



**Greater Safety
and Enhanced Convenience**

European Standard EN 14439

LIEBHERR

Introduction

Why is a new EN 14439 standard needed in Europe?

- To define **standardised safety regulations for crane use out of operation** (storm).
- To define safety standard applicable to the entire European region comprising **minimum requirements for noise emission and ergonomics, etc.**
- To introduce standardised safety guidelines for **climbing tower cranes**.
- **To guarantee a single standard applicable throughout Europe** for all new tower cranes.

The standard will be introduced by all well-known manufacturers such as Comansa, Jaso, Liebherr, Manitowoc, Terex and Wolffkran starting on 1 January 2010.

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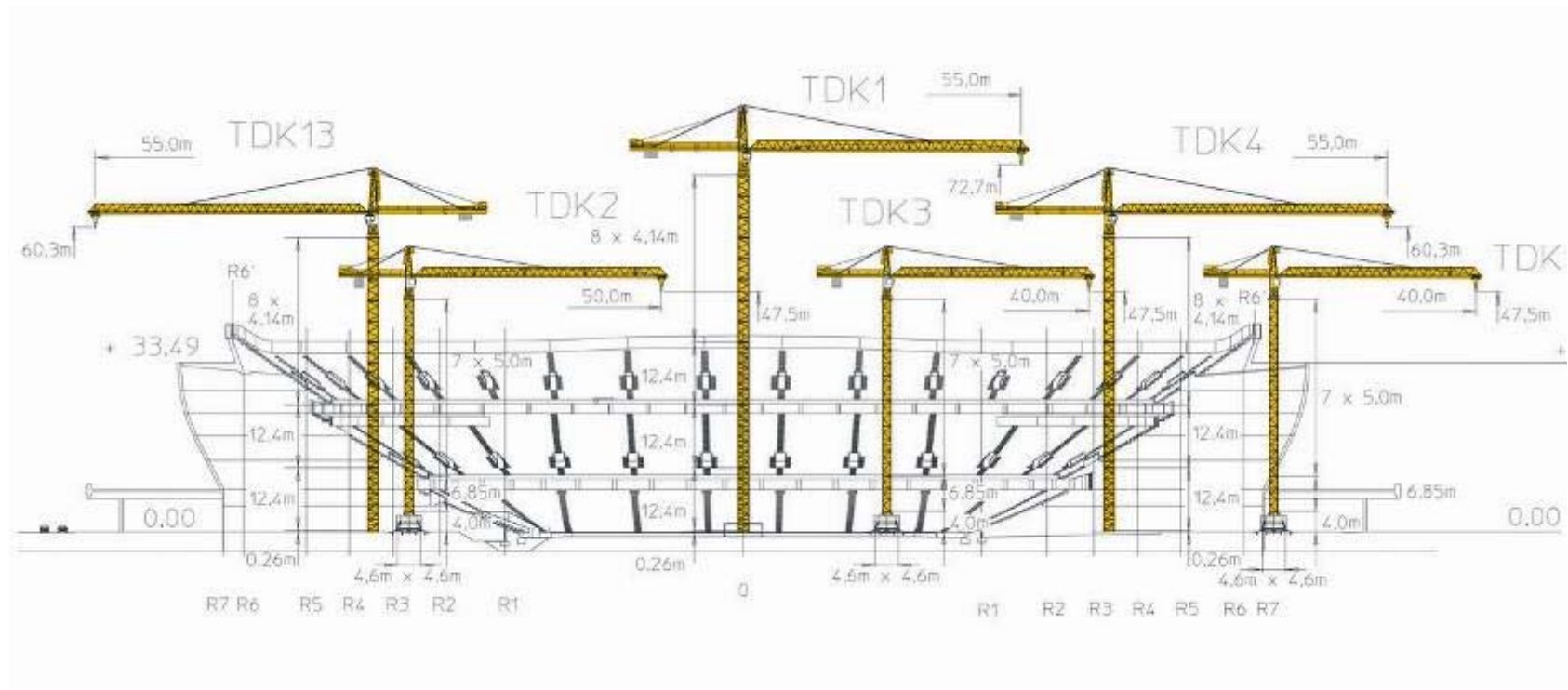
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Advantages of the new EN 14439 standard

