Signaling Technology

Signaling visualised with Pfannenberg's 3D-Coverage.

Quantifying the safety envelope. For consulting and specifying engineers, designers, and safety managers.

SHARING COMPETENCE

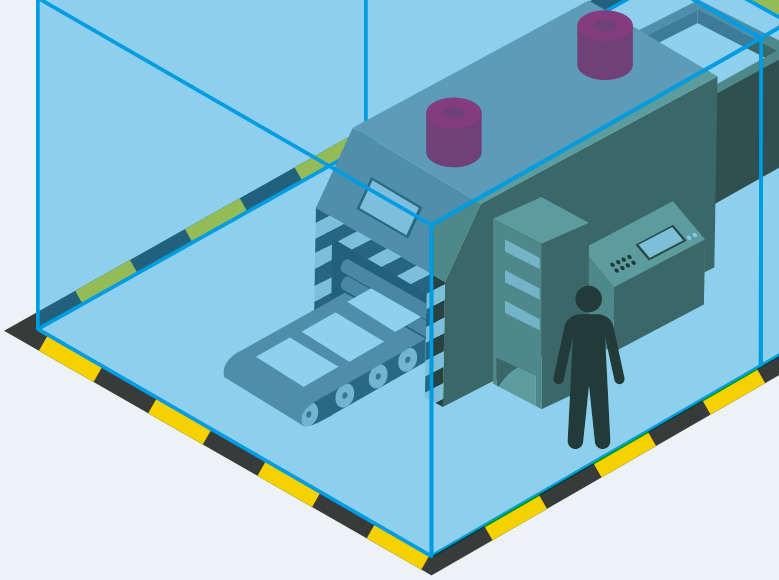
Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

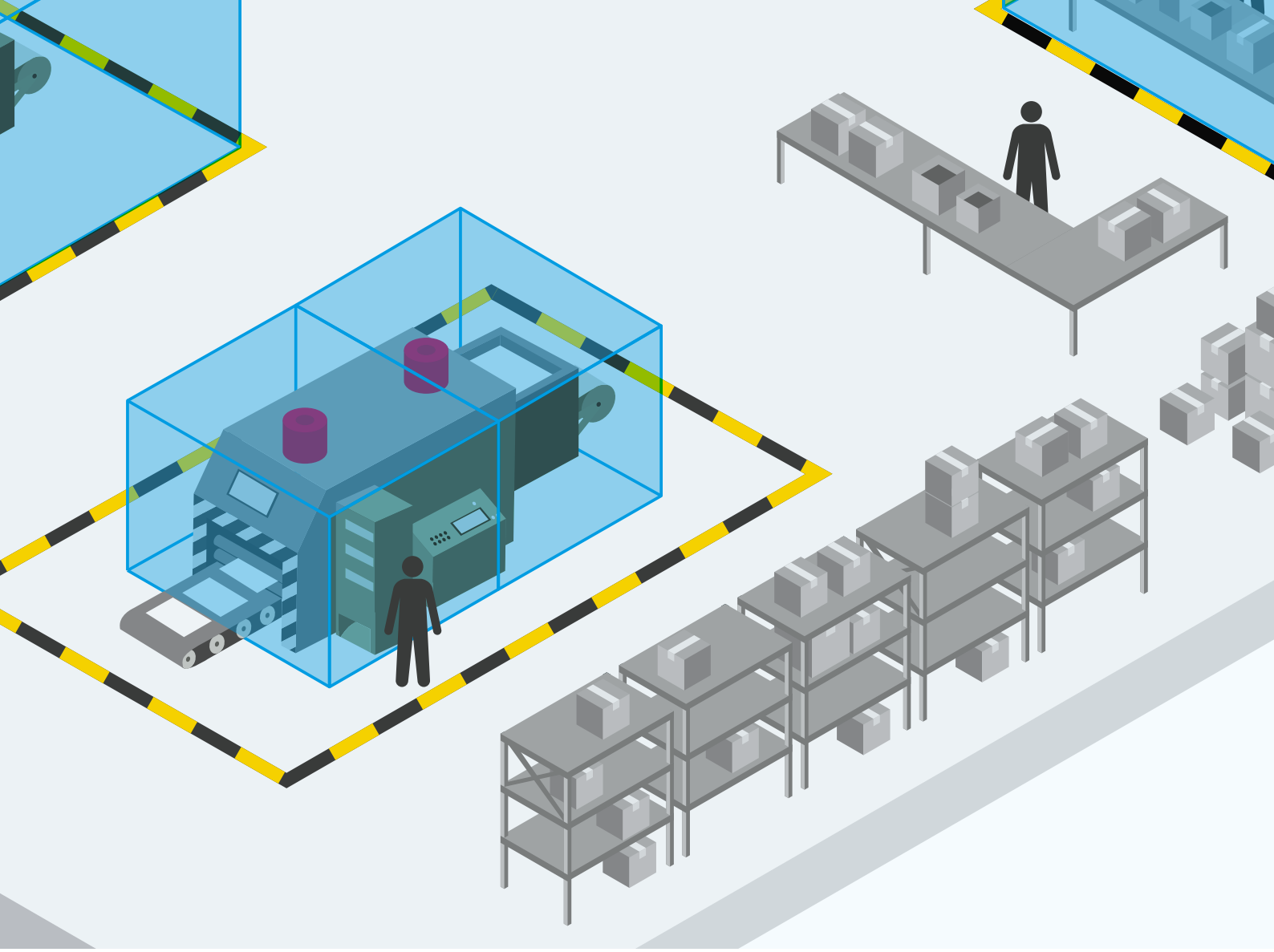
Contents

Safety at a glance.

