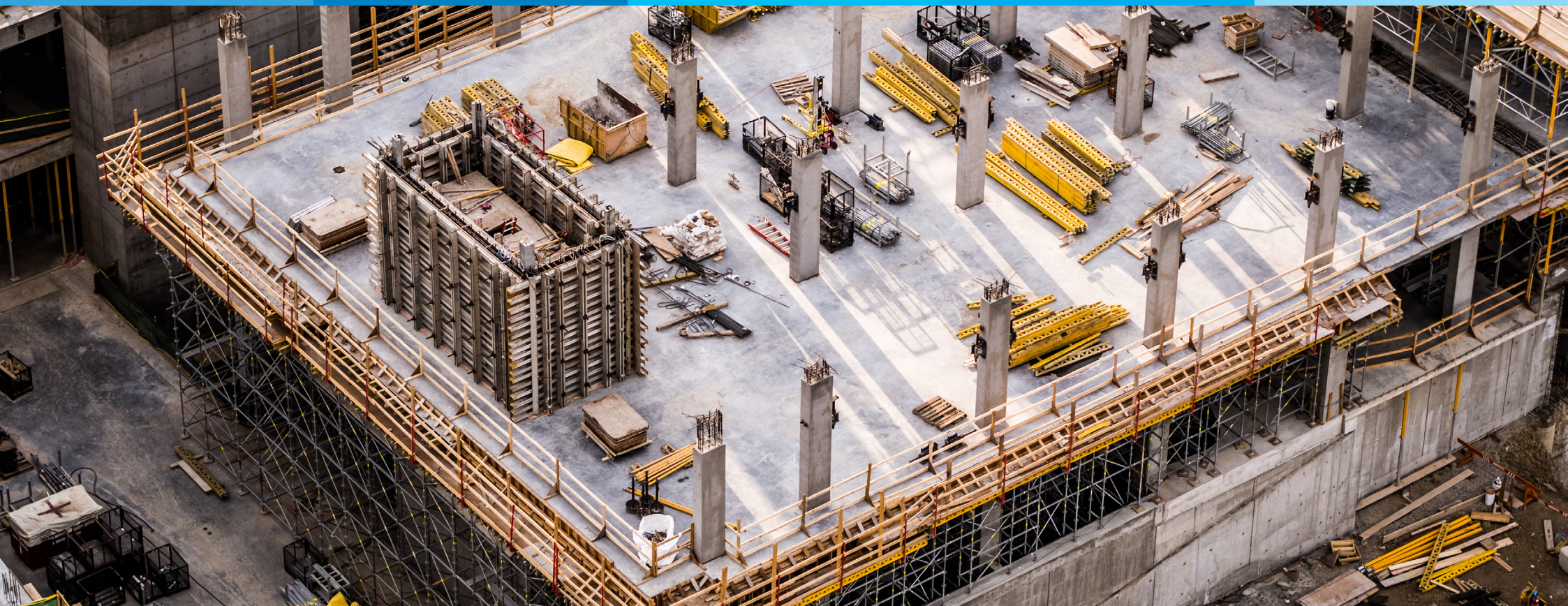
