

Technical data sheet

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Metal ceilings in sports halls

Information for building designers, installers and system manufacturers

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1.0 Preface

Ceiling systems in sports halls are always exposed to special requirements. Due to expected influences with different angles of impact and high velocities of ball shots, impact strength is one of the most important requirements. Additional demands on fire protection, corrosion protection and acoustic absorption have to be fulfilled. Metal ceilings, tested according to relevant standards, meet all these demands. Versatile characteristics are possible, e.g. strip panel ceilings in diverse variants as well as metal panels, but also expanded metal ceilings assured their acceptance for these applications.

The following information shall give parties involved in construction project practical approaches for planning and for the execution of suspended metal ceilings in sports halls, especially for demands on ball-impact resistance.

2.0 Technical regulations to metal ceilings in sports halls

2.1 Fire protection - building material class

The classification has to be effected according to "EN 13501-1 classification of construction products and construction methods to their fire behaviour", or in addition to the responsible national building permit authority.

3.0 Impact strength

3.1 EN 13964:2004 + A1:2006

When suspended ceilings have to resist impact effects (e.g. due to ball impacts in sports halls), the planner has to identify the type of influence and determine the necessary performance (e.g. classification of ball-impact resistance). The suspended ceiling has to be carried out correspondently. If ball-impact resistance is required, the impact strength has to be tested regarding appendix D according to EN 13964.

After the test, the suspended ceiling must not be affected in its strength, function and security and its appearance must not have changed too much. A visual test is enough as appraisal.
(1*)

(1*) Extract from DIN EN 13964:2004 + A1:2006

Among other things, EN 13964 regulates the test assembly, different classes of impact velocity of the balls, the analysis and necessary statements which the test report has to contain.

Table D.1 – classes of impact velocity
(Extract from DIN EN 13964)

Illustration 1

Impact balls	Handball	Impact velocity m/s
Classes	1A	16.5 ± 0.8
	2A	8.0 ± 0.5
	3A	4.0 ± 0.5

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The ball impact test is made with a handball. Preferentially, the test shall guarantee that no elements of the ceiling or parts of it fall down due to this impact. Unfortunately, EN 13964 only regulates the analysis after the ball impact in matters of optical changes very vague and gives the inspector a big range for passing or failing.
Measurable parameters to the point

„its appearance must not have changed too much“ (1)*

are missing, so that there cannot always be expected comparable test results.
(1*) Extract from DIN EN 13964:2004 + A1:2006

3.2 Different classes and their consequences are important parameters

EN 13964 differentiates between 3 different classes in „table D.1 – classes of impact velocities.“

Usual practice means to require the demands for suspended ceilings as „ball-impact resistant ceilings“ in power operation, for example in secondary schools. A specified demand concerning the different classes of table D.1 of the EN 13964 is unfortunately often forgotten.

Resourceful providers could get the idea to offer „always the most economic solution“, consequently, to offer and to assemble ceiling systems with the lowest impact velocity. **The hazard potential of damages with systems, tested according to class 3A, in secondary schools with common use is enormous.** Unsightly damages up to security relevant changes which can even lead to crashes of ceiling elements cannot be excluded.

Due to this, TAIM recommends demanding the class 1A regarding table D.1 according to EN 13964 for all suspended ceilings in sports halls in tender texts.

For economical reasons, the classes 2A + 3A can have their authority and they can be sufficient, depending on room use e.g. in areas like gymnastic rooms, swimming halls. The building designer has to do a thorough planning, enclosing the future room use.

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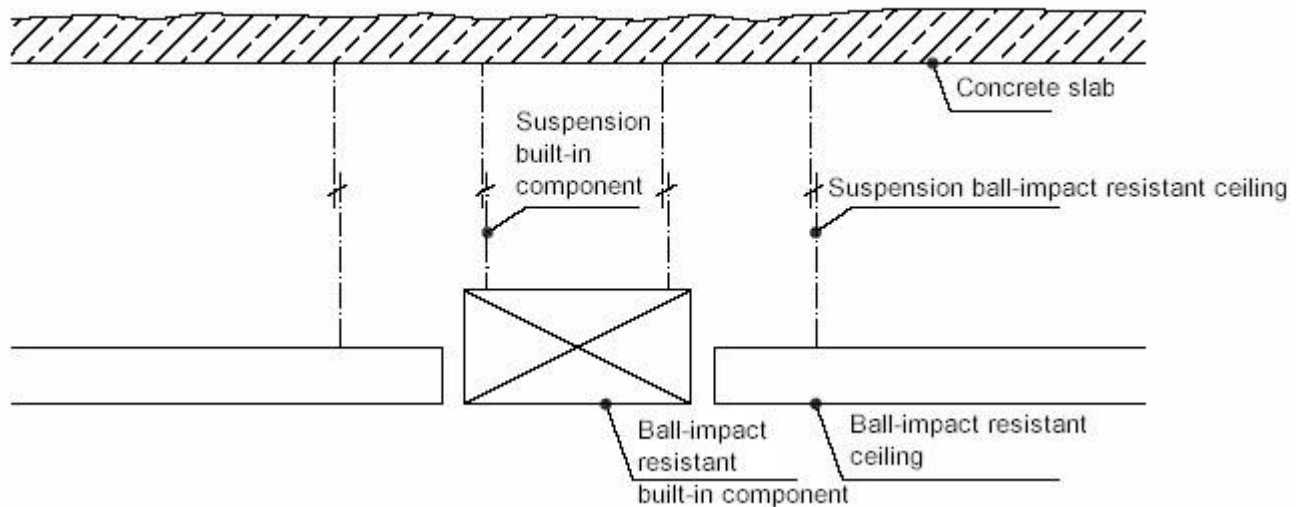
4.0 Fixtures

