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Guideline for examinations

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Structure

Structure of an examination

Qualification of the examiners

Types of questions

Criteria concerning the design of an examination

Structure of an examination

Definition of examination

- A detailed inspection or analysis of a person.
- With the aim to determine the ability of a student or a prospective practitioner.
- Usually written tests, although some may be partly oral or have practical components.
- A person who passes an examination receives a diploma or licence, depending on the examination's objectives.

→ The examination procedure should guarantee that the exam is carried out in a transparent and non-discriminatory fashion, without any conflict of interest.

Structure of an examination

An examination for future train drivers consists of

- **Theoretical component:**
  - Assessment of the knowledge in all the different topics that are necessary for train driving.
  - Applied in a written and/or oral manner.
  - In case of an examination for receiving a driver licence the written form is more common, sometimes complemented by an additional oral part.
- **Practical component:**
  - Assessment of the performance of the train driver in normal service in real traffic or in abnormal and irregular situations in simulated operation using a simulator.

Structure of an examination

Overview of the procedures of the examination for train drivers

→ *Table 1*

Qualification of the examiners

Definition of examiner

- **A specialist who examines students / trainees by a written test, oral test, and / or by a practical test.**
- **A train driver who passes all required tests gets his driving licence.**

For a good examination practice it is absolutely necessary that the responsible examiners comply with some crucial requirements.

This refers to all fields of knowledge relevant for future train drivers, i.e.

- **Technical equipment**
- **Operating procedures**
- **Educational issues**
- **Licensing procedures**

Qualification of the examiners

Overview of the requirements for the examiners of train drivers

→ ***Table 2***

Overview of the fields of knowledge and expertise of the examiners

→ ***Table 3***

Qualification of the examiners

Summary

- **Some kind of common sense in the different countries concerning the requirements for and the expertise of the examiners.**
- **The fields of knowledge and expertise required are basically very similar.**
- **Different national and company regulations that lead to different requirements concerning the basic personal conditions and the educational background.**
- **All the railway companies demand knowledge in the following topics:**
  - Safety-critical equipment
  - Configuration, method of operation, and dangers of traction current supply
  - Labour, health, fire, environmental, and disaster protection
  - Educational science and psychological aspects of examinations
  - Capability of holding examinations for their field of expertise with regard to the method and subject
- **Differences**
  - Service behaviour towards customers is examined by a second special examiner at CD and PKP.
  - Educational issues are not specifically required from the trainers of ÖBB.

Types of questions

Closed ended questions

- Limit the respondents' answers to a fixed set of responses.

Open ended questions (free-response questions)

- Suggest no options or predefined categories.
- Generally require subjects to produce written responses.

Types of questions

Closed ended questions

- **Dichotomous questions:**
  - The respondent has to decide which answer out of two alternatives is correct (e.g. “yes” vs. “no”, “false” vs. “correct”).

The pressure in the main brake pipe is in normal circumstances and the brakes released (Make the right choice and mark with X!):
O 5 bar
O 9 bar

Types of questions

- **Multiple choice questions:**
  - The test provides several possible answers (usually four or five) from which the respondents must choose.
  - There is one right answer, usually represented by only one answer option, though sometimes divided into two or more, all of which respondents must identify correctly.

The through-brake cock is filling the brake cylinder (Make the right choice and mark with X!):
O with compressed air from the main air reservoir
O by means of the brake distributor
O on a pressure of 9 bar maximum
O on a various pressure, regulated by the through-brake cock

Types of questions

- **Classification:**
  - The elements of a group (terms, sentences, graphs, etc.) have to be assigned to the proper elements of another group.

Positions of the lever of the drivers automatic brake valve and the effect to the main brake pipe. Fill in the designation:

O Emergency braking position

O Filling

O Holding position

O Release position

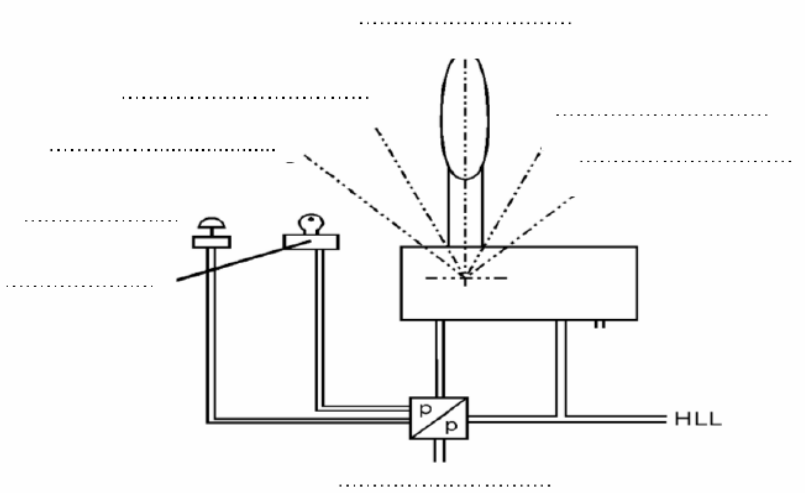
O Service braking position

O Equalisation button

O Lock

O Main air pipe

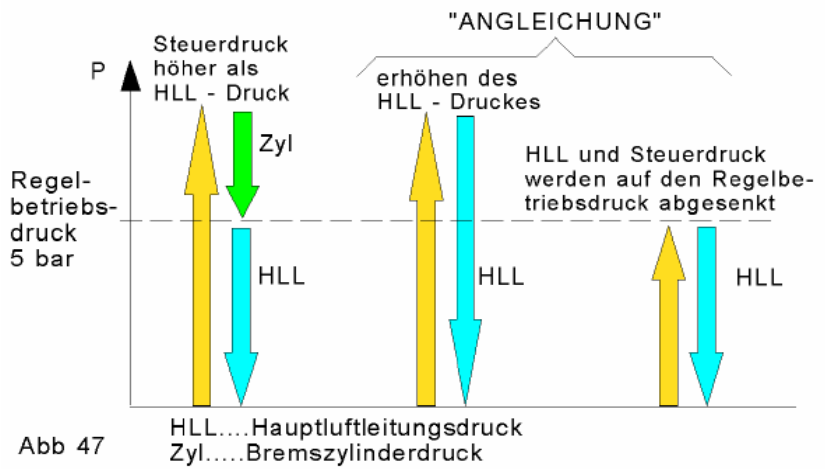
O Main reservoir pipe



Types of questions

- **Sequence:**
  - The respondent has to rearrange elements (terms, sentences, graphs, etc.) in the correct order.

Pressure adaption. Removal too much pressure in the distributer valve. Describe the process of adaption after an overloaded brake:



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Bring in correct order:

O MAPP and control pressure reduced to the normal working pressure

O Controll pressure higher than MAPP

O Increasing the MAPP

1.

2.

3.

Types of questions

- **Stepped answer:**
  - ➢ On the basis of a scale the respondent has to indicate to what extent a statement is correct or not.
  - → This type of question is not relevant for knowledge tests and exams.

Types of questions

Open-ended questions

- **Sentence completion:**
  - Respondents have to complete an incomplete sentence.
  - The length of the written response is usually as short as a single word or mathematical expression

Which kind of electro pneumatic brakes do you know?
O .....
O .....

Types of questions

- **Short essay:**
  - Respondents write the answer free and completely unstructured.
  - This question type may require the writing of an essay or a scientific proof or solution

Please describe the function of the automatic continuous air brake:

.....

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.....

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.....

.....

Types of questions

Advantages and disadvantages of different question types

	Advantages	*Disadvantages*
Dichotomous	Easy to design Ease and objectivity of assessment	Chance for correct answer is 50%
Multiple choice	Ease and objectivity of assessment	Development of distractors could be difficult
Classification	Ease and objectivity of assessment	Construction could be difficult
Sequence	Ease and objectivity of assessment	Construction could be difficult
Stepped answer	(inappropriate for knowledge test)	
Sentence completion	Recall of knowledge can be tested	Examiner could influence interpretation of assessment
Short essay	Recall and understanding of complex knowledge can be tested	Examiner could influence interpretation of assessment

Design criteria for examinations

General

- Theoretical and practical component.
- Theoretical component should consist of a written test that can be supplemented by an oral test.
- Practical component after passing theoretical test.
- Practical component should be carried out using driving tests on the rail network.
- If available, simulators should complete the practical assessment, especially concerning the examination of operational rules and the performance of the train driver in difficult and infrequent situations.

Design criteria for examinations

Theoretical component

- **Content**
  - Check of knowledge, comprehension, application and attitudes.
  - Closed and open ended questions.
  - Transfer tasks that ask for the correct behaviour in realistic situations.
- **Criterion-referenced assessment**
  - Candidates are measured against defined (and objective) criteria.
  - The performance standard is defined by the pool of tasks.
  - This pool has to reflect all competencies that are necessary for train driving.
  - Questions reflect all knowledge areas (technique, rules and regulations, etc.) and all levels of learning (knowing, understanding, and applying).
  - Normally, criterion-referenced tests require scores of more than 90%.

Design criteria for examinations

- **Psychometric properties: validity, reliability, objectivity**
  - A valid assessment is one which measures what it is intended to measure.
    - For example, it would not be valid to assess the competence of being a train driver by only asking questions that address technical knowledge.
  - Reliability relates to the consistency of an assessment.
    - A reliable assessment is one which consistently achieves the same results with the same student(s).
    - Various factors affect reliability – including ambiguous questions, too many options within a question, and vague instructions.
  - Objectivity is the extent to which the assessment and the interpretation of the results are independent of the assessor and the setting.
    - Standardised assessment tools (e.g. questionnaires and checklists)
    - Comprehensive training of the examiners including a standardised interpretation.
  - Furthermore
    - Application of safety-relevant questions should be considered.
    - Knock-out criterion

Design criteria for examinations

- **Multiple choice questions**
  - Distracters have to be developed and formulated carefully.
    - Distracters should not be apparently false.
    - Distracters should be as long as the correct response option.
    - Position of the correct response option(s) should vary from question to question.
  - Wording should be as simple as possible.
    - Clear
    - Non ambiguous
    - Familiar language

Design criteria for examinations

Computer based methods for theoretical component

- **Effectiveness of a test can be increased.**
  - The process of testing and the analysis of the test result will become automated, very economical and more objective.
  - By item analysis, studies on the prognostic validity and group based analysis a formative and summative evaluation is possible.
- **Innovative formats of test questions**
  - Realistic, dynamic situations and tasks from the driver's perspective by video or computer animation.
  - Testing of additional competences that are relevant for being a safe and professional train driver (e.g. situational awareness).

Design criteria for examinations

Simulators for practical component

- **Performance assessment by using simulation has several benefits**
  - Wide range of situations including degraded and abnormal operational conditions.
  - Events that cannot be realised in reality (e.g. equipment failures) and occur very rarely.
  - Repeatable, controllable and consistent presentation of situations (identical testing scenario for different trainees).
  - Subjective ratings by the instructor can be complemented with objective data from the simulation.

→ **An examination drive in the simulator should not substitute the practical test in real traffic but it is an adequate method to complement and expand it.**