The goal of 3D-Coverage is to provide a visual representation of the effective range of the signaling device, lending justification to its successful implementation in the defined space.

This valuable approach helps planners define alarm systems which guarantee effective safety warnings to personnel.





What is 3D-Coverage?

A holistic approach to alarm notification planning.

With Pfannenberg's 3D-Coverage approach, the design of alarm and warning notification systems becomes easier and more reliable. The methodology takes advantage of effective performance in a given space rather than relying solely on nominal output data presented in typical specifications.

Visual and audible signaling device PA X 20-15 120 dB(A), 15 J.

Pfannenberg shows what signaling devices can achieve.

The information traditionally found in technical data sheets does not allow any conclusions to be drawn about the actual performance of a product in a given space. In an innovative approach, 3D-Coverage provides designers and safety officers with information about the size of the area effectively covered by a signaling device.

Perceptibility counts.

The unique benefit of 3D-Coverage is that it takes factors such as ambient noise level and light intensity into account, focusing on the extent to which signals can be guaranteed to be heard and seen – an essential requirement for safe signaling solutions.

3D-Coverage describes the maximum area (AxBxC) of the signalised area.

For audible signaling devices

- using the DIN tone
- at the required sound level of 80, 85 and 90 dB(A)

For visual signaling devices

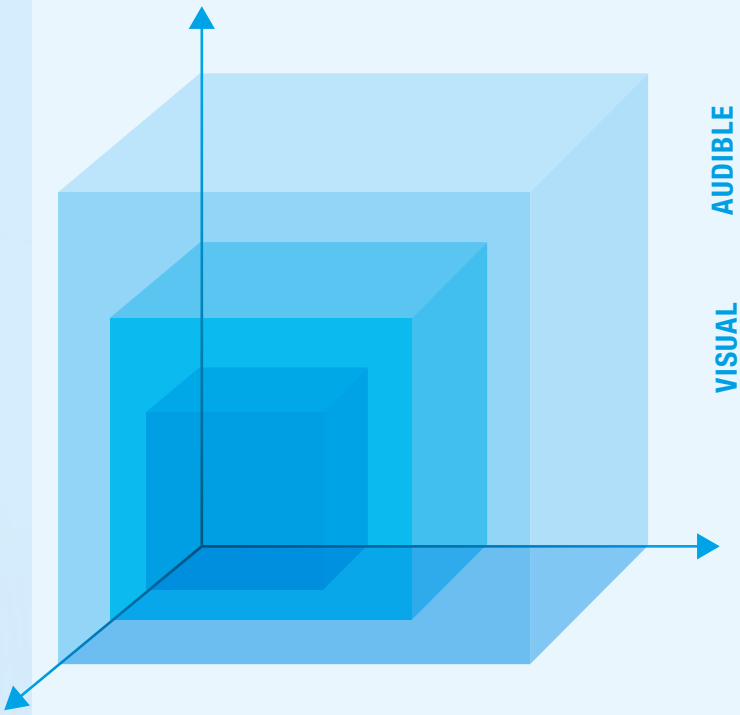
- for devices in category O
- in types of application: Indicate, Warn, Alarm (according to EN 54-23 light intensity of minimum 0.4 lm/m^2)

The differences of actual performance.

3D-Coverage reveals the differences in actual performance which previously were not detected until it was too late. A frequent reason for dangerous under-sizing is the assumption that sounders of the same performance class have identical transmission characteristics in a given space. The adjacent diagram shows how very different the effective performance can actually be.

Why Pfannenberg is better.

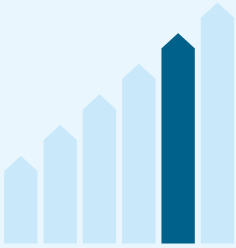
The performance of many sounder designs focuses on their capability in the axial (forward) direction, while inadequate output levels in the radial direction (side and downwards) is often overlooked. With the optimised design of Pfannenberg sounders, the sound propagation is distributed over a wider area in all directions.