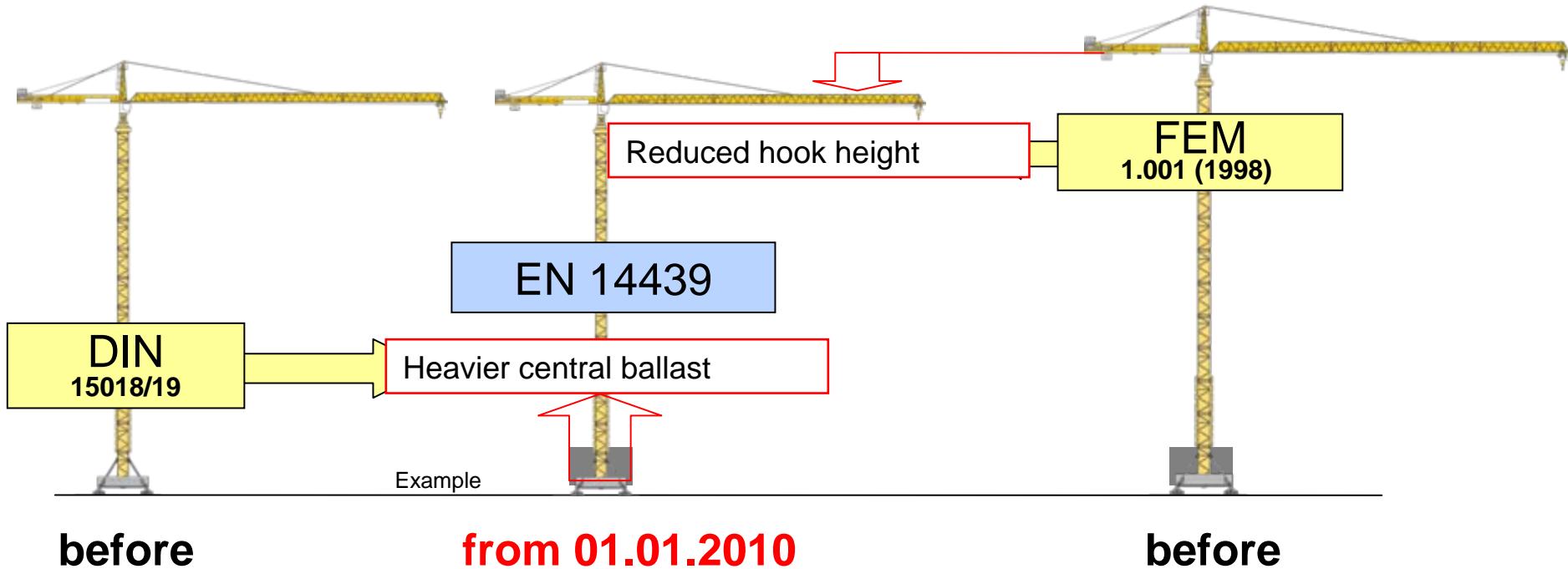


- Standardised calculation of tower cranes and therefore comparable structural heights
- More safety on construction sites
- More safety under out-of-operation conditions
- More safety for operators and erection personnel
- More safety when climbing
- Greater comfort for crane operators
- More flexibility and safety for owners
- Cross-border crane deployments within Europe made easier
- No need for retrofits or conversions, thus simplifying international pan-European crane deployments

