Power Cable Reels

Course No: E02-040
Credit: 2 PDH

Wissam Geahchan, P.Eng.

Continuing Education and Development, Inc.

P: (877) 322-5800
info@cedengineering.com

Table of Contents

1.0 Introduction

Wire and cable are critical components in electrical systems, and the reels that store, transport, and dispense them play an equally important role in ensuring product integrity and installation efficiency. Improper handling, storage, or use of cable reels can lead to mechanical damage, electrical performance issues, safety hazards, and costly project delays. Understanding how to properly manage power cable reels is essential for anyone involved in the wire and cable supply chain.

Figure 1 – Wooden reels

This course provides a practical, industry-focused overview of power cable reels, covering their design, construction, handling, storage, transportation, and on-site use. Participants will gain insight into how reels protect cable during manufacturing, shipping, and installation, and how improper practices can compromise both cable performance and worker safety. The course emphasizes real-world scenarios and common challenges faced in warehouses, job sites, and distribution environments.

The content is intended for a wide range of professionals, including electrical distributors, manufacturers, contractors, installers, inspectors, and end users who regularly handle or install wire and cable. Whether you are responsible for receiving cable shipments, moving reels with forklifts or cranes, storing reels in a yard, or paying out cable during installation, the knowledge presented in this course will help you reduce risk, improve efficiency, and extend the service life of both reels and cable.

Topics include reel materials and types, load ratings, proper lifting and rolling methods, correct payout techniques, storage orientation, environmental considerations, and inspection practices. Special attention is given to preventing common forms of damage such as flange cracking, barrel deformation, cable crushing, moisture intrusion, and conductor or insulation defects caused by mishandling.

It is important to note that this course is not intended to replace industry standards, manufacturer instructions, or regulatory requirements. Instead, it serves as a reference guide that consolidates best practices and practical guidance based on widely accepted industry experience. Users should always consult applicable standards, safety regulations, and manufacturer recommendations when making decisions related to cable reel handling and installation.

2.0 Standards, Types and Design

2.1 Standards

The most commonly referenced standard for wire and cable packaging is **NEMA WC 26 / EEMAC 201 Binational Wire and Cable Packaging Standard.** This standard is written jointly by National Electrical Manufacturers Association (NEMA) and the Electrical and Electronic Manufacturers Association of Canada (EEMAC). It establishes uniform requirements for the packaging of wire and cable products distributed throughout the North American market. The purpose of the standard is to promote safe handling, consistent quality, and reliable performance of packaging systems used across manufacturing, transportation, storage, and installation environments.

The standard defines the construction and design requirements for a variety of package types, including wooden reels, metal reels, plywood reels, steel drums, and returnable containers. Each package type is specified with minimum strength, dimensional, and structural criteria to ensure that reels and drums can safely support the weight and tension of the cable they contain. Minimum drum and reel diameters are also established to prevent excessive bending stress on conductors and insulation, which could otherwise lead to deformation or long-term performance degradation.

NEMA WC 26 also addresses reel coverings and protective materials. These coverings help shield cable from moisture, UV exposure, dirt, and mechanical damage during shipping and storage. Acceptable covering materials, application methods, and securement practices are defined to maintain product integrity until installation.

Marking and identification requirements form another key component of the standard. Reels and drums must display clear, durable labels that include essential information such as manufacturer, cable type, size, length, weight, handling instructions, and reel direction. Proper identification improves traceability, reduces installation errors, and enhances safety for warehouse and field personnel.

Handling and storage practices are also covered. The standard provides guidance on lifting points, rolling direction, stacking limitations, and surface support to prevent reel damage or instability. Proper storage conditions are recommended to minimize environmental exposure and mechanical stress while maintaining accessibility and inventory control.

Another commonly referenced packaging standard is the **Aluminum Association's Packaging Standard for Aluminum Conductor and ACSR**, which establishes requirements for the packaging, protection, and handling of overhead aluminum conductors, including all-aluminum conductor (AAC), aluminum conductor steel-reinforced (ACSR), and other related conductor constructions.

2.2 Types

Wire and cable reels are manufactured in several material types to suit different weight capacities, handling conditions, and reuse requirements. Common reel constructions include steel, metal-framed wood, solid wood, plywood, and plastic/metal spools. See **Figure 1**. Each type is designed to support a specific range of cable weights and lengths while maintaining structural stability during transportation, storage, and installation.

Figure 1 – Different types of reels – (from left to right): Steel, Metal-framed wood, Wood, Plywood, Plastic spool, Metal spool

Steel reels provide the highest strength and durability and are typically used for heavy power cables and long conductor lengths. Metal-framed wood reels combine steel flanges or hubs with wooden components to balance strength and weight. Wood reels are widely used for general cable distribution and offer good strength at lower cost. Plywood reels provide consistent quality, lighter weight, and reduced risk of splitting. Plastic reels are mainly used for lighter cables and specialty applications where moisture resistance and cleanliness are important.

Reels may be designed for reuse or single-use, depending on material, construction quality, and logistics requirements. Reusable reels are built for multiple loading cycles, while single-use reels are intended for one delivery and disposal or recycling.

NEMA WC 26 defines three reel categories.

1. Returnable reels - owned by the manufacturer and returned after use.
2. Reusable reels - designed for multiple uses but are not returned to the original supplier.
3. Nonreturnable reels are intended for one-time use only.

These classifications help standardize packaging practices across the wire and cable industry.

Returnable Reels

These reels are designed for multiple uses and are typically returned to the cable manufacturer or their designated agent after the cable is installed or dispensed. These reels are often constructed from steel, engineered plastic, or extra-heavy-duty wood (Class 3) to ensure durability and resilience over repeated shipping cycles. Returnable reels are engineered to withstand multiple loadings, environmental exposure, and repeated handling, making them ideal for heavy, long-length, or specialized cables. They are commonly used in industrial, utility, and energy projects where logistics efficiency and sustainability are priorities.