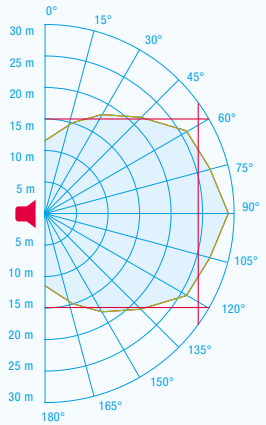
PA X 20-15

AUDIBLE	80 dB(A)	98 x 86 x 86 m
	85 dB(A)	55 x 48 x 48 m
	90 dB(A)	31 x 27 x 27 m
VISUAL	Indicate	126 x 99 x 68 m
	Warn	56 x 44 x 30 m
	Alarm	28 x 22 x 15 m

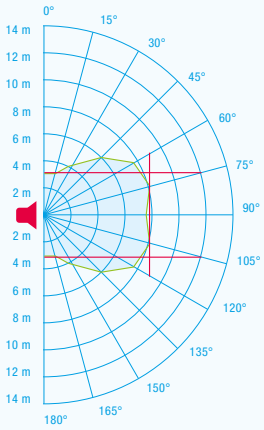
3D-Coverage performance data L x W x H, coverage area with DIN tone and required sound levels of 80, 85 and 90 dB(A) and also to be used for the applications „Indicate“, „Warn“ and „Alarm“ (EN 54-23) with clear lens.



The diagram shows the different effective 3D-Coverage of several Pfannenberg audible signaling devices.



Type A signaling device, required sound level 75 dB(A), DIN tone. Smoothed area: width 25.6 m / length 26.5 m / area 678.7 m²



Type B signaling device, required sound level 75 dB(A), DIN tone. Smoothed area: width 6.4 m / length 7.5 m / area 48 m²

— Actual coverage area
— Coverage area usable for planning

Comparison of two commercially available signaling devices in the same performance class, with DIN tone and the same ambient noise level. The areas marked in blue show clear differences between their actual effective coverage areas.

Ideal sizing.

By utilising the 3D-Coverage concept, properly sized signaling devices are specified to ensure safety to personnel under the ambient conditions present – often leading to the most cost-efficient system in terms of number of units and installation expenses.

Pfannenberg Sizing Software (PSS).

To assist system planners and designers, Pfannenberg offers free software for ideal sizing of signaling devices with respect to parameters such as given spaces, ambient conditions, and standards protocol. Visit www.pfannenberg.com/pss for more information.

Who needs 3D-Coverage?

Alarm system planners, specifying engineers, system integrators, and safety managers.

Planning the ideal signaling solution presents unique challenges. Environmental conditions, standards compliance, personnel safety, and machinery protection must all be considered when designing reliable and efficient notification. 3D-Coverage helps planners ensure adequate performance.

Consulting/Specifying Engineer
Job: fire alarm systems in industrial factories, storage facilities, and logistics terminals

> There are many certified signaling devices to choose from. 3D-Coverage shows me at a glance how well they perform.

Pfannenberg shares competency.

By working closely with planning and safety managers, Pfannenberg has gained an understanding of the needs surrounding effective signaling solutions to protect machinery, processes, and people.

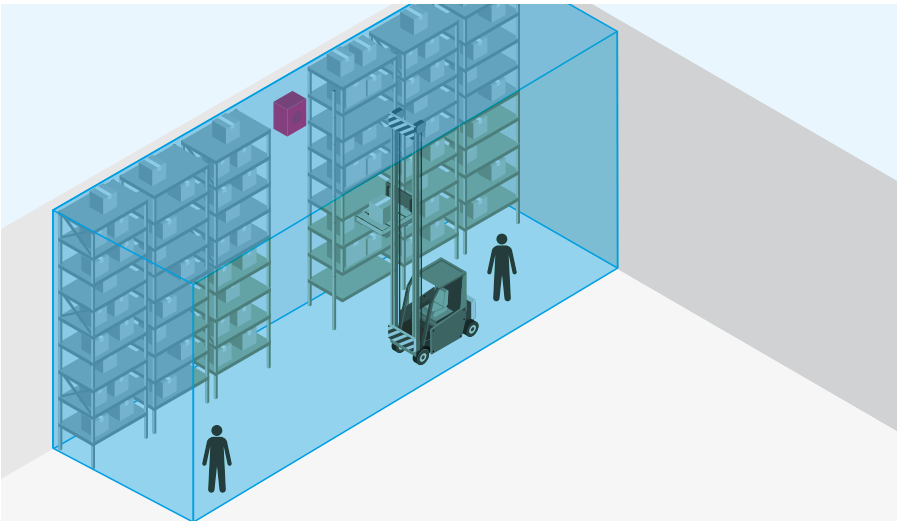
No longer is it adequate to rely solely on nominal performance data presented on manufacturers' specification sheets. Ambient conditions and actual effective coverage area of specified devices, with respect to code requirements, have become essential elements to consider.

Pfannenberg is committed to developing the tools needed to assist system designers with effective signaling solutions for all types of applications.

Fire alarms.

Evacuation alarm system planners will benefit from utilising the 3D-Coverage approach for determining adequate notification appliance coverage, particularly for large, noisy spaces, as found in industrial factories, logistic facilities, and commercial buildings.

To simplify the planning of such projects, Pfannenberg will implement the 3D-Coverage approach into BIM files (Building Information Modelling).



Safety Manager
Job: gas detection alarm systems and workplace safety

"3D-Coverage clearly shows whether my colleagues at the workbenches are really safe."

Operations Manager
Job: machine and tool safety in factories

"3D-Coverage facilitates compliance with machine safety requirements at specific levels of ambient noise."

Gas detection alarms.

