

BG Instructions
(Berufsgenossenschaftliche Informationen)
for Occupational Safety
and Health

BG-Instruction

Selection and Operation of Builders Hoists for the Construction Industry

May 2002

[Image] The Professional Associations
of the Construction Industry

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Professional Association Instructions (Berufsgenossenschaftliche Informationen, BG-Informationen, BGI) contain suggestions and recommendations, which should facilitate the application of regulations and rules to specific areas and circumstances.

Preliminary Remark

BG Instructions are primarily addressed to employers and should assist them with the implementation of the statutory occupational health and safety regulations, the accident prevention regulations, and highlight ways to avoid occupational accidents, occupational illnesses and work-related health hazards.

By observing the recommendations contained in these BG Instructions, particularly the exemplary proposals, employers can assume that they have achieved the protection goals of the accident prevention regulations and rules. Other solutions may be possible, if safety and health protection are similarly guaranteed. Should technical rules for statutory occupational health and safety regulations be established by committees arranged for that purpose, those rules shall have precedence.

The builders hoist should not replace the faster moving lift in the conveyance of persons and loads, but provide a mechanical unit to replace scaffolding, and relieve employees of the burdensome duty of transporting materials via ladders and stairs.

With an effort that is justifiable and safety-related, the pressing ergonomic points of view, as well as the economic aspects, can be realised.

1 Scope

This BG Instruction applies to the selection and operation of builders hoists, which are so designed that they not only make programmed stops, but can also be halted at user-defined locations; as highly-variable workstations, they serve to carry materials, and can transport persons to worksites.

2 Terms and Definitions

2.1 In this BG Instruction, builders hoists are special, power-driven, mast-guided climbing platforms with enclosure, in operation on construction sites, anchored to structures, and which move upward and downward.

As a highly-variable workstations, builders hoists serve to transport materials, and to transport persons to worksites. The stopping points are neither limited in number, nor their heights restricted by the controls.

2.2 In this BG Instruction, "stopping points" are locations at which the platform is halted.

2.3 In this BG Instruction, "loading areas" are stopping points for loading and unloading.

2.4 In this BG Instruction, "access points" are loading areas where, for the normal purposes of loading and unloading, components of the hoist enclosure, or of loading-area safeguards, are open to allow persons access.

3 General Requirements

At the time of this writing, no harmonised European standard exists for builders hoists. Standards for the design, construction and operation of builder hoists essentially result from the Equipment Safety Code (Gerätesicherheitsgesetz, GSG), and from the 9th Ordinance (Neunte Verordnung) of the Equipment Safety Code-Machinery Ordinance (Maschinenverordnung). The European Standard DIN EN 1495 for the construction and fitting of mast-guided climbing platforms, for use as highly-variable workstations with a single access point, contains regulations which are comparable, and in parts applicable, to builders hoists. Specifically, the Labour-Protection Law (Arbeitsschutzgesetz, ArbSchG) and the Work Equipment Ordinance (Arbeitsmittelbenutzungsverordnung, AMBV), contain regulations for the operation of builder hoists.

Existing national standards and technical specifications, which are considered important or helpful for the proper implementation of the fundamental safety and health requirements in accordance with Annex 1 of the Machinery Directive 98/37/EG, are listed in Annex 2 of this BG Instruction.

4 Selection and Operation of Builders Hoists

4.1 Preface

4.1.1 The employer shall identify hazards related to construction sites and determine the necessary means for the protection of the safety and health of the workers.

4.1.2 When providing and operating a builders hoist, the employer must observe the Work Equipment Ordinance, particularly section 4, clause 4.

4.1.3 The employer may only select builders hoists which are in accordance with the Machinery Ordinance.

Annex 1 of this BG Instruction lists sample solutions for meeting the fundamental safety and health requirements of Annex 1 of the Machinery Directive.

4.1.4 The employer may only operate builders hoists after their conformance with the Machinery Directive has been documented by an EG Declaration of Conformity, and an EC Mark.

Due to the dangers of falls of persons from a height of more than 3 meters, builders hoists fall under Annex IV of the Machinery Directive. Since there is currently no relevant, harmonised European standard corresponding to article 5, clause 2, an EG-type examination, according to Annex VI of the Machinery Directive, is to be performed before a builders hoist is put into service. The corresponding certification and the Declaration of Conformity must be available, before putting the builders hoist into service.

4.1.5 Transport, assembly and disassembly, and operation of builders hoists, shall be performed according to the operating instructions of the manufacturer.