One common type of returnable reel is the gas-tight steel shipping reel, which is typically used for pipe-type cables. These reels are fully enclosed to prevent the ingress of gases, moisture, or

contaminants, which is critical for cables sensitive to environmental conditions. Steel provides the necessary structural integrity to support heavy cable loads, while the gas-tight design ensures that the cable remains protected during storage and transport. Gas-tight steel reels are particularly important for applications in the energy and industrial sectors, where cable reliability and long-term performance are paramount.

Another variation is the steel fluted reel, which features fluted or corrugated flanges designed to develop a strong, durable package. The fluting adds rigidity to the reel, preventing flange deformation under heavy loads or repeated handling. Steel fluted reels are ideal for long-distance transportation or for cables that require higher protection against mechanical impact. These reels are engineered to maintain dimensional stability even when stacked, reducing the risk of tipping or accidental unspooling during shipping.

Engineered plastic reels represent a modern alternative in returnable reel design. These reels are typically specified by the cable manufacturer and are engineered to be lightweight, durable, and resistant to moisture and chemical exposure. Plastic reels are particularly suitable for lighter cables or for environments where corrosion from moisture or chemicals could damage metal reels. Advanced engineering plastics can also provide enhanced impact resistance while reducing the overall weight of the reel, which facilitates easier handling and reduces shipping costs.

Finally, extra-heavy-duty wood reels (Class 3) are designed for repeated use and are capable of supporting extremely heavy cables. These reels are often constructed from dense hardwoods or laminated wood and are reinforced with steel bands or hubs. Class 3 wood reels are frequently used for large industrial cables, power distribution lines, or specialized conductors that require robust support over multiple transport cycles. Their heavy-duty construction ensures that the reel maintains structural integrity during stacking, handling, and installation.

Reusable wood reels

These reels are intended for the delivery, storage, and dispensing of the cable product but are not designed to be returned to the manufacturer. They come in varying sizes to accommodate different cable lengths, diameters, and weights. They are commonly classified as Class 1 or Class 2 reels, depending on the intended application. Class 1 reels are generally used for standard or general-purpose cables, where the loads are moderate and repeated usage is not anticipated. They are suitable for commercial installations or situations where the reel may remain on-site until the cable is completely used.

Class 2 reusable wood reels, on the other hand, are engineered for heavier-duty applications. These reels feature stronger flanges, reinforced hubs, and additional bracing to support cables that are heavier or have larger diameters. Class 2 reels are often employed for medium-voltage power cables, industrial conductors, and other applications where a single-use reel needs to reliably support the cable throughout its entire deployment. While reusable, these reels are typically left at the job site after installation, which eliminates the logistical challenges of returning them to the manufacturer.

Nonreturnable reels

These types cover any reel that the cable manufacturer designates as intended for one-time use. Nonreturnable reels are often smaller, lighter, or intended for single project deployment. Small nonreturnable packages are commonly referred to as spools, which can be made from metal, wood, engineered plastic, plywood, or a combination of these materials. They provide a durable, cost-effective option for heavy or industrial cables where recycling is not feasible. Wood reels and plywood reels are widely used for commercial and light industrial applications where cost and ease of handling are priorities. Engineered plastic spools offer lightweight, corrosion-resistant solutions for specialty cables or shorter runs.

The choice between returnable, reusable, and nonreturnable reels depends on several factors, including cable type, weight, length, environmental conditions, logistics requirements, and cost considerations. Returnable reels offer the advantage of sustainability and long-term cost savings but require additional planning for collection, inspection, and refurbishment. Reusable wood reels balance durability with simplicity, providing a reliable solution for single-use or medium-term applications. Nonreturnable reels and spools maximize cost efficiency and convenience for short runs or specialized projects but may generate additional waste if not recycled.

Understanding the structural design of each reel type is also important for payout operations. Returnable and reusable reels are engineered to support repeated or extended use, allowing cable to be unreeled smoothly without excessive bending or kinking. Nonreturnable reels are generally designed for straightforward, one-time payoff, emphasizing ease of handling and cost efficiency rather than long-term durability.

Finally, reel selection also impacts transportation efficiency. Large steel or Class 3 wood reels can carry longer cable lengths and heavier loads, reducing the total number of shipments required. Smaller nonreturnable reels or spools are easier to handle manually or with smaller equipment but may require additional shipping runs to deliver the same volume of cable. Proper planning ensures that the reel size, cable length, and shipping method are compatible, reducing risk of damage during transit.

2.3 Design

The following diagram **(Figure 2)** shows the essential parameters of a reel.

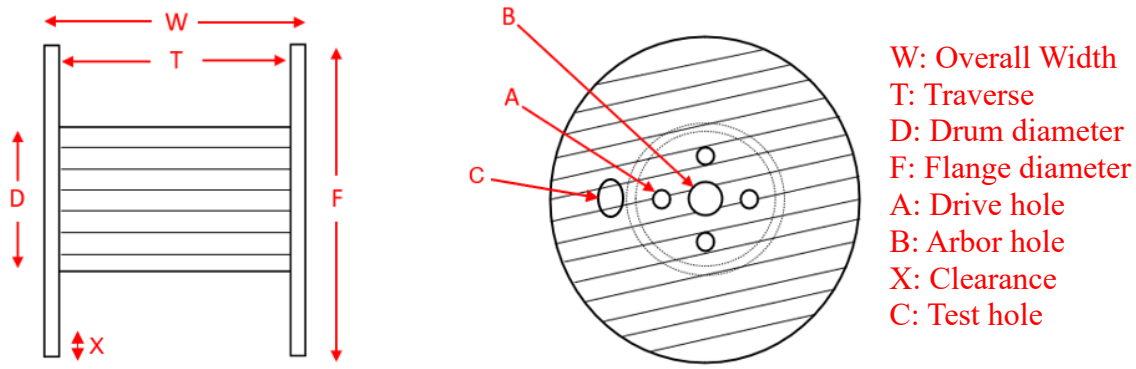


Figure 2 – Reel parameters

Reel dimensions are typically **written** as Flange x Traverse x Drum diameter**s** along with the reel's carrying capacity in pounds (lbs) or kilograms (kg).