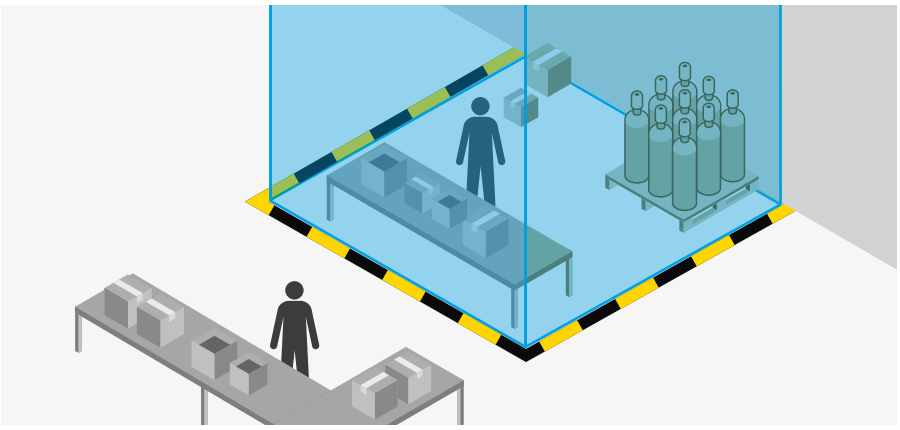
3D-Coverage helps ensure personnel safety in the event of toxic or combustible gas leaks or accumulations in such areas such as water and wastewater treatment plants, boiler rooms, mechanical rooms, compressor stations, cold storage facilities, paint booths, and enclosed vehicle parking spaces.

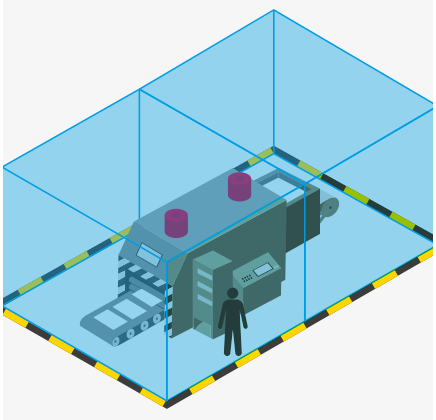
Workplace Safety.

Keeping people out of harm's way is every safety manager's objective. 3D-Coverage helps safeguard personnel with adequate warning signals when they are in proximity to such items as moving vehicles, cranes, overhead doors, lift trucks, conveyor systems, and robots.

Machinery safety.

Operators and bystanders must be alerted to dangerous working machinery. Personnel safety is ensured by utilising the 3D-Coverage approach when planning localised alarms for circumstances such as machinery startup, safety system muting, radiation processes, laser cutting, crushing, cutting, shearing, sawing, etc.





Practical example 1

Spatial performance for audible notification.

The perception of acoustic signaling devices is determined by many factors. In particular, ambient noise and the use of hearing protection must be taken into account. 3D-Coverage shows why.

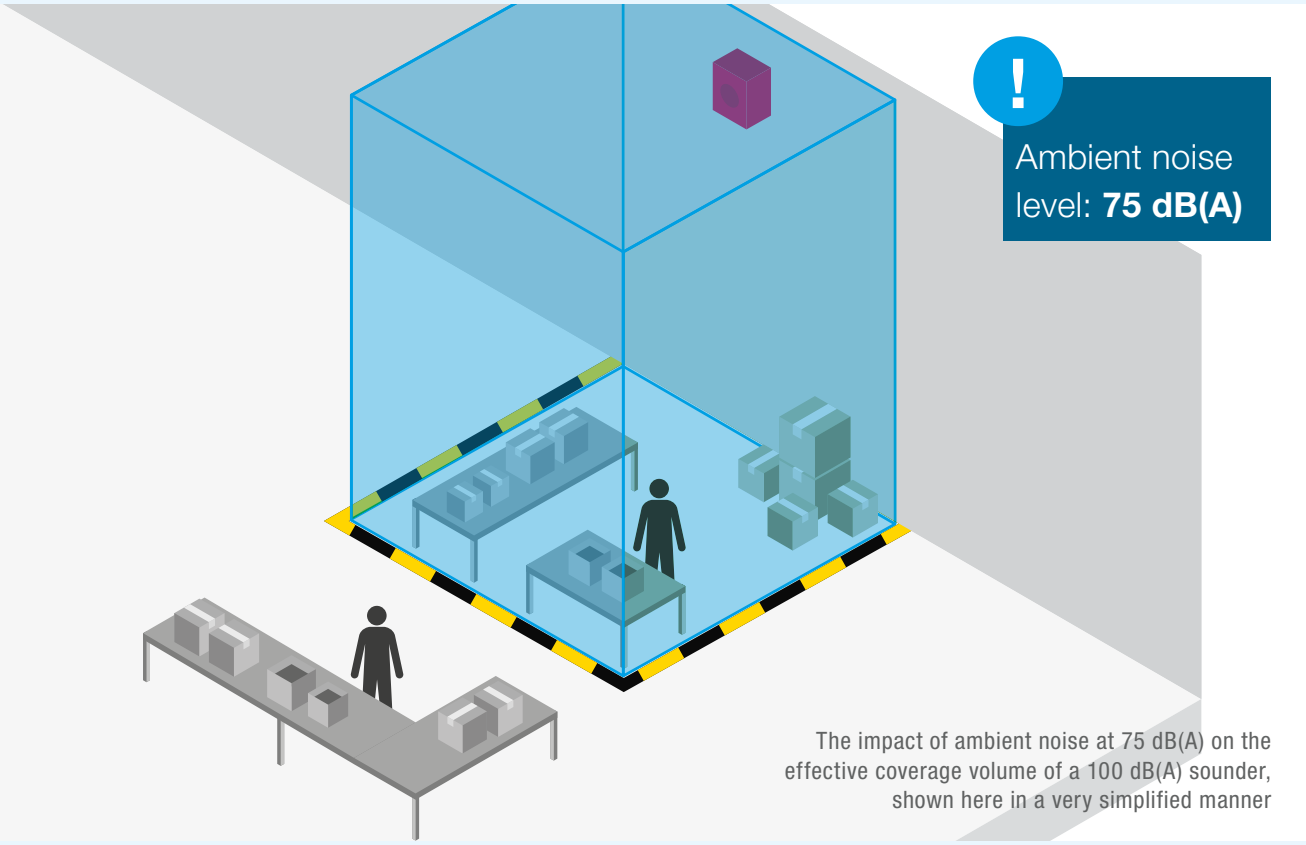
Ambient noise can influence safety.

