activity – training profile (In the original in German, English and French. Here in English only) .....	11
<b>Part I Vocational Training Regulations</b> .....	13
The applicable paragraphs of the common regulations for the training occupation of Water Supply Engineering Technician:	
§ 1 National recognition of occupations requiring training .....	17
§ 2 Duration of training .....	17
§ 3 Structure and objective of occupational training .....	18
§ 4 Description of the occupation requiring training .....	19
§ 5 Training framework plan .....	20
§ 6 Training plan .....	20
§ 7 Narrative Report .....	21
§ 8 Intermediate examination .....	22
§ 9 Final examination .....	23
§ 28 Transitional regulation .....	26
§ 29 Coming into effect, suspension .....	26
<b>Part II Explanatory notes on the training framework plan</b> .....	27
1. Description of the occupation requiring training with temporal guidance values (overview) .....	28
2. Information for the implementation of the training framework plan .....	29
3. Information and explanatory notes on the learning objectives of the training framework plan .....	30
<b>Part III Keywords from A – Z</b> .....	55
1. Advanced vocational training .....	56
2. Apprentice's pay .....	56
3. Apprenticeship contract .....	56
4. Competent bodies .....	57
5. Coordination between the training company and the vocational school .....	57
6. End of training/giving of notice .....	58
7. Flexibility clause .....	58
8. Holidays .....	58
9. In-firm's training plan .....	58
10. Occupational capacity to act .....	59
11. Probationary period .....	59
12. "Qualified electrical engineering person" .....	59
13. Suitability as instructor .....	60
14. Suitability of the training company .....	60
15. Training activities outside the training company .....	60

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<b>General Information</b> .....	61
1. Checklists .....	62
2. Framework curriculum for vocational school instruction .....	67
3. Literature/training materials .....	84
4. Addresses .....	86





## 1. Intention of the New Regulations

### What is new?

Amended qualification requirements and legal provisions as well as increased environmental sensitivity and also heavy structural changes in the firms required a modernisation of the occupation requiring training for environmental technicians with the specialist fields of water supply, wastewater and waste.

Within the framework of the new regulations four individual occupations were created with the environmental technical occupations, which have the common core qualifications in the first 15 months of the training, 18 months common content at the vocational schools and the same content with the intermediate examination. All four occupations are aimed to be customer and service oriented.

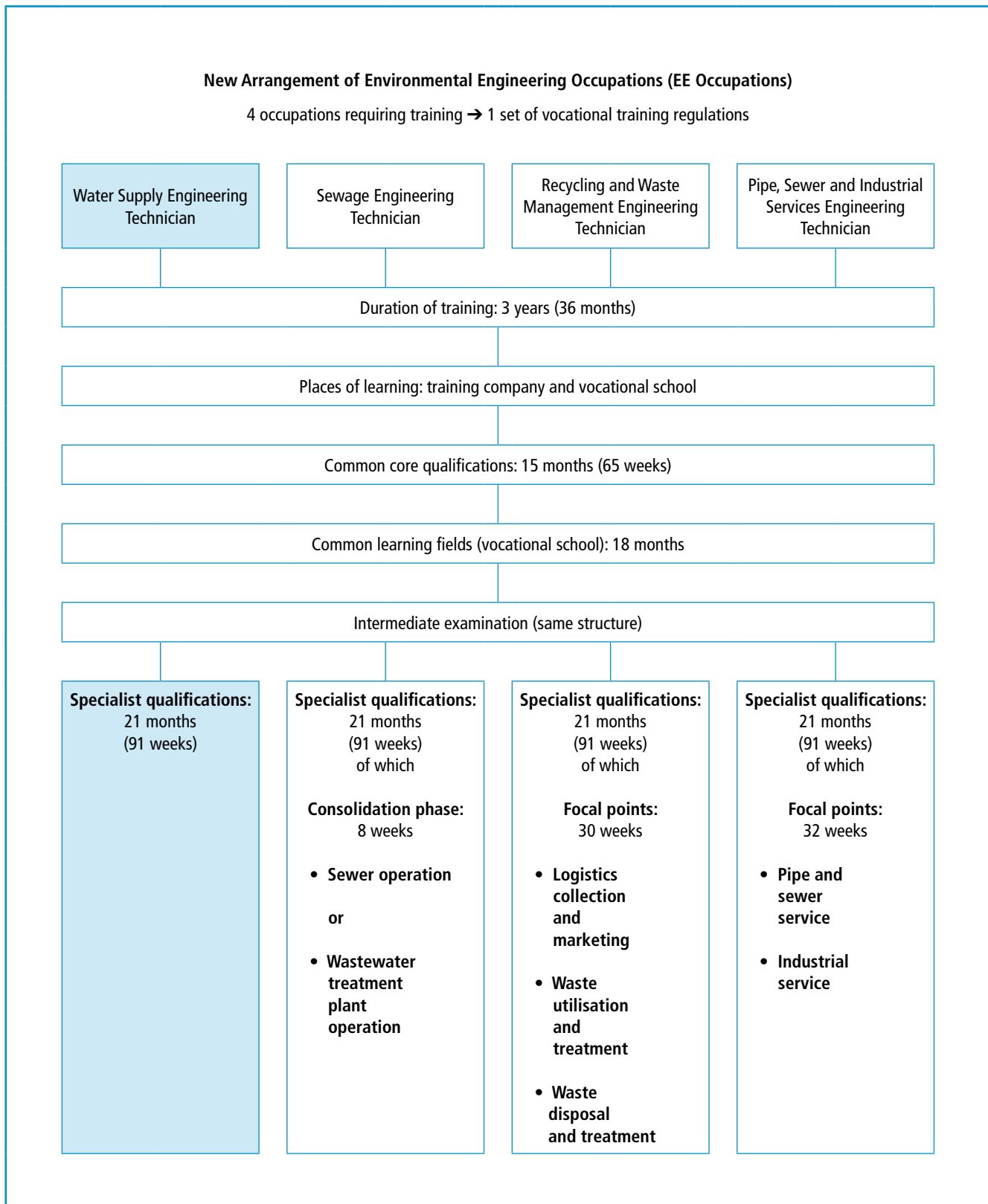
Measures for quality assurance and the application of modern information and communication technologies are also parts of the training.

As one is concerned with environmental engineering occupations requiring training, environmental engineering, ecological cycles and hygiene within the framework of the core qualifications are also part of the intermediate examination. To this belong the causes and interaction of environmental loading of the air, water, soil and environment in the same way as the possibilities for the avoidance and minimisation of environmental loading due to plants and technologies.

In addition to the tasks of water extraction, storage and distribution, the investigation of the water, protection of drinking water and the consumer facilities are the essential tasks of the Water Supply Engineering Technician. The contact with customers is becoming evermore increasingly the central point and therefore plays a large role already during training.

Completely new is the qualification as "electrical engineering authorised person".

## Structure of occupational training



## 2. Occupational Profile and Fields of Activity

Training profile (in the original German in German, English and French)

To support transparency within the European Union the training profile, in which the field of work is described and the occupational qualifications of the occupation requiring training are listed, is issued as annex to the diploma.



### Designation of occupation

Water supply engineering technician

Recognized by ordinance of 17 June 2002 (BGBl. I Nr. 43, p. 2335)

### Duration of traineeship

3 years

The venues for training are company and part-time vocational school (Berufsschule).

### Field of activity

Water supply engineering technicians work in municipal and industrial water supply firms.

### Occupational skills

Water supply engineering technicians carry out their work independently on the basis of technical documents and regulations as well as legal requirements. They acquire information, plan and coordinate their work. They document their performance and take measures to ensure quality, safety, health and environmental protection at work. They are electro-technically qualified personnel.

### Water supply engineering technicians

- manage and control technical processes
- operate, monitor, inspect, maintain, and repair water extraction, treatment, delivery, storage and distribution facilities

- install pipelines, assemble and dismantle the facilities
- examine customer facilities
- carry out to a limited extent switching operations and repairs to the electrical facilities in waterworks
- take samples of drinking water for self-monitoring, determine and evaluate quality parameters to a limited degree
- document and evaluate work procedures and operational processes
- recognise faults and react independently
- work in a cost, environmental and hygiene-conscious manner
- apply relevant legal provisions, technical regulations and work safety regulations and observe quality management guidelines
- act in a customer-oriented manner and make use of information and communication technologies



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# **Part I**

## **Vocational Training Regulations**

The occupational training for Water Supply Engineering Technician has been laid down in the [German] "Ordinance on occupational training in environmental engineering occupations" in 2002.

In this ordinance the occupation requiring training of Water Supply Engineering Technician is regulated together with the occupations requiring training of

- Sewage Engineering Technician
- Recycling and Waste Management Technician
- Pipe, Sewer and Industrial Service Technician.

In the following part of the explanatory notes the paragraphs of the vocational training regulations for the occupation of Water Supply Engineering Technician are explained. These are the common regulations listed in the first part of the ordinance for all four occupations requiring training (§§ 1-3), the regulations for the occupation requiring training for Water Supply Engineering Technician listed in the third part of the ordinance (§§ 4-9) and the transitional and final regulations applicable for all four occupations requiring training (§§ 28, 29).

#### Ordinance text

#### Explanatory notes on the ordinance

Official [German] Federal Gazette (BGBl.) for 2002, Part I, No. 43 issued in Bonn, Germany, on 02 July 2002

#### Ordinance on the occupational training in the environmental engineering occupations dated 17 June 2002

- came into force on 01 August 2002
- published on 02 July 2002 in the [German] Federal Gazette
- Public notice together with the framework curriculum in the [German] Federal Official Gazette No. 204 a dated 31 October 2002

**On April 1, 2005 the Vocational Training Reform Act (BerBiRefG) came into force which effected certain modifications in the Vocational Training Act (BBiG). The respective training regulation became effective before April 1, 2005 (on June 17, 2002). Hence, all references made are in relation to the BBiG dated August 14, 1969 and subsequent amendments thereto.**

Based on § 25, Para. 1 together with Para. 2, Clause 1 of the [German] Vocational Training Act dated 14 August 1969 (BGBl. I, p. 1112), last amended by Article 212, NO. 2 of the Ordinance dated 29 October 2001 (BGBl. I, p. 2785), the German Federal Ministry of Economics and Technology and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in agreement with the German Federal Ministry of Education and Research and the German Federal Ministry of the Interior:

Vocational training regulations are based on § 25, Para. 1 of the Vocational Training Act (BBiG). They are issued by the responsible technical ministries – here the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Federal Ministry of Economics and Technology – in agreement with the Federal Ministry of Education and Research and the Federal Ministry of the Interior, as statutory order.

Vocational training regulations regulate, as a standard across the Federal German Republic, the in-firm part of the dual occupational training in recognised occupations requiring training. They are aimed at all those involved in occupational training within the dual system, in particular at firms providing training, at apprentices and training personnel and at competent bodies.

The ordinance on occupational training in environmental engineering occupations presented here, was elaborated within the Federal Institute for vocational education and training in collaboration with experts of employee and employer agencies.

Vocational training regulations are generally binding as statutory orders. That means, the occupational training in environmental engineering occupations may take place only in accordance with the provisions of these occupational training regulations.

The dual partner of in-firm training is the vocational training school. The instruction in the vocational school takes place on the basis of the agreed framework curriculum. As instruction in vocational schools is in general subject to the responsibility of the Federal German states, these transform the framework curriculum, produced by the Conference of Federal German State Culture Ministers (KMK), into individual framework curricula. Vocational training regulations and framework curricula, with regard to the training content and the point in time of their communication to the firm and vocational school, are to be harmonised.



## Summary of contents

### Part 1

#### Common regulations

- § 1 National recognition of the occupations requiring training
- § 2 Duration of training
- § 3 Structure and objective of occupational training

### Part 2

#### Regulations for the occupation requiring training of Water Supply Engineering Technician

- § 4 Description of occupation requiring training
- § 5 Training framework plan
- § 6 Training plan
- § 7 Narrative Report
- § 8 Intermediate examination
- § 9 Final examination

### Part 3

#### Regulations for the occupation requiring training of Sewage Engineering Technician

- § 10 Description of occupation requiring training
- § 11 Training framework plan
- § 12 Training plan
- § 13 Narrative Report
- § 14 Intermediate examination
- § 15 Final examination

### Part 4

#### Regulations for the occupation requiring training of Recycling and Waste Management Technician

- § 16 Description of occupation requiring training
- § 17 Training framework plan
- § 18 Training plan
- § 19 Narrative Report
- § 20 Intermediate examination
- § 21 Final examination

### Part 5

#### Regulations for the occupation requiring training of Pipe, Sewer and Industrial Service Technician

- § 22 Description of occupation requiring training
- § 23 Training framework plan
- § 24 Training plan
- § 25 Narrative Report
- § 26 Intermediate examination
- § 27 Final examination

### Part 6

#### Transition and final regulations

- § 28 Transitional regulation
- § 29 Coming into effect, suspension

### Annexes

#### Annex 1: Training framework plan for the occupation requiring training of Water Supply Engineering Technician

Annex 2: Training framework plan for the occupation requiring training of Sewage Engineering Technician

Annex 3: Training framework plan for the occupation requiring training of Recycling and Waste Management Technician

Annex 4: Training framework plan for the occupation requiring training of Pipe-, Sewer and Industry Service Technician

In these explanatory notes only the paragraphs of the common regulations and the paragraphs concerning the occupation requiring training of **“Water Supply Engineering Technician”** are commented upon

**§ 1****National recognition of the occupations requiring training**

The occupations requiring training

1. Water Supply Engineering Technician
2. Sewage Engineering Technician
3. Recycling and Waste Management Technician
4. Pipe, Sewer and Industrial Services Technician

are nationally recognised. As far as the training takes place within the area of public service, they are public service occupations requiring training. As far as the training takes place within trade and industry they are trade and industry occupations requiring training.

For a nationally recognised occupation requiring training, training may only be carried out in accordance with the vocational training regulations (§§ 28, Para. 1 BBiG). The ordinance presented here thus forms the basis for a standard federal training in firms offering training.

Supervision on this is carried out by the **competent bodies** in accordance with §§ 84 and 75 BBiG.

The **competent body** has in particular to monitor the implementation of the occupational training and to support this with advice to apprentices and training personnel. For this purpose it is to provide training advisers (§ 45 BBiG).

**§ 2****Duration of training**

Training takes three years.

The duration of training is to be so determined that the training subject matter necessary for a qualified occupation can be communicated to apprentices and makes it possible for them to obtain the required occupational experience (§ 1, Para. 2 BBiG).

Start and duration of occupational training are given in the **apprenticeship contract** (§ 4, Para. 1 BBiG). The occupational training relationship ends with the completion of the training period or the passing of the final examination (§ 14, Paras. 1 and 2 BBiG).

Reduction due to appropriate prior training:

The **competent bodies** can on application shorten the training time if, for example, an appropriate prior training (educational or operational) allows the expectation that the training objective can be achieved in a shorter period of time (§ 29, Paras. 2 and 4 BBiG).

Reduction due to early admission to the examination. The training period will also be ended prematurely if apprentices, due to appropriate performance before the end of their training period are admitted to the final examination and pass it (§ 40, Para. 1 BBiG).

Extension:

In exceptional cases the training period can also be extended on the request of apprentices, if the extension appears to be necessary in order to achieve the training objective (§ 29, Paras. 3 and 4 BBiG). Exceptional cases are, for example, longer absence as a result of an illness or other periods of inactivity.

The training period must, on request of apprentices, be extended (up to the next examination possibility, maximum one year) if they do not pass the examination (§ 14, Para. 3 BBiG).

### § 3

#### Structure and objective of occupational training

(1) The training is divided into:

1. Common core qualifications to be communicated integratively in accordance with § 4 Nos. 1 to 12, § 10, Nos. 1 to 12, § 16, Nos. 1 to 12 and § 22, Nos. 1 to 12 for all occupations requiring training
2. specific technical qualifications for each occupation requiring training:
  - a) for **Water Supply Engineering Technician**, in accordance with § 4, Nos. 13 to 24,
  - b) for **Sewage Engineering Technician**, in accordance with § 10, Nos. 13 to 22,
  - c) for **Recycling and Waste Management Technician** in accordance with § 16, Nos. 13 to 22,
  - d) for **Pipe, Sewer and Industrial Services Technician** in accordance with § 22, Nos. 13 to 18.

The four environmental engineering occupations have common core qualifications which are communicated in the first 15 months of the in-firm training. They are the subject of the intermediate examination in all four occupations requiring training.

The respective technical qualifications are communicated in the second part of the training.

(2) The skills and knowledge given in this ordinance should be so communicated that the apprentice is enabled to exercise a qualified occupational activity within the meaning of § 1, Para. 2 of the German Vocational Training Act (BBiG) which, in particular, includes independent planning, implementation and monitoring. The enablement described in Para. 1 is also to be verified in examinations according to §§ 8, 9, 14, 15, 20, 21, 26 and 27.