Minimum drum diameters for cable reels are a critical design requirement in wire and cable packaging standards. The drum diameter determines the bending radius applied to the cable as it is wound onto the reel. If the drum is too small, the cable is forced into an excessively tight bend, which can damage conductors, insulation, shields, and jackets.

Each cable type has a specified minimum bending radius based on its construction, materials, and voltage rating. The minimum drum diameter must be large enough to maintain this bending radius when the cable is wound under normal tension. Exceeding the allowable bend limits can lead to cracked insulation, distorted conductor strands, separation of shielding layers, and long-term performance degradation that may not be immediately visible.

Proper drum sizing also improves handling and installation. Cables wound on adequately sized drums pay off more smoothly, reduce internal stress, and maintain their original shape when unreeled. This helps prevent installation difficulties such as kinking, oval deformation, and uneven tension during pulling.

Consideration must also be given to the arbor hole, flange and traverse diameters to ensure that the reels will fit on special pay-off equipment, such as reel jacks or truck-mounted payoff units.

3.0 Marking and Identification

Reel marking and identification plays a critical role in the safe, efficient, and consistent handling of wire and cable products throughout the supply chain. Proper labeling allows reels to be clearly distinguished by type, ownership, size, and intended use, supporting better logistics, traceability, and compliance with industry standards. Without clear reel identification, the risk of handling errors, misuse, and packaging inefficiencies increases significantly.

One of the essential marking requirement is the identification of flange, traverse, and drum dimensions as well as Class type. Dimension markings allow manufacturers, distributors, and recyclers to identify the reel without physical measurement, improving efficiency and reducing handling errors. They also help confirm that the reel can safely support the intended cable weight and length.

A common industry practice is the use of NEMA/EEMAC Class markings, where Class 1, Class 2, or Class 3 identifies the structural class of the reel. These classes reflect differences in construction strength, reuse capability, and service life. The class marking allows users to quickly understand the reel's intended performance level and determine whether it is suitable for reuse, return, or recycling.

Reel marking may also differentiate returnable reels from non-returnable reels. Clear identification prevents accidental disposal of returnable reels and helps distributors and contractors manage return programs effectively, reducing waste and packaging costs.
Reel markings also typically indicate reel size and supplier, which supports inventory control, transportation planning, and proper matching of reels to cable types. When reel origin and specifications are clearly visible, it becomes easier to confirm compatibility with handling equipment, storage racks, and payoff systems.

In addition to standard markings, additional reel identification may be applied at the customer's request or at the cable manufacturer's option. This can include asset numbers, barcodes, RFID tags, project names, color coding, or special handling instructions. T

Reel marking must also align with other applicable standards. CSA and UL labeling requirements may apply depending on the cable type, application, and regulatory environment. These standards ensure that safety, performance, and compliance information is clearly communicated. Manufacturers and users should always verify that reel labeling practices meet the latest CSA and UL requirements in addition to NEMA and EEMAC guidance.

Beyond compliance, proper reel marking directly supports safety. Clear rolling direction arrows, lifting points, and weight information reduce the risk of improper handling, tipping, or structural damage. Field personnel can quickly understand how a reel should be moved, stored, and positioned for payoff, minimizing accidents and cable damage.
From a sustainability perspective, accurate reel identification also supports reuse and recycling programs. When reels are properly classified and dimensioned, they can be efficiently sorted, refurbished, or recycled, reducing environmental impact and material waste.

4.0 Capacity

Reel capacity calculations are essential for selecting the correct reel size and determining how much cable can be safely packaged on a given reel. Two primary limits must always be considered:

1. The maximum volumetric capacity of the reel; and
2. The maximum allowable cable length capacity.

Understanding both ensures that reels are not overloaded, cables are not damaged, and handling remains safe throughout transportation, storage, and installation.

The maximum volumetric capacity is based on the physical dimensions of the reel. More specifically, the flange diameter, drum diameter, and traverse width. These dimensions define the available space where cable can be wound. If the volumetric capacity is exceeded, the cable may overbuild beyond the flanges, leading to instability, flange damage, and poor payout performance. Overfilled reels are also more difficult to handle and transport safely.

The maximum cable length capacity, however, is not determined by volume alone. Cable construction, outer diameter, stiffness, weight per unit length, and minimum bending radius all influence how much cable can be placed on a reel. A cable with a larger diameter or heavier construction will reach its weight or bending limitations before the reel's volumetric space is fully used. Conversely, smaller or lighter cables may reach volumetric limits first. This is why both volume and cable characteristics must be considered together.

Accurate capacity calculations help manufacturers select the correct reel size for a given cable design. They prevent situations where a reel is structurally capable of holding the weight but lacks sufficient volumetric space, or where space is available but the reel is overloaded beyond its design rating. Both scenarios increase the risk of reel failure, cable deformation, and transportation damage.

From an installation perspective, proper reel sizing improves payout performance. Cables wound within calculated limits maintain uniform layers, consistent tension, and smooth payoff. Overfilled reels often cause cable crossovers, binding, and sudden tension changes that can damage the cable or create safety hazards for installers.