Whether or not the audible signal from a sounder is successfully perceived is not just dependent on the output sound level generated and technology used to create the alarm signal. Ambient noise levels and sounder placement location are crucial elements that should not be overlooked.

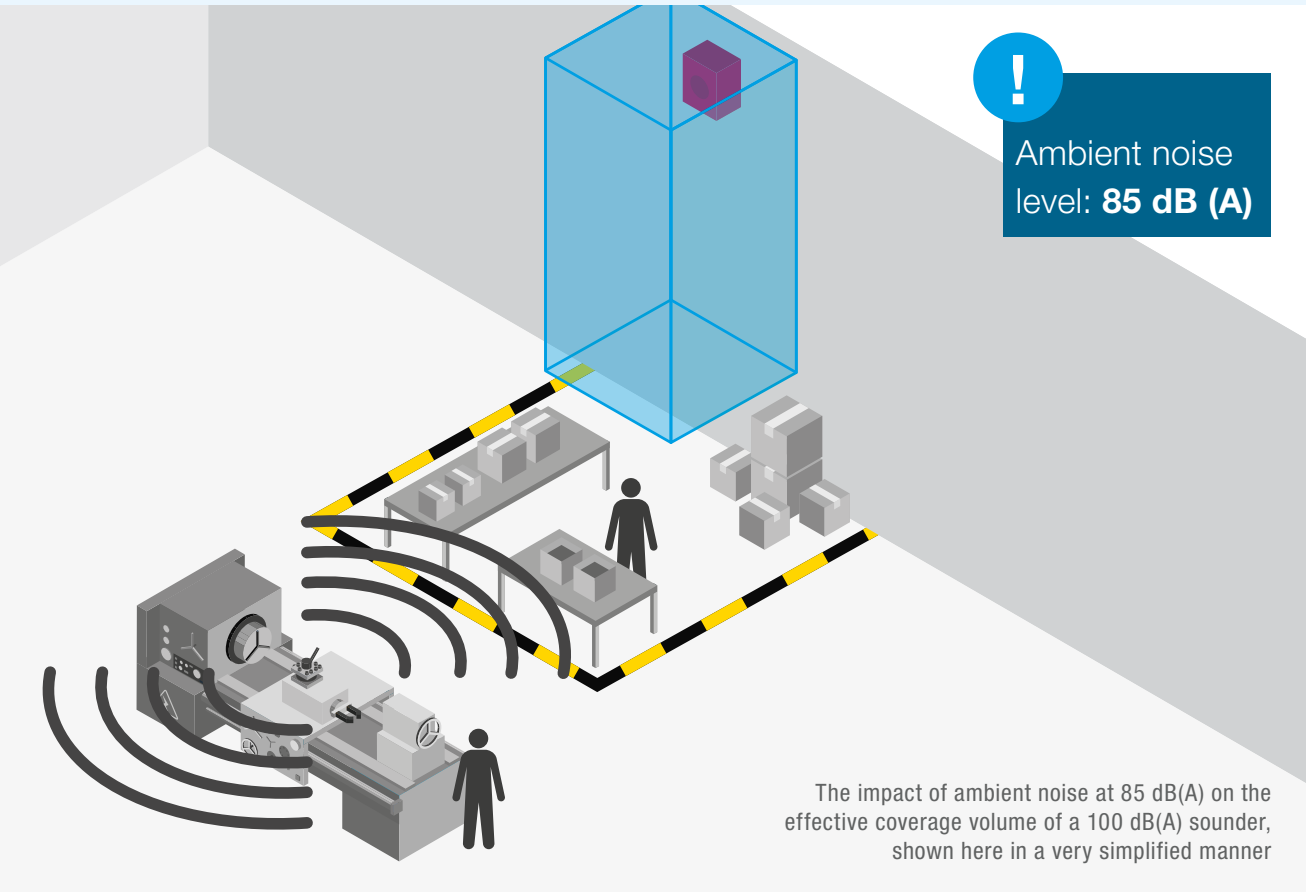
The adjacent example illustrates the effect on coverage volume of an 100 dB(A) audible signaling device due to a 10 dB(A) change in ambient noise level. Increasing from 75 dB(A) to 85 dB(A) shows that the warning signal will not be successfully perceived.