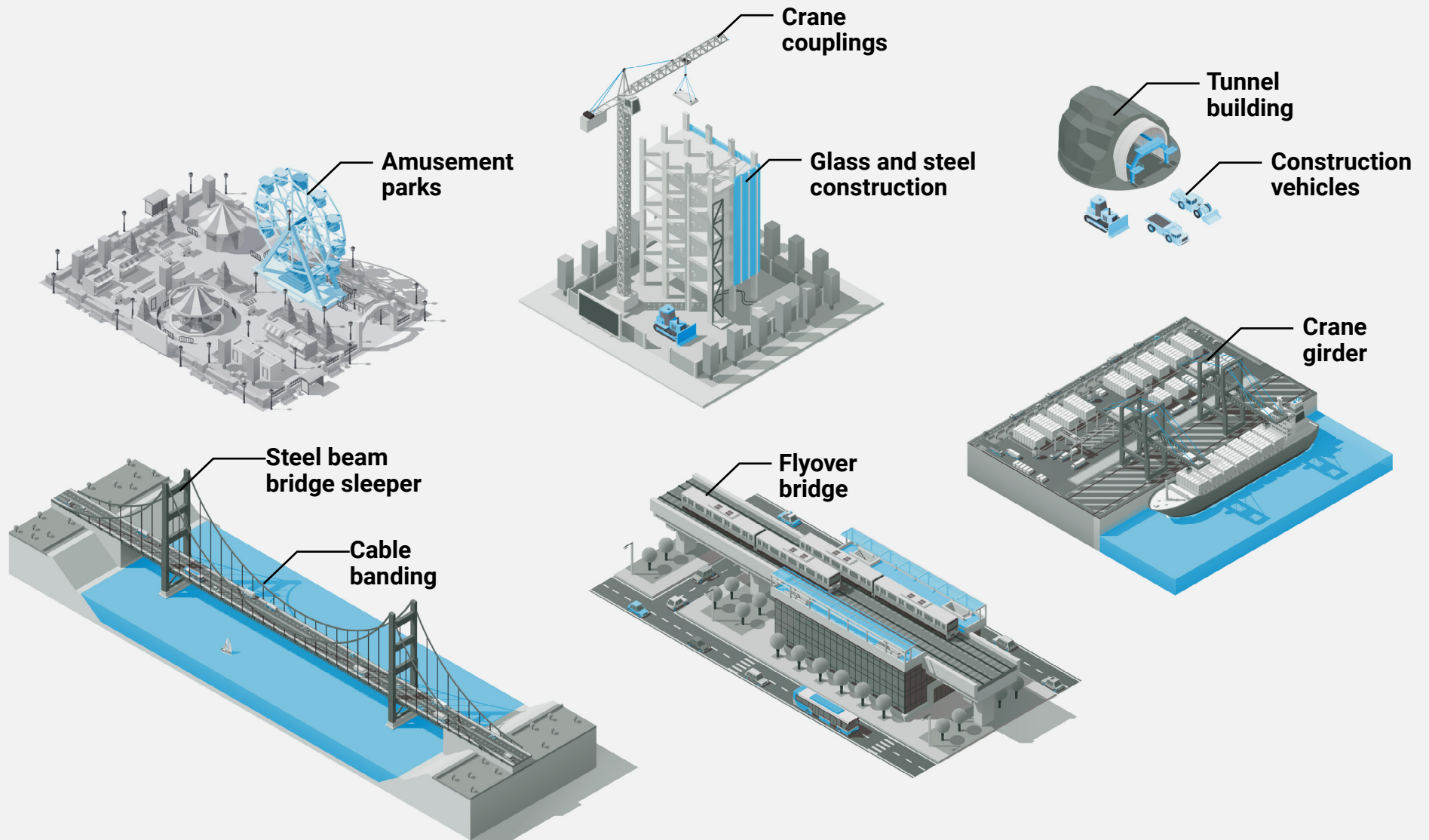