Reel capacity calculations also support logistical efficiency. By knowing the maximum cable length that can be placed on each reel size, manufacturers can optimize production runs, reduce the number of reels required, and improve shipping efficiency. Distributors and contractors benefit from predictable reel sizes that fit handling equipment, storage racks, and transportation constraints.

In addition, correct capacity planning supports compliance with packaging standards such as NEMA, EEMAC, and Aluminum Association guidelines. These standards establish limits that protect both the cable and the reel, ensuring consistent performance across the supply chain.

5.0 Coverings

There are 6 levels of covering protection defined in the NEMA WC 26 standard:

1. **Level 1:** No covering normally required
2. **Level 2:** Weather Protector
3. **Level 3:** Heavy Duty Physical Protector
4. **Level 4:** Extra Heavy Duty Physical Protector
5. **Level 5:** Export
6. **Level 6:** Special Packaging

Level 1 requires no covering and is applied when the cable and reel are not exposed to significant environmental or mechanical hazards. In these cases, the cable may be shipped or stored in controlled indoor environments where weather, moisture, and physical impacts are minimal. Level 1 coverage is typically reserved for short-term storage or distribution within manufacturing facilities where conditions are carefully monitored. Despite the lack of external covering, proper handling and careful stacking of reels remain important to prevent physical damage to the cable layers.

Level 2 introduces a weather protector, which provides basic protection against environmental exposure during storage. This level is intended to shield reels from light rain, sun, dust, and other moderate weather conditions. Coverings may include plastic wraps, tarpaulins, or light-coated paper wraps that prevent moisture absorption and UV degradation. Weather protection is especially important for reels stored outdoors for extended periods, as exposure to moisture can lead to corrosion of metallic conductors, deterioration of insulation, or swelling of wooden reels. Level 2 protection does not provide significant impact resistance, so care must still be taken during handling and transportation.

Level 3 is classified as a heavy-duty physical protector, offering increased physical protection for reels and cable. This level incorporates more robust materials, such as reinforced plastic, laminated paper, or heavy-duty tarps, often combined with additional banding or edge protection. Level 3 coverings are designed to prevent damage from accidental contact, minor impacts, or abrasion during storage and movement. They are commonly used in industrial yards, construction sites, or warehouses where reels may be stacked, shifted, or handled by forklifts or cranes. By providing a stronger barrier, Level 3 coverings help maintain the integrity of cable insulation, prevent scuffing, and reduce the likelihood of cosmetic or structural damage that could affect performance during installation.

Level 4 is the extra heavy-duty physical protector, providing a substantial amount of physical protection for the most demanding environments. Reels covered at this level typically feature multiple layers of reinforced material, including heavy-duty plastics, composite wraps, or even protective boards that cover the flanges and drum surfaces. This level is used when reels may be exposed to significant mechanical hazards, such as stacking in tight storage areas, handling with large equipment, or transport on rough terrain. Extra heavy-duty protection ensures that the cable retains its shape, minimizes the risk of deformation, and prevents contact with sharp edges, abrasive surfaces, or other reels that could compromise the product. Level 4 coverings are often

accompanied by strapping, corner guards, and edge reinforcement to further protect the reel during rigorous handling and long-term storage.

Level 5 is known as export protection, is specifically intended for prolonged transit and international shipping. This level combines robust physical protection with resistance to environmental factors such as moisture, salt, UV exposure, and temperature fluctuations. Export-level coverings often include water-resistant tarps, shrink wrap, reinforced bands, and protective crates or pallets designed to secure the reel during long journeys by truck, rail, or ship. Level 5 protection ensures that reels withstand extended handling, exposure to weather, and mechanical stress encountered during multi-modal transportation. For overseas shipments, this level is particularly critical, as exposure to saltwater, humidity, and long-term vibration can significantly affect the structural integrity of the reel and the cable itself.

Level 6 is designated as special packaging. Special packaging can include custom crates, rigid enclosures, padded covers, or other engineered solutions designed to meet unique conditions, such as extreme environmental exposure, hazardous chemical environments, or highly sensitive cables like fiber optic or high-voltage conductors. This level may also incorporate features like desiccants, corrosion inhibitors, and climate-controlled packaging for highly sensitive or expensive cable products. Level 6 ensures that the cable arrives at its destination in optimal condition, even under extreme or specialized circumstances.

Each level of reel covering represents a balance between protection, cost, and application. Lower levels are economical and sufficient for controlled environments, while higher levels are designed to mitigate the risks of long-term storage, heavy handling, or harsh transport conditions. Selecting the correct covering level is essential to preserve cable performance, minimize damage, and reduce the likelihood of costly rework or replacement. Properly applied coverings not only protect the cable's physical integrity but also contribute to consistent installation quality and safety across the supply chain.

Beyond the basic material specifications, the effectiveness of a covering system also depends on proper application. Wrapping must fully enclose the reel, secure against wind or movement, and avoid sharp folds or gaps that could expose cable surfaces. Reinforced edges, corner protection, and strapping can enhance the performance of both heavy-duty and export-level coverings. In addition, marking and labeling the covered reel with the cable type, length, and handling instructions ensures that personnel can transport, store, and deploy the cable correctly without compromising its protection.

In addition to identifying these covering types, the NEMA WC 26 standard also provides guidance on the materials recommended for each protection level. Plastic wraps, tarpaulins, paper coatings, engineered plastics, and composite materials are selected based on durability, moisture resistance, and mechanical strength. For export-level or special packaging, additional materials like plywood boxes, reinforced pallets, or climate-resistant coatings may be specified.

By adhering to these guidelines, manufacturers can consistently apply the correct level of protection to every reel while optimizing material usage and cost.

