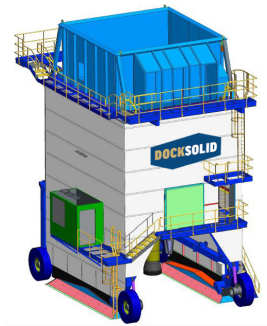




**CLEAN. FLEXIBLE. ROBUST.**

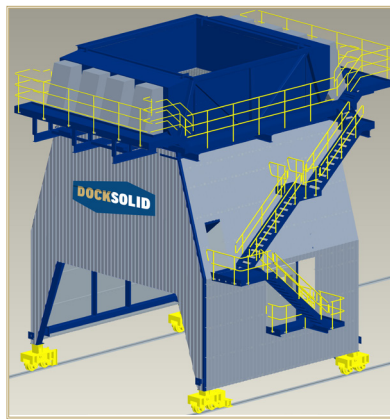
**DOCKSOLID**

# DOCKSOLID Hoppers



## Wheel-Mounted Hoppers

	Standard Hopper	HD Hopper	Environmental Hopper
Grab Size	5m <sup>3</sup> - 10m <sup>3</sup>	5m <sup>3</sup> - 30m <sup>3</sup>	5m <sup>3</sup> - 30m <sup>3</sup>
Hopper Opening	5m <sup>2</sup> - 6m <sup>2</sup>	5m <sup>2</sup> - 9m <sup>2</sup>	5m <sup>2</sup> - 9m <sup>2</sup>
DOCKSOLID Suspension	✓	✓	✓
Dust Control Flex-Flap	Option	Option	✓
Self-Driving Capability	-	✓	✓
Dust Extraction Filters	-	-	✓
Discharge Chute	Option	Option	✓
Operator Cabin	Option	Option	Option



## Rail-Mounted Hoppers

Grab Size	5m <sup>3</sup> - 40m <sup>3</sup>
Hopper Opening	5m <sup>2</sup> - 10m <sup>2</sup>
Dust Thimble	Option
Dust Control Flex-Flap	Option
Self-Driving Capability	Option
Dust Extraction Filters	Option
Discharge Chute	Option
Operator Cabin	Option



## Static Hoppers

Grab Size	5m <sup>3</sup> +
Hopper Opening	5m <sup>2</sup> +
Dust Thimble	Option
Dust Control Flex-Flap	Option
Dust Extraction Filters	Option
Discharge Chute	Option

## Customised Loading Solutions

The DOCKSOLID range of hoppers are customised unloading solutions for dry bulk products. The hoppers are used to quickly and cleanly load trucks, rail-wagons or conveyors from a crane grab. The hoppers are customised to meet the performance and commercial requirements of clients, with each unit tailored to the product and environment in which it will be used. DOCKSOLID hoppers are used to handle a very diverse range of dry bulk goods ranging from grains, minerals, fertilizers and coal, to biomass, foodstuffs and powders. They're built for reliability and longevity, with a structure and frame engineered specifically for the static and dynamic loads exerted by moving bulk. DOCKSOLID units are also fitted with a patented suspension system that balances forces evenly across the hopper's frame and the quay wall; this system ensures long-lasting structural integrity and safe, reliable bulk loading.

The range extends from the simple, reliable Standard hopper, to units with sophisticated environmental controls, self-driving mobile capability or bespoke discharge options. The hoppers can be wheel-mounted, rail-mounted or static. Units can be designed to handle any amount from a small throughput up to several thousand tons per hour, depending on the loading-grab size, height restrictions imposed by the crane, and the density of the product. Each hopper in the DOCKSOLID range is built to meet the client's requirements, we strive to understand the functionality required and offer an unloading solution tailored to each application. DOCKSOLID equipment is engineered to thrive in clients' facilities, and almost never require specialised civil works for installation and operation.



### Dry Bulk Handling

DOCKSOLID hoppers handle dry bulk materials. Products with a moisture content and particle size below a specified limit will flow uniformly through the hopper and can be discharged to trucks, rail-wagons or conveyors. Ideal for ship unloading with a grab crane, mobile units move easily between hatches and are designed to withstand the abrasive conditions of a busy port environment. The versatility of a hopper makes it an extremely flexible, space efficient and cost effective alternative to an installed continuous bucket unloader or other ship unloading options. The DOCKSOLID units are employed in a variety of port, industrial and bulk logistics applications.