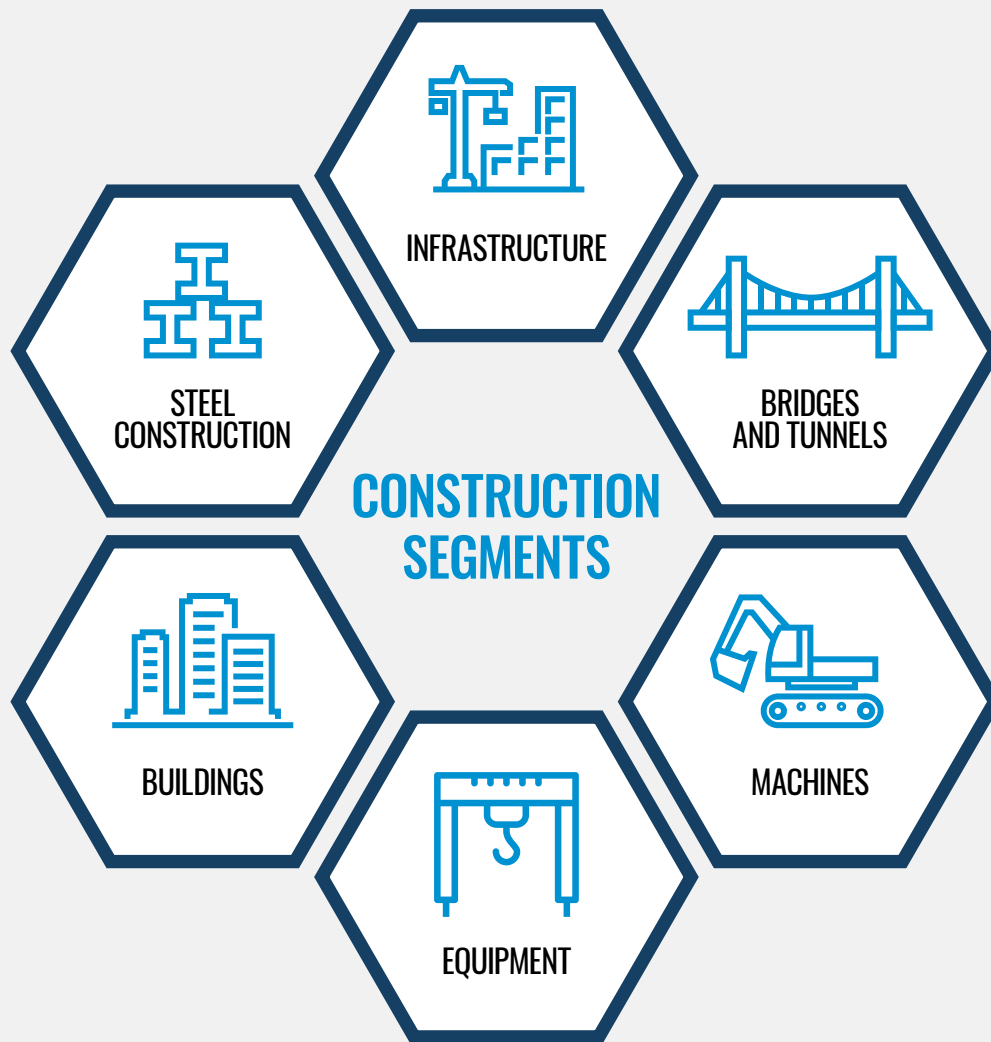
CONSTRUCTION

SAFE BOLTING FOR CONSTRUCTION APPLICATIONS





OUR WORLD OF CONSTRUCTION



Global Construction 2030 – forecasts the volume of construction output will grow by 85% to **\$15.5 trillion** worldwide by 2030

Source: Global Construction 2030, by Global Construction Perspectives and Oxford Economics

CONSTRUCTION BOLTING CHALLENGES

- New and complicated regulations;
- New requirements for torque/tension and load specifications;
- Speed in installation & minimum downtime;
- Increased strain on application due to increased length, height and size;
- Long lifetime requirement calls for durable solutions.

Traditional bolting methods are common even though they may cause disruption in production as well as work injuries.

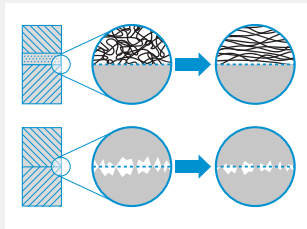
CONSTRUCTION BOLTING CHALLENGES



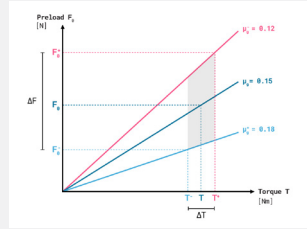
**Fatigue failure
(stress point nut)**



**Vibration induced
loosening**



**Settlement and
relaxation**



**High accuracy
needed to achieve
the required preload**



**Difficulties to access
bolt and nut to
retighten**



**Simultaneous
tightening needed**

SECURE BOLTING SOLUTIONS FROM NORD-LOCK GROUP

Endure severe loads & optimum fatigue life;

Safe and effective installation and removal, also at confined spaces;

Achieve required preload in the joint, despite bolt size;

Maintain preload over life time;

Meet design requirement: material, clamp length, conditions,

Reduce operation & maintenance requirements.



NORD-LOCK®

NORD-LOCK WEDGE-LOCKING WASHERS

**PREVENT BOLTS
FROM LOOSENING**

The challenge

To tighten and secure bolted joints in critical applications.