The 3D-Coverage values show that the effective covered area is significantly reduced when the ambient noise level rises. If the alarm system designer does not take all aspects into consideration, the consequences can spell danger for people in the surrounding area.

SOUNDER	AMBIENT NOISE	A	B	C	Pfannenberg 3D COVERAGE
Pfannenberg PA 1 100 dB(A)	65 dB	29 m	25 m	29 m	21,025 m^3
	70 dB	16 m	14 m	16 m	3,584 m^3
	75 dB	9 m	8 m	9 m	648 m^3
	80 dB	5 m	4.5 m	5 m	113 m^3
	85 dB	3 m	2.5 m	3 m	23 m^3



The impact of ambient noise at 75 dB(A) on the effective coverage volume of a 100 dB(A) sounder, shown here in a very simplified manner



The impact of ambient noise at 85 dB(A) on the effective coverage volume of a 100 dB(A) sounder, shown here in a very simplified manner

The example shows the effect of two different levels of ambient noise on the 3D-Coverage of a 100 dB(A) sounder.

Practical example 2

Spatial performance for visual notification.

The technologies used to generate light have a considerable effect on the range and perception of visual signals. 3D-Coverage demonstrates the differences.

Beacon technology can influence safety.

The colours mainly used in signaling technology are red, amber, yellow, green and blue, and clear/white. The range of application types includes:

1. Alarm.
2. High-priority warning.
3. Low-priority warning.
4. Information/Indicate/Status.

Visual signals for “Alarm” and “Warning” must be perceived without fail under all circumstances. Such requirements benefit from signaling devices with the largest possible coverage area.

“Clear” signals were chosen for this example because they are perceived more readily at further distances.

Xenon v. LED.

Comparison of a Xenon flashing light with an LED flashing light, both with the same current draw, demonstrates the difference the technology makes. Apart from measured signaling distance it is also important to consider the specific light emitting characteristics.

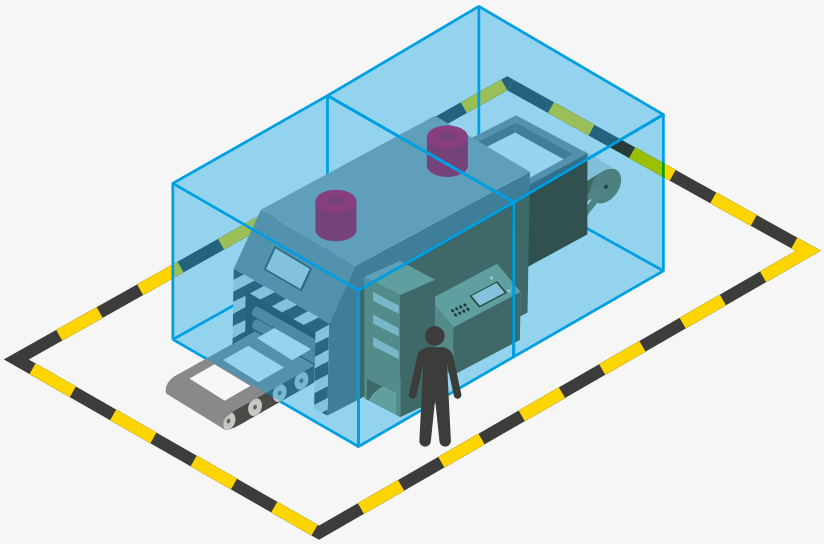
The Xenon light was clearly superior.

The 3D-Coverage values are evidence that the Xenon technology offers a wider range and is more readily perceived.

The reason for this is that the Xenon flashing light emits a very short but intense pulse with a peak value far exceeding 100,000 cd. The light pulse of an LED flashing light is longer, but only reaches around 400 cd.