Impacts on crane construction



Impacts on crane construction



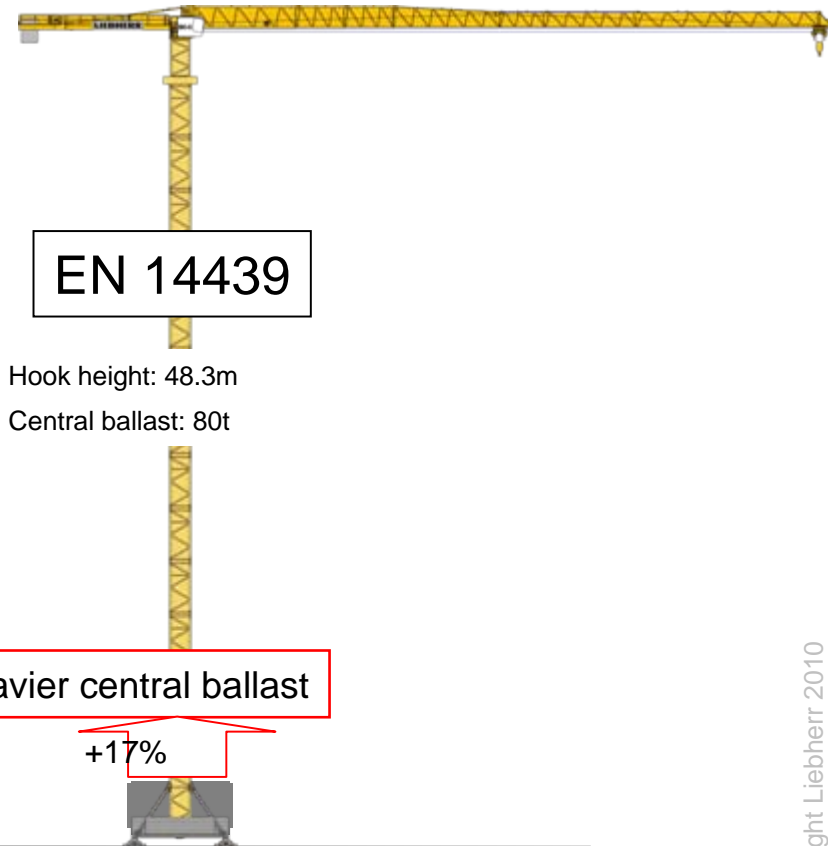
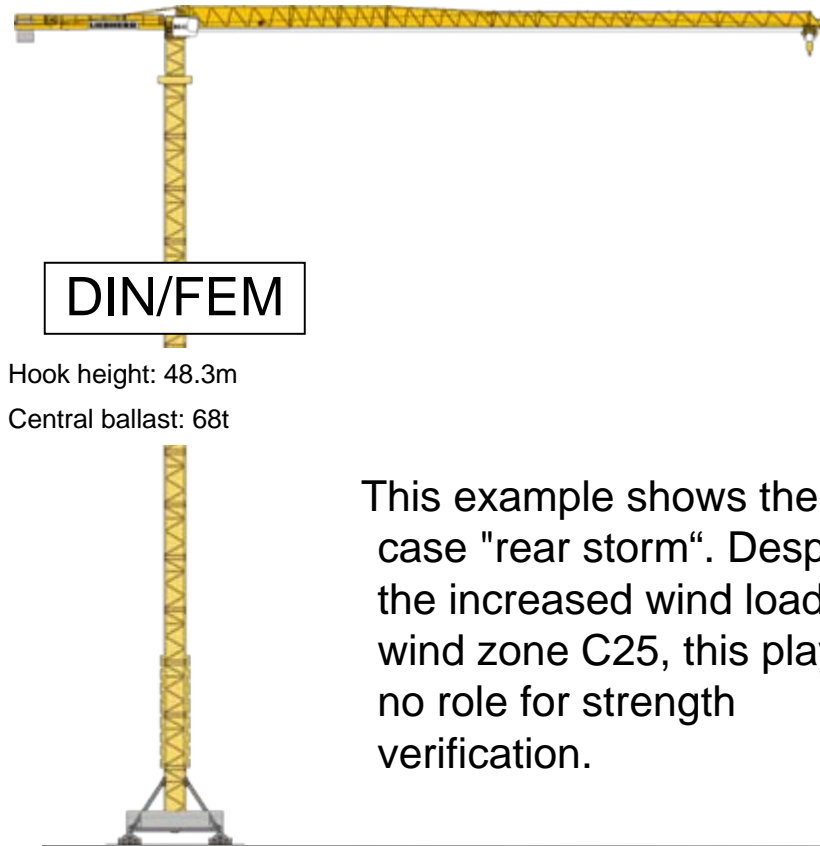
Simplified diagram showing interdependencies of standards.

Impacts on crane construction

Depending on crane construction and wind zone and under certain circumstances the new standard leads to:

- Heavier foundation loads
- Heavier central ballast
- Lower hook heights
- Use of stronger crane components