Comprehensive objective of occupational training is to enable the apprentices to exercise a qualified occupational activity. The trained specialists are to be capable of carrying out the tasks given to them of

- independent planning
- independent implementation and
- independent monitoring.

What is to be understood under this in detail is described by the training framework plan. The scope in which independence can develop is here, as a rule, laid down and limited by the constraints within the firm. Accordingly, for example,

Independent planning means:

- lay down work steps (occupational schedule),
- determine tools and aids,
- take account of substance and material requirements,
- estimate execution times.

Independent implementation means:

- carrying out work without instruction.

Independent monitoring means:

- comparison of work results with specifications,
- determination of whether the specifications have been achieved or which reworking is possibly required.

This concept on occupational qualification is, above all, to express that specialists can make independent decisions within the scope of their work, for example on the process of their work in the firm, on quality assurance as well as on health and environmental protection. Also, in this respect, a trained specialist differs from an untrained or semi-skilled employee.

**Part 2****Regulations for the occupation requiring training of Water Supply Engineering Technician****§ 4****Description of occupation requiring training**

Object of the occupational training are at least the following skills and knowledge:

1. Vocational training, employment and collective bargaining law,
2. Structure and organisation of the firm providing training,
3. Safety and health protection on the job,
4. Environmental protection,
5. Operational processes, work organisation,
6. Information and documentation, quality assurance measures,
7. Environmental protection technology, ecological cycles and hygiene,
8. Fundamental principles of mechanical and process engineering, measurement technology, numerical control engineering and control technology,
9. Dealing with risks posed by electricity,
10. Application of scientific principles,
11. Materials, ancillary materials and dangerous materials, dangerous working substances, materials processing,
12. Storage, tools and equipment,
13. Safety of personnel and plant,
14. Water management,
15. Water winning,
16. Water condition, water treatment,
17. Water delivery, storage and distribution,
18. Investigation of water,
19. Measurement technology, numerical control engineering and control technology,
20. Electrical plant in water supply,
21. Documentation,
22. Protection of drinking water and consumer facilities,
23. Customer orientation,
24. Legal provisions and technical rules and standards.

The description of the occupation requiring training contains the training subject matter collated in summarised form. It basically covers all training subject matter (skills and knowledge), which is required as instrument to attain the qualification as Water Supply Engineering Technician. The subject matter belonging to each serial number of the description of occupation requiring training is listed in the training framework plan and is arranged by subject and time (see § 5).

The training subject matter of Positions 1 to 4 is to be communicated integratively during the whole training.

In order to make the arrangement of the occupation description during training the guiding chronological figures are to be listed in a column in the explanatory notes to the training framework plan.

## § 5

### Training framework plan

The skills and knowledge in accordance with § 4 are to be communicated in accordance with the instruction on technical and chronological structuring of the occupational training (training framework plan) in accordance with Annex 1. A technical and chronological structuring of the training subject matter deviating from the training framework plan is in particular permitted, insofar as practical in-firm peculiarities necessitate the deviation.

The training framework plan forms the basis for the in-firm training. It lists the training subject matter which is to be communicated in the firms providing training. The training subject matter is to be described in the form of the skills and knowledge to be communicated.

The description of the skills and knowledge to be communicated orients itself on occupational terms of reference and the activities connected with these. The educational objectives thus show a clearly recognisable reference to the occupational actions taking place in the firm. In this way the instructors receive an overview of what they communicate and for what the apprentices are to be qualified.

The sequence of the skills and knowledge of an occupational description position to be communicated, as a rule is based on the work cycle. For apprentices and training personnel this simplifies the overview of the qualifications to be acquired.

The communicating of the training subject matter named in the training framework plan is to be ensured by all firms providing training. In order that firm-related peculiarities can also be taken into account with the training, a so-called **flexibility clause** is adopted

in the vocational training regulations. Through this the communicating of additional training subject matter, whose inclusion can appear to be necessary, is also enabled if, due to technical or labour organisational developments, new requirements on Water Supply Engineering Technicians result, which are not named in this training framework plan. A flexibility aspect also lies in that the skills and knowledge to be communicated can, as required, be communicated in cooperation with other firms (combined training) and/or through occasional involvement of inter-firm training centres (see keyword **Training activities outside the training companies**).

It is to be ensured that the core qualifications (training subject matter of the first 15 months, Ser. Nos. 1 to 12) with the intermediate examination and the totality of the training subject matter with the final examination are available.

The training framework plan for the in-firm training and the framework plan for the vocational school education are matched to each other with regard to contents and time. In this respect the training in-school and in-firm is also provided for in step. Accordingly it is recommended that training personnel and instructors in vocational schools meet and confer regularly.

## § 6

### Training plan

Training personnel are to produce a training plan for the apprentices based on the training framework plan.

The firm providing training is obliged to produce an **in-firm's training plan** for the apprentices on the basis of the training framework plan. It serves the purpose of applying the skills and knowledge listed in the training framework plan to the existing conditions in the firms.

The **in-firm's training plan** is part of the **apprenticeship contract** and is attached to this as annex, (also for registration at the **competent body**) and delivery to the apprentices at the latest at the beginning of training.

## § 7

### Narrative Report

The apprentice is to keep a Narrative Report in the form of a verification of training. He/she is to be given the opportunity to keep the Narrative Report during training. Training personnel are to examine the Narrative Report regularly.

The Narrative Report, which is to be kept by apprentices and is to be examined by the training personnel responsible for in-firm training, represents an important instrument for information on the actual status of the overall training in-firm and in vocational schools for training personnel and instructors in vocational schools up to being prior information for the examining board.

Through the keeping of the Narrative Report is to be ensured that the timely and technical course of training is made verifiable for all those involved – apprentices, training centres, vocational schools and legal representatives of apprentices – in the simplest possible form (details in keywords, possibly in loose-leaf form). Reference to the training framework plan must also be clear from this verification of training.

Following the recommendations of the German Federal Committee for Occupational Training, the verification of training is to be kept at least once a week by apprentices. Training personnel are to examine and sign off the verification of training at least monthly. They are to ensure that the legal representative of the apprentices as well as the vocational school receive information from the verifications of training at suitable intervals and that these can confirm this through their signatures. The Narrative Report can be kept according to the regulations of the **competent bodies**.

Apprentices keep the verification of training during working time. With this it is immaterial whether the Narrative Report is kept at the firm or is kept outside the firm with appropriate reduction of the attendance times at the firm.

The presentation of the Narrative Report is prerequisite for admission to the final examination.

An assessment of the form and content is, however, not possible within the scope of the final examination.

Aim of the Narrative Report is, inter alia, to record, via the monitoring of progress of training, deviations from the orderly course of training in order to be able to influence this correctively.

Fundamentally the Narrative Report can be kept, beyond the function as verification of training, also as technical documentation on the overall training time. For apprentices themselves the Narrative Report could then become an instrument if they have again to consider what they have learned in that they report on this in writing.

Reference: BBiG § 6, Para. 1, No. 4 and § 39, Para. 1, No. 2.

## § 8

### Intermediate examination

- (1) An intermediate examination is to be carried out for the determination of the state of training. It is to take place before the end of the second year of training.
- (2) The intermediate examination comprises the skills and knowledge listed in Annex 1 in Section 1 for the first 15 months as well as the subject matter to be communicated in the vocational school instruction according to the framework curriculum, so far as it is important for the occupational training.
- (3) The candidate, in the practical part of the examination, is to carry out a practical task, which can consist of several sub-tasks, in overall a maximum of seven hours. With this, the candidate is to show that he/she can plan work routines economically, determine tools and supplies for the work, document results of work as well as take measures for safety and the protection of health with the work, for environmental protection and for quality assurance. For the practical task the following in particular are considered: processing of materials, assembly, dismantling and maintenance of components or working equipment, taking samples, measurement of physical parameters and execution of investigations and application of technical communication means.
- (4) The candidate in the written part of the examination is to solve practice-related tasks, in a maximum of 180 minutes. Here measures for safety and protection of health with the work, for environmental protection as well as for quality assurance are to be presented. The following, in particular, come into consideration for the tasks, taking into account scientific relationships and occupation-related calculations:
  1. Environmental protection technology, ecological cycles and hygiene,
  2. Plant and mechanical engineering,
  3. Measurement and analysis technology,
  4. Materials, auxiliary and hazardous matter, hazardous substances.

An intermediate examination is to be carried out before the end of the second training year. The date is laid down and promulgated by the **competent body** well in time.

The training company is obliged to enter apprentices in good time and to release them for participation.

Object of the intermediate examination are the core qualifications of the training framework plan and the framework curriculum.

The intermediate examination is, as a rule, carried out first after 18 months of the training.

The intermediate examination is divided into a practical part and a written part.

In the intermediate examination it is to be established whether and to what extent the apprentices have achieved the skills and knowledge to be communicated in this period of training and to be able to verify this under examination conditions. The intermediate examination is a monitoring instrument for training personnel and apprentices. Both are to identify the respective status of training in order, if required, to be able to have a corrective, supplementary and supportive effect on the training.

The outcome of the examination has no legal results for the continuation of the training relationship and also does not pass into the result of the final examination. Nevertheless, participation in the intermediate examination is prerequisite for the admission to the final examination (§ 39, Para. 1, No. 2 BBiG).

**§ 9****Final examination**

- (1) The final examination comprises the skills and knowledge listed in Annex 1 and the syllabus communicated in vocational school instruction so far as it is important for the occupational training.
- (2) The examination in the practical part the examination is to be carried out in a practical task over a maximum of 10 hours, which can be divided into several subtasks. For this the following, in particular are considered:

Operation, monitoring and maintenance of water supply facilities taking into account the examination of quality parameters and the carrying out of electro-technical tasks incorporating measurement, control and regulation technology.

With the carrying out of tasks the candidate is to show that he/she can plan the work procedures economically, recognise work relationships, monitor and document the results of work, take measures for safety and the protection of health at work, take measures for environmental protection and quality assurance. The candidate is further to show that he/she can identify possible dangers of electrical current, and can assess electrical tasks and carry them out safely.

- (3) The candidate, in the written part of the examination, is to be tested in the examination fields of water supply, electrical engineering tasks as well as economic and social studies. In the examination fields of water supply and electrical engineering tasks the candidate is to show that he/she can solve tasks related to practice with associated labour organisational, technical and mathematical-scientific facts. With this, measures for safety and for the protection of health with work as well as quality assurance measures are to be presented. Taking into account occupation-related calculations, tasks from the following areas are in particular considered:

1. In the examination field of water supply:

- a) Operation, monitoring and maintenance of facilities,
- b) Control of conditioning processes,
- c) Sampling; measurement, documentation and evaluation of quality parameters,
- d) Pipe networks and pipelines.

2. In the examination field of electrical engineering tasks:

- a) Basic elements of electrical engineering,
- b) Electrical plant and components,
- c) Electrical measuring equipment and safety devices.

3. In the examination field of economic and social studies:

General economic and social interrelationships of the occupational and working world.

- (4) The written part of the examination has a maximum duration of:

1. In the examination field of water supply	180 minutes
2. In the examination field of electrical engineering tasks	60 minutes
3. In the examination field of economic and social studies	60 minutes

- (5) The written part of the examination, at the request of the candidate or at the discretion of the examination committee, is to be supplemented in individual fields by an oral examination if this can be decisive for passing the examination. With the determination of the results for the examination fields tested orally, the previous result and the result of the oral supplementary examination are to be weighted in the ratio 2:1.

- (6) Within the written part of the examination the examination fields are to be weighted as follows:

1. Examination field of water supply	60 %,
2. Examination field of electrical engineering tasks	20 %,
3. Examination field of economic and social studies	20 %.



Subject of the final examination can be all the training contents (also the core qualifications) to be communicated in accordance with the training framework plan as well as the subject matter to be communicated in the vocational school curriculum as far as it is essential for the occupational training.

Essential component of the final examination is that the candidate, within the scope of the carrying out of a practical task, which can consist of several parts, is to plan, carry out economically the sequences of work and independently monitor the results.

Examination regulations for the carrying out of the final examination: The examination rules are regulated in the BBiG by §§ 34-41.

For the acceptance of the examination the **competent body** sets up at least one examining board. It consists of:

- a representative of the employers,
- a representative of the employees and
- an instructor of a vocational school.

For the carrying out of examinations the respective competent body promulgates examination regulations (§ 41 BBiG). Inter alia, these regulate:

- admission,
- breakdown of the examination,
- assessment standards,
- issue of the examination results,
- results from violations of the examination regulations and
- repeat examination.

An oral supplementary examination is only planned if the examination performance in the written part of the examination as a whole has resulted in no satisfactory performance. The supplementary examination is carried out at the discretion of the examining board or on application of the candidate for one examination field only, if it can be decisive for the passing of the examination but not, however, for the improvement of individual examination grades. The result of this oral examination has half the weight compared with the result of the appropriate written examination field.

(7) The examination has been passed if respectively in the practical and written part of the examination at least sufficient performance has resulted. And if with this, within the practical part of the examination in the examination field of electrical engineering tasks as well as in the written part of the examination in the examination field of water supply also at least sufficient performance has resulted.

Passing of the final examination:

The written part of the examination and the practical part of the examination receive respectively one grade.

The grade of the written part of the examination is made up as follows:

Water Supply	60 %
Electrical engineering tasks	20 %
Economic and social studies	20 %

The examining board is to inform the candidate on the last day of the examination, whether he/she has passed or not passed the examination. The candidate receives a written confirmation for this from the chairman.

The candidate receives from the **competent body** a certificate of the successfully completed examination, which contains the designation of the training occupation and the results of the written and practical examination.

Final examination Water Supply Engineering Technician			
Practical part	Written part		
<p><b>A practical task, which can consist of several subtasks:</b></p> <p>Operation, monitoring and maintenance of water supply facilities taking into account the checking of quality parameters and the carrying out of electrical engineering tasks with the inclusion of measurement, control and regulation technologies tasks.</p>	<p><b>Written tasks:</b></p>		
<p>The candidate is to show that he/she can:</p> <ul style="list-style-type: none"> <li>■ plan the sequence of work economically,</li> <li>■ identify work results,</li> <li>■ document work results,</li> <li>■ take measures for safety and for the protection of health at work,</li> <li>■ take measures for environmental protection,</li> <li>■ take quality assurance measures,</li> <li>■ identify possible dangers of electrical current,</li> <li>■ assess electrical tasks,</li> <li>■ carry out electrical tasks safely.</li> </ul>	<p>The candidate is to show that he/she can:</p> <ul style="list-style-type: none"> <li>■ solve practice-related tasks with associated work-organisational, technical and mathematical-scientific contents, taking into account technical rules and standards as well as quality assurance measures.</li> <li>■ here measures for safety and protection of health with the work as well as quality assurance are to be presented.</li> </ul>		
	<p><b>Water Supply</b></p> <p>a) Operation, monitoring and maintenance of facilities,</p> <p>b) Control of conditioning processes,</p> <p>c) Sampling; measurement, documentation and evaluation of quality parameters,</p> <p>d) Pipe networks and pipelines.</p>	<p><b>Electrical engineering tasks</b></p> <p>a) Basic elements of electrical engineering,</p> <p>b) Electrical plant and components,</p> <p>c) Electrical measuring equipment and safety devices.</p>	<p><b>Economic and social studies</b></p> <p>General economic and social interrelationships of the professional and working world.</p>
Max. 10 hours	Max. 180 minutes	Max. 60 minutes	Max. 60 minutes
	Weighting: 60 %	Weighting: 20 %	Weighting: 20 %
<p>Restrictive function: minimum sufficient performance</p> <p>Examination field electrical engineering tasks: minimum sufficient performance</p>	<p>Restrictive function: minimum sufficient performance</p> <p>Examination field wastewater engineering: minimum sufficient performance</p>		

**Part 6**  
**Transition and final regulations**

**§ 28**  
**Transitional regulation**

The previous provisions are to be applied further to occupational training conditions, which are in existence with the coming into effect of this ordinance, unless the parties to the contract agree to the application of the provisions of this ordinance.

**§ 29**  
**Coming into effect, suspension**

This ordinance comes into effect on 01 August 2002. At the same time the Environmental Technician Regulations of 30 May 1984 are suspended (BGBl. I p. 731).