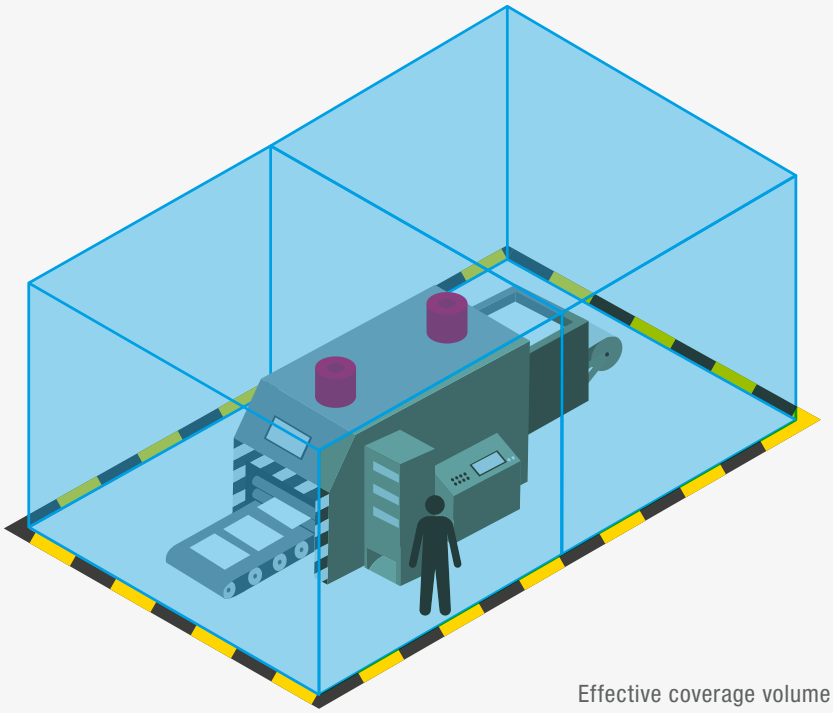
Furthermore, because the Xenon gas is energised in a glass tube, the light signal is emitted evenly in all directions. Conversely, the linear nature of LED light relies on reflectors and optical lenses to create an omnidirectional profile.

			ALARM	
FLASHING LIGHT	PERFOR-MANCE	LENS COLOUR	AREA AxBxC	Pfannenberg 3D COVERAGE
Competitor‘s LED	120 cd	clear	7 x 7 x 3 m	147 m^3
PYRA M (xenon)	118 cd	clear	23 x 18 x 10 m	4,140 m^3



Used technology: **LED**

Effective coverage volume by a clear LED flashing light, with the same current draw as the Xenon light, shown here in a very simplified form



Used technology: **Xenon**

Effective coverage volume by a clear Xenon flashing light, with the same current draw as the LED light, shown here in a very simplified form

The technology behind the visual signaling device has an impact on effective coverage. The example shows a comparison between a Xenon flashing light and an LED flashing light, both with the same current draw.

Planning with certainty

Effective coverage – guaranteed.

Every aspect of the alarm system design process is susceptible to errors. Incomplete system requirements, inattention to environmental factors, insufficient product specifications, and lack of actual signal coverage dimensions can all contribute to an inadequate safety mechanism. The 3D-Coverage approach planners users avoid errors and achieve the optimum solution.

1. Defining requirements.

2. Taking env conditions

Pfannenberg 3D COVERAGE

1. Requirements.

Various standards and codes are in force which influences the planning of signaling solutions. However, many of them are merely superficial.

For example, the EU Machine Directive stipulates that machinery manufacturers must put in place suitable measures to minimise the risks of operating the machinery – but if signaling is a potential solution, there are no defined requirements for the performance of such devices. Since the machinery builder is responsible for mitigating operational risks, it is imperative to utilise signaling devices which offer sufficient effective coverage to operators and nearby personnel.

The **3D-Coverage** approach gives them the answers needed to deploy adequate signaling to ensure that warning signals are perceived.

With fire alarm systems, performance requirements for signaling devices have been formulated. To ensure adequate alarm perception, EU directives such as EN 54-23 require that ambient conditions within the space in which the signal is to be heard or seen are taken into consideration. Utilising the **3D-Coverage** approach, planners and system designers are not only assured of adequate notification appliance performance since they can also gain confidence in designing the most cost-effective solution.

2. Environmental conditions.

Many harmful situations, including fire and gas leaks, chemical spills, machinery hazards, moving equipment dangers, and other workplace safety concerns can be effectively mitigated only when signaling systems are properly designed. An examination of the space to be protected produces vital information that must not be overlooked when planning for safety.

Where are people situated? What environmental influences and risks are they exposed to? What are the particular features of the building? It is essential that these issues be considered at the planning stage in order to ensure the safety of all personnel within the space in which the alarm signal must be seen and heard.

Unfortunately, in many circumstances, the environmental conditions surrounding the application are not thoroughly examined or understood. For example, an ambient noise level

Pfannenberg 3D COVERAGE

2. ironmental into account.

3. Comparing product information.

4. Ensuring optimal sizing.

that is assumed to be lower than it actually is will inevitably result in signal tones that are difficult to hear or cannot heard at all.

When the **3D-Coverage** approach is utilised, environmental factors are taken into consideration at the very start of the planning process. Not only does this represent a more cost-effective procedure, but more vitally, the resultant system design is safer for personnel and guaranteed to meet with final approvals.

3. Product information.

Information supplied on technical data sheets alone often results in unrealistic assumptions about the actual performance of signaling devices. Details such as the transmission distance and coverage envelope must be obtained if they are to be taken into consideration when planning alarm systems.

For the **3D-Coverage** approach, Pfannenberg supplies transparent and unambiguous information about the performance of a product in a given space, taking into account defined environmental conditions.

4. Optimal sizing.

It is only when all factors, such as environmental influences, local codes and requirements, and true overall performance of the signaling devices to be used are understood, that a properly sized and effective alarm notification system can be designed.