Example Liebherr: 130 EC-B 8 FR.tronic on 120 HC-Tower

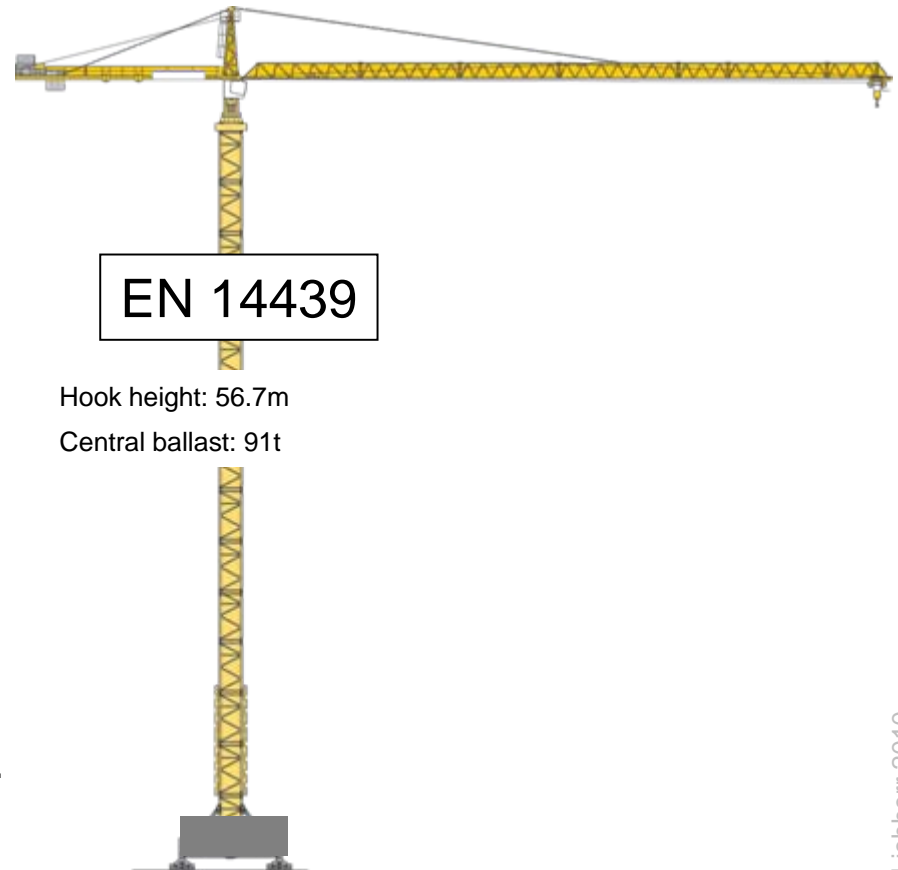
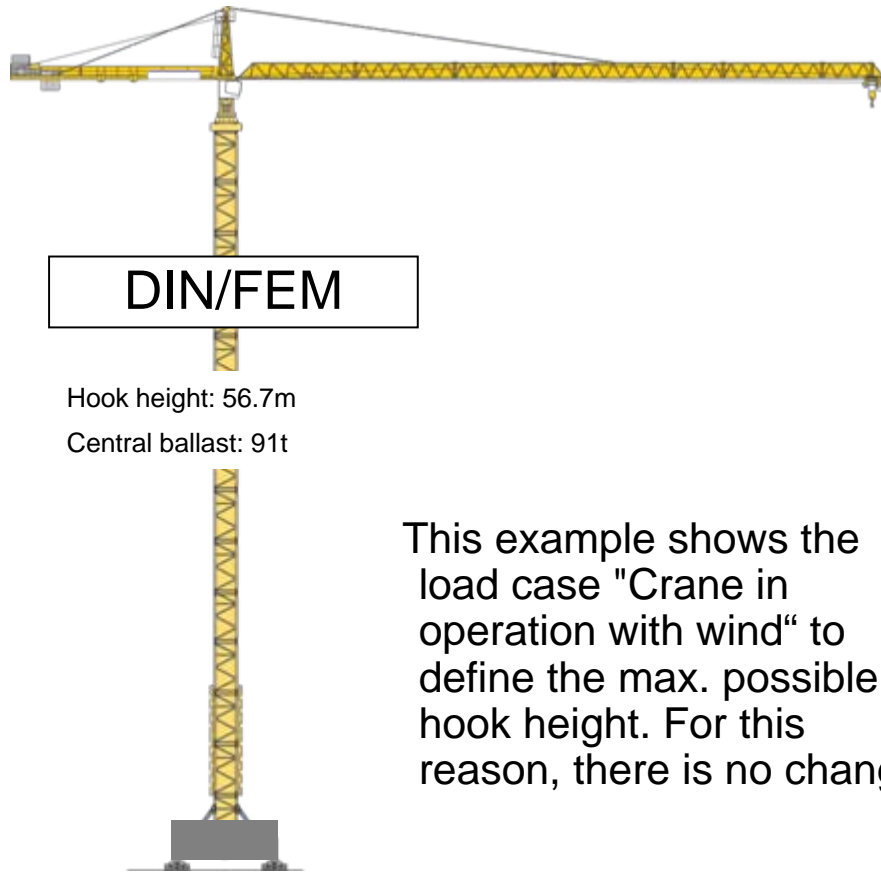


This example shows the load case "rear storm". Despite the increased wind load in wind zone C25, this plays no role for strength verification.

From
01.01.2010

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Example Liebherr: 280 EC-H 12 Litronic on 256 HC-Tower



This example shows the load case "Crane in operation with wind" to define the max. possible hook height. For this reason, there is no change.

