

May 16, 2008

Lynne Birkinbine, Environmental Manager
City of Tucson
Environmental Services
100 N. Stone Ave, 2nd Floor
Tucson, AZ 85701

Re: Evaluation of Sub-grade Waste Storage and Collection Systems

Dear Ms. Birkinbine:

The purpose of this letter is to summarize the results of the Sub-grade Waste Storage and Collection System evaluation as described in the proposal from Malcolm Pirnie, Inc. (Malcolm Pirnie) dated February 7, 2008 and authorized by the City of Tucson Environmental Services (COT-ES) in a notice to proceed dated February 11, 2008. Malcolm Pirnie performed an internet-based investigation of sub-grade solid waste storage and collections systems currently in service in many European countries. Once we identified manufacturers, we contacted these manufacturers concerning details of their respective systems including: where these systems were currently operated, principal applications such as commercial or residential uses, equipment needs, and whether any systems have been sold and operated in the United States.

On February 26, 2008, Malcolm Pirnie met with representatives of COT-ES to discuss details associated with the magnitude of COT-ES' solid waste collection operations and preferences for potential downtown waste storage and collection systems. COT-ES stated that downtown is dominated by commercial/retail customers. The City views their role in this project as collecting information to guide redevelopment efforts downtown. As a result, the end product of this effort may result in guidelines and specification for downtown developers to include in their future development plans. Downtown land use is dominated by office space, then food and entertainment, and some retail. Previously, COT-ES tried to promote downtown waste generators to use "community" collection points with little success (everyone wanted their own garbage service). COT-ES would still be interested ultimately in 12 to 20 centralized trash collection points for multiple local users at approximately 20 cubic yard (cy) sizes depending upon how often collections are made. Although, the large 20 cy size containers were desired, COT-ES has an existing fleet of front load compactor trucks (fork lift type) that use 4 and 8 cy trash containers, which should also be considered when evaluating solid waste storage and collection systems.

The City operates 23 front-load trucks servicing approximately 70 customers and 100 waste containers in the downtown area (between 6th Street and 14th Street on the north and south, respectively, and 4th Avenue and Granada Avenue on the east and west). The front-loader trucks

require a 14-foot wide by 40-foot long clear approach to allow for a perpendicular access to the waste container enclosures. The trucks must have a 25-foot vertical clearance to allow for overhead emptying of the waste containers into the top of the compactor trucks using the front-load forklifts. The front-loader trucks can service either 4 or 8 cy containers. The weight limit for either of these containers is based on the lifting capacity of the trucks at 2,000 pounds. The dimensions of the typical 4 cy container is 7 feet wide by 4.5 feet deep and 4.5 feet high, while the 8 cy containers are 7 feet wide by 7 feet deep and 7.5 feet high. Currently, the City uses a standard enclosure specification of a clear width of 10 feet by 10 feet for waste containers within the enclosure. The City also requires a minimum 2-foot clearance above the container. The City standard also includes the installation of a smooth 5-inch concrete slab in front of the enclosure approximately 10-foot by 10-foot.

Malcolm Pirnie conducted the internet-based investigation of underground waste storage and collection systems used in Europe as scoped. Based on the research, Malcolm Pirnie identified and contacted three potential vendors of systems currently being employed in Europe: SULO MGB Ltd (SULO), Terberg Machines B.V. (KTZ), and Otto Environmental Services (Otto). There were no European subsidiaries supplying these systems in the United States (U.S.). Attached are cut sheets downloaded from websites that provide descriptions of the various systems.

A phone interview was conducted with COT-ES on March 21, 2008 to discuss the status of the European systems and possible applications with the City of Tucson. Based on these discussions, Malcolm Pirnie performed additional research into American manufacturers of hydraulic lifts that could be used by the City in a similar manner to some of the European systems. An overview of the European manufactures, their respective systems, and potential alternatives for system development in the U.S. are discussed below.

European Manufacturers

SULO MGB Limited is located in Germany, and has installed approximately 40,000 underground waste containers across Europe. SULO offers a range of products and services that include transport and distribution, assembly, financial services, and public relations. SULO's underground waste container system, called Iceberg, is used in primarily residential areas.

OTTO Limited is located in the United Kingdom, and is a division of Environmental Solutions Europe BV (ESE). Waste handling and collection systems are the main products offered by the OTTO Group. This range covers the whole sector of containers and lifting systems through most of Europe. Their underground waste system has been used throughout Europe for 10 years in residential areas, and is manufactured in Holland.

Terberg Machines and the Kliko Company have developed the KTZ system and are located in the United Kingdom. The system is comprised of two parts, (1) the underground containers made by

Kliko and (2) the vehicles retrofitted by Terberg. This system has been mainly installed in residential areas of the Netherlands.

Types of Waste Systems

Two types of systems are provided by industry suppliers, a crane operated system and a hydraulic lift system.

Crane Operated System

The standard system provided by each of the suppliers is based on a crane operated system that is mounted on waste removal trucks. The crane lifts the container out of the ground by attaching to hooks that are mounted on the top of the receptacle which is directly connected to the container. Based on the manufacturer, the crane will either lift the container in the air over the top of the truck, or flip the container over the side of the truck body into the truck. The container is then placed back into the ground. The crane operated systems provide the faster operation time of the two systems, but require significant overhead clearance, specifically with the overhead dumping truck system, as well as complex retrofitting of solid waste collection trucks.