6.0 Handling

Caution must be taken when handling reels, namely when loading, unloading and transporting.

When offloading reels from a truck, lower them carefully using a hydraulic gate, hoist or forklift truck. Never drop reels. If reels must be rolled, then roll them in the opposite direction to the cable wraps to keep the cable from loosening on the reel.

When using a hoist, install a mandrel through the reel arbor hole and attach a sling. Use a spreader bar approximately 6 inches longer than the overall reel width placed between the sling ends just above the reel flanges. This will prevent bending of the reel flanges and damage to the cable.

If a forklift is used, approach the reel from the flange side. Position the forks such that the reel is lifted by both reel flanges. Do not allow the lift forks to contact the cable. Care must be taken by the forklift operator not to make sudden stops or turns.

Cable and reels less than 1,500 lb (total) may be lifted by the top or bottom flange using a vertical reel handling system. If the cable and reel weighs more than 1,500 lb, then cable and reel damage will occur.

Lifting using cranes (See Figure 3)

Proper crane lifting techniques are essential to protect both the cable and the reel from damage and to ensure the safety of personnel during handling. Cable reels can be extremely heavy, and improper lifting can result in tipping, dropping, flange damage, or deformation of the drum, which may compromise the cable inside.

The first consideration when lifting a reel with a crane is selecting the appropriate lifting equipment. Standard lifting methods include slings, hooks, reel lifting bars, or specialized reel lifting devices designed to cradle the drum or engage the reel hub. Slings should be made from durable materials such as wire rope, synthetic webbing, or chain, rated for the load they will carry. They must be free from fraying, kinks, or other defects that could compromise strength. When using lifting hooks or bars, it is critical that the hook diameter, sling placement, and crane rating align with the reel's weight, dimensions, and center of gravity.

Proper attachment points are essential for safe lifting. Many reels feature a designated lifting hub or eye, which ensures the load is balanced and reduces the risk of twisting or tilting. When lifting by the drum, lifting bars or reel hooks should be positioned through the hub to evenly distribute the load across the reel flanges. Care must be taken to prevent slings or lifting bars from coming into contact with the cable layers themselves, as this could cause indentations, insulation damage, or cable deformation.

Before lifting, the load should be inspected and secured. Strapping, flange protection, and edge guards can prevent damage from contact with slings or lifting bars. Personnel should establish clear communication with the crane operator and maintain a safe distance from the load to avoid

injury if the reel shifts unexpectedly. The path of the lift should be free of obstacles, and sudden movements should be avoided.

During the lifting process, maintaining a controlled, slow lift is critical. Sudden starts or stops can shift the center of gravity, causing the reel to swing or tilt. A controlled lift minimizes dynamic forces and reduces stress on the reel structure and cable layers. When lowering the reel, care must be taken to place it on a stable surface, ideally on a level pad or reel stand, to prevent rolling or tipping.

Training is an important component of crane operations for cable reels. Operators should understand the weight, dimensions, and center of gravity of each reel and be familiar with safe crane operation techniques. Personnel involved in attaching slings, guiding the load, or securing the reel should also be trained in proper procedures to reduce the risk of accidents.

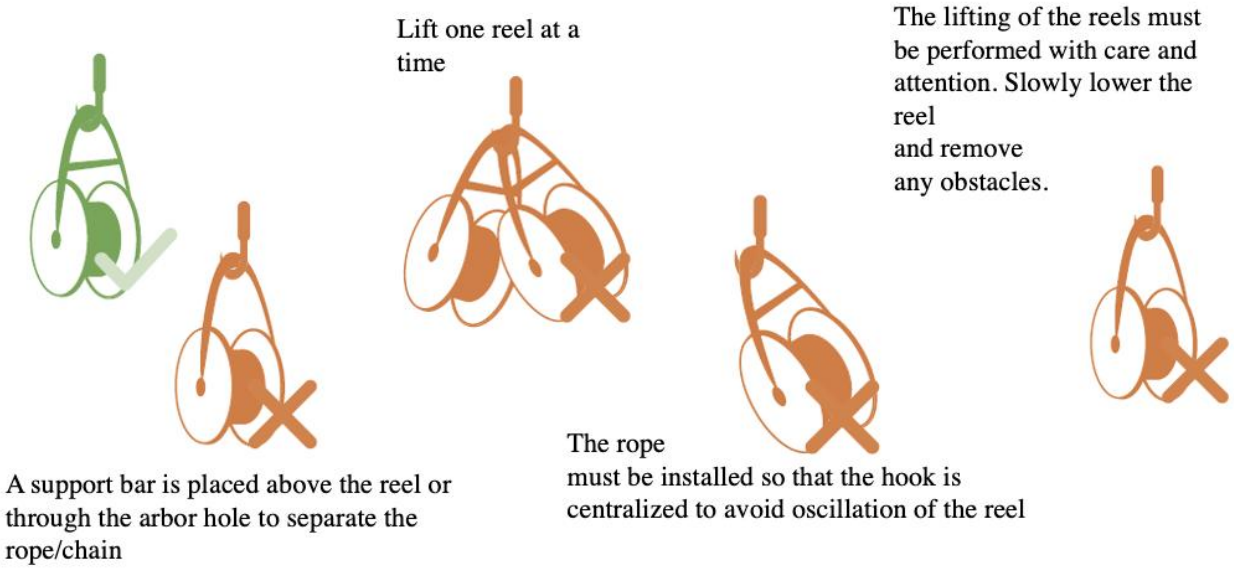


Figure 3 – Lifting using cranes

Lifting using forklifts (See Figure 4)

Lifting and handling cable reels using forklifts is a common and efficient method in warehouses, manufacturing facilities, and construction sites. Proper procedures and equipment are critical to ensure both the safety of personnel and the protection of the cable and reel.