Each hopper is designed for the client's specific product and process. The thickness and angles of the hopper plates, as well as the expected stress on the structure are all adjusted to account for the density, flow characteristics and required throughput of the bulk commodity.

- Grains
- Biomass
- Coal
- Clinker & Cement
- Iron Ore
- Oilseed Meal/Cakes
- Animal feeds
- Fertilizers
- Powders
- Wood-pellets
- Minerals

## Mounting Options

DOCKSOLID hoppers are designed for efficiency of handling, flexibility of use, as well as structural strength to ensure reliability and longevity. There are three mounting options, to suit a variety of port and industrial functions; these are wheel-mounted units, rail-mounted units and static installed units.

### Wheel-Mounted Hoppers

The wheel-mounted hoppers are carried by four single wheels, designed to carry the units while empty to and from the quay and between hatches, incorporating the DOCKSOLID steering and suspension systems. When the hopper is being loaded it sits on four loading pads to give greater dispersal of weight from the bulk product and hopper structure over a wider area of the quay wall. They can be self-drive or towed by a crane, front-end loader or similar vehicle. Self-Driving units are fitted with proprietary hub motors and gear boxes. Wheel-mounted hoppers have a structure designed especially to withstand the torsional and deadweight loads exerted during both loading and driving, and give unparalleled flexibility with efficient use of quay-space.

- 4 single wheels
- DOCKSOLID suspension & steering system
- Wheels for driving, Pads for loading
- Optional self-drive capability
- Structure design for deadweight & torsional loads



### Rail-Mounted Hoppers

DOCKSOLID rail-mounted hoppers can be mounted onto new or existing tracks of any width, and are usually mounted with steel bogies and steel wheels. They can be designed with self-drive capability, but are more commonly pulled by their loading crane. The hopper's frame and structure is tailored to the rail infrastructure to ensure efficient weight dispersal and a strong structure while moving and loading product. Rail-mounted units can be fitted with all environmental, dust and operator features.

- Customised to rail-width
- Optional self-drive capability
- Structure design for deadweight & torsional loads
- Optional Dust control features



### Static Hoppers

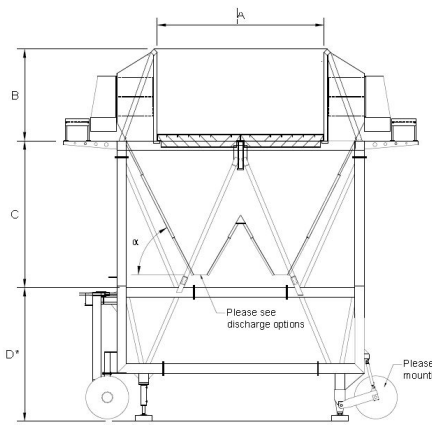
DOCKSOLID hoppers can be permanently installed as part of a port terminal or industrial facility, used an intake system or for out-loading to trucks or wagons. The static, installed units are built along the same structural design as the rest of the range, and can be modified to sit into an existing terminal facility, or a detailed drawing of a terminal under development.

- Customised mounting
- Structure design for deadweight & dynamic bulk loads
- Optional Dust control features



## Hopper Structure & Frame

A core feature of the DOCKSOLID range is a commitment to reliability and longevity of the units; the first step to achieving this is a strong and reliable hopper structure and frame. The hopper platework, and dust suppression thimble where it is included, are fabricated from S275 quality steel, to take the impact of the dropped bulk product, as well as abrasion during the loading process. This steel is usually a thickness of between 8mm and 12mm depending on the characteristics of the product being handled. The hopper's structure is an external, torsionally stiff frame comprised of vertical columns and diagonal supports, fabricated from S355 quality steel



to ensure strength. The structure is secured by full penetration welding, with appropriate levels of NDT (non-destructive testing) carried out. All external steel has a marine quality finish. There is a trash grid over the hopper opening to prevent over-size items, such as rocks or logs, from entering the hopper and obstructing the loading process. Where minimising the weight of equipment is a critical fac-

### Discharge Options

DOCKSOLID hoppers can have a single or double discharge; more may be possible on non-standard units with customised design. Bulk materials are discharged from the hopper through either a slide door or a clamshell door. A slide door can be hydraulically or pneumatically controlled and can be fitted with an optional retractable out-loading chute of an appropriate grade for the product being handled. Products that are particularly abrasive, sticky or bulky can be discharged through a clamshell door, though adapting a clamshell door for use with a retractable chute can be more difficult.