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Wind as an influencing factor



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European wind regions from EN 13001

(This map of Europe is in EN 13001, country maps are in FEM 1.005)

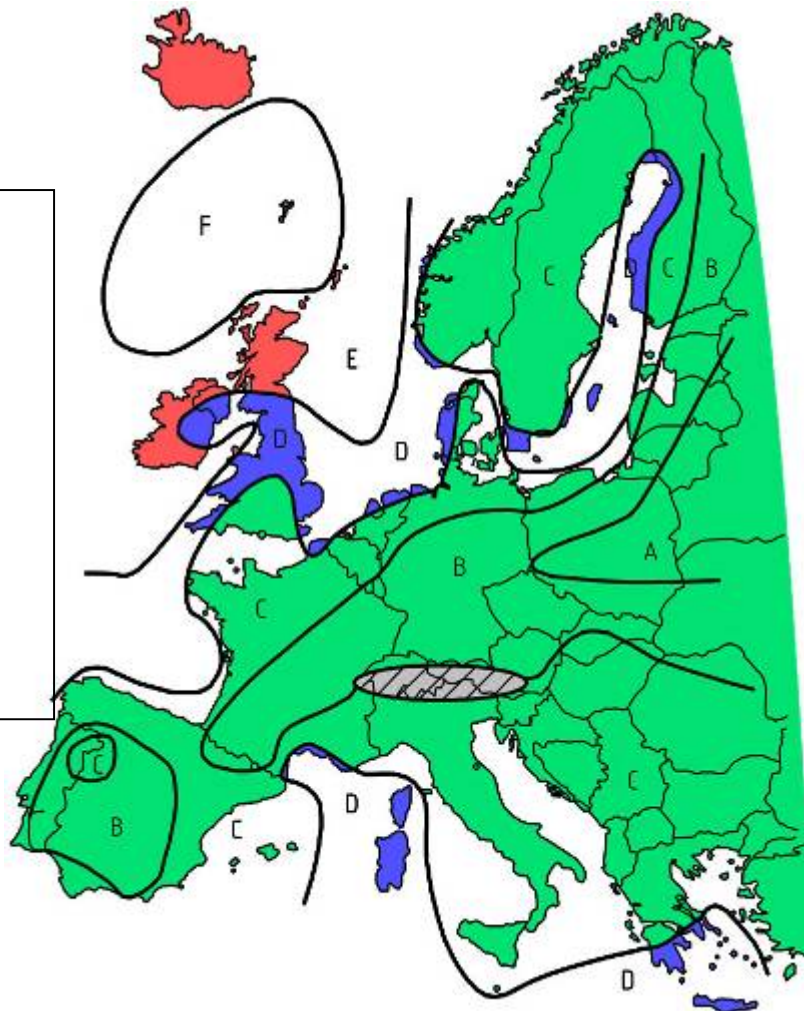
Wind Region

C
[comprises A and B]

D

E

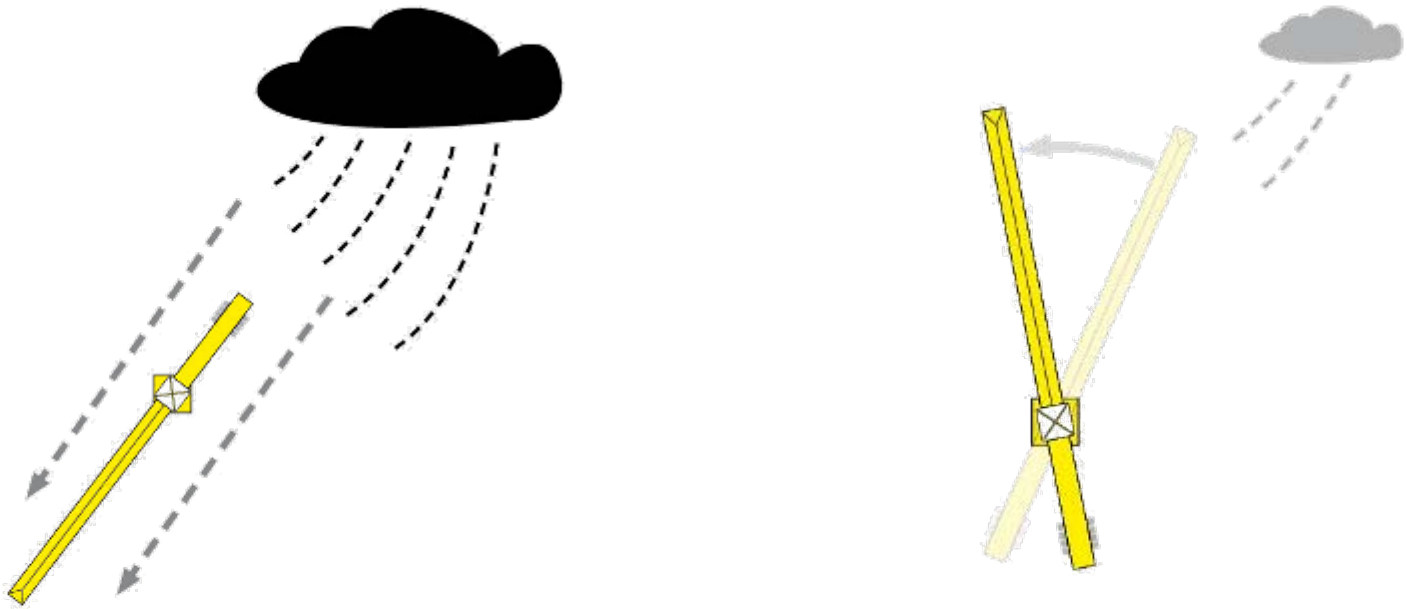
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(map only intended as guide)

