



TECHNICAL WHITEPAPER

Overhead Crane Grabs for Metal **Coil Handling**

A Complete Guide to Grab Selection,
Manual vs. Automated Operation, and the
Direct Impact on Coil Storage Density

Prepared by **CareGo Process Automation Services**



Introduction

The type of grab used to lift and place steel or aluminum coils has a profound effect on far more than just the lift.

Grab selection is one of the most consequential decisions a facility can make. It directly determines:

- How tightly coils can be stored
- Whether crane operations can be automated
- How much product tonnage a facility can ultimately hold

This guide provides steel and metal producers, service centers, and coil processors with a **clear, engineering-grounded comparison of the four principal grab types in use today:**

C-hooks, fixed leg grabs, retractable foot grabs, and electromagnetic magnets.

For each grab type, we examine how it works, its pros and cons, its compatibility with automation, and most importantly: **how storage capacity increases or decreases based on row spacing with each grab type.**

The data is compelling: moving from a manual C-hook environment to an autonomous crane with a magnet grab can **increase coil storage density by up to 300%** in the same building footprint. For a facility handling 50,000 to 200,000+ tons of coil annually, that represents a transformational business case.



Why Grab Selection Matters

Most facility planners focus on crane capacity, span, and speed when evaluating overhead crane systems. Grab selection is frequently treated as an afterthought or a procurement detail resolved late in the project. **But waiting until the end to make this decision leaves a significant opportunity on the table.**

The grab is the physical interface between the crane and the coil. Its geometry, operating clearances, and alignment requirements dictate:

- **The minimum spacing** required between coil storage rows
- Whether the crane operation can be **automated or must remain manual**
- The **safe stacking height** achievable without risk of topple or damage
- The **cycle time per lift** and therefore overall facility throughput
- The risk of **coil surface damage**, bore damage, and product quality loss

72-FOOT BAY

Capacity Evaluation Scenario:

Throughout this document, we'll share an example of coil storage capacity achievable with CareGo's TELIA system for autonomous, automated material handling using each crane grab.

These scenarios represent a 72-foot wide storage bay with 60-inch wide coils and standard bunking.



Let's look at each major grab type currently in use for coil handling. Each grab is evaluated on its operating principles, key characteristics, automation compatibility, storage density impact, and ideal use cases.

C-Hook (Single and Double Arm)

SINGLE OR DOUBLE ARM | MANUAL OPERATION | THROUGH-THE-BORE LIFT

How It Works	A curved hook is inserted into the coil's inner diameter (ID), also known as the bore. The coil's weight is then supported from the inside. The crane operator or a ground worker physically guides the hook into alignment with the coil bore before lifting.
Typical Row Spacing	36 to 48 inches minimum. Requires a walkway alongside each storage row to allow ground workers to walk the hook into position and visually confirm alignment.
Automation Rating	Poor: not suitable for full automation. Requires human guidance and visual alignment confirmation for each lift cycle. High risk of coil bore damage and misplacement when automated without operator supervision.
Storage Impact	Very low density. Wide spacing requirements force alternating empty rows, generous travel lanes, and mountain-stacking configurations to compensate for limited floor positions.
Best Use Cases	• Low-volume manual handling • Inbound and outbound truck loading • Maintenance and occasional-use lifts • Facilities not pursuing automation or high-density storage

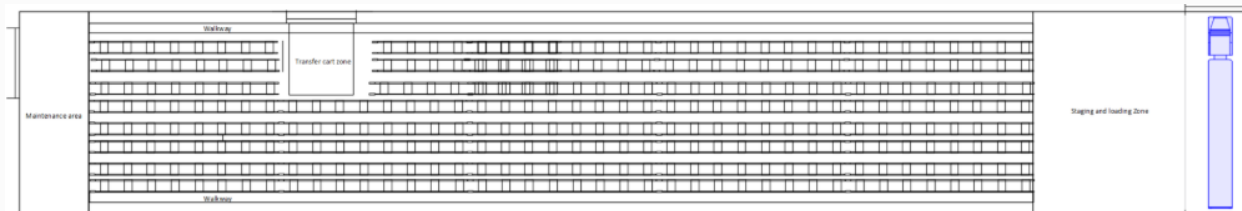


INDUSTRY NOTE:

C-hooks remain the most widely used coil lifting device in North American service centers. Facilities planning to implement crane automation or improve storage density will need to transition away from C-hooks as their primary grab. High-density automated storage and C-hooks simply don't mix.

C-Hook (Single and Double Arm)

72-FOOT BAY – Capacity Evaluation Results: C-Hook – 36" Row Spacing



Storage Configuration	Coil Count	Total Capacity
Double-High (2 High)	605 Coils	13,310 tons
Triple-High (3 High)	891 Coils	19,602 tons

THE PROS OF C-HOOKS

- Simple, robust design with minimal mechanical components
- Low capital cost and wide availability from multiple suppliers
- No power source required; the grab is purely mechanical
- Works reliably across a wide range of coil bore diameters with appropriate hook sizing
- Familiar to operators and low training requirement

THE CONS OF C-HOOKS

- Requires a ground worker or operator to physically guide the hook into the coil bore
- Wide aisle and row spacing requirements dramatically reduce storage density
- Fundamentally incompatible with fully automated, high-density coil storage
- Slow cycle times; manual alignment step adds significant time per lift
- Risk of coil bore damage if hook is misaligned during insertion
- Operator safety exposure; ground workers in crane load zone

Fixed Leg Grab (Man Saver / Fixed Foot Grab)

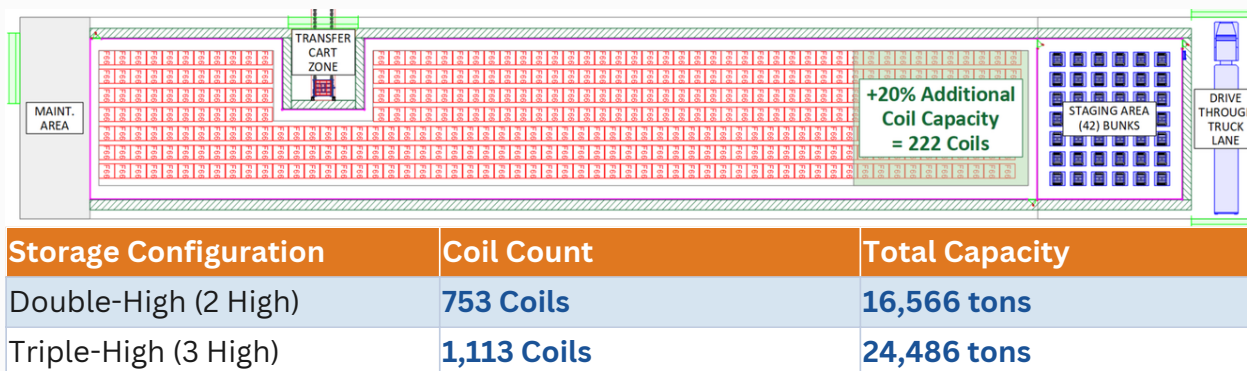
FIXED FOOT | SEMI-AUTOMATED COMPATIBLE | INTERNAL ID GRIP

How It Works	Rigid mechanical legs extend outward and engage the inside diameter of the coil. The grab is lowered into the coil bore and the legs expand to grip from the inside, allowing the coil to be lifted without requiring a worker to guide the hook by hand.
Typical Row Spacing	Manual crane: 24 to 30 inches. Autonomous crane with precision positioning: approximately 20 inches.
Automation Rating	Good: Widely used in semi-automated and fully automated coil yards. The self-aligning mechanical grip is more forgiving of minor positioning variance than a C-hook, making it a practical choice for automation retrofit projects.
Storage Impact	Medium. Tighter row spacing supports three-high stacking, high-density block storage, and significantly reduced aisle widths compared to C-hook environments.
Best Use Cases	• Semi-automated service centers • First-stage automation upgrades from C-hook environments • Mixed manual/automated facilities • Heavy mill environments with large bore coils