The first step in lifting reels with a forklift is ensuring that the forklift is appropriately rated for the weight of the reel. Operators must verify the load capacity, including the reach and lift height, to prevent tipping or overloading. Reels should be inspected to determine their center of gravity and weight distribution. Unevenly loaded reels, or those with damaged flanges or hubs, can shift during transport, posing a serious hazard.

Forklift attachments play an important role in safely handling reels. Standard forklift forks can be used for smaller reels, but for larger or heavier reels, specialized attachments such as reel rams,

cradle attachments, or adjustable fork extensions are recommended. Reel rams are particularly useful because they provide a cylindrical support for the reel, allowing it to rotate smoothly when unrolling cable. Cradle attachments hold the reel securely from the sides, distributing the load evenly and reducing the risk of flange damage. Fork extensions may be needed when the reel diameter exceeds standard fork width, ensuring that the reel is fully supported and stable.

Proper positioning of the forks is essential. For small reels, forks can be inserted beneath the reel, keeping the load balanced and centered. For larger reels, the attachment should engage the hub or drum in a way that prevents slipping or rolling. Securing the reel with straps or chains to the attachment can provide additional safety, especially during transport over uneven surfaces or ramps.

Operators should always maintain clear communication with personnel guiding the lift and keep bystanders at a safe distance. Lifting should be done slowly and steadily to avoid sudden shifts, which could destabilize the load. When transporting the reel, the forklift mast should be kept as low as practical to maintain stability, and turns should be made gradually to reduce the risk of tipping.

When placing the reel on the ground or a storage surface, care must be taken to ensure it rests securely. Reels should ideally be positioned on flat, level surfaces or on purpose-built reel stands to prevent rolling. For long-term storage or staging prior to installation, it is important to maintain spacing between reels to allow safe handling and prevent accidental damage from contact with neighboring reels.

Forklift operators must be trained in safe handling procedures specific to reels and regular maintenance of forklifts and attachments is essential to prevent equipment failure during handling.

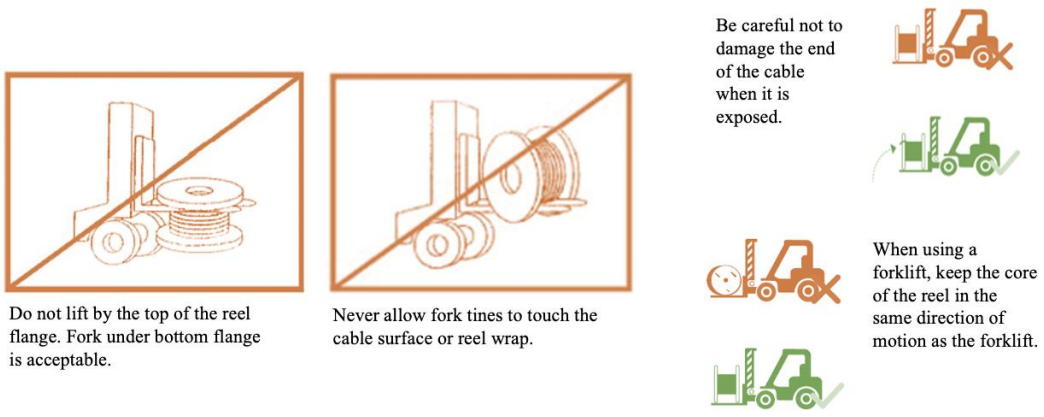


Figure 4 – Lifting using forklifts

Rolling Reels

Rolling reels containing wire and cable is not recommended. If rolling is necessary, always roll in the opposite direction to which the cable is wrapped to avoid the release of the cable.

Reel Flipping

Reels should not be flipped. Especially so for shipment or storage of products that are tension-wound on the reel. This prevents "birdcaging".

Packaging Methods

Some packaging methods include cradling, choking, strapping and palletizing. See **Figure 5**.

Cradling is a basic packaging technique that involves placing a wooden or metal structure under the reel to prevent it from rolling or moving sideways. Cradles are often custom-designed to fit the diameter of the reel and are used during transportation, storage, or even in staging areas before installation. By supporting the reel along its drum, cradling distributes the weight evenly and stabilizes the reel against lateral movement. Cradles are especially important for larger or heavier reels, which may be difficult to control manually and can become unstable during handling.

Chocking or blocking is a heavily used method for stabilizing reels. Wooden stops, wedges, or blocks are placed in front of and behind the reel flanges to prevent it from rolling. This technique is widely used when reels are loaded onto trucks, trailers, or flatbeds, and during on-site deployment when cable is being unreeled. Chocks are particularly important on inclined surfaces or uneven terrain, as they physically restrain the reel from rolling forward or backward. Proper chocking reduces the risk of accidents and ensures smooth, controlled cable payout during installation.

Strapping is a method used to hold reels securely in place during transport or storage. Straps, which can be made from polyester, nylon, or metal, are applied around the reel and attached to the transport platform, such as a truck bed or shipping container. Strapping prevents lateral or rotational movement, keeping the reel stationary even under vibration or sudden braking. When strapping large reels on flatbed trucks, multiple straps are typically applied in a crisscross pattern to evenly distribute the holding force and minimize stress on the reel flanges and drum.

Palletizing is a technique often used for smaller reels that can be stacked or grouped together for storage or transport. Reels are placed on wooden or plastic pallets, which provide a flat, stable surface and facilitate handling with forklifts or pallet jacks. Palletizing allows multiple reels to be moved simultaneously, improving operational efficiency while keeping reels organized and secure. When combined with strapping or shrink wrap, palletized reels are protected against shifting, tipping, or damage during transit.