- The actual wind region must be verified in future for every tower crane!
- Exposed locations, e.g.:
 - Mountains
 - Natural topologies, e.g. valleys
 - Special local features, e.g. urban canyons or other peculiarities, may result in the application of a different wind region! This may result in certain wind turbulence.
- The crane owner is responsible for clarification and specification of the correct wind region and the repetition interval for each erection location.

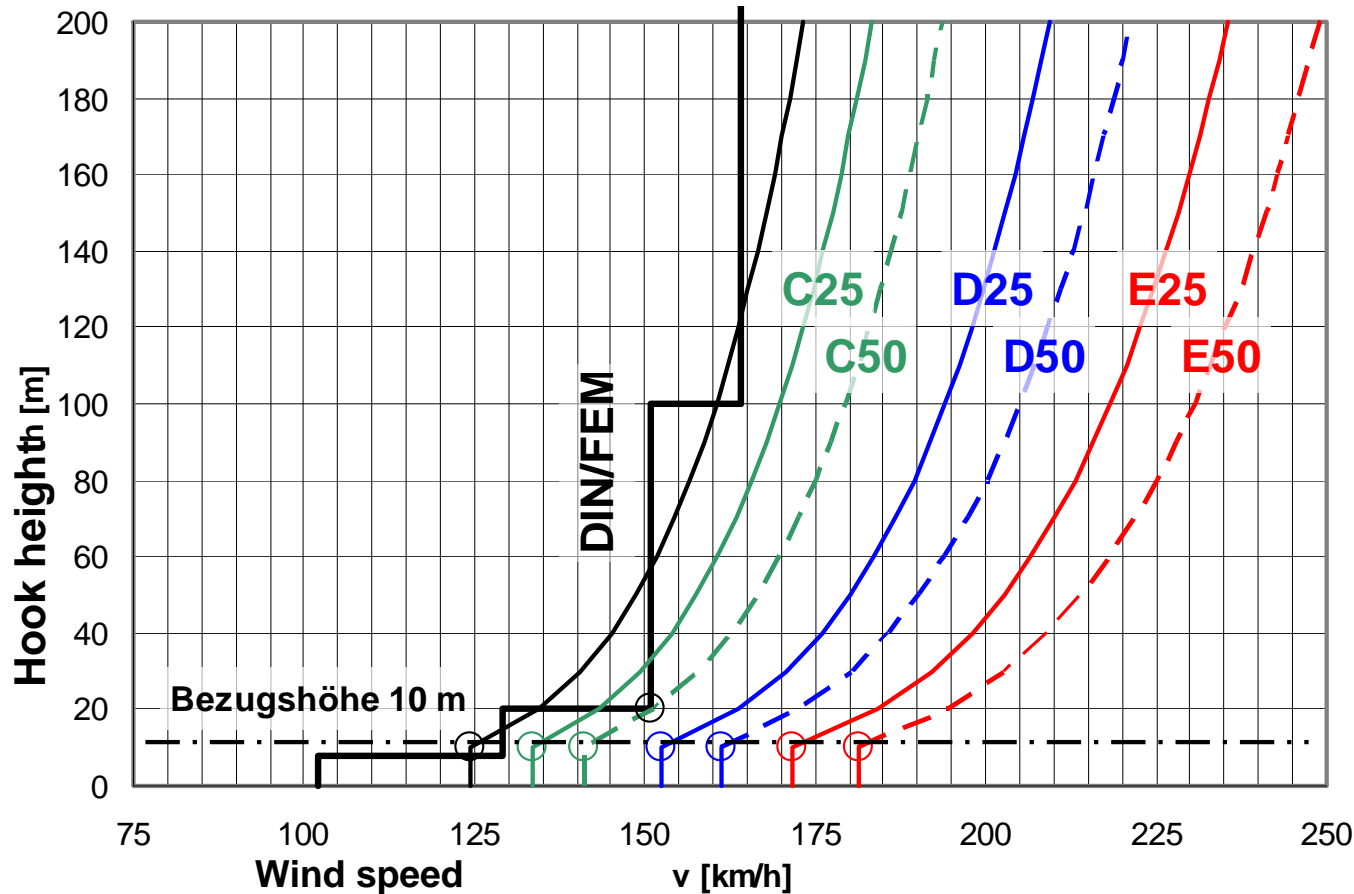
Load case "frontal storm"