Berlin, 17 June 2002

**The German Federal Minister of Economics and Technology**

Signed for and on behalf of:  
Tacke

**The German Federal Minister for the Environment, Nature Conservation and Nuclear Safety**

Signed for and on behalf of  
Rainer Baake

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## **Part II**

# **Explanatory notes on the training framework plan**

## 1. Description of the occupation requiring training with temporal guidance values (overview)

Ser. No. Training Framework Plan	Description of the occupation requiring training	Temporal guidance value in weeks in the training period	
		1 <sup>st</sup> – 15 <sup>th</sup> month	16 <sup>th</sup> – 36 <sup>th</sup> month
Core qualifications			
1 2 3 4	Vocational training, employment and collective bargaining law Structure and organisation of the firm providing training Safety and health protection on the job Environmental protection	To be communicated during the complete training	
5	Operational processes, work organisation	4	
6	Information and documentation, quality assurance measures	4	
7	Environmental protection technology, ecological cycles and hygiene	8	
8	Fundamental principles of mechanical and process engineering, measurement technology, numerical control engineering and control technology	19	
9	Dealing with risks posed by electricity	4	
10	Application of scientific principles	10	
11	Materials, ancillary materials and dangerous materials, dangerous working substances, materials processing	12	
12	Storage, tools and equipment	4	
Specialist qualifications			
13	Safety of personnel and plant		2
14	Water management		2
15	Water winning		4
16	Water condition, water treatment		12
17	Water delivery, storage and distribution		24
18	Investigation of water		9
19	Measurement technology, numerical control engineering and control technology		8
20	Electrical plant in water supply		16
21	Documentation		4
22	Protection of drinking water and consumer facilities		4
23	Customer orientation		4
24	Legal provisions and technical rules and standards		2*

\* ) To be communicated together with other training materials.

## 2. Information for the implementation of the training framework plan

### The training framework plan – introduction for the training

The training framework plan regulates the training in firms, the framework curriculum the instruction in vocational schools (see page 67 et sqq.). Both framework plans together are the basis of the training.

The training framework plan is an introduction to the technical and temporal structure of the company training. In addition to the contents listed in the description of the occupation requiring training, it describes in detail the training objectives (skills and knowledge to be communicated).

### The training contents in the training framework plan describe minimum requirements.

The firms providing training, with regard to the depth and breadth of communication of the training subject matter, can instruct beyond the minimum requirements if the individual progress of learning of the apprentices allows this and the firm-specific circumstances allow or even require this.

For the respective contents temporal guidance in weeks is given as orientation for the duration of firms communicating. (Temporal structure, Page 28). The temporal guidance value reflects the significance given to this section of the contents in comparison with other content sections.

The sum of the temporal guidance values is 52 weeks per training year. The temporal guidance values given in the training framework plan are gross times and must be converted to actual training times available operationally (net time). With this, the times for vocational school instruction and **holidays** must be deducted.

According to the following model calculation the guidance values for time given in the training framework plan can be converted into actual, operationally available training times (net time). With this, an estimated value of in total 12 weeks annual vocational school instruction is assumed. (The carrying out of the vocational school instruction is the responsibility of the individual German Federal States).

<b>Gross time (52 weeks = 1 year)</b>	<b>365 days</b>
less 52 Saturdays/52 Sundays	- 104 days
less approx. 12 weeks vocational school	- 60 days
less 6 weeks holiday <sup>1)</sup>	- 30 days
less public holidays which fall on days of training in firms <sup>2)</sup>	- ca. 8 days
<b>Net time</b>	<b>= 163 days</b>

The purely firm-based training time, according to this model calculation, is approx. 163 days per year. This leaves – related to 52 weeks per year – approx. 3 days per week. For every week given in the training outline plan there are thus approx. 3 days of firm's training time available.

How the times for the communicating and consolidation are distributed to the individual learning objectives is up to the teaching personnel. Here they should be guided by the level of training of the apprentices or should place emphasis according to the operational requirements.

#### Example: "Water delivery, storage and distribution (§ 4 No. 17)"

This teaching position is allocated nine learning objectives (a) to (i), for which in total 24 weeks are planned. The distribution of these 24 weeks to the individual learning objectives is a task of training personnel.

The **firms' training plans** are elaborated on the basis of the training framework plan, which regulates the organisational and pedagogical-didactic execution of the training specifically to the firms.

### Methodical procedure for the achievement of the training objective

Within the training framework plan the training objectives are described didactically by subject through the training content and deliberately *not* the paths (training methods), which lead to these objectives. Thus the selection of the methods, with which they can put together their training concept for the complete training course, is left open for the teaching personnel. That means that for the individual training sections suitable training methods are to be applied – related to the respective training situation. This openness in the question of training should be seen by the apprentices as a chance which makes it possible for them to proceed flexibly with different training situations.

In § 3, Para 2 of the Vocational Training Regulations an important methodical accent is, however, set with the requirement so to communicate the named training content, "that the apprentices are qualified to carry out a qualified occupational activity within the meaning of § 1, Para. 2 of the Occupational Training Act, which in particular includes independent planning, implementation and monitoring".

Independent action was previously also already the comprehensive objective of training. It is, however, new that the vocational training regulations lay down the promotion of this qualification in the occupational training and to verify this in the intermediate and final examination. In practical training in firms the training objective "independent action" should be continuous principle of training and be systematically communicated.

1) For this compare in detail the legal and collective bargaining rules

2) For this compare with the appropriate rules in the individual Federal State

### 3. Information and explanatory notes on the learning objectives of the training framework plan

The following statements make no claim to completeness but are rather to serve for illustration of individual learning objectives.

Common core qualifications in accordance with § 3, Para. 1, No. 1

Part of the description of occupation requiring training		Explanatory notes
Skills and knowledge to be communicated		
1. Vocational training employment and collective bargaining law [§ 4 No. 1]		
a) Explain significance of apprenticeship, contracts, in particular final examination, duration and termination	To be communicated during the whole training	<ul style="list-style-type: none"><li>• Provisions on the in apprenticeship contract in §§ 3, 4, 5 Occupational Training Act</li><li>• inter alia statements:<ul style="list-style-type: none"><li>- type and objective of the training</li><li>- start and duration of training</li><li>- probationary period</li><li>- remuneration</li><li>- holidays</li><li>- conditions for termination</li></ul></li></ul>
b) Give mutual rights and obligations from the apprenticeship contract		<ul style="list-style-type: none"><li>• Basis for this are, inter alia:<ul style="list-style-type: none"><li>- Occupational Training Act</li><li>- vocational training Regulations</li><li>- Youth Employment Protection Law</li><li>- Working Hours Law</li><li>- Labour and Collective Bargaining Law</li></ul></li><li>• Inter-company training</li><li>• Vocational school attendance</li><li>• In-firm regulations, e.g. training plan, regulation of tasks, working hours and breaks, right of complaint, contents of Working Hours Regulations</li></ul>
c) Give possibilities of occupational further training		<ul style="list-style-type: none"><li>• Possibilities of adjustment and advancement further training through matching to the technical, economical and social development</li><li>• Operational further training</li><li>• Advancement further training, e.g. Master Technician</li><li>• Possibilities for promotion</li></ul>
d) Give essential parts of the employment contract		<ul style="list-style-type: none"><li>• E.g.:<ul style="list-style-type: none"><li>- description of tasks</li><li>- working hours</li><li>- beginning and duration of employment</li><li>- probationary period</li></ul></li></ul>

Part of the description of occupation requiring training		Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 1 cont.</i>		<ul style="list-style-type: none"> <li>- termination</li> <li>- holidays</li> <li>- in-firm regulations and contracts</li> </ul>
e) Give essential provisions of the applicable collective agreements of the firm carrying out training		<ul style="list-style-type: none"> <li>• Parties to collective agreements, applicable area (spatial, technical, personal) of the collective agreements for employees</li> <li>• Application to apprentices</li> <li>• E.g.:               <ul style="list-style-type: none"> <li>- pay, salary, apprentice's pay</li> <li>- length of holidays, holiday bonus</li> <li>- working hours, working time regulation</li> <li>- bonuses</li> </ul> </li> </ul>
<b>2. Structure and organisation of the firm providing training</b> (§ 4 No. 2)		
a) Explain structure and tasks of the firm carrying out training	To be determined throughout the whole of training	<ul style="list-style-type: none"> <li>• Branch affiliation</li> <li>• Legal structure</li> <li>• Objective and range</li> <li>• Structure and process organisation</li> <li>• Interaction of factors on development, on service and on marketing the firm-specific products</li> </ul>
b) Explain basic functions of the firm carrying out training, such as procurement, manufacture, sales volume and administration		
c) Give relationships of the firm carrying out training and its employees to economic organisations, trade representatives and unions		<ul style="list-style-type: none"> <li>• Relationships to               <ul style="list-style-type: none"> <li>- employers' associations and unions</li> <li>- occupational organisations, occupational associations and competent bodies</li> </ul> </li> <li>• Their aims, structure and tasks</li> <li>• Commitment to the rules of a collective agreement</li> </ul>
d) Describe basic elements, tasks and methods of operation of the industrial consultation or personnel representation legal organs of the training company		<ul style="list-style-type: none"> <li>• Principles of trusting collaboration between employer and employee representatives as content of the [German] Industrial Constitution Law, [German] Personnel Representation Law</li> <li>• Employee council, personnel committee, youth and apprentice representatives and their information, consultation and codetermination rights; company/employment agreements</li> </ul>



Part of the description of occupation requiring training		Explanatory notes
Skills and knowledge to be communicated		
3. Safety and health protection on the job (§ 4 No. 3)		
a) Determine hazards to safety and health in the working place and take steps for their avoidance	To be determined throughout the whole of training	<ul style="list-style-type: none"><li>• Employers duty to ensure welfare</li><li>• Health and work safety provisions e.g.:<ul style="list-style-type: none"><li>- Labour Protection Law</li><li>- Working Hours Law</li><li>- Youth Employment Protection Law</li><li>- Technical Plant and Equipment Safety Law</li><li>- Hazardous Substances Ordinance</li><li>- Technical Standards for Hazardous Substances</li><li>- Labour Safety Law</li></ul></li><li>• Mechanical, biological, chemical , thermal, acoustic and electrical hazards</li><li>• Hazards and loading due to disregard of ergonomic principles</li><li>• Hazard symbols and safety markings</li><li>• Advice and monitoring of firms through external organisations, e.g. supervisory authorities, occupational organisations</li></ul>
b) Apply occupation-related labour protection and accident prevention regulations		<ul style="list-style-type: none"><li>• Advisory leaflets and directives for the prevention of accidents when handling substances and auxiliary materials as well as tool machines and plant</li><li>• Substances hazardous to health</li><li>• Behavioural rules for the maintenance of health, personal protection equipment, e.g. protection for the head, eyes, mouth, ears and skin</li></ul>
c) Describe conduct with accidents and introduce initial measures		<ul style="list-style-type: none"><li>• First aid measures and facilities</li><li>• Emergency call, escape and rescue routes</li><li>• Work accident notification (duty to report)</li></ul>

Part of the description of occupation requiring training		Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 3 cont.</i></p> <p>d) Apply regulations for preventative fire protection; describe conduct with fires and take measures for the combating of fires</p>		<ul style="list-style-type: none"> <li>• Provisions for protection against fire and explosion</li> <li>• Rules of conduct in cases of fire</li> <li>• Sources of ignition and easily inflammable substances</li> <li>• Method of operation and areas of employment of extinguishing facilities and auxiliary means</li> <li>• Fire extinguishers and fire blankets</li> </ul>
<b>4. Environmental protection</b> (§ 4 No. 4)		
<p>Contribute to the avoidance of operational environmental loads in the occupational area of influence, in particular</p> <p>a) by means of examples explain possible environmental loads due to training operations and their contribution to environmental protection</p> <p>b) apply applicable environmental protection regulations for the firm providing training</p> <p>c) use possibilities for economic and environmentally friendly use of energy and material</p> <p>d) avoid wastes; pass substances and materials to an environmentally friendly disposal</p>	<p>To be determined throughout the whole of training</p>	<ul style="list-style-type: none"> <li>• Determination and avoidance of environmental loads through, for example, noise, exhaust air, substances hazardous to water and soil</li> <li>• Emissions and immissions</li> <li>• Immission Protection Law</li> <li>• Employment of various energy carriers, e.g. electrical current, oil, coal, gas, air, water and steam</li> <li>• Possibilities for the economic use of energy e.g. avoidance of leakages, optimum lighting and use of heat</li> <li>• Economic handling of working and auxiliary materials</li> <li>• Marking, keeping separate, storage, utilisation, disposal of wastes</li> <li>• Collection, storage and disposal of industrial wastes</li> <li>• Legal consequences of non-compliance</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
5. Operational processes; work organisation [§ 4 No. 5]		
a) Note efficiency of operational performances	4	<ul style="list-style-type: none"><li>• Range of available services</li><li>• Availability of resources</li><li>• Costs and revenues</li><li>• Basic elements for calculation</li></ul>
b) Describe types of cost and cost centres		<ul style="list-style-type: none"><li>• Types of cost e.g. personnel, equipment, material</li><li>• Functional accounts chart and its significance</li><li>• Recording and distribution of costs</li></ul>
c) Carry out own work in a customer oriented manner		<ul style="list-style-type: none"><li>• Quality requirements on services</li><li>• Discussions and contacts with customers</li></ul>
d) Apply working and organisation means as well as techniques		<ul style="list-style-type: none"><li>• Forms</li><li>• EDP applications</li><li>• Working procedures, processes, time planning</li></ul>
e) Plan, process and agree tasks within the team; evaluate results, monitor and present		<ul style="list-style-type: none"><li>• Team structures</li><li>• Team ability</li><li>• Teamwork</li></ul>
f) Collaborate with measures to improve work organisation and the design of the working place		<ul style="list-style-type: none"><li>• Compare/analyse</li><li>• Weak points/errors</li><li>• Modifications</li><li>• Operational proposal system</li></ul>
6. Information and documentation, quality assurance measures [§ 4 No. 6]		
a) Procure, process and evaluate information, use information and communications systems	4	<ul style="list-style-type: none"><li>• Specialist books, journals, catalogues, operating instructions, technical documents, electronic communication means</li></ul>
b) Read technical documents and plans, produce sketches		<ul style="list-style-type: none"><li>• Operating instructions, inventory plans, flow diagrams</li><li>• Drawing equipment and sketches</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 6 cont.</i>		
c) Apply organisational instructions		<ul style="list-style-type: none"><li>• Process and work instructions</li><li>• Service and technical operating instructions</li></ul>
d) Produce work records and reports		<ul style="list-style-type: none"><li>• Recording of measured data</li><li>• Technical work procedure plans</li><li>• Operating conditions of plant components</li><li>• Maintenance verification</li><li>• Performance records</li><li>• Logbook and documentation</li><li>• Acceptance</li></ul>
e) Observe legal regulations for the protection of data		<ul style="list-style-type: none"><li>• Operating specifications</li><li>• Data security</li></ul>
f) Carry out, document and monitor quality measures		<ul style="list-style-type: none"><li>• Significance of quality assurance, e.g. quality management, operating manuals</li></ul>
<b>7. Environmental protection technology, ecological cycles and hygiene</b> [§ 4 No. 7]		
a) Describe ecological cycles	8	<ul style="list-style-type: none"><li>• Water cycle<ul style="list-style-type: none"><li>- water cycle in nature, precipitation, percolation, runoff, evaporation</li><li>- drawing of water and water usages</li><li>- types and qualities of water</li><li>- geogenic and anthropogenic pollution</li><li>- types of wastewater: domestic wastewater, precipitation water, industrial wastewater, percolation water</li><li>- wastewater discharge, wastewater treatment, residues of wastewater treatment</li><li>- eutrophication, self-cleaning strength of surface waters, water quality</li></ul></li><li>• Recycling management, waste management<ul style="list-style-type: none"><li>- avoidance of waste, low waste product design</li><li>- product, waste</li><li>- waste for utilisation, waste for disposal</li><li>- possibilities for utilisation and disposal of wastes</li><li>- limits of recycling management</li></ul></li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
Serial No. 7 cont.		<ul style="list-style-type: none"> <li>• Carbon, nitrogen cycles <ul style="list-style-type: none"> <li>- oxidation and reduction of carbons</li> <li>- conversion of nitrogen compounds</li> </ul> </li> <li>• Soil uses <ul style="list-style-type: none"> <li>- application of sewage sludge, wastes and fertilisers</li> <li>- fertilisation of soils</li> <li>- percolation of water</li> <li>- loading of soils</li> <li>- self-cleaning of soils</li> </ul> </li> <li>• Air <ul style="list-style-type: none"> <li>- the terms "emission" and "immission"</li> <li>- passing of pollutants into the air</li> <li>- aerosols (e.g. sewer cleaning)</li> <li>- global warming, greenhouse effect</li> </ul> </li> </ul>
b) Learn about and describe the causes and interactions of environmental loads of the air, of water, of the soil and of the surroundings		<ul style="list-style-type: none"> <li>• Environmental loads with the operation of networks and plants during processing and control</li> <li>• Environmentally relevant content substances of the soil, air and water and their effects on people, animals and plants</li> </ul>
c) Note principles and rules of hygiene with the operation of networks, systems and plants		<ul style="list-style-type: none"> <li>• Possibilities for transmission, infection of illnesses through intake, skin contact, inspiration</li> <li>• Preventative measures</li> <li>• Personal protection equipment</li> <li>• Disinfection</li> <li>• Washing of hands</li> <li>• Consumption of food and nourishment</li> <li>• Regulation for the use of working clothes</li> <li>• Hygienic monitoring</li> </ul>
d) Describe risks due to pathogens in raw water, wastewater, sludge and waste		<ul style="list-style-type: none"> <li>• Pathogens in water, wastewater, waste</li> <li>• Bacteria, viruses, fungi, toxins, worms, vermin</li> <li>• Conditions for life of pathogens</li> <li>• Typical symptoms of illness</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 7 cont.</i>		
e) Describe networks and plants		<ul style="list-style-type: none"><li>• Networks and plant systems, e.g. for the conditioning of water, for wastewater treatment, for waste treatment</li><li>• Process techniques, machines, equipment, function and/or principles</li></ul>
f) Describe possibilities for the avoidance and minimisation of environmental loads using plants and techniques		<ul style="list-style-type: none"><li>• Techniques and processes for the reduction of environmental loads, e.g. rational employment of energy, sludge utilisation, avoidance of waste</li></ul>
g) Apply legal regulations and sets of rules and standards		<ul style="list-style-type: none"><li>• Build up of sets of rules and standards</li><li>• Relevant technical regulation</li></ul>
<b>8. Fundamental principles of mechanical and process engineering, measurement technology, numerical control engineering and control technology</b> (§ 4 No. 8)		
a) Apply methods for the combination of substances and the separation of mixtures of substances	19	<ul style="list-style-type: none"><li>• Methods for combination, e.g. mixing, stirring, kneading, gassing</li><li>• Methods for separation:<ul style="list-style-type: none"><li>- mechanical separation, e.g. settling, centrifuging, sieving, grading, sifting and precipitating</li><li>- thermal separation, e.g. drying, volatising, distilling</li><li>- physical, chemical, biological separation, e.g. precipitation, filtration, absorption</li></ul></li></ul>
b) Employ methods for the conveyance of solids, liquids and gases		<ul style="list-style-type: none"><li>• Basic physical elements of conveyance technology</li><li>• Conveyance of solids, e.g. lifting, sucking, blowing, displacing</li><li>• Conveyance of liquids and gases, e.g. pumping, vacuum sucking</li></ul>
c) Assemble and dismantle fittings		<ul style="list-style-type: none"><li>• Structure, employment and function of shut-off devices and control fittings, valves, gate valves, taps and check (clack) valves, hose pipes and pipe connections, seals and expendable parts</li><li>• Technical installation tasks, e.g. assembly and dismantling of pipeline sections</li></ul>
d) Employ and operate units, in particular pumps, blowers, compressors and electrical motors and combustion engines as well as equipment for heating, cooling and tempering		<ul style="list-style-type: none"><li>• Structure and function:<ul style="list-style-type: none"><li>- electrical motors, combustion engines</li><li>- pumps, e.g. centrifugal pumps, positive displacement pumps, vacuum pumps</li><li>- blowers and compressors</li></ul></li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
Serial No. 8 cont.		<ul style="list-style-type: none"> <li>- heating plant, e.g. hot water heating, heat exchangers, feed and circulation pumps, safety facilities</li> <li>- cooling and tempering, e.g. ventilators, blowers, condensate dryers, air conditioning equipment</li> <li>• Application examples for pneumatics and hydraulics</li> <li>• Pump characteristic curves, system characteristic lines, efficiency</li> <li>• Inspection and maintenance</li> </ul>
e) Differentiate methods of measurement, control and regulation, explain structure and function of operation-specific equipment		<ul style="list-style-type: none"> <li>• Methods <ul style="list-style-type: none"> <li>- mechanical, pneumatic, electric and electronic methods of measurement</li> <li>- measurement accuracy, measurement range, scale graduation, sensitivity, reproducibility, response time</li> <li>- differentiation control/regulation</li> <li>- basic terms, e.g. probe, measuring site, measuring transducer, regulator, control device, regulating point, control variable, control loop, actual-set-alignment, block diagram</li> <li>- standard signal, registration technology</li> </ul> </li> <li>• Equipment <ul style="list-style-type: none"> <li>- equipment for measuring, for example, temperature, pressure, height level and throughflow</li> <li>- float control</li> <li>- setting of pump switching and control</li> <li>- bimetal regulators</li> </ul> </li> </ul>
f) Carry out measurement, control and regulation processes under instruction		<ul style="list-style-type: none"> <li>• Operational facilities for regulation of processes</li> <li>• Causes of failures</li> <li>• Measures for the remedying of failures, e.g. switching to manual operation, passage of information</li> </ul>
g) Employ energy carriers and types of energy taking account of economic efficiency, efficiency and the hazard potential		<ul style="list-style-type: none"> <li>• Primary energy carriers, e.g. natural gas, coal, oil, water, sun energy</li> <li>• Secondary energy carriers, e.g. steam, electrical current, digester gas and dump gas, fuels, compressed air</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
Serial No. 8 cont.		<ul style="list-style-type: none"><li>• Storage of energy carriers</li><li>• Hazard classes of energy carriers</li></ul>
h) Describe methods of energy conversion		<ul style="list-style-type: none"><li>• Power-heat coupling</li><li>• Combustion</li><li>• Steam generation and usage</li><li>• pressure water generation</li><li>• Biochemical processes</li><li>• Efficiency</li></ul>
9. Dealing with risks posed by electricity (§ 4 No. 9)		
a) Describe basic quantities and their relationships	4	<ul style="list-style-type: none"><li>• Primary quantities: current, voltage resistance (actual resistance, capacitive, inductive)</li><li>• Differentiate Ohm's Law and the following dependencies of the individual quantities derived from this</li><li>• Current (direct current, alternating current, three-phase current)</li><li>• Build up of a circuit, series connection, parallel connection</li><li>• Power (real power, apparent power, reactive power)</li><li>• Efficiency</li><li>• Generator and motor principles</li></ul>
b) Identify dangers of electrical current at fixed and changing work places		<ul style="list-style-type: none"><li>• Effect of electrical currents on humans</li><li>• Accidents due to electrical current</li><li>• Body current and contact voltage</li><li>• Voltage flashovers</li><li>• Fixed and movable electrical apparatus</li><li>• Damaged insulation and connections</li></ul>



Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 9 cont.</i></p> <p>c) Take and arrange protective measures for the avoidance of hazards due to electrical current</p>		<ul style="list-style-type: none"><li>• Protective measures and their effects: e.g. protective extra low voltage, protective insulation, fuse disconnection, residual current circuit breaking</li><li>• The five safety rules</li><li>• Types of protection and protective classes</li><li>• Suitable and approved electrical apparatus</li></ul>
<p>d) Describe conduct with accidents due to electrical current and introduce initial measures</p>		<ul style="list-style-type: none"><li>• Accident prevention regulations</li><li>• First aid with accidents due to electrical current</li></ul>
<b>10. Application of scientific principles</b> [§ 4 No. 10]		
<p>a) Measure and evaluate physical quantities, determine material properties</p>	10	<ul style="list-style-type: none"><li>• Length, volume, mass, time, temperature, pressure</li><li>• Material properties: e.g. electrical conductivity, pH value, oxygen content, density, melting point, boiling point</li><li>• Measuring equipment with various measurement accuracy</li></ul>
<p>b) Take, prepare, mark, conserve and preserve samples following different processes</p>		<ul style="list-style-type: none"><li>• Significance of sampling</li><li>• Types of sampling</li><li>• Sampling equipment</li><li>• Storage, transport, conservation</li><li>• Sampling protocols</li></ul>
<p>c) Explain relationships of structure and characteristic properties of materials</p>		<p>Chemical symbols and compounds:</p> <ul style="list-style-type: none"><li>• inorganic compounds: e.g. metals, acids, alkaline solutions, salts, oxides</li><li>• organic compounds: e.g. hydrocarbons, alcohols, carbonic acids, halogenated hydrocarbons, fats and plastics</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 10 cont.</i>		
d) Calculate, produce and separate mixtures of substances; monitor results		<ul style="list-style-type: none"> <li>• Homogeneous and heterogeneous substances and mixtures of substances</li> <li>• Details of concentration, blending ratios, percentage by mass and by volume</li> <li>• Process and equipment technology</li> </ul>
e) Describe reaction processes, in particular precipitation reactions, acid-base reactions and Redox reactions		<ul style="list-style-type: none"> <li>• Reaction processes of metals, acids, bases, salts and other relevant substances</li> <li>• Substance conversions</li> <li>• Neutralisation, precipitation, Redox reaction</li> </ul>
f) Carry out qualitative and quantitative determinations and evaluate results		<ul style="list-style-type: none"> <li>• Anionic and cationic detection</li> <li>• Volumetric analysis</li> <li>• Gravimetric analysis</li> <li>• Photometric analysis</li> <li>• Employment of indicators</li> <li>• Handling of reaction products</li> </ul>
g) Describe structure types and living conditions of micro-organisms and describe their significance for work in the operation		<ul style="list-style-type: none"> <li>• Aerobic and anaerobic conditions</li> <li>• Influences on micro-organisms, e.g. temperature, pH value, nutrient availability</li> <li>• Micro-organisms in operational processes</li> <li>• Biological working materials and their classification into risk groups</li> </ul>
h) Present material cycles and describe microbiological methods of investigation		<ul style="list-style-type: none"> <li>• Significance of micro-organisms in the natural and operational material cycles, in particular nitrogen and carbon cycles</li> <li>• Parameter of microbiological processes</li> <li>• Handling a microscope</li> <li>• Microscopic picture</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 1 <sup>st</sup> – 15 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
11. Materials, ancillary materials and dangerous materials, dangerous working substances (§ 4 No. 11)		
a) Select and employ materials and ancillaries taking into account their properties and applicability	12	<ul style="list-style-type: none"><li>Metals, plastic, wood, concrete</li><li>Lubricants and coolants</li><li>Chemical and physical properties, e.g. expansion behaviour, melting point, flash point, electrical conductivity, elasticity, thermal and chemical resistance, hardness, viscosity, fracture behaviour</li></ul>
b) Recognise hazardous substances and hazardous working materials and employ these taking account of safety regulations and protective measures processes		<ul style="list-style-type: none"><li>Characteristic properties, e.g. corrosive, combustible, potentially explosive, contaminative, irritant</li><li>Hazard symbols</li><li>Safety data sheet</li><li>Hazard instructions</li><li>Personal and technical protective measures</li></ul>
c) Handling of tools, machines and equipment for the processing of materials		<ul style="list-style-type: none"><li>Process materials, e.g. measure, scribe, corn, file, drill, saw, grind, burr, bend, ream</li><li>Flange, screw, welded, hard and soft solder connections, Velcro fastener, turn-lock fastener</li><li>Working principles of component connections (material connection, frictional connection, positive locking)</li></ul>
d) Produce work pieces made from metal and plastics		
e) Describe joining techniques		
f) Shape, join and separate metals and plastics under tension and without cutting		
12. Storage, tools and equipment (§ 4 No. 12)		
a) Store and transport materials and goods according to their physical qualities and material properties	4	<ul style="list-style-type: none"><li>Forms of store, types of store, store facilities</li><li>Economic store management</li><li>Storage conditions</li></ul>
b) Carry out inventory checks and introduce corrections		
c) Operate cranes, elevators and transport facilities		<ul style="list-style-type: none"><li>Industrial trucks, cranes and elevators, e.g. fork-lift trucks, travellers, conveyor belts, cranes, wheel loaders, chain conveyors</li></ul>
d) Employ, inspect, maintain and clean working equipment and facilities		<ul style="list-style-type: none"><li>Tools, equipment and workshop facilities</li><li>operating instructions</li></ul>
e) Determine faults on working equipment and facilities and take measures for their correction		<ul style="list-style-type: none"><li>Servicing, repair and maintenance instructions</li><li>Fault indication and fault correction</li></ul>

## Occupation-specific specialist qualifications in accordance with § 3 Para. 1 No. 2 Letter b

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
13. Safety of personnel and plant (§ 4 No. 13)		
a) Observe technically-specific regulations for work safety and for the protection of health	2	<ul style="list-style-type: none"><li>• Accident prevention regulations</li><li>• Operational instructions for work safety and the protection of health</li><li>• Hazards for human health from disinfectants</li></ul>
b) Take measures for the protection of facilities from outside effects		<ul style="list-style-type: none"><li>• Maintenance of object protective systems</li><li>• Monitoring and maintenance of protective facilities e.g. fences, locks</li></ul>
14. Water management (§ 4 No. 14)		
a) Present overall relationships of water management	2	<ul style="list-style-type: none"><li>• History of water supply</li><li>• Water and people</li><li>• Natural water cycle</li></ul>
b) Explain and delineate types of water resources		<ul style="list-style-type: none"><li>• Groundwater</li><li>• Spring water</li><li>• Surface water, e.g. flowing water, lake water, barrage water, seawater</li></ul>
c) Differentiate possibilities of water usage		<ul style="list-style-type: none"><li>• Types of water usage, e.g. drinking water, process water, transport, energy extraction</li></ul>
d) Determine and substantiate water usage		<ul style="list-style-type: none"><li>• Determining factors of the water requirement e.g. number of inhabitants, livestock units, industrial/ commercial development, artificial water cycles, climate, water losses</li><li>• Variations in requirement, e.g. annual, daily, hourly</li><li>• Determination of estimated water requirement</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
15. Water winning (§ 4 No. 15)		
a) Explain processes of water winning	4	<ul style="list-style-type: none"><li>• Structural design of water winning facilities and their installations, e.g.:<ul style="list-style-type: none"><li>- catching of sources</li><li>- catching of groundwater, e.g. vertical filtering well, horizontal filtering well, siphon pipe well</li><li>- surface water catchment</li><li>- river bank filtration, artificial groundwater recharge</li></ul></li></ul>
b) Explain and implement measures for the protection of water resources		<ul style="list-style-type: none"><li>• Hazards to water resources</li><li>• Necessity of protective areas, e.g. for groundwater, for surface water</li><li>• Criteria for the laying down of protective areas</li><li>• Scope for action, restrictions for action</li><li>• Monitoring and care of protective areas</li></ul>
c) Operate and maintain facilities for water winning		<ul style="list-style-type: none"><li>• Maintenance and care of water winning structures, e.g.:<ul style="list-style-type: none"><li>- structural damage</li><li>- functional capability of fittings</li><li>- measurement of potential yield of sources and water levels, e.g. still water level, process water level, water meter reading, productivity measurements</li></ul></li><li>• Initiation of water quality controls in own laboratories and/or outside laboratories</li><li>• Documentation and evaluation of measured results, e.g.:<ul style="list-style-type: none"><li>- operating protocols</li><li>- introduction of maintenance and regeneration measures</li></ul></li><li>• Initiation and monitoring of well regeneration measures</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
16. Water condition, water treatment (§ 4 No. 16)		
a) Describe characteristics and content substances of the water	12	<ul style="list-style-type: none"><li>• Physical and chemical characteristics</li><li>• Biological and microbiological properties</li><li>• Organic and inorganic content substances, e.g.:<ul style="list-style-type: none"><li>- alkaline and alkaline-earth ions, heavy metal ions</li><li>- halogenide, cyanide, sulphate and phosphate ions</li><li>- nitrogen compounds</li><li>- silicates</li><li>- oxygen, carbon dioxide, hydrogen sulphide</li><li>- insecticides and pesticides, PACs, tensides, oils, phenols</li><li>- humic matter</li></ul></li></ul>
b) Observe water quality requirements		<ul style="list-style-type: none"><li>• Parameter limiting values in legal provisions</li><li>• Combined water problems</li></ul>
c) Apply hygienic principles with the operation of water supply facilities		<ul style="list-style-type: none"><li>• Causes and results of germination and regermination</li><li>• Measures for the avoidance of hygienic pollution</li></ul>
d) Explain processes of water conditioning		<ul style="list-style-type: none"><li>• Flocculation and sedimentation</li><li>• Aeration processes, e.g. atomising, cascades, technical oxygen</li><li>• Aim of aeration, e.g. neutralisation, separating out of unwanted highly volatile water content substances, input and dissolving of oxygen</li><li>• Differentiation of filter systems, e.g. according to flow rate, type of construction, flow direction, structure of filter bed</li><li>• Filter materials, e.g. quartz sand, active carbon, pumice</li><li>• Aim of filtration, e.g. neutralisation, deferrisation, demanganisation</li><li>• Settling process with and without flocculants</li><li>• Disinfection, e.g. with chlorine, chlorine dioxide, ozoning, UV radiation</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 16 cont.</i></p> <p>e) Operate and maintain facilities for water conditioning</p>		<ul style="list-style-type: none"> <li>• Inspections</li> <li>• Expense materials</li> <li>• Calibration of measuring equipment</li> <li>• Control of filter inflows</li> <li>• Backflushing of filters</li> <li>• Servicing of filter systems, e.g. heights of freeboard, filter nozzles</li> <li>• Monitoring of water quality</li> <li>• Dosing facilities and additives</li> <li>• Disposal and reutilisation of the products of water processing, e.g. through neutralisation, stabilisation, dewatering</li> <li>• Functional capability of fittings</li> <li>• Structural condition</li> </ul>
<b>17. Water delivery, storage and distribution</b> (§ 4 No. 17)		
<p>a) Operate and maintain installations for the delivery of water</p>	<p>24</p>	<ul style="list-style-type: none"> <li>• Hydrostatic pressure, volume flow, delivery height</li> <li>• Areas of employment, design, method of operation and delivery characteristics of pumps, e.g. centrifugal pumps, reciprocating pumps, diaphragm pumps</li> <li>• Pump characteristic curves</li> <li>• Booster facilities</li> <li>• Documentation and evaluation of operating records</li> <li>• Arrangement for and monitoring of measures for the maintenance of value</li> <li>• Areas of employment and design of shut-off, safety and security fittings</li> <li>• Consumable and repair materials</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 17 cont.</i></p> <p>b) Differentiate different types of water storage</p>		<ul style="list-style-type: none"> <li>• Types and location of water storage facilities, e.g. elevated tanks</li> <li>• Tasks of water storage, e.g. variations in consumption, constant plant operation, constant supply pressure, operating and general reserves</li> <li>• Construction, equipping and operation</li> </ul>
<p>c) Operate and maintain of facilities for water storage</p>		<ul style="list-style-type: none"> <li>• Carrying out and documentation of operating controls</li> <li>• Decommissioning, commissioning</li> <li>• Cleaning and disinfection</li> <li>• Arrangement for and control of repair measures, e.g. with structural damage, pipeline damage</li> </ul>
<p>d) Differentiate components and systems</p>		<ul style="list-style-type: none"> <li>• E.g. ramification (branched) networks, ringed networks, mesh networks</li> <li>• Supply pressure and static pressure</li> <li>• Topography, height profiles and pressure zones</li> <li>• Pipelines, e.g. trunk , branch, main, supply, connection pipelines, siphons, bridge pipelines</li> <li>• Accoutrements and fittings, e.g. slide valve, clack valve, plain valve, tap, tapping stop valve, hydrant, check valve, pressure reducer, aerator and ventilator, safeguards against pipeline rupture</li> </ul>
<p>e) Select and employ materials and aids for the construction and operation of pipelines</p>		<ul style="list-style-type: none"> <li>• E.g. ferrous materials, non-ferrous materials, plastics, concrete</li> <li>• Seals</li> <li>• Aids and ancillaries, e.g. lubrication and sliding agents</li> </ul>
<p>f) Secure construction sites in public traffic areas</p>		<ul style="list-style-type: none"> <li>• Approval processes</li> <li>• Traffic security</li> <li>• E.g. Plan of signing, warning clothing, traffic control installations</li> </ul>



Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 17 cont.</i>		<ul style="list-style-type: none"><li>• Pipe trench works and their security</li><li>• Tasks of pipe assembly</li><li>• Calibration and documentation of pipelines and structures</li><li>• Measures for corrosion protection</li><li>• Cleaning and disinfection</li><li>• Pressure tests</li></ul>
g) Monitor civil engineering works, assemble pipelines		<ul style="list-style-type: none"><li>• Commissioning and decommissioning of pipelines</li><li>• Pipe network plans</li><li>• Pressure measurement, pressure loss diagrams</li><li>• Water loss</li><li>• Locating of leaks</li><li>• Pipe network structures</li></ul>
h) Operate and maintain pipe networks		<ul style="list-style-type: none"><li>• Cleaning of pipelines, e.g. using scrapers, brushes, high pressure water jets</li><li>• Rehabilitation processes, e.g. cement mortar lining, in-liner methods</li><li>• Rehabilitation of pipe connections</li></ul>
i) Describe rehabilitation measures for pipeline networks		
<b>18. Investigation of water</b> [§ 4 No. 18]		
a) Explain necessity of the examination of water	9	<ul style="list-style-type: none"><li>• Examinations<ul style="list-style-type: none"><li>- according to legal specifications</li><li>- for operational monitoring</li><li>- with special occurrences</li></ul></li></ul>
b) Operate and maintain sampling equipment		<ul style="list-style-type: none"><li>• E.g. Sampling containers, laboratory equipment, sampling pumps for groundwater measuring points</li><li>• Hydrant standpipes</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<i>Serial No. 18 cont.</i>		
c) Take water samples, carry out on-site investigations		<ul style="list-style-type: none"><li>• Sampling, e.g. for bacteriological, physical-chemical investigations</li><li>• Conservation of water samples</li><li>• On-site investigations, e.g. temperature, pH value, conductivity, oxygen, odour, taste, appearance</li></ul>
d) Carry out, evaluate and document physical-chemical analyses		<ul style="list-style-type: none"><li>• Water hardness</li><li>• Acid and base capacity</li><li>• Photometric determinations, e.g. iron, manganese, nitrate</li></ul>
19. Measurement technology, numerical control engineering and control technology (§ 4 No. 19)		
a) Describe processes for measurement of water levels, quantities, flows and quality parameters	8	<ul style="list-style-type: none"><li>• Measurement of water levels, e.g. using cable light plumb, float in water level pipe, capacitive probe, piezoelectric pressure cell, ultrasonics</li><li>• Water meter, impeller water meter, cylindrical piston water meter, large water meter, combined water meter</li><li>• Flow measurement, e.g. using magnetic-inductive flow measuring equipment (devices) (MID), ultrasonic flow metering equipment, suspended solid particle flow metering equipment</li><li>• Quality measurements, e.g. pH value, conductivity, chlorine, turbidity</li></ul>
b) Record and influence technical parameters and processes		<ul style="list-style-type: none"><li>• Formation of well groups depending on:<ul style="list-style-type: none"><li>- the combined water quality</li><li>- the desired summation delivery flow</li><li>- the lowering of the groundwater level</li></ul></li><li>• Control and regulation of pumping stations, e.g. through modification of revolutions, throttling, switching depending on the water level</li><li>• Even distribution of a complete water flow over several filters</li><li>• Regulation of the filter overdamming</li><li>• Quantity-based dosing of chemicals</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 19 cont.</i></p> <p>c) Explain methods of tele-control technology</p> <p>d) Operate, monitor and maintain measurement, control and regulation devices</p> <p>e) Determine faults in the process and take measures for their correction</p>		<ul style="list-style-type: none"> <li>• Remote monitoring</li> <li>• Remote control</li> <li>• Measurement transduction</li> <li>• Remote reading out of operating parameters, e.g. through radio read out, remote read-out using GSM (global system for mobile communication) or "carry-over" of counter reading indicator</li> <li>• Operating controls, e.g. differential filter pressure, loading condition of active carbon filters, energy consumption, chemical supplies, calibration of measuring equipment</li> <li>• Operating/maintenance reports</li> <li>• Differentiation and assignment of optical and acoustic fault messages</li> <li>• Acknowledgement of fault messages</li> <li>• Fault protocols</li> </ul>
<b>20. Electrical plant in water supply</b> (§ 4 No. 20)		
<p>a) Select and handle measuring equipment and working materials</p>	16	<ul style="list-style-type: none"> <li>• Personal protective equipment</li> <li>• Measuring equipment, e.g. voltmeter, ampere meter, ohmmeter, multifunction metering equipment</li> <li>• Indication of measured data, e.g. analogue, digital, recording tapes</li> </ul>
<p>b) Read operationally specific circuit diagrams</p>		<ul style="list-style-type: none"> <li>• Marking of working materials</li> <li>• Electrical symbols for contact units and switching devices</li> <li>• Electrical circuit diagrams, e.g. installation plan, layout plan, wiring plan, plant identification system</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 20 cont.</i></p> <p>c) Test and exchange fuses, sensors, measurement facilities, lighting means and signal lamps</p>		<ul style="list-style-type: none"> <li>• Observance of protective and safety measures, nominal voltage, nominal current, suitability of tools</li> <li>• Function and marking of fuses, e.g. lead fuses, automatic cut-outs, overcurrent protection</li> <li>• Classification of faults in electrical components</li> <li>• Renewal of electrical screwed and clamped connections</li> <li>• Functional test</li> </ul>
<p>d) Assess operating faults, exchange and return to operation plant components, in particular pumps and motors</p>		<ul style="list-style-type: none"> <li>• Types of fault, e.g. breaks in the conductor, short circuit, body contact, earth contact, conductor contact, mechanical fault in the switching system</li> <li>• Types of motor, e.g. direct current motor three-phase asynchronous motor</li> <li>• Maintenance and care of electrical motors, e.g. connections, power transfer, cooling, bearings</li> <li>• Return to operation and monitoring: <ul style="list-style-type: none"> <li>- functional capability</li> <li>- electrical installation</li> <li>- function of the motor protective switch</li> </ul> </li> </ul>
<p>e) Exchange electrical components outside service cabinets, which can be switched off directly</p>		<ul style="list-style-type: none"> <li>• E.g. limit switches, initiators, sensors, manual switches, solenoid valves, pressure switches, measuring probes, float switches, level switches; not in connection with complex switching systems and outside the explosive zone</li> <li>• Observation of the signal form</li> </ul>
<p>f) Employ and operate alternative generators</p>		<ul style="list-style-type: none"> <li>• Determination of the required performance</li> <li>• Observation of protective measures, in particular the correct earthing of units</li> <li>• Structure, function, mounting</li> <li>• Commissioning and decommissioning</li> <li>• Test runs and servicing intervals</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 20 cont.</i></p> <p>g) Employ, test and maintain battery systems</p>		<ul style="list-style-type: none"> <li>• Structure and method of operation, nominal values, details on standard specifications of primary elements (dry batteries)</li> <li>• Structure and method of operation, commissioning and servicing, charging of lead accumulators</li> <li>• Servicing intervals and safety devices</li> <li>• Monitoring of the charging state</li> </ul>
<b>21. Documentation</b> (§ 4 No. 21)		
<p>a) Produce laying drawings for pipelines</p>	<p>4</p>	<ul style="list-style-type: none"> <li>• Drawing equipment</li> <li>• Design of general, location and pipe network plans, construction site and precise measurement drawings</li> <li>• Scales, symbols</li> </ul>
<p>b) Determine requirement for materials and order same</p>		<ul style="list-style-type: none"> <li>• Derive requirement for materials from diagrams and drawings, produce item lists</li> <li>• Internal and external material requirements</li> <li>• Use of catalogues, books of tables and ADP</li> </ul>
<p>c) Keep and evaluate operating records, produce reports</p>		<ul style="list-style-type: none"> <li>• Statistics, e.g. on damage, water requirement energy consumption</li> <li>• Diagrams and nomograms</li> <li>• Operating logbooks, verification of operating data</li> <li>• Working reports, file notes, damage reports, special minutes</li> </ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
22. Protection of drinking water and consumer facilities (§ 4 No. 22)		
a) Determine hazards to drinking water quality through consumer facilities and introduce measures	4	<ul style="list-style-type: none"><li>• Causes of a prejudicing or hazarding of drinking water quality, e.g.:<ul style="list-style-type: none"><li>- backflow of contaminated water</li><li>- connection of drinking water systems to other systems</li><li>- working and operating materials, ancillaries</li><li>- insufficient and incorrect servicing</li><li>- operation not in accordance with the intended use</li></ul></li><li>• Security measures against backflow, e.g.:<ul style="list-style-type: none"><li>- individual/collective security</li><li>- pipe interrupters</li><li>- pipe disconnecter</li><li>- security combinations</li></ul></li></ul>
b) Describe and assess components, apparatus and materials in domestic installations		<ul style="list-style-type: none"><li>• Graphic symbols, letter symbols</li><li>• Requirements on components, apparatus and materials, e.g. on<ul style="list-style-type: none"><li>- pipe systems</li><li>- fittings</li><li>- drinking water heating plants</li><li>- drinking water containers</li><li>- plants for the treatment of drinking water</li><li>- measurement and metering devices</li></ul></li><li>• Drinking water quality and selection of materials</li><li>• Laying directives for connection pipelines and water meters</li></ul>
23. Customer orientation (§ 4 No. 23)		
a) Conform with legal relationships between firms and customers	4	<ul style="list-style-type: none"><li>• Ordinance on general conditions for the supply of water (German= AVBWasserV)<ul style="list-style-type: none"><li>- type and scope of supply</li><li>- liability with interruptions of supply</li><li>- domestic connections and measuring facilities</li><li>- consumer facilities</li></ul></li><li>• Limitations of responsibility between public water supply and consumer facilities in accordance with the ordinance on general conditions for the supply of water (AVBWasserV)</li></ul>

Part of the description of occupation requiring training	Temporal guidance values in weeks in the 16 <sup>th</sup> – 36 <sup>th</sup> training month	Explanatory notes
Skills and knowledge to be communicated		
<p><i>Serial No. 23 cont.</i></p> <p>b) Carry out discussions and negotiations in a customer-oriented way, make use of possibilities for winning-over/retention of customers</p>		<ul style="list-style-type: none"> <li>• Image of supply companies and of drinking water</li> <li>• Rules for the attendance of customers</li> <li>• Interchanges between personal appearances, company image, winning over/retention of customers</li> </ul>
<b>24. Legal provisions and technical rules and standards</b> (§ 4 No. 24)		
Apply legal provisions and technical rules and standards	2*	<ul style="list-style-type: none"> <li>• For example in Germany: Water Framework Directive (WRRL), Water management Resources Law (WHG), Ordinance on General Conditions for the Supply of Water (AVBWasserV), Federal State water laws, Drinking Water Ordinance (TrinkwV), foodstuffs and objective requirements law, law for the protection against infection</li> <li>• Municipal bylaws and ordinances</li> <li>• Sets of rules and standards of associations</li> <li>• Standard specifications</li> <li>• Accident prevention regulations</li> <li>• Guidelines for the Securing of Working Sites in Roads (German = RSA)</li> </ul>

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# Part III

## Keywords from A - Z



## 1. Advanced vocational training

The advanced vocational training is to enable the maintenance and expansion of knowledge and skills, adjustment to development and occupational advancement.

To advanced occupational development training belong, above all, advanced vocational training courses which are regulated by **competent bodies**. These determine the objective, the requirements, the procedure of examination, the prerequisites for registration and the establishment of examination committees.

## 2. Apprentice's pay

Those providing instruction must provide apprentices with a fair remuneration (§ 10 BBiG). The amount of the remuneration is to be regulated in the **apprenticeship contract**.

With continuing occupational training it must increase at least annually.

## 3. Apprenticeship contract

Before the start of occupational training an apprenticeship contract must be concluded between those providing instruction and apprentices (§ 3 BBiG).

The essential content of the apprenticeship contract must be recorded in writing by those providing instruction after agreement, in any case before the start of the occupational training (§ 4 BBiG). The record of the contract is to be signed by those providing instruction, by the apprentices and (for those under age) by their legal representatives (§ 4 BBiG). The contractual record must, at the least, contain details on:

- type and objective of the occupational training, in particular the occupation for which training is to be carried out,
- start and duration of the occupational training,

- **training activities outside the training company**,
- duration of regular daily working time,
- duration of the **probationary period**,
- payment and amount of the **apprentice's pay**,
- duration of **the holidays**,
- conditions under which the apprenticeship contract can be terminated.

## 4. Competent bodies

According to the Vocational Training Act the following tasks are delegated to the competent bodies: monitoring of the implementation of the occupational training, to support this through consultation with instructors and apprentices through the training advisers appointed for this purpose and, insofar as no regulations exist to regulate the execution of occupational training through legal provisions (e.g. examination rules) (comp. § 45 BBiG).

Water Supply Engineering Technician is an occupation requiring training of the public service. So far as the training takes place in trade and industry firms it is an occupation requiring training of trade and industry.

Public service within the meaning of § 1 of the Ordinance on Occupational Training in environmental engineering trades covers all legal persons under public law with all their facilities, which are not legally made independent.

For the area of public service the responsible agencies for the Federal [German] Government are determined by the top Federal Government Authority otherwise through the Federal States (comp. § 84 Para. 1 BBiG). The directory of competent bodies for this can be found on Page 87 in the part "General Information".

If occupational training takes place in trade and industry firms then the respective local Chamber of Commerce and Industry takes over the function as competent bodies.

The responsible agency sets up an occupational training committee (§ 56 BBiG), to which belong representatives of the employers and of the employees as well as – with an advisory capacity – teachers of the vocational school.

The occupational training committee has to adopt the legal provisions to be implemented by the competent body for the execution of the occupational training (e.g. the examination rules) and must be informed of and follow all important matters of the occupational training.