Figure 5 – Packaging methods (from left to right): Cradling, Chocking/Blocking, Strapping, and Palletizing

6.0 Transportation

Cables on reels are heavy, bulky, and delicate, and improper handling during transportation can lead to damage that affects both performance and safety. Ensuring that reels are properly prepared for shipment and that transportation methods account for long distances and varying environmental conditions is essential to maintaining product quality, reducing costs, and meeting project timelines.

Once the appropriate reel has been selected, it should be inspected for any pre-existing damage, such as cracks, splits, or corrosion. Damaged reels may fail during transit, causing cable damage or safety hazards. The cable itself should also be inspected to ensure it is correctly wound and that the layers are uniform. Uneven winding can cause overlapping, crossovers, or tension irregularities, which may lead to kinks, insulation damage, or difficulties during payout.

Reels should be properly secured with protective coverings, such as plastic wrap, tarps, or even specialized coverings such as wood lagging, to shield the cable from moisture, dirt, and ultraviolet exposure during transit. These coverings help prevent surface degradation, especially for ACSR or aluminum conductor reels that are prone to corrosion if exposed to water or chemicals. Strapping or banding should be applied to prevent cable movement without over-tightening, which could compress or deform the cable layers. Clear and durable markings and labels may also be helpful.

Proper loading techniques are critical for safe transportation. Reels should be placed on flat, stable surfaces in trucks, trailers, or containers. They may be placed on flatbeds, inside enclosed trailers, or on specialized reel trailers equipped with cradles or bracing. Placement should prevent movement, tipping, or rolling during transit. Securing the reels typically involves chocking the flanges or using wedges to prevent lateral movement, combined with ratchet straps, chains, or tie-downs. Straps should be positioned across the drum and flanges without causing deformation of the reel or cable. For heavier reels, multiple straps may be required to distribute load evenly and reduce the risk of shifting. The orientation of the reel during transport is also important. Reels are usually transported with the drum axis horizontal, but vertical transport may be necessary for smaller reels or in specific storage conditions. Proper bracing, blocking, and padding should always accompany vertical placement to prevent tipping. Additionally, the rolling direction marked on the reel should be considered during loading to ensure smooth payout upon arrival.

Long-distance transport presents additional challenges compared to local deliveries. Extended transit times increase the exposure of reels to environmental conditions such as temperature fluctuations, moisture, dust, and vibrations, which can affect both the cable and the reel if not properly mitigated. Exposure to moisture over time can lead to corrosion of metal components, degradation of insulation, or swelling of wooden reels. Protective coverings and moisture-resistant packaging are therefore essential. Vibration and repeated handling during long hauls may loosen banding or straps; regular inspection and maintenance of securing systems are recommended, especially for multi-leg trips or intermodal shipping involving rail, truck, and port transfers.

Weight distribution during transport is also critical. Uneven loading can cause instability, increase wear on vehicle suspension, and increase the risk of accidents. Heavy reels should be evenly spaced and positioned over axles to maintain vehicle balance. For very heavy reels, specialized

trailers with multiple axles may be required to comply with road weight limits and ensure safe operation.

Handling during loading, unloading, and in-transit transfers is a critical factor in preventing damage. Heavy reels should be lifted using reel jacks, forklift attachments, slings, or cranes designed for reel transport. Improper lifting, such as dragging reels by flanges or rolling them on the ground, can cause severe structural or cable damage. Operators should follow guidelines for the maximum allowable lift points, speed of movement, and prevention of sudden shocks. In addition, personnel must be trained in safe handling practices, as reels can pose crushing hazards due to their weight and cylindrical shape.

The transportation process should also consider the conditions and capabilities at the receiving facility. Before shipment, it is important to confirm that unloading equipment, storage areas, and payoff systems are adequate for the size and weight of the reels. This reduces the risk of damage during transfer and ensures the cable can be deployed efficiently on arrival. By adhering to proper preparation and handling practices, the supply chain can minimize damage, improve safety, and ensure that cables arrive at their destination ready for efficient and reliable installation.

Loading:

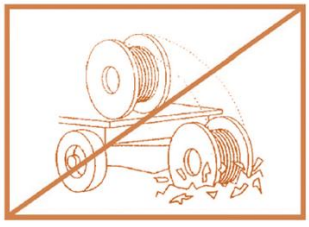
The reel core must be arranged perpendicularly to the direction of travel

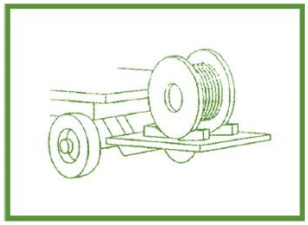
The reels should not exceed the useful width of the transport platform

To handle or move reels onto a truck or flatbed, always use a forklift, crane or winch.

Unloading:

Never unload by rolling/dropping off the platform to the ground





Lowering reels from a truck using a hydraulic gate, hoist, or forklift. Lower carefully.

7.0 Storage

Cable shipped on pallets should be stored indoors if possible. Cable shipped on wooden or metal reels may be stored outdoors. When selecting a storage site, consideration should be given to the following:

- Traffic patterns during off-loading
- Grade and condition of the soil or pavement
- Protection from vehicle damage during the time in storage
- Environmental conditions such as exposure to heat, corrosive chemicals, etc.

Cable reels should be stored with the flanges upright and resting on a hard surface. Align all reels flange to flange and, if possible, arrange them so that the first in is the first out. Multiple reels stacked on top of each other ("pancake" storage) or storing reels flopped on their sides (flanges horizontal) is not recommended for medium- voltage power cables and other constructions such as AAC, ACSR, line wire, etc. The weight of the stack can total thousands of pounds creating an enormous load on the bottom reel. Also, damage to the reel and cable will likely occur when the reel is flipped for transit. A concentration of stress on the reel flange may cause it to break and subsequently damage the cable.