4.1.6 The employer may not operate a builders hoist in the respective site of assembly, until expert testing, in accordance with 5.2 and 5.4, has determined proper assembly and operational readiness.

4.2 Special Requirements for Builders Hoists

4.2.1 The employer shall only allow independent operation of builders hoists by employees,
-who are at least 18 years of age,

-for whom no health-related conditions exist that would affect performance of this activity,

-who have been trained in the operation of builders hoists and have proved this competence to their employer,

and

-whom it can be expected will responsibly fulfil the assigned tasks.

4.2.2 The employer's authorization of builders hoists operators must be in writing.

4.3 Operating Instructions/Operating Directions

4.3.1 The employer shall familiarize the employees with the operating instructions and the operating directives of the manufacturer, and issue these to the builders hoists operators, and to the assembly personnel.

4.3.2 In specific circumstances, for which special measures are required, the employer shall record these in the operating instructions.

Such a circumstance would be, for example, if the ties (see clause 4.4.4) cannot be erected at the distances intended by the manufacturer.

4.3.3 The builders hoists operators, the assembly personnel and users of the builders hoists, shall observe the operating instructions and operating directives.

4.4 Special Requirements for Assembly and Disassembly

4.4.1 The employer shall only employ technically competent personnel for assembly and disassembly, who have sufficient, relevant knowledge and experience in the area of builders hoists. The employer should designate an assembly supervisor to ensure a flawless assembly.

4.4.2 Connection to the electric power supply shall take place only at a special electrical-feeder point.

For example, energy distributors with circuit breaker switches or, where necessary, residual current devices.

4.4.3 Builders hoists may only be assembled on an appropriate load-bearing surface, with consideration of the allowable surface stress.

4.4.4 Ties may only be performed on load-bearing components of structure which are able to reliably accommodate the resulting stress. In the event of a deviation from the anchoring raster of the operating instructions, or doubt of the load-bearing capacity of the tie surface, a static test is required.

- 4.4.5 If assembly does not take place in front of scaffolding, the installation of the mast ties must be performed from an assembly bridge intended for the purpose.
- 4.4.6 Mast connections must be installed in such a manner that hazards to them from vehicles are completely eliminated.
- 4.4.7 Assembly, and the installation of safety features, shall take place concurrently, and in accordance with operating instructions. The unobstructed movement of tow cables must be verified.
- Safety features are, for example, terminal switches, switch guide plates and tow-cable guides.*
- 4.4.8 At any access point where a fall height of more than 2 meters exists, loading-area safeguards must be built between the builders hoist and the structure, or, where applicable, the scaffolding, and must be as wide as the opening of the platform.
- 4.4.9 The assembly of the hoist and the installation of the ties must ensure that the following special hazards are reduced during normal operations:
- there shall be no danger of crushing or sheering between the platform and stationary components in the area. This requirement shall be considered fulfilled if a clearance of at least 50 cm is maintained throughout the entire operating area.
 - Ties must be installed so that no danger of crushing exists for persons on the hoist platform.
 - There shall be no dangers of falling to persons at either loading areas or access points.
 - In passageways from access points, there shall be no vertical joints wider than 20 cm, and no horizontal joints wider than 5 cm.
- 4.5 Operation
- 4.5.1 Control of the hoist during operation shall be carried out only from the platform. The emergency release must not be used during normal operations.
- 4.5.2 Operation of the hoist must be halted whenever wind speeds exceed 15 m/s.
- 4.5.3 Employees must use personal protective equipment during operation, as dictated by local conditions, but shall at least wear safety helmets and protective footwear.
- 4.5.4 In accordance with the operating instructions, the maximum number of persons and the maximum allowable load shall not be exceeded.

- 4.5.5 During operation, materials in transit shall not exceed the area of the platform floor.
- 4.5.6 Materials in transit are to be placed on the platform so as to exclude the dangers of shifting or falling over. To this end, additional safety measures shall be taken as necessary.
- 4.5.7 Hoist ramps and other components of the enclosure shall only be opened at access points.
- 4.5.8 No one is permitted underneath the platform during operation. This area must be kept clear.
- 4.5.9 In the event of any defect which might compromise safety, operation must be halted.
- 4.5.10 Correction of defects shall only be carried out by qualified and authorized personnel.

5 Testing

- 5.1 The employer must provide for the testing of builders hoists by a specialist at least once, or annually, as dictated by the conditions of service and operating circumstances. At such times, an assessment shall be made of the remaining portion of the estimated useful life of the hoisting unit. The manufacturer's testing guidelines are to be taken into account.