4.1 Built-in components, for example recessed light fittings

Built-in components have to be checked individually. Test certificates of the manufacturer of built-in components provide the size, weight, conditions and installation situation which have to be observed by the assembly operation.

4.1.1 Built-in components – Installation situation with suspension from the concrete slab, - without statically supporting connections to the ceiling system -

Illustration 2



The built-in components are independently fixed to the concrete slab, without statically supporting connections to the ball-impact resistant system ceiling.

- A test certificate according to EN 13964 regarding table D.1 has to be presented for the built-in components. The built-in component should be checked individually**. There are often practical problems, as e.g. manufacturers check luminaires when they are screwed only on one chip board panel. Thus, the installation instruction of the luminaire manufacturers has to be observed carefully.
- Suspended built-in components which are checked individually require the processing of the ceiling to the built-in component of the ceiling installer according to the conditions of the manufacturer. The installation instruction of the manufacturer has to correspond to the test construction of the ceiling.
- Unless otherwise stated, at least the same impact velocity, according to table D.1, has to be proved for the built-in components as well as for the system ceiling.
- Please observe the installation instructions of the manufacturer of the built-in components as well as those of the manufacturer of the ceiling system.

** if the ceiling system and the built-in component are checked together, an individual test of the built-in component is not required.

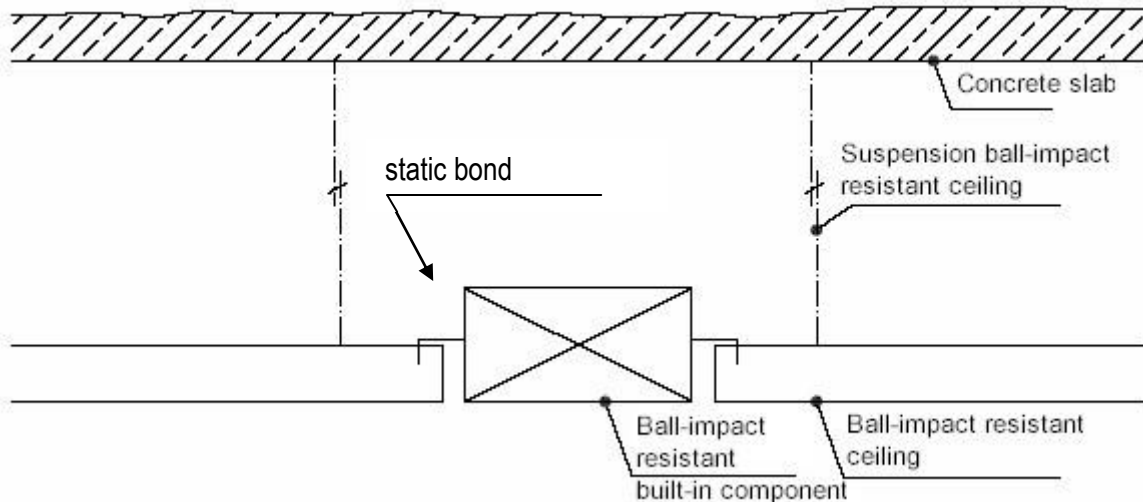
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4.1.2 Built-in components – Installation situation without statically supporting suspension from the concrete slab – The built-in components will be connected to the statically supporting ceiling system -

Illustration 3



There are two possibilities:

4.1.2.1 The ceiling system and the built-in component are checked together.

In these cases, an individual test of the built-in component is not required.

Please observe the installation instruction of the manufacturer of the built-in components as well as those of the manufacturer of the ceiling system.

4.1.2.2 The built-in component is checked independently but separate from the ceiling system. The installation will be effected according to the installation instructions of the manufacturer of the built-in components at an installation frame which is checked for this according to the test construction of the ceiling manufacturer.

If the maximum size of a checked built-in component (incl. weight specifications) was checked at the test construction of the ceiling, other types of checked built-in components (up to their maximum dimensions) can analogically be installed.

Please observe the installation instruction of the manufacturer of the built-in components as well as those of the manufacturer of the ceiling system.