- Steel platework and frame
- Marine finish on all external steel
- Full-penetration welding and NDT
- Trash grid and optional dust thimble
- Vehicle standard spec for wheel-mounted units

tor for a client, certain structural elements can be replaced with aluminium or other metals to reduce the loads exerted on the quay wall.

The frame and structure of wheel-mounted units are designed to a vehicle specification – rather than a rigid structure – and incorporate a bespoke suspension, jacking and steering system to maintain a sound structure and shape, even with travelling and loading on uneven surfaces. A common cause of damage or failure in mobile bulk handling equipment is poorly engineered structures that fail to account for torsional loads on equipment structure during the loading or driving process. The dynamic loads exerted by the flow of bulk product include both torsional and deadweight loads; DOCKSOLID equipment is designed to handle these loads along with uneven quay surfaces, occasional overloading and the unintended, but inevitable, bumps and abrasions of a busy bulk handling environment. The structures designed for rail-mounted and static hoppers are less structurally complex than the wheel-mounted units; as with all DOCKSOLID equipment, they are engineered to be extremely robust and reliable.

- Slide-door and Clam-door options, depending on product handled
- Pneumatic or hydraulic operation
- Unloading chute options



## Wheel-Mounted Hopper Features

### DOCKSOLID Suspension System

Wheel-mounted hoppers are fitted with a jacking and suspension system, designed in-house, to give the mobile units exceptional load handling without putting undue stress on the hopper's structure, or the quay surface, during driving and loading. The patented system equalizes the pressure across all four wheels while the hopper is in driving mode, allowing the units easily handle uneven surfaces without putting strain on the upright columns or the hopper's structure. In loading mode, the suspension system self-equalizes all static and dynamic loads from the product being handled, and the hopper's weight, evenly across the four loading pads. The suspension system means that weight is distributed evenly, protecting the port's quay wall; it also ensures that no point on the structure comes under excessive strain – giving the units very reliable structural integrity and low risk of damage from overloading.

- Load equalization across wheels and pads during driving and loading
- Protects structure from stress points and uneven surface
- Patented engineering

### DOCKSOLID Steering System

A purpose designed steering system to give the mobile hoppers a very high level of manoeuvrability, for quick and agile repositioning. The dual tie-bar steering mechanism allows much greater wheel rotation than standard systems, giving units an extremely agile turning radius as well as reducing power consumption. Dual tie-bar steering ensures that there is no misalignment of wheels during turning, preventing scrub on the tyres and premature failing of bearings. DOCKSOLID units therefore achieve significantly better manoeuvrability with less wear and tear than mobile equipment using a simplistic or Ackermann steering mechanism.

- Dual tie-bar steering system for tight turning without tyre scrub
- Low wear on bearings and tyres
- Patented engineering



### Loading Pads

A bespoke jacking system allows operators a simple and quick transition between driving and operating modes. While the hopper is in operating mode, the loading pads are lowered and the weight of the hopper and the product being handled is transferred from the wheels to the loading pads. This allows greater dispersal of weight over the quay's surface area. The loading pads are customised according to the hopper's weight and capacity; where there are constraints on the load permissible on the quay, extra-large loading pads can be fitted to further disperse the weight. The loading pads work with the suspension system to ensure the structural integrity of the hopper, they also preserve the wheels from excessive loads and therefore reduce the maintenance required on bearings and tyres.

- Simple jacking system for transition from wheels to pads
- Loading pads for stability and weight dispersal during bulk handling
- Customisable pad sizes



## Mobility Options

### Self-Driving

The DOCKSOLID wheel-mounted and rail-mounted units can be fitted with an optional self-drive capability. These are customised with an efficient engine to power the hopper's drive and operation, including dust aspiration filters and other optional features where required. The engine is usually diesel-hydraulic or diesel-electric, however other power sources can be used where the client has a particular requirement. Where the hopper is operating in a dusty environment an enclosed, aspirated room for any generator, compressor, hydraulic power-pack or engine-packs can be installed to prevent the ingress of dust and dirt, making maintenance easier and preventing excessive wear on equipment. Self-driving units generally have a drive speed of 4 kilometers an hour.

- Optional self-drive capability for wheel- and rail-mounted units
- Efficient engine selection to match hopper's drive and other power requirements
- Aspirated cabin for mechanical components for easy maintenance and longevity

### Towing

Where clients opt not to install a self-drive mechanism, but instead to have a crane, front-end loader or other heavy vehicle tow the mobile hopper, a tow-bar can be installed into the hopper's frame. Towed hoppers operate with the same DOCKSOLID suspension, jacking and steering options as the self-drive units – ensuring easy and agile repositioning. The hopper frame is engineered to be towed as well as driven, so towing units – even those with self-drive capabilities – poses no risk to the structure. Both wheel-mounted and rail-mounted hopper units can be towed.