## 5. Coordination between the training company and the vocational school

The initial occupational training for the Water Supply Engineering Technician takes place in the dual system for occupational training.

Characteristic for the dual occupational training is that the apprentices acquire the skills and knowledge, required for the practice of an occupation, within a training company and in a vocational school.

The duality is also evident in the different vocational training regulations:

- Basis for the training carried out in the firm are the standard nationally applicable vocational training regulations issued as legal ordinance.
- Basis for the curricula of the vocational schools are the framework curricula of the Conference of [German] Federal State Culture Ministers, which represent a recommendation.

Vocational training regulations and framework curricula therefore differ both in their legal quality and in their area of application.

The firm carrying out training and the vocational school must complement each other and agree in the training in order that the dual system works in a sensible and helpful way for all those involved. Such a collaboration cannot be prescribed.

Training practice for the occupational training as Water Supply Engineering Technician on a framework training plan can fall back on a training framework plan, which is agreed with the framework curricula of the Conference of Culture Ministers. With this the prerequisites for the collaboration between training companies and the vocational schools are met.

The successful conversion of the new vocational training regulations is essentially dependent on a constructive agreement between the two places of learning: school and firm.

## 6. End of training/giving of notice

A giving of notice can take place at any time from the apprentices or instructors during the **probationary period**. Notice requires to be in the written form. During the **probationary period** no reasons have to be given.

After the **probationary period** the training relationship can be terminated only with good reasons, i.e. if for one side it is unreasonable to continue the training relationship. When an important reason exists has to be decided in the individual case. The reasons are to be given.

Another possibility of giving notice exists if the apprentice wishes to be trained in another occupation requiring training. Here the training relationship can be terminated with four weeks notice. Notice must be given in writing and must contain the reasons for the termination.

For those who have not yet reached their majority notice can only be given if the legal representative agrees. If minors are given notice the termination must be discussed with the legal representatives.

## 7. Flexibility clause

The **in-firm's training plan** can deviate from the training framework plan with regard to its content and timely structure due to practical business characteristics. This fact designated as flexibility clause can be derived from § 5 of the ordinance.

The skills and knowledge listed in the training framework plan are to be communicated by the final examination.

## 8. Holidays

Apprentices have the right to paid holidays. The legal minimum holidays are laid down:

- for young persons in the [German] Youth Employment Protection Law (JarbSchG) and
- for adults in the [German] Federal Holidays Law.

For young persons the duration of the holidays is scaled according to age. Annually it is:

- at least 30 working days if the young person is still not 16 years of age at the beginning of the calendar year

- at least 27 days if the young person is still not 17 years old at the beginning of the calendar year

- at least 25 days if the young person is still not 18 years old at the beginning of the calendar year (JarbSchG).

For the year in which they become 18 years old young persons still have holidays in accordance with the Youth Employment Protection Law. Those who are 18 years old at the beginning of the calendar year receive adult holidays. Adult holidays are a minimum of 24 working days a year.

## 9. In-firm's training plan

For the individual training process the firm providing training produces the in-firm training plan for the apprentices. This is handed out and explained to the apprentices at the start of training; in the same way the vocational training regulations are also to be made available.

A technical and temporal breakdown of the training subject matter is in particular admissible if operationally practical peculiarities make this necessary (**Flexibility Clause**, § 5 of the Ordinance). It is to be noted that training subject matter of the training framework plan is not lost. The minimum requirements are laid down in the training framework plan.

Additional skills and knowledge can be additionally communicated depending on the requirement.

With the production of the training plan the following are to be taken into account:

- the personal qualifications of the apprentices (e.g. different educational background)
- the circumstances of the training company (e.g. operational structures, personnel and technical installations, regional peculiarities)
- the carrying out of training (**training activities outside the training company**, blocking of the vocational school instruction).

The temporal guidance values are to be calculated to firm requirements. In addition an arrangement of the training blocks for fixed months in the training year must also take place. With this block training, **holidays** and, if required, **training activities outside the training company** are to be taken into account.

With a larger number of apprentices the elaboration of a transfer plan is recommended.

If, during the course of training, a decrease or increase of the contractual training time results, then it is recommended undertaking well in time an adjustment of the training plan to the changed course of training.

## 10. Occupational capacity to act

Objective of the training is the occupational capacity to act. It is to enable apprentices to independently plan, execute and monitor qualified occupational activities within the meaning of § 1 Para. 2 BBiG (comp. § 3 Para. 2 of the ordinance).

In order to achieve this objective technically-related and interdisciplinary qualifications (skills, knowledge and competence) are communicated in the training and, within this framework, expertise is supported which can be realised in precise activities.

**Professional competence**  
enables certain tasks in occupational relationships to be processed to meet the objective.

**Methods expertise**  
covers strategy, organisation, structure and arrangement of an activity.

**Social competence/personal competence**  
enables the mastery of occupational activity also in social relationships.

These qualification components and expertise are basically not isolated within the training but are communicated and supported together using complex tasking.

Professional competence, methods expertise and social competence are to be placed at the same level in the personality development of the young persons during training. Appropriate qualifications are to be included in the training framework plan.

## 11. Probationary period

The occupational training relationship starts with the probationary period. It must be at least one month long and may be a maximum of three months (§ 13 BBiG).

As the probationary period already belongs to the occupational training the complete obligations of the instructors and the apprentices also stand. During the probationary period the instructors are obliged to examine carefully the suitability of apprentices for the trade to be

learned. The apprentices must also examine whether they have made the right selection.

During the probationary period the occupational training relationship can, at any time, be terminated in writing both by the instructors and also by the apprentices without giving reasons and without any time limit (§ 15 BBiG).

## 12. Qualified electrical engineering person

The term "qualified person" is anchored in the [German] Labour Protection Law. If tasks can be carried out only with observance of certain protective measures without prejudice to health the suitability of the employee concerned for the execution of this measure belongs to the labour protection requirements with such work.

Therefore the law obliges the employer to pay attention with the transfer of the tasks, that those employed are physically and mentally in a position to understand the protective equipment and carry out protective measures relevant for the tasks. From this formulation it is to be derived that for work on electrical plant and operating means

certain skills are absolutely necessary. The electrician is the qualified person for these activities.

The technical qualification of an electrician as a rule is acquired through the completion of technical training, for example as electrical master technician/-electrical technician.

Equally, training in a firm for a certain area of work in electrical engineering can communicate the necessary knowledge and skills. This is the case with the Water Supply Engineering Technician.

## 13. Suitability as instructor

In accordance with the [German] Vocational Training Act (BBiG) only those persons may carry out instruction who are personally and technically qualified. Technically qualified to carry out occupational training are those who possess the skills and knowledge as well as the occupational and labour pedagogic knowledge (§ 20 BBiG). Further information is provided in the ordinance on the occupational and labour pedagogic suitability for occupational training - The [German] Ausbildereignungsverordnung (AEVO) – dated 16 February 1999. According to this, training personnel for occupational training have to verify occupational and labour-pedagogic knowledge in a special examination (§ 21 BBiG).

The specialist qualification is given in detail in § 76 BBiG. Here you will also find an exception ruling which allows for the recognition of the specialist qualification of specialists without recognised final examination following consultation by the **competent body**.

The **competent body** are to see that the personal and specialist qualification of instructors is available (§ 23 BBiG).

The new occupation requiring training demands from training personnel basic pedagogic skills. It is not just “demonstrators” that are required but rather more the guidance and advisory function and thus the urging of apprentices towards independent learning.

## 14. Suitability of the training company

Apprentices may only be engaged if the training company, according to type and equipment, is suitable for the occupational training, and the number of apprentices is in a reasonable relationship to the number of training places and the technicians employed.

The suitability of a training facility in which the laid-down occupational skills and knowledge cannot be communicated completely exists if suitable **training activities outside the training company** can be carried out (§ 22 BBiG).

The determination of the suitability takes place through the **competent body** (§ 22 BBiG).

It is necessary to develop a high degree of flexibility with the assessment of the suitability of firms providing training.

It is undisputable that that the legal requirements on the training company have to be met without limitation. However, collaborative training ventures and co-operations increase possibilities for negotiation.

## 15. Training activities outside the training company

If firms carrying out training are too specialised to be able to cover all parts of the training or if the firm is too small to ensure all technical and personnel prerequisites there is a possibility of balancing out such deficits through training activities outside the training company.

To this belong training measures in

- **inter-company vocational training centres**  
(comp. § 22 BBiG)

and in the

- **collaborative training venture.**

**Inter-company vocational training centres:**

In order to relieve the pressure on training operations inter-company vocational training centres can be offered. Information on this is given by the **competent bodies**.

**Collaborative training venture:**

A collaborative training venture exists if different firms combine to plan and, based on the division of labour, carry out occupational training together. The apprentices then complete certain parts of their training not in the training company but rather in one or more partner firms.

In practice four variants of collaborative training ventures have developed, also in combined form:

- leading firm with partner firms

- consortium training companies

- operational training association

- operational contracted training

The following legal conditions are to be observed with a collaborative training venture:

- the training company within whose responsibility training is carried out must cover the major part of the description of the occupation requiring training.

- The instructors can only finalise conditions for taking on part of the training when it is guaranteed that the quality of the training in the other training company is equally assured.

- The training company must be able to influence the appointment of the training personnel.

- The **apprenticeship contract** may contain no limitations of the legal rights and responsibilities of the instructors and apprentices. The agreements of the partner firms concern only the relationship between each other.

- Fundamentally, the **in-firm's training plan**, it must be shown which training contents are being communicated at which point in which training facility (cooperative training company).

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# General Information

## 1. Check lists

### Check list 1:

#### What is to be done before start of training

• Is the firm recognised by the competent body as a firm providing training?	<input type="checkbox"/>
• Are the legal prerequisites for training present, i.e. does the technical and personal suitability in accordance with § 20 BBiG exist? Has the trainer or one of the instructors determined by him/her obtained the necessary training qualification?	<input type="checkbox"/>
• Are, in addition to the responsible instructors, sufficient specialists in the individual training places/areas available for the instruction of the apprentices?	<input type="checkbox"/>
○ • Has an instructor been named to the competent body?	<input type="checkbox"/>
• Which actions have to be started in order to present the concern as attractive training company for those interested in training (e.g. making contact with the responsible labour exchange, place advertisements in daily newspapers or youth magazines, present firm on potential trainee days, industrial placements)?	<input type="checkbox"/>
• Are firm selection processes (employment tests) as well as selection criteria for apprentices laid down?	<input type="checkbox"/>
• Who directs the job interviews with the applicants and decides on employment?	<input type="checkbox"/>
• Is the apprenticeship contract formulated and signed by the instructor and the apprentices?	<input type="checkbox"/>
• Is the firm in the position to communicate all technical contents of the vocational training regulations? Are all training locations/areas necessary for this available? Can or must one fall back on additional training activities outside the training company (inter company vocational training centres, collaborative training venture)?	<input type="checkbox"/>
• Has a in-firm's training plan been produced (technical and temporal structure as annex to the training contract)?	<input type="checkbox"/>
○ • Has the concluded apprenticeship contract including the in-firm's training plan been made available to the apprentice(s) as well as the competent body?	<input type="checkbox"/>
• Is the apprentice registered with the vocational school?	<input type="checkbox"/>
• Are the training regulations, the training framework plan, if required the framework curricula as well as an example of the Vocational Training Act and of the Youth Employment Protection Law available in the firm?	<input type="checkbox"/>
• Is the first day already completely planned? (Check list 4)	<input type="checkbox"/>

**Check list 2:**  
**Obligations of the training company/of the instructors**

	• Observe the legal constraints, e.g. of the Vocational Training Act, Youth Employment Protection Law, firms agreements and apprenticeship contract as well as the provisions for labour safety and accident prevention.	<input type="checkbox"/>
○	• Conclusion of a apprenticeship contract with the apprentice(s).	<input type="checkbox"/>
	• Release for vocational school and examinations.	<input type="checkbox"/>
	• Apprentice's pay, if necessary observation of collective bargaining agreements.	<input type="checkbox"/>
	• Significance and duration of the probationary period.	<input type="checkbox"/>
	• Conversion of the vocational training regulations and the training framework plan as well as technical and temporal structuring into working practice, above all through the production of training and transfer plans.	<input type="checkbox"/>
	• Configuration of a "training work place" according to the training subject matter and the free provision of all necessary training means.	<input type="checkbox"/>
	• Communication of skills and knowledge.	<input type="checkbox"/>
	• Observation of the training responsibility.	<input type="checkbox"/>
○	• Assessment of apprentices.	<input type="checkbox"/>
	• Production of a training report at the end of training.	<input type="checkbox"/>



**Check list 3:**  
**Obligations of the apprentices**

<input type="radio"/>	• Obligation to attend.	<input type="checkbox"/>
	• Active acquiring of all skills and knowledge which are necessary to complete the training successfully.	<input type="checkbox"/>
	• Attending the vocational school.	<input type="checkbox"/>
	• Production of verification of training (Narrative Report).	<input type="checkbox"/>
	• Sitting of intermediate and final examinations.	<input type="checkbox"/>
<input type="radio"/>		

**Check list 4:**  
**The first day**

• How is the day structured? Are all responsible persons, including specialists, informed that new colleagues are joining the firm?	<input type="checkbox"/>
• Which actions are planned? (Examples: presentation of the firm, its organisation and internal structure, how it sees itself, the persons responsible for training; if required carry out a tour of the firm).	<input type="checkbox"/>
• Which rights and responsibilities result from the apprenticeship contract for the apprentices as well as for the instructors and the firm?	<input type="checkbox"/>
○ • Handing out of working clothing and protective equipment.	<input type="checkbox"/>
• Information on the greatest hazards in the firm.	<input type="checkbox"/>
• Which regulations on work safety and for the prevention of accidents apply in the company?	<input type="checkbox"/>
• Familiarisation with the social rooms.	<input type="checkbox"/>
• Which working time regulations apply for the apprentices?	<input type="checkbox"/>
• Explanation of the in-firm's training plan.	<input type="checkbox"/>
• Which special work equipment is available for the training?	<input type="checkbox"/>
• How is the verification of training to be carried out? (Form, time intervals: day, week, month).	<input type="checkbox"/>
○ • Explain significance of the Narrative Report for admission to the examinations.	<input type="checkbox"/>
• Which vocational school is responsible? Where is it and how does one get to it? Is the instruction in block training or on individual days of the week? Must the apprentices come to work in the firm after school?	<input type="checkbox"/>
• Examinations: explain the role of the intermediate and final examination, discuss timings, explain the contents of the examinations.	<input type="checkbox"/>
• With which health insurance are the apprentices insured against illness?	<input type="checkbox"/>
• What has to be observed in case of illness?	<input type="checkbox"/>
• Significance of the probationary period.	<input type="checkbox"/>
• Firm's holiday regulations.	<input type="checkbox"/>
• Firm's additional services/apprentice's pay.	<input type="checkbox"/>

**Check list 5:**

**What has to be observed with the registration for the intermediate examination?**

<input type="radio"/>	• Have the apprentices registered in time with the responsible agency for the intermediate examination?	<input type="checkbox"/>
	• How are the apprentices prepared in-firm for the intermediate examination?	<input type="checkbox"/>
	• Do the apprentices know the location, structure and duration of the intermediate examination?	<input type="checkbox"/>
	• Have the apprentices had the content of the intermediate examination explained to them?	<input type="checkbox"/>
	• Has the training subject matter for preparation for the examination been repeated and consolidated?	<input type="checkbox"/>
<input type="radio"/>		

**Check list 6:**

**What has to be observed with the registration for the final examination?**

<input type="radio"/>	• Have the apprentices been registered in time with the competent body for the final examination?	<input type="checkbox"/>
	• How are the apprentices prepared in-firm for the final examination?	<input type="checkbox"/>
	• Do the apprentices know the structure of the final examination (e.g. written, practical parts)?	<input type="checkbox"/>
	• Have the apprentices had the content of the final examination explained to them?	<input type="checkbox"/>
	• Has the training subject matter for preparation for the examination been repeated and consolidated?	<input type="checkbox"/>
	• Do the apprentices know the time, location, structure and duration of the final examination?	<input type="checkbox"/>
	• Check Narrative Report for completeness.	<input type="checkbox"/>
<input type="radio"/>		

## 2. Framework Curriculum for the vocational school instruction

### Framework curriculum

for the occupation requiring training of

Water Supply Engineering Technician

[Decision of the Conference of Culture Ministers of a 14 May 2002]

#### Part I: Preliminary remarks

This framework curriculum for the occupation related instruction of the vocational school has been decided by the permanent Conference of Culture Ministers and Senators of the [German] Federal States.