The solution

By using mechanical locking, Nord-Lock washers prevent bolts from coming loose.



SUPERBOLT™

SUPERBOLT MECHANICAL BOLT TENSIONING

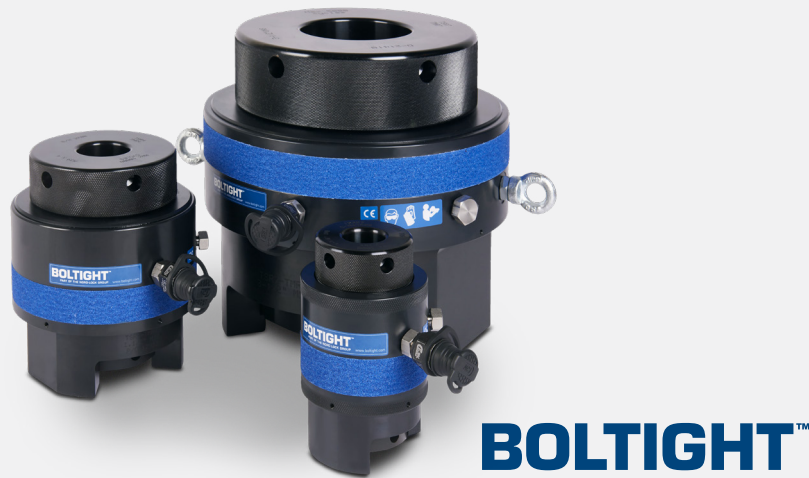
**TIGHTEN LARGE BOLTS USING
EASILY MANAGEABLE TORQUES**

The challenge

Create enough bolt load on large bolted joints.

The solution

Dividing the torque into multiple manageable forces.



BOLTIGHT™

BOLTIGHT HYDRAULIC BOLT TENSIONING

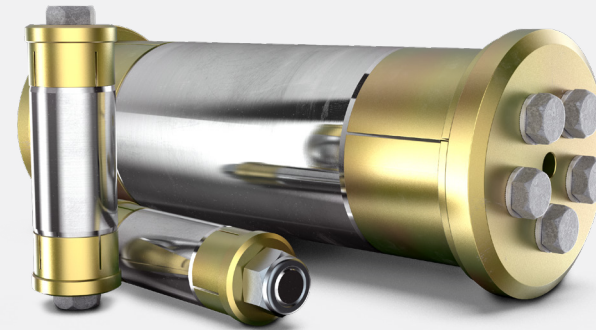
**ACCURATE AND EVEN PRELOAD
ON CRITICAL BOLTED JOINTS**

The challenge

Ensuring bolt load accuracy to avoid bolt loosening, leaks or critical machine failure.

The solution

Fast, accurate and safe solutions to tighten and loosen multiple bolts simultaneously with accuracy and even preload.



 **Expander®**

EXPANDER SYSTEM PIVOT SOLUTIONS

NO MORE LINE BORING

The challenge

Due to the clearance between the bore and the pin, lug wear occurs, affecting the machine pivot pins.

The solution

The Expander System pin has sleeves that expand radially and fixates the axle and lugs, eliminating lug wear.

SUCCESS STORIES

Discover how Nord-Lock Group solved numerous challenges across different industries around the world.



TUSENFRYD AMUSEMENT PARK

Location: Oslo, Norway

Application: Thundercoaster roller coaster

The challenge: over 4,000 critical bolted connections

The solution: Nord-Lock Washers



ONE WORLD TRADE CENTER

Overall project cost: \$3.1 billion

The challenge: Securing the hoist drums

The solution: Superbolt multi-jackbolt tensioners, 40 units for each hoist

Contractors: FKC-Lake Shore



OAKLAND BAY BRIDGE

Overall project cost: \$6.4 billion

Application: Replacing the bridge's east span

The solution: Hydraulic bolt tensioning of cable band bolts

Contractors: American Bridge/Fluor



STOCKHOLM SLUSSEN

Application: Struts for hinged columns

The challenge: Manage movements in a bridge with great variation in cross-section height and variable cross-section geometry