Fixed Leg Grab (Man Saver / Fixed Foot Grab)

72-FOOT BAY – Capacity Evaluation Results: Fixed Foot Grab – 20" Row Spacing



THE PROS OF FIXED LEG GRABS

- Eliminates the need for a ground worker to guide the hook, which increases safety significantly
- More forgiving positioning tolerance than C-hooks; better suited to semi-automation
- Supports three-high stacking with appropriate crane automation
- Faster cycle times than C-hooks with no manual alignment step
- Compatible with a wide range of coil sizes and bore diameters

THE CONS OF FIXED LEG GRABS

- Row spacing still requires 20+ inches; not suitable for ultra-dense storage
- Mechanical components subject to wear, requiring regular maintenance of gripping legs
- Less effective than retractable foot grabs in the tightest automated storage configurations
- Higher capital cost than C-hooks

Retractable Foot Grab (Deploying Feet Grab)

DEPLOYING FEET | AUTONOMOUS COMPATIBLE | ULTRA-LOW PROFILE DURING TRAVEL

How It Works	Gripping feet retract fully during horizontal travel and lower/raise. The grab body passes over coil rows in a retracted state and only deploys its gripping feet once positioned directly over the target coil bore, dramatically reducing the clearance envelope required between rows.
Typical Row Spacing	12 to 15 inches with autonomous crane systems. The small travel envelope of the retracted grab allows coils to be positioned in extremely tight rows.
Automation Rating	Excellent: Purpose-designed for fully autonomous coil warehouses. Precision positioning combined with the retractable foot mechanism produces the highest storage density achievable with a mechanical grab system.
Storage Impact	Very high density. Enables rack-free floor stacking, triple-tier stacking, and extremely tight block storage configurations.
Best Use Cases	- Fully autonomous coil yards - High-volume facilities with limited floor space - New automated warehouse construction - Maximum-density storage

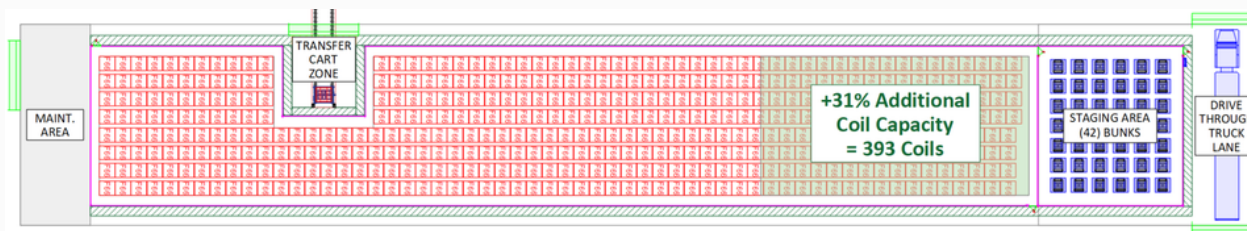


INDUSTRY NOTE:

Retractable foot grabs are an excellent choice for facilities serious about getting the most out of their automation investment. Their reliability translates directly into tighter storage configurations, as the system can place and retrieve coils with confidence at reduced spacing.