## Environmental Control Options

Handling of many dry bulk materials can generate airborne dust. This can pose a health threat to port workers, an environmental hazard, as well as a fire safety and explosion risk. Excessive dust emissions from bulk loading processes are heavily regulated in many jurisdictions for safety and environmental reasons. Dust emissions also represent a loss of product during the handling process. The DOCKSOLID hopper has a number of dust and environmental control techniques that can be incorporated into a hopper's design. These features offer state-of-the-art dust prevention and suppression; we can work with clients to include some, all or none of them as necessary, given the location, climate, product characteristics and performance requirements that the hopper is designed to meet.

### Dust Thimble

The dust thimble is an extension of the hopper walls above the grid area, in order to create a sheltered space in which the loading grab can be opened. The dust thimble prevents exposure of the product to the wind or external influences while it is being dropped into the hopper. It also prevents the lateral spread of dust when the product is dropped through the trash grid. As a simple and effective measure to prevent dust spreading during grab unloading, including a dust thimble is recommended in most circumstances, unless there are restrictive height limits.

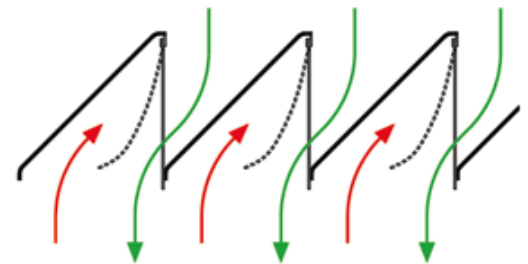
- Steel skirt above hopper's grid, preventing lateral spread of dust



### Flex-Flap System

The flex-flap mechanism is a one-way non-return valve system positioned beneath the trash grid. Made from steel and flexible rubber the flex-flap allows the product that has passed through the trash grid to fall freely into the hopper, but prevents dust rising upon impact with the hopper wall or other product. Simply, the flex-flap system allows product into the hopper but prevents dust escaping. Where a dusty product is being handled, this is an effective method of reducing dust emitted and product lost.

- One-way dust control valve beneath the hopper's grid



### Dust Extraction Filters

Dust extraction filters can be positioned along and underneath the hopper's thimble. These extractor filters remove air from the hopper and thimble at a rate required to create significant negative air pressure, keeping the product subdued inside the hopper structure, while removing the dust from the air being extracted. The reverse-jet filter system collects dust from the extracted air in reusable filter bags, then periodically pulses compressed air through the filters to return collected dust to the product. The rate of air extraction and the filter cleaning pulse can be adjusted to economise on power and compressed air. The revers-jet filter can even be set with a 'Delta(P)' controller, to vary the rate of filter emptying in accordance with the level of dust present in the extracted air. The extraction filter system is used alongside the dust thimble and flex-flap options, and effectively minimizes dust from the loading process. When the grab is correctly positioned and opened by the operator, the loading process can be carried out with almost no dust and product loss.

- Extractor filters create negative pressure in hopper and thimble to subdue product and dust
- Remove dust from extracted air and return to product.





## Safety Features

DOCKSOLID hoppers come with a range of safety features as standard, and can be adapted to meet the port or operator requirements where they differ from the existing design. Safety features include warning siren and flashing beacons when the hopper is driving, heat and smoke detectors, as well as ATEX precautions and deluge systems described in section 7d. It is also possible to fit carbon monoxide and nitrous oxide sensors in enclosed spaces. All access platforms, ladders, stairs and the optional operator cabin are designed to include all appropriate hand-railing, easy access and safe use features.

### ATEX & Deluge Systems

Where there are bulk materials being handled, there is always a possibility of dust. Where there is a build-up of dust, there is an explosion risk. The DOCKSOLID hopper range can be customised with explosion panels, spark resistant mechanisms and gas deluge systems as required. The level of ATEX (Anti-Explosion) precautions necessary will depend on the products being handled, the surrounding environment and operations being carried out in the hopper's vicinity. These systems can be designed and installed where appropriate, in-keeping with clients' in-house safety systems, industry best practice and regional regulatory requirements.