The framework curriculum is aligned with the appropriate federal vocational training regulations (promulgated by the German Federal Ministry of Economics and Technology or the otherwise responsible specialist ministry in mutual agreement with the German Federal Ministry of Education and Research. The process of coordination is regulated through the "Joint minutes dated 30 May 1972". The framework curriculum fundamentally builds on the German Certificate of Secondary Education (Hauptschulabschluss) and describes the minimum requirement.

With assigned occupations the framework curriculum is structured into an basic training spanning the combined occupational field and specialist training which builds on this.

On the basis of the vocational training regulations and of the framework training plan, which regulate the objectives and contents of the occupational training, the final qualification in an occupation requiring training as well as – joint with instruction in further subjects – the graduation from the vocational school are imparted.

With this, important prerequisites for a qualified employment as well as for the entry into educational and occupational advanced and further education courses are achieved.

The framework curriculum contains no methodical determinations for the instruction. Independent and responsibly conscious thought and action as global objective of the training is preferably communicated in such teaching forms, in which it is part of the overall methodical concept. With this, fundamentally every methodical procedure can contribute to the achievement of the aim. Methods which directly support the occupational capacity to act are particularly suitable and should therefore be suitably taken into account in the structuring of the teaching.

The [German] Federal States take over the framework curriculum directly or convert it into their own curriculum. In the second case they ensure that the result of the technical and temporal agreement with the respective vocational training regulations taken into account in the framework curriculum are retained.

#### Part II: Training contract of the vocational school

The vocational school and the training companies fulfil a common apprenticeship contract in the dual training occupational training.

With this, the vocational school is an independent place of learning. It functions as equal partner with those others involved in occupational training. It has the task of communicating occupational and general training teaching matter to the students taking particular account of the requirements of the occupational training.

The vocational school has basic and technical occupational training as the objective and expands the previously gained general education. With this, it wants to enable the fulfilment of the tasks in the occupation as well as helping to structure occupational life and society in social and ecological responsibility. Here it aligns itself in accordance with the regulations of the national educational law applicable for this type of school. In particular the occupation-related instruction orientates itself additionally to the resources of national standard occupational regulations officially recognised for each occupation requiring training:

- framework curriculum by the Permanent Conference of [German] Culture Ministers and Senators of the Federal States (KMK)

- vocational training regulations of the [German] Federal Government for in-firm training.

In accordance with the General Agreement on Vocational Schools (Decision of the KMK dated 15 March 1991) the vocational school has as objective:

- "to communicate an occupational ability which combines the specialist competence with general abilities of a humane and social type;

- to develop occupational flexibility for the mastery of the changing requirements of occupational life and society also with regard to the coalescence of Europe;

- to kindle the willingness for continuation and further occupational training;

- to encourage the ability and readiness to behave with a sense of responsibility with the creation of individual life styles and in public life."

To achieve these objectives the vocational school must

- align the teaching to a theory of education specific to its tasks, which emphasises action-orientation;

- to communicate interdisciplinary occupational and occupational field qualifications taking into account the required specialisation;

- to ensure a differentiated and flexible range of training in order to meet different abilities and talents as well as the respective requirements of occupational life and society;

- to support and encourage those who are handicapped or disadvantaged within the scope of their capabilities;
- to draw attention to the threats and dangers of accidents associated with the exercising of the occupation and with the private life style and to indicate possibilities for their avoidance or reduction.

In addition, the vocational school, as far as is possible within general instruction and within the scope of occupation-related instruction, is to go into the core problems of our time such as, for example:

- work and unemployment,
- peaceful coexistence of people, nations, and cultures in a world with the observance of cultural identity,
- maintenance of the basic elements of life and
- guarantee of human rights.

The listed objectives are aimed at the development of the occupational capacity to act. Here these are understood to be the willingness and ability of individuals to behave in social, occupational and private situations correctly, thoughtfully as well as individually and socially responsibly.

**Occupational capacity to act** develops into the dimensions of occupational competence, personal competence and social competence.

**Professional competence** stands for the willingness and ability, on the basis of technical knowledge and skills, to solve problems objective-oriented, appropriately, methodically and independently and to evaluate the results.

**Personal competence** stands for the willingness and ability, as individual personality, to clarify, to consider thoroughly and to assess the chances for development, the demands and the limitations; to develop one's own talents as well as to formulate and further develop schemes for life. It covers personal characteristics such as independence, critical faculty, self-assurance, reliability, responsibility and sense of duty. To this belongs in particular also the development of well-considered moral concepts and the self-determined commitment to values.

**Social competence** stands for the willingness and ability to live and form social relationships, to detect benefits and pressures, to understand others and to discuss rationally and responsibly with them and to advise them. To this belongs in particular also the development of social responsibility and solidarity.

**Competence in method and learning** grows from a balanced development of these three dimensions.

Competence stands for the success in learning with regard to the individual learner and his/her qualification for self-dependent dealings in private, occupational and social situations. In opposition to this, under qualification is to be understood the success in learning with regard to usability, i.e. from the aspect of the demand in private, occupational and social situations (comp. Deutscher Bildungsrat [German Central Advisory council for Education] Recommendations of the Education Commission for the Reorganisation of the Secondary Level II).

### Part III: Didactic principles

The objective of occupational training requires that the instruction is directed towards an education tailored to the tasks of the vocational school, which emphasises action-orientation and which enables young people independently to plan, execute and assess working tasks within the framework of their occupational activity.

Learning in the vocational school takes place fundamentally related to concrete occupational action as well as in a wide range of intellectual operations, also the intellectual comprehension of the actions of others. This learning is above all tied to the reflection of the execution of the action (of the action plan, of the procedure, of the results). With this mental inspiration of professional work the prerequisites are created for the learning within and outside work. This signifies for the framework curriculum that the description of the objectives and the selection of the content takes place related to the occupation.

On the basis of learning theoretical and didactic knowledge, in a practical approach for the formation of action-oriented instruction, the following orientation points are given:

- didactic reference points are situations which are significant for the exercising of the occupation (learning for action).
- the starting point of learning is formed by actions, as far as possible carried out or intellectually understood independently (learning by doing).
- actions must, as far as possible, be planned, executed, checked, if necessary corrected, and finally evaluated independently by those learning.
- actions should support a holistic comprehension of professional reality, e.g. include technical, security, economic, legal, ecological aspects.
- actions must be integrated into the experiences of those learning and must be reflected with regard to their social effects.
- actions are also to include social processes, e.g. declaration of interests or mastering of conflicts.

Action-oriented instruction is a didactic concept, which brings together systematic technical and activity structures. It can be realised through various teaching methods.

The range of instruction of the vocational school depends on young persons and adults who differ, according to previous education, cultural background and experiences from the firms carrying out training. The vocational school can only fulfil its apprenticeship contract when it takes account of these differences and encourages students – also those disadvantaged or particularly talented – according to their individual possibilities.

#### Part IV: Occupation-related preliminary remarks

The above framework curriculum for the occupational training of the Water Supply Engineering Technician is harmonised with the [German] Ordinance on Occupational Training in Environmental Engineering Occupations, dated 17 June 2002 (BGBl. No. 43, p. 2335).

For the examination area of economic and social science, important subject matter of the vocational school is communicated on the basis of "Elements for instruction of the vocational school in the field of economic and social science of commercial-technical occupations requiring training" (Decision of the Conference of Culture Ministers (KMK) dated 18 May 1984). The framework curriculum for the occupation requiring training, Environmental Technician (Decision of the KMK dated 20 August 1984), is rescinded.

The framework curriculum for the occupation requiring training, Water Supply Engineering Technician, was developed together with the framework curricula for the occupations requiring training, Sewage Engineering Technician, Recycling and Waste Management Technician and Pipe, Sewer and Industry Service Technician. In view of the scope of the common core qualifications, which are necessary for the pursuit of these occupations, the learning fields 1 to 6 (1st and 2nd Training Years) of these four framework curricula are identical and should be taught together.

Learning fields 7 to 14 are designed specifically for the occupation of Water Supply Engineering Technician. The communicating of mathematical knowledge takes place integrative in the appropriate learning field.

#### Part V: Learning fields

##### Summary of the learning fields for the occupation requiring training Water Supply Engineering Technician

Learning fields		Time guidance values		
Serial No.		1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year
1	Planning of an environmental concept	80		
2	Handling of micro-organisms	40		
3	Employ environmental chemicals	80		
4	Operate pipeline systems	80		
5	Examination of the content substances of water and waste		60	
6	Operate and maintain machines and installations		80	
7	Operate and maintain electrical plant		40	
8	Water winning		40	
9	Establish domestic connections		60	
10	Investigate water characteristics			40
11	Condition water			60
12	Connect electrical equipment			40
13	Deliver, store and distribute water			100
14	Control and regulate water supply facilities			40
Sum (in total 840)		280	280	280

**Learning Field 1:**

**1<sup>st</sup> Training Year**

**Planning of an environmental concept**

**Time guidance value: 80 hours**

**Formulation of the objective:**

Students design a concept for the operation of an environmental engineering concern. For this they collect information on material flows in environmental engineering systems and make themselves familiar with the method of function of supply and disposal facilities as well as of the pipe, sewer and industrial services. With their planning they take into account causes and results of environmental loading of the air, water and soil which originate from the facilities and determine

interactions with living creatures. They take into account possibilities for the avoidance and minimisation of environmental loads. With the concept development of work sharing they learn in a team, to plan, mutually process and jointly agree tasks. They apply information and communication systems to meet objectives, document results and evaluate these.

**Contents:**

- Eco-system
- Water cycle and water quality
- Water pollution: eutrophication, contamination, acidification
- Air pollution : soil pollution, biotope destruction
- Avoidance of wastes
- Development and function of wastewater disposal facilities
- Development and function of water supply facilities
- Development and function of recycling and waste management operations
- Development and function of facilities of pipe, sewer and industrial services
- Legal requirements, technical rules and standards
- Labour organisation
- Work place layout
- Use of information systems
- Data protection regulations
- Procurement of work equipment
- Accident prevention, labour protection

**Learning Field 2:****1<sup>st</sup> Training Year****Handling of micro-organisms****Time guidance value: 40 hours****Formulation of the objective:**

Students create suitable living conditions for micro-organisms and can employ micro-organisms for the conversion of matter in systems. They are made aware which hazards for their personal health and also

for the health of the population emanate from micro-organisms. They are in a position to take hygienic measures in practice and to combat pathogenic micro-organisms.

**Contents:**

- Structure, types and characteristics of micro-organisms
- Conditions for life and resistance of micro-organisms
- Significance of micro-organisms for environmental engineering occupations
- Material cycles
- Hazards due to micro-organisms: viruses, bacteria, fungi, animal parasites
- Hygiene measures
- Vaccinations
- Identification of micro-organisms
- Prevention of accidents and protection against accidents
- Work safety



**Learning Field 3:**  
**Employ environmental chemicals****1<sup>st</sup> Training Year****Time guidance value: 80 hours****Formulation of the objective:**

Students plan the employment of environmental chemicals for the conditioning of water, industrial treatment, wastewater and waste disposal. They know the properties and the build-up of these substances and assess the danger of the reaction. Students arrange the working materials and hazardous materials into hazard classes and carry out deliberate measures for disposal. They store and pack hazardous sub-

stances correctly and know the legal basis for the transport of hazardous goods. They identify the effects of hazardous substances and take suitable protective measures. The students participate with the production of operational instructions for the handling of hazardous materials and can react suitable to hazardous situations in the firm.

- Contents:
- Mixtures of substances
  - Material structure and properties
  - Precipitation, acidic, base and Redox reactions
  - Classes of substances
  - Stoichiometric calculations
  - Temperature, conductivity, pH value, oxygen
  - Mass, volume, density
  - Classification of hazardous substances
  - Creation of hazardous substances
  - Handling of hazardous substances
  - Disruption of operational procedures due to hazardous substances
  - Dangerous chemical reactions
  - Disposal of hazardous substances
  - Storage, packaging of hazardous substances
  - Transport of dangerous goods
  - Operating instructions
  - Accident prevention, labour protection

## Learning Field 4: Operate pipeline systems

1<sup>st</sup> Training Year

Time guidance value: 80 hours

### Formulation of the objective:

Students read pipeline plans and complete sketches. They notionally carry through the production of pipeline sections. The students plan the installation of fittings and conveyance facilities and, taking account of the medium to be transported, select the required materials and sealing materials. Here they carry out calculations on pipeline systems and produce material lists. They employ processes for the sealing of pipeline components with the production of pipeline systems taking

into account the different materials and ancillaries and the technical process conditions. Students take measurements and explain the methods of converting, transferring and processing of measured values. They evaluate the measurements taken and introduce measures for the correction of defects. Students decide upon the employment of control and regulating facilities.

- Contents:
- Pipelines, fittings, seals
  - Pipe and hose connections
  - Pipeline plans, basic-, process and RI flow diagrams
  - Markings of pipes and fittings
  - Linear expansion, mass and volume flow calculations
  - Pressure loss in pipelines
  - Characteristics of materials
  - Working materials and ancillaries
  - Corrosion and corrosion protection
  - Temperature, pressure, filling level, volume and flow measurement methods
  - Transducers
  - Standard signals
  - Connection handler and stored-program control
  - Continuous and discontinuous controllers, control cycles
  - Legal provisions, sets of technical rules and standards
  - Accident prevention, labour protection

**Learning Field 5:**  
**Examination of the content substances of water and waste**

**2<sup>nd</sup> Training Year**

**Time guidance value: 60 hours**

**Formulation of the objective:**

For selected conditions, students carry out preparation and sampling as well as the conservation and transport of samples according to the applicable regulations. They verify qualitatively important content substances of water and waste. They carry out simple quantitative determi-

nations check the results for plausibility, interpret and document these. They are aware of the effects of analysis results on the progress of processes and can introduce measures for process optimisation.

**Contents:**

- Sampling
- Sensor values
- Physical parameters
- Individual, group and summation parameters
- Laboratory equipment
- Qualitative determination of relevant cations and anions
- Quantitative determination, volumetric, gravimetric, instrumental
- Operating logbooks, performance picture
- Accident prevention and protection against accidents
- Work safety
- Accuracy
- Accident prevention, labour protection

**Learning Field 6:****2<sup>nd</sup> Training Year****Operate and maintain machines and installations****Time guidance value: 80 hours****Formulation of the objective:**

Students operate various mechanical installations and decide upon employment to meet the situation whereby they understand the functional principle of the machines. With the aid of instructions they can carry out the inspection and servicing of mechanical installations typical for their occupation. The inspection and servicing tasks are documented with the aid of the application of current ancillaries. They ascertain the causes of operating faults with the help of technical drawings and instructions. With all activities they apply current knowledge of technical environmental protection. They plan the environmentally friendly

storage and disposal of the operating resources for the machines and take part actively in decisions on the disposition of consumable materials. Students know the methods for bringing together and separating of substances and can describe and differentiate these according to their function. They are in a position to employ solid, liquid and gaseous energy carriers and electrical energy correctly taking into account the operating conditions. Students use their knowledge of basic electrical parameters for the selection of electrical facilities. Here they take note of the hazards of electrical current and take protective measures.

**Contents:**

- Electrical motors and combustion engines
- Pumps, blowers and compressors
- Selection, employment and application of work equipment
- Assembly and dismantling of operational facilities
- Maintenance of operational facilities, card files, protocols
- Lifting equipment and transport facilities
- Storage and disposition
- Avoidance and/or minimisation of environmental loads due to operating equipment
- Technical documents
- Bringing together and separation of substances
- Energy carriers
- Equipment for heating and cooling
- Basic electrical parameters
- Voltage generators, transformers and motors
- Protective measures, conduct with accidents due to electrical current
- Responsibility
- Prevention of accidents and protection against accidents
- Work safety

**Learning Field 7:**

**2<sup>nd</sup> Training Year**

**Operate and maintain electrical plant**

**Time guidance value: 40 hours**

**Formulation of the objective:**

Students operate electrical plant. For this they read circuit diagrams, make sketches measure electrical parameters and evaluate the measured values. They check safety installations and with faults take steps for the correction of the fault. They recognise the effects of electrical

current and are aware of the dangers which emanate from electrical plant. They make themselves familiar with VDE (Association of German Engineers) Regulations and take measures for the protection of persons and facilities.

**Contents:**

- Effect and dangers of electrical current
- Safety rules
- Symbolic representation
- Circuit diagrams
- Direct, alternating and three-phase current
- Capacitance, inductance
- Protective measures with and without protective ground wiring
- Network configurations
- Measurement of voltage, measurement of current
- Legal provisions, sets of technical rules and standards, e.g. VDE (Association of German Engineers) 0100
- Accident prevention, labour safety

## Learning Field 8:

2<sup>nd</sup> Training Year

## Water winning

Time guidance value: 40 hours

**Formulation of the objective:**

Students produce a concept for the extraction of raw water, whereby they take into account water protective areas and drinking water protective zones. Based on the water resources they select a method of water extraction and are in a position, within team discussions, to justify the selection.