A "specialist" is someone who has sufficient knowledge of builders hoists due to his/her technical education and experience; who is familiar with the relevant statutory labor-protection regulations, accident-prevention regulations, directives and generally accepted technical rules, (e.g., DIN-EN Standards, DIN Standards, Technical Rules of other Member States of the European Union, or of nations that are signatories to the Agreement of the European Economic Zone), and who can judge the functional capability of builders hoists.

- 5.2 In accordance with clause 5.1, the employer must provide for the testing of builders hoists before putting them into service at the respective assembly sites. The testing must include the assessment of defects and damage, as well as appraisal of proper assembly and operating status.

Damage can be, for example, damage during transport.

- 5.3 During the technical testing required in 5.1 and 5.2, a test of the fall arrester must be performed. This test must only be performed with an empty platform, and only from ground level, with the intended controls.
- 5.4 Builders hoists must undergo technical testing after each changeover, depending upon the comprehensiveness of the changeover.
- 5.5 Along with the specific testing detailed in clauses 5.1 through 5.4, additional testing is to be performed as indicated by the manufacturer.
- 5.6 The hoist operator shall test daily, before the beginning of the workday, the functioning of the end switch, and make a visual assessment of the entire hoist, including the hoist way, the ties, and the information and warning signs.
- 5.7 The results of the tests detailed in clauses 5.1 through 5.5 are to be recorded in a Test Log.

Compliance with the Fundamental Safety and Health Requirements of Annex I of the Machinery Directive

Preliminary Remark

To determine the best available technology for the building and fitting of hoists

- DIN EN 1495 Lifting platforms, mast-climbing work platforms, and
- DIN EN 12158-1 Builders Hoists for Goods – Part 1: Hoists with Accessible Platforms

can be consulted.

The following requirements for building and fitting are a summary, based upon Annex I of the Machinery Directive, of applicable individual regulations from the above-stated standards, combined with the knowledge and experience in operating such equipment.

1 Markings

The following information from the manufacturer must be permanently posted on the builders hoist, in a conspicuous place, and easily read, in the official national language:

- Name and address of the manufacturer or vendor,
- Classification type,
- Serial number or lot number,
- Year of manufacture,
- Lift speed (m/s),
- Maximum assembly height,
- Maximum allowable free-standing height (m),
- Maximum allowable wind speed during assembly and disassembly (m/s),
- Maximum allowable wind speed during operation (m/s),
- Details for power supply,
- Allowable load and allowable number of persons, as well as the required distribution of weight, corresponding to the respective configuration.

Essential requirements for the operation of hoists can be represented using pictograms, for example

- materials in transit shall not extend beyond the area of the platform floor, and

- control of the hoist during operation shall be carried out only from the platform floor.

2 Operating Speeds

With reference to clause 1.1.2 c of Annex 1 of the Machinery Directive, the conceptual design of hoists leads to risks associated with the expected use of the machinery. It is therefore required that operating speeds be limited to those of the construction design. The maximum operating speeds compatible with safety shall be considered:

- within the 2 m range, according to clause 4.7 of this Annex, 0.2 m/s
- above the 2 m range, 0.4 m/s

3 Number of Persons

Owing to a better overview for the hoist operator, it shall be necessary to limit the allowable number of persons, including the hoist operator, to 7. When determining the load, allow 100 kg for each person.

4 Control and Command Devices

- 4.1 The electrical installation shall be carried out in accordance with DIN EN 60204-32.
- 4.2 It is essential that electricity to the hoist can be cut off from the area of the hoist enclosure. This may be accomplished, for example, with a main shut-off switch, or, with shorter connections, with a plug device.
- 4.3 According to DIN EN 12158-1, an improper phase-sequence in the electrical power supply must be automatically recognized by the control equipment. A start and operation must not be possible. Additionally, in the event of malfunction of a phase, the hoist must automatically be slowed to a stop. The operator should have the capability, with simple means, to reconstruct the correct phase-sequence.
- 4.4 According to DIN EN 1495, under normal operating conditions the control panel must be located in the hoist. The operating components of the control system must be arranged so that the hoist operator has the best possible overview. They must be designed as non-locking pushbuttons. Unauthorized use must be able to be prevented, for example via a key-switch. Control from within the hoist must have precedence over and against test controls. If the switchover to another mode of operation is envisioned, for example, as a builders hoist for the delivery of materials, this switchover shall only be possible through the operation of a switching mechanism accessible to the cage operator. Once the switchover has been completed, the transport of persons must not be possible.