- In the past, the load case "frontal storm" was already part of DIN 15019 but not FEM 1001. This load case was always considered by Liebherr for DIN and FEM cranes.
- In addition, the safety load case "frontal storm" or alternatively "storm from all sides" is now considered as binding, this load case covers the delayed slewing of the crane into the prevailing wind direction or, in general, cross gusts out-of-operation.

Gusts and wind speed profiles according to DIN 15018 and EN 13001

Wind repetition interval



The chart shows the previous DIN/FEM staircase profiles.

Wind is now considered more realistically. Curves C25 to E50 show the maximum wind speeds that can occur over a period of 25 or 50 years in various wind regions (C-E).

As minimum standard for the calculation takes the repetition interval of 25 years = **C 25** is defined.

Bezugshöhe=Reference height

Summary: Wind as an influencing factor

For the first time, this standard provides a standardised regulation for wind loads in the "crane out-of-operation" condition.

- The background is the large number of **severe storms** in the past few years and **new calculation methods** in civil engineering that were taken into consideration during the production of this guideline. In future, this will allocate **every crane to a wind region depending on the erection location and configure the crane accordingly.**
- Countries and regions are divided into wind regions with different reference wind speeds as per FEM 1.005.
- In FEM 1.005, the wind region C and a repetition interval of 25 years – abbreviated to C25 – were defined as the minimum standard for static calculations, stability verification and specifications for tower cranes in the operating instructions.

This achieves a standard safety level on European construction sites for tower cranes in out-of-operation condition, irrespective of whether the crane is erected on the coast or in the interior of the country. **The most important innovation is the realistic consideration of storm wind loads in the crane out-of-operation condition.**

- **Tower crane owners are therefore expected to consider local wind conditions depending on the erection location and to plan crane deployment accordingly.**

Application: New cranes



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Application scope of EN 14439 standard – New cranes

New cranes

- Starting on 1 January 2010, **every new tower crane delivered by Liebherr will be calculated with technical specifications at a wind repetition interval of C25 in accordance with EN 14439.**
- This European standard does not apply to tower cranes that were manufactured prior to the publication of this European standard.
- Tower cranes of the current series will be integrated in the calculation according to EN 14439 at Liebherr starting on 1 January 2010. They will therefore be modified to the current state of the art.
- The new datasheets are available online at http://www.liebherr.com/cc/products_cc.asp?menuID=106087!12573-0

Application: Old cranes



Application for the EN 14439 standard – Old cranes

Old cranes

- The general rule is **that the crane owner must take suitable measures within the EU to ensure the safety and health protection of his employees by operating his tower crane in accordance with the regulations.** These measures must comply with the results of his risk assessment and the state of the art. This means that even old cranes may have to conform with the new regulations in regions with increased wind speeds.
- **In order to keep work within practical limits and still support the introduction of a standardised level of safety throughout European, all statics enquiries from crane operators within the European economic area that are not explicitly referred to as DIN structures will be calculated according to EN 14439 C25 at Liebherr starting on 1 January 2010.**
- For all enquiries **from outside Europe**, the DIN/FEM staircase profile will remain as the minimum wind condition for cranes out-of-operation.