With the selection of the method of water extraction they are aware of the ecological results of a water extraction. Students differentiate facilities for water extraction according to design and function and can operate and maintain selected plant types.

## Contents:

- Water management
- Water protective areas
- Water extraction processes
- Protective measure for water resources
- Facilities for water extraction

**Learning Field 9:**  
**Establish domestic connections**

**2<sup>nd</sup> Training Year**

**Time guidance value: 60 hours**

**Formulation of the objective:**

Taking into consideration the conditions for the supply of water, students plan the setting up of a domestic connection. Following an analysis of the domestic network and discussions with the customers they are able to produce a connection to the public water supply pipeline and take measures for the protection of the public water network. For the carrying out of the installation tasks for the installation of water

metering facilities they produce material lists for the planning of work. In discussions with customers they are in a position to present the significance of drinking water as nourishment. Students are aware of the significance of contact with customers for economic success of the company and utilise the direct contact with customers for consultation and the winning over/retention of consumers.

- Contents:
- Technical communication
  - Tabular calculation
  - Public water connection
  - Build up of a domestic network
  - Components of domestic installations
  - Carrying out of discussions
  - Advertising means
  - Customer advice
  - Combination facilities
  - Legal provisions, technical rules
  - Accident prevention, work safety

**Learning Field 10:****3<sup>rd</sup> Training Year****Investigate water characteristics****Time guidance value: 40 hours****Formulation of the objective:**

Students take samples of raw and drinking water, prepare these and produce sample protocols. They examine the samples for parameters specified in legal provisions and draw conclusions from the results of

examinations for the process control of drinking water conditioning as well as the assessment of drinking water quality.

**Contents:**

- Sampling
- Types of water
- Bioindicators
- Organic and inorganic water content substances
- Colorimetry, photometry, titrimetry, electrometry
- Organoleptic investigations
- Protocols
- Accuracy, purity
- Legal provisions, technical rules and standards
- Accident prevention, work safety



**Learning Field 11:**

**3<sup>rd</sup> Training Year**

**Condition water**

**Time guidance value: 60 hours**

**Formulation of the objective:**

Students use the results of the examination of water in order to carry out measures for the reduction or removal of water content substances. Here they observe the legal quality requirements for the quality of drinking water and justify their necessity. For the conditioning of drinking water, in compliance with technical rules they select suitable

processes and describe the method of function of water conditioning installations. With the aid of operating documents they can operate water conditioning facilities and carry out monitoring, servicing and maintenance tasks. Students select recycling or disposal processes from the aspect of economical and ecological aspects.

**Contents:**

- Water quality requirements
- Water content substance
- Water properties
- Water conditioning processes
- Water conditioning installations
- Operating logbook
- Residual matter
- Trickle filter and biological contactor processes
- Legal provisions, technical rules
- Sense of responsibility
- Accident prevention, work safety

**Learning Field 12:****3<sup>rd</sup> Training Year****Connect electrical equipment****Time guidance value: 40 hours****Formulation of the objective:**

Students read circuit diagrams separate electrical equipment from the mains network, carry out maintenance tasks and reconnect the equipment observing the safety rules. With faults in electrical systems they carry out measurements in accordance with VDE directives, evaluate the measured values, identify operating faults and attend to their

correction. They are able to replace defective components selecting suitable material. Students are aware of the responsibility which they take on through work on electrical installations. They apply the regulations for electrical explosion protection.

- Contents:
- Connecting and disconnecting electrical motors and pumps
  - Types of connection
  - Torque behaviour
  - Performance plate
  - Starting switch gear
  - Terminal board
  - Types of motor and performance  
e.g. shunt motor, inverse-speed motor, alternating current universal motor, three-phase asynchronous motor
  - Exchange of electrical components  
e.g. fluorescent lamps, cables, switches, fuses, contactors, standby generators
  - Measurements, measured results, operating faults
  - Test protocols
  - Legal provisions, technical sets of rules and standards e.g. VDE 0100
  - Accident prevention, work safety

**Learning Field 13:**

**3<sup>rd</sup> Training Year**

**Deliver, store and distribute water**

**Time guidance value: 100 hours**

**Formulation of the objective:**

Students structure the necessary activities for the operation of water storage facilities, carry out calculations on size and structure of water containers and organise legally required controls. For water distribution they select the construction and working materials and use planning documents for the organisation of maintenance tasks in different pipe network systems, and can carry out and document these. Students

obtain an overview of the excavation work required for the pipe laying. Measures for the commissioning of pipelines can be organised and implemented by them. With all activities they use the possibilities of teamwork, in that they obtain information from specialist colleagues and commission for activities outside their specialist area.

**Contents:**

- Organisation of work
- Technical communication
- Requirement for water
- Construction and working materials, ancillaries
- Corrosion protection
- Pumps
- Water containers
- Pipe network systems
- Pipe network plans
- Pipeline construction
- Pipe network operation
- Rehabilitation methods
- Excavation works
- Security of construction sites
- Storekeeping
- Servicing plans
- Legal provisions, technical rules
- Work safety, accident prevention

**Learning Field 14:****3<sup>rd</sup> Training Year****Control and regulate water supply facilities****Time guidance value: 40 hours****Formulation of the objective:**

Students simulate the control of a water supply network as well as the technical installations for the extraction and conditioning of water. For this the control and regulation systems are analysed and the effects of

changes in the operating case are evaluated. They identify faults which occur during process control and remove their causes. The students discuss the results of work and document these in a field report.

**Contents:**

- Simulation models
- Control principles
- Measuring, control and regulation facilities
- Process control systems
- Documentation

### 3. Literature/Training materials

#### Specialist books

- **Handbuch für Umwelttechnische Berufe (Ver- und Entsorger)**  
[Handbook for Environmental Engineering Occupations  
(Environmental Technician)]  
Hirhammer Verlag München  
Vol. 1: Grundlagen für alle Fachrichtungen [Basics for all specialisations], ISBN 3-88721-071-9

Vol. 2: Wasserversorgung [Water supply],  
ISBN 3-88271-072-7

Vol. 3: Abwasser [Sewage]  
ISBN 3-88721-073-5

Vol. 4: Kreislauf- und Abfallwirtschaft  
[Recycling and waste management]  
ISBN 3-88721-074-3

- Damrath, H.  
**Wasserversorgung**  
[Water supply]  
ISBN 3-519152495  
B.G. Teubner Verlag

- Mutschmann, Stimmelmayer  
**Taschenbuch der Wasserversorgung**  
[Handbook of water supply]  
ISBN 3-528225548  
Vieweg Verlag

- Grombach, P. Haberer, K., Merkl, G. u.a.  
**Handbuch der Wasserversorgungstechnik**  
[Handbook of water supply technology]  
ISBN 3-486-26394-3  
R. Oldenbourg Verlag, München

- Bieske, Erich, Rubbert, Wilhelm, Treskatis, Christoph  
**Bohrbrunnen**  
[Drilled wells]  
ISBN 3-486-26388-9  
R. Oldenbourg Verlag, München

- Grupe, Albrecht und Selent, Klaus-Dieter (Publishers)  
**Die Probenahme von Wasser**  
[Sampling of water]  
ISBN 3-486-26413-3  
R. Oldenbourg Verlag, München

- Krischy, Rainer  
**Desinfektion von Trinkwasser**  
[Disinfection of drinking water]  
R. Oldenbourg Verlag, München

- Schulze, Dieter  
**Der Wasserspeicherung: Planung, Bau und Betrieb von Erdbehältern**  
[Water storage: Planning, construction and operation of ground tanks]  
ISBN 3-8027-5506-5  
Vulkan-Verlag

- Erb, Heinz G.  
**Durchflussmesstechnik für die Wasser- und Abwasserwirtschaft**  
[Flow measurement technology for the water and wastewater industry]  
ISBN 3-8027-2177-2  
Vulkan-Verlag

- Seyfarth, Rolf und Soiné, Klaus J.  
**Kleines Lexicon zur Trinkwasserbeschaffenheit**  
[Small lexicon on the nature of drinking water]  
ISBN 3-486-26474-5  
R. Oldenbourg Verlag

- DVGW German Technical and Scientific Association for Gas and Water (Publisher)  
**Maschinelle und elektrische Anlagen in Wasserwerken**  
[Mechanical and electrical plant in waterworks]  
ISBN 3-486-26339-0  
R. Oldenbourg Verlag

- Brien J.  
**Praktische Wassermengenmessung**  
[Practical measurement of water quantities]  
ISBN 3-8127-2836-X  
R. Oldenbourg Verlag

- Forschungs- und Entwicklungsinstitut für Industrie- und Siedlungswasserwirtschaft sowie Abfallwirtschaft e.V., Stuttgart (Publisher)  
**Schutz und Aufbereitung von Grundwasser**  
[Protection and conditioning of groundwater]:  
**Trinkwasserkolloquium am 22. February 1990**  
ISBN 3-486-26129-0  
R. Oldenbourg Verlag

- DVGW German Technical and Scientific Association for Gas and Water (Publisher)  
**Wasserverwendung/Trinkwasser-Installation**  
[Water usage/drinking water installation]  
ISBN 3-486-26390-0  
R. Oldenbourg Verlag

- DVGW German Technical and Scientific Association for Gas and Water (Publisher)  
**Wassergewinnung und Wasserwirtschaft**  
[Water extraction and water management]  
ISBN 3-486-26123-1  
R. Oldenbourg Verlag

- DVGW German Technical and Scientific Association for Gas and Water (Publisher)

**Praxis der Wasserversorgung**  
[Practice of water supply]  
wvgw Verlag

- Rott  
**Wasserversorgungsanlagen**  
[Water supply facilities]:  
**12. Trinkwasserkolloquium**  
ISBN 3-486-26424-9  
R. Oldenbourg Verlag

#### Additional training media and materials

- **Ausbildung und Beruf**  
[Training and occupation]  
Rights and responsibilities during occupational training inter alia  
German Federal Ministry of Education and Research  
[www.bmbf.bund.de](http://www.bmbf.bund.de)
- **KURS** – The database for training and further training of the  
German Employment office  
[www.arbeitsagentur.de](http://www.arbeitsagentur.de)
- **Federal Institute for Vocational Education and Training (BIBB)**  
annually issues the handbook "Lieferbare Veröffentlichungen  
[Deliverable publications]" in which comprehensive material on all  
subjects of occupational training are to be found. This summary  
which also appears as a CD-Rom can be obtained directly from the  
BIBB.  
[www.bibb.de](http://www.bibb.de)

#### **foraus.de: the virtual BIBB Forum for Training Personnel**

The Federal Institute for Vocational Education and Training (BIBB), together with Thinkhouse GmbH has developed a forum in the internet under the address: [www.foraus.de](http://www.foraus.de).

foraus.de offers its visitors not only information, an instructors' library and online further training. With membership (free registration) in foraus.de, in addition to a personalised communication platform there are available many additional functions for discussion, research and exchange of experiences. Furthermore, one is informed per E-mail on the latest developments in the field of vocational training and on current events in foraus.de.

## 4. Addresses

■ **ver.di – Vereinte Dienstleistungsgewerkschaft**  
[United Services Union]

Bundesverwaltung  
Paula-Thiede-Ufer 10  
D-10179 Berlin  
Tel.: +49 (0) 30/69 56-0  
Fax: +49 (0) 30/69 56-39 56  
Internet: [www.verdi.de](http://www.verdi.de)  
E-mail: [info@verdi.de](mailto:info@verdi.de)

■ **Deutsche Vereinigung des Gas- und Wasserfaches e.V.**  
(DVGW)  
[German Technical and Scientific Association for Gas and Water] (DVGW)

Josef-Wirmer-Straße 1-3  
D-52123 Bonn  
Tel.: +49 (0) 2 28/91 88-5  
Fax: +49 (0) 2 28/91 88-9 90  
[www.dvgw.de](http://www.dvgw.de)  
E-mail: [bbw@dvgw.de](mailto:bbw@dvgw.de)

■ **Bundesinstitut für Berufsbildung**  
[Federal Institute for Vocational Education and Training]  
(BIBB)

Robert-Schuman-Platz 3  
D-53175 Bonn  
Internet: [www.bibb.de](http://www.bibb.de)  
E-mail: [zentrale@bibb.de](mailto:zentrale@bibb.de)

■ **Bundesministerium für Bildung und Forschung [Federal Ministry of Education and Research] (BMBF)**

Heinemannstr. 2  
D-53175 Bonn  
Tel.: +49 (0) 18 88/57 -0  
Fax: +49 (0) 18 88/57-36 01  
Internet: [www.bmbf.bund.de](http://www.bmbf.bund.de)  
E-mail: [information@bmbf.bund.de](mailto:information@bmbf.bund.de)

■ **Bundesministerium für Wirtschaft und Technologie [Federal Ministry of Economics and Technology] (BMWi)**

Scharnhorststr. 34-37  
D-10115 Berlin  
Villemombler Str. 76  
D-53123 Bonn  
Tel.: +49 (0) 18 88/61-50  
Fax: +49 (0) 18 88/57-36 01  
Internet: [www.bmwi.bund.de](http://www.bmwi.bund.de)  
E-mail: [info@bmwi.bund.de](mailto:info@bmwi.bund.de)

■ **Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit [Federal Ministry for the Environment, Nature Conservation and Nuclear Safety] (BMU)**

Alexanderplatz 6  
D-10178 Berlin  
Tel.: +49 (0) 30/18 305-0  
Fax: +49 (0) 30/18 305-4375  
Robert-Schuman-Platz 3  
D-53175 Bonn  
Tel.: +49 (0) 2 28/99 305-0  
Fax: +49 (0) 2 28/99 305-3225  
Internet: [www.bmu.bund.de](http://www.bmu.bund.de)  
E-mail: [info@bmu.bund.de](mailto:info@bmu.bund.de)

■ **Sekretariat der Ständigen Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland [Secretariat of the Permanent Conference of the Culture Ministers of the Federal States of the Federal Republic of Germany] (KMK)**

Lennéstr. 6  
D-53113 Bonn  
Tel.: +49 (0) 2 28/5 01-0  
Fax: +49 (0) 2 28/5 01-7 77  
Internet: [www.kmk.org](http://www.kmk.org)  
E-mail: [berufsbildung@kmk.org](mailto:berufsbildung@kmk.org)

**Competent bodies**

For the occupational training in environmental occupations

■ **Baden-Württemberg**

Regierungspräsidium Karlsruhe  
Referat 12d  
D-76247 Karlsruhe  
E-mail: poststelle@rpk.bwl.de

■ **Bayern**

Bayerische Verwaltungsschule (BVS)  
Ridlerstraße 75  
D-80339 München  
E-mail: info@bvs.de

■ **Berlin**

Senatsverwaltung für Inneres und Sport  
ZS B11MO  
Klosterstraße 47  
D-10179 Berlin  
E-mail: poststelle@sennin.sport.berlin.de

■ **Freie Hansestadt Bremen**

Der Senator für Finanzen - 33/6 -  
Doventorscontrescarpe 172, Block B  
D-28195 Bremen  
E-mail: office@finanzen.bremen.de

■ **Freie und Hansestadt Hamburg**

Senat der Freien und Hansestadt  
Hamburg  
Zentrum für Aus- und Weiterbildung  
zuständige Stelle nach § 73 Berufsbildungsgesetz  
Steckelhörn 12 (Gotenhof)  
D-20457 Hamburg  
E-mail: poststelle@personalamt.hamburg.de

■ **Niedersachsen**

Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und  
Naturschutz (NLWKN)  
Zuständige Stelle für die Berufsbildung  
An der Scharlake 39  
D-31135 Hildesheim  
E-mail: poststelle@nlwkn-hi.niedersachsen.de

■ **Nordrhein-Westfalen**

Bezirksregierung Düsseldorf  
Postfach 30 08 65  
D-40408 Düsseldorf  
E-mail: poststelle@bezreg-duesseldorf.nrw.de

■ **Rheinland-Pfalz**

Aufsichts- und Dienstleistungsdirektion  
Zuständige Stelle – Ref. 12  
Willy-Brandt-Platz 3  
D-54290 Trier  
E-mail: poststelle@add.rlp.de

■ **Saarland**

Ministerium für Umwelt  
Referat A3  
Keplerstraße 18  
D-66119 Saarbrücken  
E-mail: poststelle@umwelt.saarland.de

■ **Sachsen**

Regierungspräsidium Leipzig  
Referat 12  
Braustraße 2  
D-04107 Leipzig  
E-mail: poststelle@rpl.sachsen.de

■ **Schleswig-Holstein**

Verwaltungsakademie Bordesholm  
Heintzestraße 13  
D-24582 Bordesholm  
E-mail: fortbildung@vab-sh.de

■ **Thüringen**

Thüringer Landesverwaltungsamt  
Referat 420  
Postfach 22 49  
D-94403 Weimar  
E-mail: poststelle@tlvwa.thueringen.de