- Anti-explosion measures and fire safety systems

## Operation

DOCKSOLID hoppers come with a range of safety features as standard, and can be adapted to meet the port or operator requirements where they differ from the existing design. Safety features include warning siren and flashing beacons when the hopper is driving, heat and smoke detectors, as well as ATEX precautions and deluge systems described below. It is also possible to fit carbon monoxide and nitrous oxide sensors in enclosed spaces. All access platforms, ladders, stairs and the optional operator cabin are designed to include all appropriate hand-railing, easy access and safe use features.

### Operator Cabin Option

An operator cabin allows operators to easily and comfortably manage the discharge process. The cabin be installed with a view over the discharge outlets and any attached loading chutes, a basic model will seat one operator, however optional upgraded cabins could accommodate an extra person, air-conditioning, in-seat controls and other features to enhance ease of operation and operator comfort.

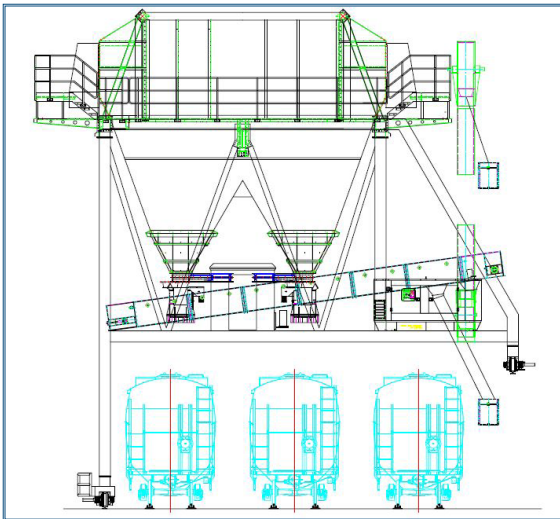


## Customisation

- Non-standard design, including height, dimensions and functionality can be engineered in-house to meet performance specifications

As described, the DOCKSOLID hopper range encompasses a spectrum of units built from standard frame sizes with extremely customisable features and levels of sophistication. However, many clients' require hoppers with non-standard designs, often due to height, weight or other restrictions at their quay. The dimensions of DOCKSOLID hoppers can be adapted to meet a specific requirement, with further design to accommodate non-standard wheel-sizes, loading pads, cabin positioning, extra-large capacities, multiple discharge hatches and other alterations. Further processing equipment such as crumblers and bagging systems can also be incorporated into the hopper, but often impose extra height and weight costs.

Aesthetic features such as external lighting, branding and equipment colours can also be adapted to the clients' specifications where desired.



## Company Profile

DOCKSOLID is a bulk port equipment brand owned, designed and fabricated by Buttimer Engineering. The equipment design has been developed and refined through multiple iterations – Buttimer have been producing hopper units since 1998 – and constantly improving innovative core features such as the bespoke steering and suspension systems. Buttimer's range of port equipment began initially as a number of once-off solicited bulk port terminal and equipment fabrication projects; over more than a decade this learning experience has been developed into a range of increasingly sophisticated and designs and bulk handling solutions that now make up the core of the DOCKSOLID range. The DOCKSOLID brand has come to represent the range's three market leading capabilities, which are state-of-the-art dust prevention and suppression techniques, extremely agile and manoeuvrable mobile units as well as a strong structural design and innovative suspension system to ensure reliability and longevity. In short: Clean. Flexible. Robust.

Buttimer Engineering is a diversified mechanical engineering firm which offers design, project, equipment and fabrication services to sectors such as agri-industry, food & beverage, mining, ports, power generation and dairy. Established in 1978 by Mr Edward Buttimer, it has grown from its base in Cahir, Co Tipperary to serve clients internationally, and also has a subsidiary based in Warsaw, Poland. Despite the company's broad range of clients and sectors, the core expertise remains the mechanical handling of dry bulk materials and high-quality steel fabrication.



# DOCKSOLID BESPOKE BULK PORT EQUIPMENT

- DOCKSOLID** State-of-the-art Dust Prevention and Suppression Systems.
- DOCKSOLID** Built for Reliability and Longevity: Structure Designed for Dynamic and Static Loads.
- DOCKSOLID** Patented Steering and Suspension Innovations for Highly Manoeuvrable Mobile Units.
- DOCKSOLID** Custom Designed to Suit Clients' Bulk Product(s) and Terminal.
- DOCKSOLID** Low Carbon and Noise pollution.
- DOCKSOLID** Engineered in Ireland.