Standardised safety requirements



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Safety when climbing tower cranes

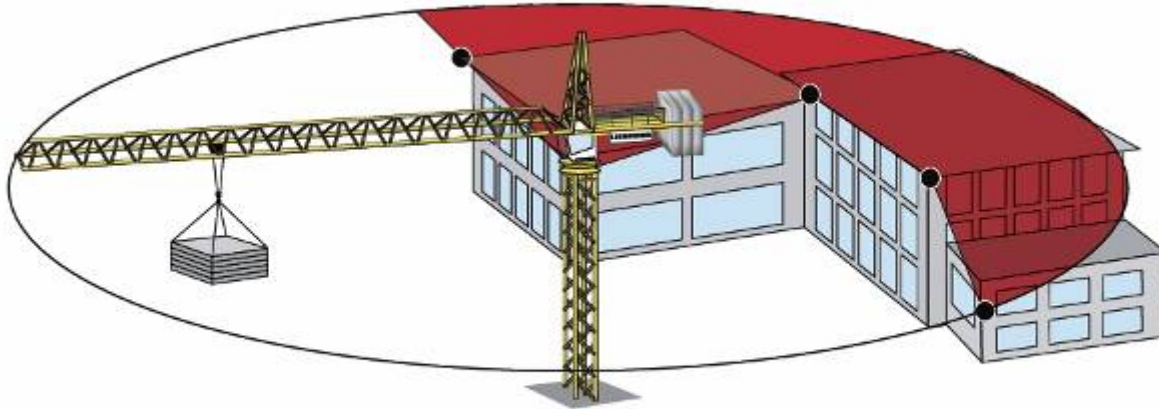


For the first time, the new standard defines **clear climbing rules** for tower cranes.

These rules apply equally to static calculations and structural design.

- The required safety level corresponds to that of crane operation. This is supported by various safety devices and limit switches.
- To summarise, the standard raises agreed **safety levels** for tower cranes throughout Europe and their climbing equipment and defines the minimum requirements for noise emissions, ergonomics and convenience for crane owners, erection personnel and ultimately crane drivers.

Safety devices: Minimum requirements



Minimum requirements for safety devices

In addition to the well-known safety devices such as overload protection and various limit switches, all new cranes brought into circulation must now be fitted with **an anemometer and an interface for collision-prevention systems**. A working range limit must also be retrofittable if required.

Interface must be prepared for a working range limit. This is already integrated in PLC-controlled Liebherr cranes.



- There is an exception rule for self-erecting tower cranes. They need only be fitted with an anemometer from a hook height greater than 30m.

More ergonomics and convenience for crane operators



- Standards are defined for the cabins, e.g. access, size, insulation, noise protection.
- Indicators, windshield wipers and heaters must be fitted and must meet definite requirements.



Safety for crane operators, erection and maintenance personnel

Minimum requirements for safety devices

- The standard also defines uniform requirements throughout Europe for access and safety distances for crane parts. The requirements are defined for the design of platforms, passage ladders, catwalks, handrails, ladders, etc.



Appendix: Standards



The harmonised product standard EN 14439 for tower cranes

- The EN 14439 standard "Cranes – Safety – Tower cranes" is the product standard for tower cranes applicable throughout Europe. Together with other industrial standards, e.g. EN 13135 (Equipment), EN 13557 (Controls and control stands), EN 13586 (Accesses) and others, the standard will ensure that the basic safety and health requirements (work protection) of the EC Machine Directive 98/37/EC (in future 2006/42/EC) are achieved.
- EN 14439 is therefore not comparable to DIN 15018 that is applicable in Germany. Together with DIN 15019, DIN 15018 supplies the basic principles of calculation for all crane types and its subject matter is therefore more the predecessor for the future EN 13001.
- Viewed in concrete terms, EN 14439 considers all conceivable risks (significant dangers) that may occur in operation and utilisation of tower cranes and, based on this, describes the design, statics and electrical minimum requirements that the manufacturer must meet to minimise these risks or exclude them. This occurs by the direct specification of a technical regulation and permitted limits or reference to another harmonised standard. Its contents therefore regulate areas which were previously covered in Germany by professional association rules.

Summary of currently valid standards and regulations for calculating tower cranes

- EN 14439:2009 Cranes – Safety – Tower cranes
- DIN 15018-1 Cranes – Basic principles for steel supporting framework – Calculation
- DIN 15018-2 Cranes – Basic principles for steel supporting framework – Basic principles for structural design and construction
- DIN 15019-1 Cranes – Stability for all cranes except for trackless mobile cranes and floating cranes
- FEM 1.001:1998 Basic principles for calculating cranes
- FEM 1.005:2003 Recommendation for the calculation of crane structures out of operation

Future general crane calculation standard:

- EN 13001 Cranes – General design

Remark: EN 13001 is already applied at Liebherr in acc. with EN 14439 in the development of new tower cranes although not all parts of the standard are available and the implementation and application for tower cranes has not yet been finally defined.