The solution: Expander System



BUNDESLIGA FOOTBALL STADIUM

Location: Benteler Arena, Paderborn, Germany

Application: Stadium expansion

The challenge: Withstanding the vibration caused by thousands of jumping fans

The solution: Nord-Lock SC washers



TOKYO SKYTREE

Application: the world's tallest broadcast tower

The challenge: Components had to withstand high winds, earthquake threats and corrosion

The solution: over 10,000 pairs of Nord-Lock 254 SMO® washers



TEREX TOWER CRANES

Application: CTL 1600-66

The challenge: Designing the coupling between the tower and the jib to easy and safe for operators without altering their design

The solution: Superbolt MJTs



LIEBHERR 900 EXCAVATOR

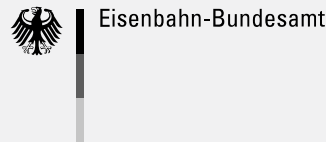
Location: Iowa, United States

The challenge: Pivot pins were frequently coming loose in the lug ears causing extra costs and downtime

The solution: Expander System

To see more success stories or learn more about our technologies, please visit www.nord-lock.com

PROVEN AND CERTIFIED



NORD-LOCK®

- CE-mark certification of SC-washers for use with HV sets
- ABP: General Appraisal Certificate
- DIBt: Technical Approval and European Technical Approval
- Lloyd's Register
- Siemens system audit
- RoHS, ELV and REACH conform
- ISO 9001 and ISO 14001
- TÜV

SUPERBOLT™

- 3.1 or 3.2 Material certificate
- Magnetic Particle test, Ultrasonic inspections
- Notched bar impact test (material)
- ISO 9001
- TÜV

BOLTIGHT™

- ISO 9001
- 97/23/EC European Pressure Equipment Directive

Expander®

- ISO 9001 and ISO 14001
- DNV 2:22/ OS E-101
- API 8C/ISO 13535
- TÜV

SPECIALISTS IN BOLTING, DESIGN AND ENGINEERING

Engineering projects are complex and can encounter many difficulties that cause delays and budget problems. Our technical teams are passionate about sharing their knowledge, insights and expertise to ensure optimal long-term solutions.

We work closely with you to understand your needs, solve your problems and support your projects from the initial planning to installation and ongoing maintenance. Our services focus on life cycle profitability, design and production, and training and installation support. With a commitment to delivery excellence, we ensure that you will receive the correct components on time.



WE ENSURE THE SAFETY OF YOUR MECHANICAL JOINTS

We keep up with technological innovations and the extraordinary demands on bolting solutions from our customers. With close cooperation, standard and customized products can be designed and manufactured quickly.

Our six technical centers located in Europe, North America and Asia are equipped with the latest testing technology to perform bolted joint analyses.

WE PROVIDE TRAINING AND INSTALLATION SUPPORT

The more you know about the mechanical behavior of bolts, the less likely you are to encounter challenges or machine downtime. We offer on-site and remote training sessions to educate your team. This includes installation support, as well as assistance with service and retrofitting. E-learning courses, web applications and resources are also available for knowledge building.

WE FOCUS ON DELIVERY EXCELLENCE

The quicker you receive your solutions, the sooner your projects can be completed. Therefore we have developed – and continue to perfect – the robustness of our logistics system. Our products are supplied through distribution centers in North America, Europe and Asia to our mature network of authorized partners, ensuring we are able to deliver our products anywhere in the world.



THE MOST COMPREHENSIVE WARRANTY PROGRAM IN OUR INDUSTRY

The Nord-Lock Group Lifetime Warranty ensures your solution will perform as expected from the moment it is installed until the end of its intended lifecycle. That means:

- The **entire lifetime** of the bolted connection for Nord-Lock wedge-locking washers;
- The **entire lifetime** of the bolted connection for Superbolt multi-jackbolt tensioners;
- **10 years/10,000 hours** for Expander Systems pivot technology;
- **3 years/10,000 cycles** for Boltight tensioning tools.

BOLTING AND ENGINEERED SOLUTIONS

Nord-Lock Group believes that no one should have to question the integrity of the mechanical systems that play such a critical role in our way of life. As a global leader in engineering and bolting technologies, we strengthen public and industrial infrastructures with high-quality, safe and innovative solutions that will change the face of global industries for decades to come.

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GROUP