Retractable Foot Grab (Deploying Feet Grab)

72-FOOT BAY – Capacity Evaluation Results: CareGo Retractable Foot Grab – 15" Row Spacing



Storage Configuration	Coil Count	Total Capacity
Double-High (2 High)	868 Coils	19,096 tons
Triple-High (3 High)	1,284 Coils	28,248 tons

THE PROS OF RETRACTABLE GRABS

- Best-in-class storage density for a mechanical grab system
- Small travel envelope allows rows spaced 12–15 inches apart
- Ideal for fully autonomous crane systems; no operator guidance required
- Positive mechanical grip; reliable and consistent across variable coil bore sizes
- Compatible with three-high or higher stacking configurations
- No ground worker exposure required during lift cycles

THE CONS OF RETRACTABLE GRABS

- Higher mechanical complexity than fixed leg grabs; more components to maintain
- Requires precise crane positioning system to function reliably; not suitable for manual cranes
- Higher capital cost than fixed leg grabs and C-hooks
- Foot deployment mechanism requires regular inspection and lubrication

Crazy Legs (Articulated Multi-Leg Internal Grab)

MULTI-LEG ARTICULATED | VARIABLE ID GRIP | MANUAL & SEMI-AUTO

How It Works	Multiple articulating legs provide a flexible gripping geometry that adapts to different coil bore diameters. The legs pivot and adjust to engage the coil ID from multiple contact points, distributing load across a larger contact area than fixed-leg alternatives.
Typical Row Spacing	Manual operation: 24 to 36 inches. Automated operation: 18 to 24 inches.
Automation Rating	Moderate: Automation is possible but requires more sophisticated control programming to manage the articulating leg mechanics reliably. Not the preferred choice for ultra-dense automated storage.
Storage Impact	Medium density improvement over C-hooks. A useful middle ground for facilities handling mixed coil products with variable bore diameters, but not optimal for maximum-density automated storage configurations.
Best Use Cases	• Mixed-product warehouses handling wide variation in coil IDs • Heavy mill environments • Facilities requiring one grab to handle multiple coil types without changeover

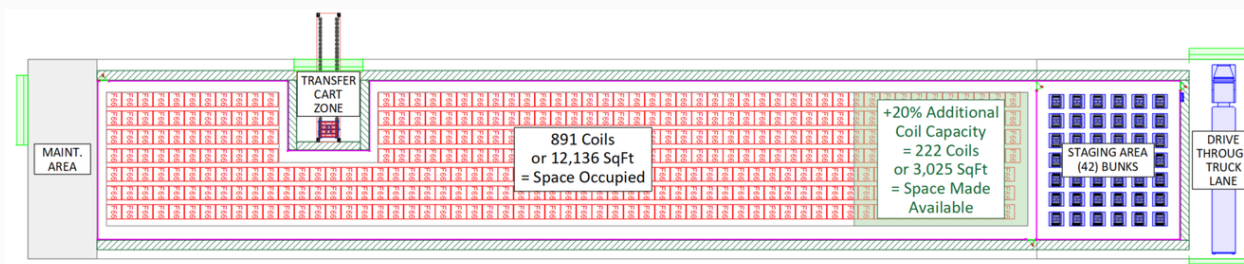


This is a solution we rarely (if ever) see used for automated environments.

Automating this grab is a significant engineering challenge. Reliable positioning is difficult to achieve without human intervention. For TELIA-managed environments, we recommend exploring other grab types that are better suited to the precision and repeatability that automation demands.

Crazy Legs (Articulated Multi-Leg Internal Grab)

72-FOOT BAY – Capacity Evaluation Results: Crazy Legs Grab – 24" Row Spacing



Storage Configuration	Coil Count	Total Capacity
Double-High (2 High)	753 Coils	16,566 tons
Triple-High (3 High)	1,113 Coils	24,486 tons

THE PROS OF CRAZY LEGS GRABS

- Flexible grip adapts to variable coil bore diameters without grab changeover
- Good load distribution across multiple contact points means lower bore contact pressure
- Suitable for heavy-mill coils with irregular or damaged bore edges
- Allows one grab to handle a broader range of coil specifications