- 4.5 According to Annex 1, clause 1.2.4, of the Machinery Directive, the emergency device shall have the form of a palm-operated button. An emergency shut-off switch must be located at every operating location.
- 4.6 According to DIN 1495, all movements must be terminated via an end switch. There must be an emergency shutoff switch located with each final upper limit and final lower limit switch, whose activation shall interrupt the power supply to the drive.
- 4.7 To reduce the dangers of crushing beneath the platform, it is required that the descent of the platform be interrupted at a height of 2 m, together with a beeping signal, and that continued movement shall be possible only after an approximately three-second stop.
- 4.8 Power-operated travel movements must not be possible,
- whenever components of the enclosure, for example, for the purpose of installing the mast, are open,
 - whenever components of the side protection, which can be opened during normal operating conditions, are not completely closed,
- or
- as long as platform augmentations, for example, the installation of mast ties, exceed the area of the platform floor.

5 Design

DIN EN 1495 and DIN EN 12158-1 should be consulted for the design of the hoist. The more demanding requirements of each shall be definitive.

6 Construction

- 6.1 Means are required at the base frame, which shall allow for the horizontal positioning of the hoist.
- 6.2 In order to ensure that the hoist remains level through the entire hoistway, it is essential to provide for balanced travel mechanically by using two or more masts.

6.3 According to DIN EN 12158-1, an overload device is required which warns the hoist operator and shuts down all operations.

6.4 In the event of the malfunction of the end switch, a broken pulley, or a broken pinion, the hoist must not be able to become separated its track work.

6.5 For transport using a crane, coupling points are required.

7 Defects during Operation

7.1 If the drive system fails, some means is required to bring the hoist to the lowest landing position, or some other landing position that allows persons located on the platform to exit safely. This can only be ensured if the emergency procedure can be operated by a single person.

7.2 It is required that a possible crash of the hoist be prevented using, for example, a speed-dependent safety catch. According to DIN EN 12158-1,

- the trigger speed shall not exceed the rated speed by more than 0.4 meters per second,

- triggering of the safety catch must lead to the interruption of the safety circuit,

and

- the safety catch must operate independently of the drive system.

8 Platform

8.1 Builders hoists must be equipped with a platform of fixed dimension. Any platform alterations must be performed in such a manner that the side protectors remain at the platform edges. The surface of the platform must be stable and slip-resistant.

8.2 In accordance with DIN EN 12158-1, the platform enclosure must be at least 1.10m high, and meet the following requirements:

- gaps between moving parts may be a maximum of 20 mm wide.

- below a height of 0.60 m, the width of openings may be a maximum of 50 x 50 mm.
- above 60 cm the vertical clearance between components of the enclosure may be a maximum of 0.50 m.

8.3 An unintended opening of the side enclosure protectors of the platform, and of the access point safety features, shall be prevented. This may be achieved, for example, by requiring that opening be allowed only after performing two, independent actions.

8.4 Danger points must be secured from unintended reaching in hazards from the platform. A distance of least 50 mm from stationary components shall be maintained.

9 Access Points

9.1 For access points to the hoist, related safety features are required, which are secured against an unintentional opening, and, in accordance with DIN 4420, provide for three-part side protection.

9.2 Safeguards, which may not be circumvented, must operate at all access points. An unavoidable, mechanical safeguard shall be provided between access points' safeguards and the hoist ramp. Folding ramps extending to the structure are limited to a maximum endpoint that shall not exceed 20 degrees from horizontal.

10 Assembly

10.1 Mast ties, tow-cable guides and other components used in the construction of hoists shall be manufactured in an ergonomically sustainable way, so as not to endanger the assembler. Where necessary, platform augmentations shall be provided, such as an assembly bridge.

- 10.2 The unintended collision with an unsecured mast shall be avoided (optimally, via extensive supervision of the anchoring of the mast).
- 10.3 Ties shall be installed so that no danger of crushing to persons on the hoist arises.
- 10.4 The unobstructed movement of tow cables shall be ensured via cable guides.