Unless otherwise stated, the building designer is responsible for the reliability of the interface planning whereas the assembly operation is responsible for the professional execution.

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5.0 Superstructures

If surface mounted light fittings or other attachments are used which are not separately suspended, a mounting or installation basically has to be accredited in the test report of the ball-impact resistant ceiling. The maximum allowed loads as well as the dimensions of the mounted and surface mounted components are important criteria which have to be anchored in the test report of the manufacturer of the ceiling.

The mounted and surface mounted components also have to be tested. Preferentially, EN 13964 is also used, e.g. for surface mounted components. For requirements exceeding impact resistance, e.g. electrical safety for luminaires, further standards have to be used. The manufacturer of the mounted and surface mounted components is responsible for this proof and not the manufacturer of the ball-impact ceiling.

Please observe the installation instruction of the manufacturer of the surface mounted components.

6.0 Constructive changes of ceiling systems – special solutions

In general, only components certified and licensed by the system manufacturer should be used for the installation. The operating assembly is responsible for the installation according to the regulations of the manufacturer.

In praxis, there are discrepancies between the checked construction and the actual situations on site.

Unfortunately, EN 13964 does not manage the proceeding with such discrepancies.

Due to this, TAIM advises a differentiated point of view with the involvement of the responsible ceiling manufacturer. On demand, the ceiling manufacturer can consult the testing institute to do a reliable test which compares the execution of the planned construction to the tested system.

7.0 Corrosion protection

A specific, normative requirement profile concerning the corrosion protection is not known to EN 13964. As a "minimum standard" for sports halls, TAIM advises to categorise the demand and corrosion protection class according to table 7/8 according to EN 13964. In view of an increased awareness of quality and the rising required longer life cycles of a product and a building, planners often exceed these minimum standards and require, in relation to the corrosion protection, the class C according to EN 13964.

Please observe additional requirements of corrosion protection in swimming pools. Further information on corrosion protection can be found in the data sheet 04 of TAIM of November 2008 on www.TAIM.info.

8.0 Room acoustics

Room acoustic requirements are regulated in national standards. Depending on the room volume and the designated room use, reverberation target times are determined. To assess the acoustic functionality of a room, sound absorption coefficients of surfaces, measured in the reverberation room according to ISO 354, are required.

9.0 Fastening to concrete slab

The fastening to concrete slab has to be executed with fastening material allowed by the building authorities. Due to different conditions of the concrete slab and the used fastening possibilities, the kind of fastening is normally not determined in the test report of ball-impact

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resistant ceilings. Unless otherwise indicated by the manufacturer, the installer has to arrange the correct choice, usage and installation on his own responsibility. If bridging girders are used, a static calculation according to Eurocode 3 (EL3) or to national standards has to be presented.

10.0 Edge connections

The kind of formation of edge angles has to be designed according to the conditions of the ceiling manufacturer. Discrepancies have to be clarified with the ceiling manufacturer. Please observe the installation instructions of the ceiling manufacturer.

11.0 Installation

The installer or operating assembly has to meet all conditions of the building designer, the ceiling manufacturer and the manufacturer of the built-in components. The ceiling manufacturer has to provide the proof of ball-impact resistance according to EN 13964 for the ceiling system.

12.0 Summary

Ceiling systems for sports halls require a careful planning bearing in mind all project specific requirements. Due to the introduction of EN 13964, a differentiated consideration of the building designer regarding the impact demands became very important. These start with the determination of stress classes regarding the impact resistance bearing in mind the accurate planning and execution with significant discrepancies to the test report of the system manufacturer. Please observe the installation instructions as well as the conditions of the system manufacturers for possible tests and maintenance.

Principal and planner have to be observant and they have to be aware of the still existing gap concerning the appraisal of the look of the ceiling after the ball impact.

Visual changes after the ball impact are only roughly qualified. Obviously, these are incidental regarding the standard test.

If the sports hall is used e.g. for events, many smaller "in its look not exceeding changes" which are normatively allowed can seem noisy!

Please observe to install only components which are approved by the system manufacturer. If the installer uses different components as those of the manufacturer, the installer alone has the responsibility and obligation to unsolicited provide proof for the system.

Regarding the determination of the system, the building designer has to observe if there is sufficient ventilation behind the ceiling void to avoid condensation water and if there is a sufficient corrosion protection.

Do not neglect an accurate execution by qualified specialists. TAIM recommends advising the customer already with the order to present a declaration of compliance with the test report of the system manufacturer concerning the ball-impact resistance with the requirement class according to EN 13964 on his own responsibility after having finished his performances. According to demands, they also advise him to present the required sound absorbing values, the corrosion protection and the fire protection.

Note:

The contents of this data sheet represent the opinions of the members of TAIM at the time of publication at a European and German level.

Compliance with national regulations is particularly referred to.

TAIM expressly states that it can in no way be liable for the accuracy of this content.