THE CONS OF CRAZY LEGS GRABS

- Articulating leg mechanism is mechanically complex, leading to a higher maintenance burden
- Row spacing still too wide for ultra-dense automated storage
- Automation integration is more complex than fixed or retractable foot alternatives
- Not the optimal choice where maximum storage density is the primary objective

Electromagnetic Magnet Coil Lifters

ELECTRO OR PERMANENT MAGNET | NO-CONTACT OD GRIP | MAXIMUM STORAGE DENSITY

How It Works	Electromagnets or permanent-electro magnets grip the outer diameter (OD) of a steel coil through magnetic force. The magnet is lowered onto the top of the coil and energized, creating a powerful magnetic bond to the coil OD or face.
Typical Row Spacing	As little as 6 inches in TELIA-configured facilities. Because there are no mechanical legs or arms that project beyond the coil OD during travel, coils can be stored with near-contact spacing.
Automation Rating	Excellent: Perfect for fully automated and autonomous crane systems. Extremely fast cycle times, no bore alignment required, and minimal travel clearance make magnets the highest-performance grab type for automated coil storage.
Storage Impact	Maximum density. The densest coil storage configuration achievable by any grab type. Enables up to 300% percent more coil rows than other grabs.
Best Use Cases	• Fully autonomous coil warehouses • Steel mill coil yards • High-throughput service centers • Any facility where maximum storage density is the primary objective and coils are ferromagnetic

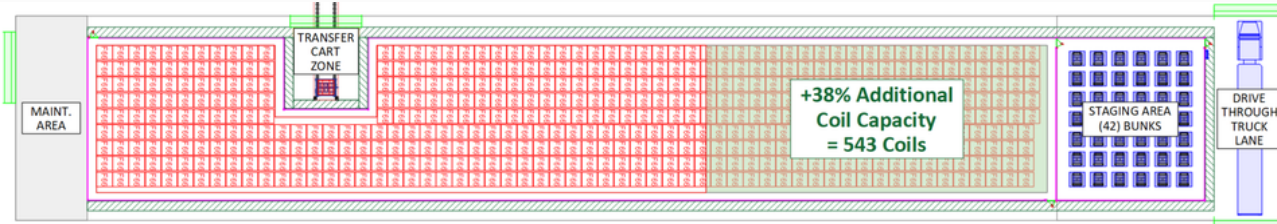


For coil handling in service centers, steel mills, and coil processors, **magnet grabs** paired with an **autonomous overhead crane** represent the highest-performance, highest-density material handling configuration available today.

[See a magnetic coil grab – operating autonomously by TELIA – in action here.](#)

Electromagnetic Magnet Coil Lifters

72-FOOT BAY – Capacity Evaluation Results: CareGo Magnet Grab – 6" Row Spacing



Storage Configuration	Coil Count	Total Capacity
Double-High (2 High)	970 Coils	21,340 tons
Triple-High (3 High)	1,434 Coils	31,548 tons

THE PROS OF RETRACTABLE GRABS

- Best-in-class storage density for a mechanical grab system
- Small travel envelope allows rows spaced as little as 6 inches apart
- Ideal for fully autonomous crane systems; no operator guidance required
- Positive mechanical grip; reliable and consistent across variable coil bore sizes
- Compatible with three-high or higher stacking configurations
- No ground worker exposure required during lift cycles

THE CONS OF RETRACTABLE GRABS

- Higher mechanical complexity than fixed leg grabs; more components to maintain
- Requires precise crane positioning system to function reliably; not suitable for manual cranes
- Higher capital cost than fixed leg grabs and C-hooks
- Foot deployment mechanism requires regular inspection and lubrication

Storage Density: The Business Case for Grab Optimization

This comparison table summarizes the direct relationship between grab type, row spacing, automation compatibility, and achievable storage density.

These figures represent our scenario of a 72-foot-wide coil storage bay handling 60-inch coils with a crane-based ASRS or automated handling system such as TELIA.