11 Operating Instructions

According to the Machinery Directive, the following points must be addressed in the operating instructions:

- a) the exact information as clause 1, Markings, with the exception of serial or model number,
- b) general information about the intended use of the hoist,
- c) Information concerning connection to the power supply,
- d) Information concerning assembly and disassembly
 - maximum mast length above the uppermost tie,
 - maximum distance between ties,
 - tie strength,
 - sequence of assembly and disassembly including diagrams
 - special workstations for assembly
 - use of personal safety equipment;
- e) Information on putting builders hoists into use, regular maintenance, testing, where necessary, the performance of special tests, see clause 5.5, and correction of defects,
- f) Essential Operating Information
 - materials in transit shall not extend beyond the area of the platform floor,
 - control of the hoist during operation shall be carried out only from the platform
 - Loading is to be secured against slips and falls,
 - absolutely no one is allowed under the platform at any time
 - restriction of the lower loading area, with exception of access points
 - no material to be stored in restricted areas

- recommendations for the use of personal safety equipment
- recommended procedures concerning the occurrence and correction of defects
- requirements for maintenance and repair personnel

12 Putting Builders Hoists into Service

Due to the danger of falls of persons from a height of more than 3 meters, builders hoists fall under Annex IV of the Machinery Directive. Since there is currently no relevant, harmonised European Standard corresponding to Article 5, (2), an EG type-examination, according to Annex VI of the Machinery Directive, is to be performed before a builders hoist is put into service. The corresponding certification and the Declaration of Conformity must be available, before putting the builders hoist into service.

A test log shall be delivered with every hoist to document all tests performed. A copy of the Declaration of Conformity shall be attached to the test log.

Regulations and Rules

The following is a summary of the most important and relevant regulations and rules.

1 Laws/Statutes

(Supplier: Bookstore
or Carl Heymanns Verlag KG,
Luxemburger Str. 449, 50939 Cologne Germany,
Tel. (02 21) 9 43 73-0
Telefax (02 21) 94 37 39 01)

Directive 98/37/EG of the Council on the Approximation of the Laws of the Member States Relating to Machinery (Machinery Directive)

Law on the Implementation of Measures of Work Protection for the Improvement of the Occupational Safety and Health of Workers (Arbeitsschutzgesetz, ArbSchG)

Work Equipment Ordinance (Arbeitsmittelbenutzungsverordnung, AMBV)

Equipment Safety Code (Gerätesicherheitsgesetz, GSG)

9th Ordinance of the Equipment Safety Code, Machinery Ordinance
(Maschinenverordnung-9. GSGV [Gerätesicherheitsgesetzverordnung])

2 Regulations for the Prevention of Accidents

(Supplier: Bookstore
or Carl Heymanns Verlag KG,
Luxemburger Str. 49, 50939 Cologne Germany,
Tel. (02 21) 9 43 73-0
Telefax (02 21) 94 37 39 01)

General Regulations (Bundesgenossenschaftliche Vorschriften [BGV A1], previously Vorschriften der Bundesgenossenschaften [VBG 1])

Electrical Equipment and Manufacturing Equipment (BGV A2, previously VBG 4)

Power-Driven Work Equipment (VBG 5)

Winches, Lifting and Towing Equipment (BGV D8, previously VBG 8)

Load Suspension Devices in Hoist Operations (VBG 9a)

Lifts (VBG 14)

Builders Lifts (BGV D7, previously VBG 35)

Construction (BGV C22, previously VBG 37)

3 Directives, Safety Regulations, Principles and Instructions of the BG Professional Association

(Supplier: Bookstore
or Carl Heymanns Verlag KG,
Luxemburger Str. 449, 50939 Cologne Germany
Tel. (02 21) 9 43 73-0
Telefax (02 21) 94 37 39 01)

ZH 1/22: Principles for the Testing of Builders Lifts by Technical Experts or Specialists According to the Regulations for the Prevention of Accidents, "Builders Lifts" (VBG 35)

4 Standards

(Supplier: Beuth Verlag GmbH,
Burggrafenstr. 6, 10772 Berlin Germany,
Tel. (0 30) 26 01-22 60
Telefax (0 30) 26 01 12 31)

DIN 4420-1:1990	Service and working scaffolds; general rules, safety requirements, tests
DIN 15018-1:1984	Cranes, steel structures; verification and analyses
DIN 15018-2:1984	Cranes, steel structures; principles of design and construction
DIN EN 292-1:1991	Safety of machinery; basic concepts, general principles for design Part 1: Basic terminology, methodology
DIN EN 292-2:1991	Safety of machinery; basic concepts, general principles for design Part 2: Technical principles and specifications
DIN EN 1495:1997	Lifting platforms, mast-climbing work platforms

DIN EN 12158-1	Builders hoists for goods Part 1: Hoists with accessible platforms
DIN EN 60204-32	Safety of machinery, electrical equipment of machines Part 32: Requirements for hoisting machines