If cable reels must be pancaked or stored on their side in vertical racks, do not lift the reel by the top flange. Spacers (two 2 X 4s placed wide side up) should be placed under the bottom flange and between the reels in order to create a space to insert the forks and lift the reels without damaging the cable. If nails are used to secure the spacers, make sure that they do not go through the flange and into the cable.

For the extended storage of bare or insulated cables (spare cable, etc.), the reels should be stored cradled between railroad ties, power poles or crossarms. The size and spacing of these supports should be enough to raise the flanges above the ground. This helps to keep the flanges from decaying and keeps the reel from rolling. At temporary storage sites where the soil may be soft, preservative-treated plywood sheets may be used to keep the flanges from sinking into the ground.

It is recommended that the reel wrap or lagging supplied on the reels should be replaced to help protect the cable and detect inadvertent damage. Under extreme weather conditions, other measures may be necessary. To prevent the entrance of water into an insulated cable, the ends should be sealed with plastic end caps. Whenever the cable is cut, the ends should be resealed and secured to the flange of the reel.

Cables are typically supplied with end cap sealing to prevent ingress of moisture or water. Cable drums should be handled such that damage to the cable jacket or to sealing caps does not occur as this would subsequently permit the ingress of moisture.

If the cable is used progressively (partial length is cut off and used) the exposed end must be immediately sealed with a new end cap.

Heat shrinkable end caps are recommended for this purpose for installation as follows:

1. The cable end to be sealed must be cut at right angles and flat so that the cores do not protrude from the jacket. To fit the end cap, position the cable end so that it is facing vertically upwards.
2. Some hard plastic jacket materials are quite smooth and slippery. These materials may not adhere to the end cap and may not adhere even if mastic lined end caps are used.
3. To enable adhesion to take place, such jacket materials must be abraded with coarse sand paper before shrinking the end cap over the cable surface.
4. Place the end cap over the cable end and gently apply heat using a propane flame. Heat should be applied evenly over the whole surface of the end cap, by smooth movements of the flame (only a small flame is necessary). Start at the very end of the cable and shrink the cap sleeve away from the cable end.
5. Allow the cable end to cool and then check that the end cap has firmly gripped the cable end and that a satisfactory seal has been achieved. Electricians' PVC tape is then wrapped around the junction of the end cap and the cable jacket to reinforce the seal.

Only sunlight resistant cables should be stored outdoors. Otherwise, cables should be stored indoors or protected against direct sun light with suitable protection package such as black plastic sheeting, lagging or another sunlight resistant wrap.

8.0 Long Term Storage

Long term wire and cable reel storage is considered longer than 3 months. Nexans strongly recommends FIFO inventory management as a "best practice" to mitigate problems that associated with product and packaging deterioration due to exposure to the elements.

The instructions below are directed to assist in the case of any of the following:

a) Reels and the timber used in reels deteriorates with time and weather

b) Cable end caps deteriorate with time and weather

c) Exposed cable surfaces can deteriorate or colours fade

d) Cable can be damaged by the environment

e) Cable may be damaged during movements or transport

Reels should be stored on a level and firm surface (e.g. timber baulks, firm gravel, or concrete), on the flange edges (not with the flange flat on the ground), such that they will not be standing in water or in continually damp conditions and restricted from rolling. Failure to provide these conditions is likely to result in timber rot and weakening of the flange with potential breaks of the flange or collapse of the reel to the point where the cable itself will rest on the ground. Any of these outcomes will make installation of the cable more problematic or impossible. Wedges must be used to retain reels from moving. Wedges must be positioned at flange edges and not between flanges. The use of stones is not recommended.

Rate of deterioration and ageing is dependent on the environmental conditions and seasons, so inspection and maintenance of the reel will be required during the storage period. The interval between inspections is a maximum of 12 months in frequently wet weather conditions and reduced to 6 months in tropical environments where wet or humid conditions are concurrent with high temperatures environments.

Maintenance involves the tightening of the transverse bolts (flange to flange, also known as "barrel bolts"). At the same time, the bolts holding the steel plate at the spindle hole are to be tightened. These actions are to prevent the collapse of the reel during movement and during cable installation.

If cable reels are required to be stored for periods longer than two years it is recommended that they are stored in an enclosed area sheltered from the environment. If considered necessary, the cable could be rewound on to steel cable reels (if not already supplied).

Normally, the reel dimensions are so chosen that the cable wound onto the reel almost fills the space between the flanges up to their outer edge. In these cases, the cable assists in the stability of the drum flanges and their respective positioning, but the heavy weight of the cable may induce the flange to bend if left unmoved.

On occasions, the purchased length does not fill the reel and sometimes reels are stored after installation of part of the length, so the reel contains a portion of the total length of cable. In these cases, the flange extends well beyond the supporting cable and is more likely to flare or bend under the weight of the cable, when left in the one position over time.

Therefore, in either case of the full reel or the partially empty reel, any sign of flange distortion is indicative that it is necessary to occasionally turn these reels some amount (example a 90° rotation) so that a "new" part of the flange is employed to support the cable weight. Failure to do this could result in a flange distortion that will make it difficult to wind the cable off the reel and may result in damage to the cable.

Arresting or slowing the rate of deterioration for any reel, but particularly for those reels most affected, can only be done by storage in a covered dry area.

Reference

1. National Electrical Manufacturers Association. (2008). *NEMA WC 26/EEMAC 201:2008 Binational Wire and Cable Packaging Standard* [Standard]. National Electrical Manufacturers Association.