An alternative reason for implementing an autonomous material handling system is to gain space in your facility, instead of increasing storage.

Many companies utilise these space savings for a few different purposes. For warehousing and toll processing operations, it can be a straight inventory play – consolidating the footprint to hold more product without expanding the building. Others choose to free up bays entirely, making room for automated packing lines or new high-value processing equipment that wouldn't have fit before. And for those who can take on more product, bulk buying or hedge buying becomes a real option when you suddenly have the space to support it.

Grab Type	Min. Row Spacing	Automation Readiness	Storage Density	3-High Stacking Capacity	Alternative Space Savings
C-Hook	36" – 48"	 Poor	Very Low	891	0 Sq Ft
Crazy Legs	18" – 36"	 Moderate	Medium	1,113	+ 3,025 Available Sq Ft
Fixed Leg Grab	~20"	 Good	Medium	1,113	+ 3,025 Available Sq Ft
Retractable Foot	12" – 15"	 Excellent	Very High	1,284	+ 4,791 Available Sq Ft
Electromagnetic Magnet	4" – 5"	 Excellent	Maximum	1,434	+ 6,199 Available Sq Ft

CASE STUDY

Fixed Foot Grab at CR Slitters



59K Tons Autonomously Stored

25.3% Growth in Throughput

132.9 Tons Stored Per 100 Sq.Ft.

When CR Slitters set out to retrofit their facility, they faced a challenge familiar to many service centers: **how to grow capacity without growing the building.** Rather than starting from scratch, they partnered with CareGo to design a smarter facility around what they already had, including three legacy coil transfer cars worth preserving. The result was a right-sized, high-density operation built for long-term performance.

CareGo integrated TELIA™ to coordinate 11 assets across the facility — lifting devices, overhead cranes and ground-level transfer cars — creating a seamless intralogistics workflow from receiving to shipping.

The optimised layout reduced the building size requirement by nearly 25%, saving CR Slitters approximately \$2.5 million CAD in upfront construction costs. Precision stacking with 11 smart cradles per receiving bay pushed storage density to 132.9 tons per 100 sq. ft., a 20% increase in coil capacity without adding a single square foot.

The facility now stores 59,000 tons of coils autonomously and has grown throughput by 25.3% — all while operating with zero manual intervention in critical handling zones.

The CR Slitters project demonstrates what's possible when grab selection, facility design and automation are planned together from the start.



Conclusions and Recommendations

Overhead crane grab selection is one of the highest-leverage decisions a metal facility can make.

Grab choice directly determines the minimum achievable row spacing in a coil storage bay – and row spacing determines storage capacity. Switching from a C-hook environment to an autonomous crane with electromagnetic magnets means fitting 2 to 3 times more coil rows into the same footprint.

Here's what that means in practice:

- Do not specify grab type in isolation from storage density and automation objectives. These decisions are inseparable.
- C-hooks are the right choice only when manual operation is permanent and storage density is not a business priority.
- Fixed leg grabs represent a practical step-change improvement for facilities beginning the automation journey.
- Retractable foot grabs are the preferred mechanical grab for fully autonomous coil storage systems.

- Electromagnetic magnets deliver the maximum storage density achievable and are the optimal choice for carbon steel coil handling in automated environments.
- Aluminum and non-ferrous material handling requires mechanical grabs or vacuum lifters. The automation principles are identical, only the grab mechanism differs.
- Plan the grab type for the facility's ultimate automation state, not just the immediate project phase, to avoid costly rework.

ABOUT CAREGO & TELIA

CareGo delivers autonomous, automated material handling for steel mills, metal service centers, coil processors, tube and pipe producers, coil coaters, third-party warehouses, and port facilities. CareGo's system, TELIA, integrates precision crane positioning, anti-sway control, autonomous crane operation, and real-time ASRS inventory management into a single, unified solution. To learn how CareGo can transform your facility's storage capacity and operational efficiency, visit **CareGo.com**.