Possible consequences of inappropriately designed signaling systems include under-sizing, over-sizing, safety to personnel, cost overruns, system non-acceptance, and loss of machinery and assets.

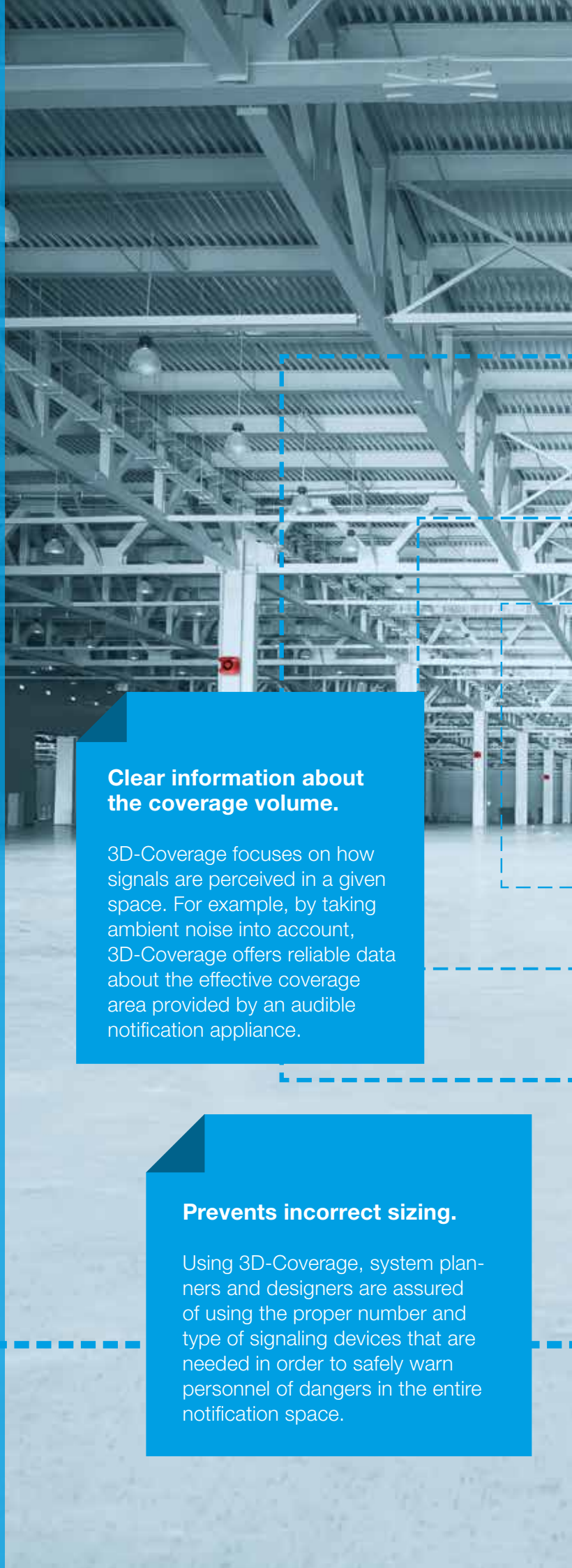
Under-sizing, or using too few or less-capable devices, can be the result of relying solely on published specifications for notification appliances and not taking environmental conditions into account. This can lead to a safety risk or non-acceptance of the system by the local authority having jurisdiction (AHJ). When re-designs are mandated, costs will increase.

Over-sizing, or using too many devices, can unnecessarily raise costs for materials, installation labor, and maintenance. A holistic approach at the planning stage is the only way to ensure effective alarm notification, safety, and design efficiency. With 3D-Coverage, Pfannenberg emerges as the logical choice for helping planners and system designer fulfill these requirements.

3D-Coverage

The benefits at a glance.

3D-Coverage offers transparency in an area where incorrect assumptions and ambiguous performance values can have dangerous consequences. Because it delivers explicit data, 3D-Coverage provides certainty for those involved in creating signaling systems and safety for personnel who occupy spaces in which these systems are used.



Clear information about the coverage volume.

3D-Coverage focuses on how signals are perceived in a given space. For example, by taking ambient noise into account, 3D-Coverage offers reliable data about the effective coverage area provided by an audible notification appliance.

Prevents incorrect sizing.

Using 3D-Coverage, system planners and designers are assured of using the proper number and type of signaling devices that are needed in order to safely warn personnel of dangers in the entire notification space.

Pfannenberg

3D COVERAGE

The ideal solution for safety signaling.

With explicit information about the effective coverage volume, 3D-Coverage provides maximum reliability in both the type and quantity of visual and audible signaling devices selected for alarm systems.

Confidence in design, costing, and acceptance.

With 3D-Coverage, the optimum signaling systems are assured, leading to immediate acceptance and avoidance of potentially costly redesigns.

Protecting man, machine and the environment.

The safety of personnel and operating systems are crucial to the success of any organisation. 3D-Coverage makes it easy to be certain that protection systems are effective and efficient.

Getting it right the first time.

When systems are properly designed from the beginning, unforeseen and costly redesigns and delays are avoided. 3D-Coverage ensures that projects are properly designed.

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