Hydraulic Lift System

SULO and OTTO manufacture hydraulic lift systems as an alternate to the standard crane lift system. The hydraulic lift system utilizes wheeled containers that sit on an underground platform and are separated from the above receptacle. The underground platform is raised either by an installed electrical power source to run a hydraulic pump, or by connecting the truck's hydraulic system to pressurize the hydraulic pistons of the platform. Once the platform reaches the ground surface, the containers are wheeled out and loaded into the truck. These systems provided for a slower operation time, but do not require trucks with mounted hydraulic cranes.

Characteristics of the Underground Systems

The underground waste systems provided by the suppliers are primarily installed for residential areas. Containers are produced in three sizes, 3 m³ (4 cy), 4 m³ (5.25 cy), and 5 m³ (6.5 cy). Due to the size constraints, in areas where more capacity is needed, multiple containment systems are installed to provide the additional capacity support.

Each supplier provides a similar system setup. An above ground receptacle and housing sits on a ground plate which is flush with the ground surface. The ground plate connects to the waste collection container forming a one-piece system from top to bottom. The container opens from the bottom using emptying flaps.

The suppliers offer different styles of receptacles for each waste stream. Different styles, colors, and signs are available based on the supplier, but each offers receptacles for bulk waste, glass and

plastic recyclables, and paper. The ground plate is also supplied in a variety of finishes based on the supplier, and can be finished to blend into the existing surroundings.

The system is housed in a waterproof reinforced precast concrete vault, which allows complete self containment of the system. For the crane operated setup, safety base plate with counterweights is supplied in the vault to protect the hollow cavity during emptying operations. The concrete vault is designed to the same specifications for both the crane operated setup and the hydraulic lift setup, which allows the hydraulic system to be easily converted into the crane operated system at a later date.

Sulo offers the SuTerra hydraulic style underground waste storage system. The system can be covered with a flat walkable cover which includes a 3mm hot dip galvanized plate with a carrying capacity of 775 lbs., or the above ground waste container which is typically 2.5 ft wide x 1.8ft deep x 3.5ft high with an opening for waste depositing. The standard refuse container used is durable plastic, wheeled, and sized at 1.5cy. Dimensions of the underground vault are typically 6.25ft length x 5.6ft width x 6.5ft depth. The motor is mounted inside the vault with a key switch located at ground level.

Limitations of the Systems

Although the characteristics of these underground collection systems have lead to success of these systems in the European market, these same characteristics lead to several limitations for the needs of COT-ES. There are no installations of these systems in the U. S. and, therefore, no vendors are currently local. The off the shelf systems have been designed for the European market and function, for example, using a different electric systems, and would need to be modified to operate in the U.S. With no local presence, purchase of any product from the overseas vendors would raise the question of costs of the system and costs for maintenance, service, and parts. Unfortunately, the above referenced suppliers would not provide costing information on the systems.

Past the limitations of vender support, maintenance, and size limitations, purchase of the crane operated would require either retrofitting of COT-ES waste vehicles with hydraulic crane systems or the purchase of new vehicles equipped with crane mounted systems. The system manufactured by KTZ requires the use of their manufactured trucks, so purchase of their system would mandate new trucks to be purchased along with the system.

The crane-based systems are also limited in size. The systems are installed primarily for residential applications, and the manufacturers currently have no plans to increase the capacities of the systems. Based on discussions with COT-ES; the primary focus for implementation of this system in the City of Tucson would be for commercial applications involving 10 cy and 20 cy waste containers. To accommodate the larger volumes anticipated in the commercial sector, multiple

containers using the crane-based systems would need to be installed in the area. This would result in more units, and thus more area to be utilized.

The hydraulic lift system could potentially be implemented without the retrofit of new trucks, but if purchased through one of the European manufacturers, vendor support, maintenance, and container sizes would still be limited. Based on discussions with COT-ES on March 21, 2008, Malcolm Pirnie was asked to research potential U.S. based hydraulic lift system manufacturers that could install a hydraulic lift system capable of lifting larger commercial size waste containers.

Conceptual Hydraulic Lift Alternative

Malcolm Pirnie also contacted four hydraulic lifts companies based in North America, American Custom Lifts (AC Lifts), Titan Worldwide Inc. (Titan), Metro Hydraulic Jack Co. (Metro), and ECOA Industrial Products Inc. (ECOA). These companies provide hydraulic lift systems for a variety of applications throughout the U.S. AC Lifts, based in California, offers automotive lifts, designing and marketing custom design lifts, parking lifts, and material handling equipment such as scissor tables and vertical reciprocating conveyors. Titan, based in Ontario, provides industrial cylinder products, materials handling such as hydraulic scissor lifts and pneumatic scissor lifts, car parking system, heavy equipment, specialty products and custom manufacturing. Metro, based in New Jersey, offers automotive products, construction products, industrial products, and material handling products such as standard and custom scissor lifts, ergonomic lifts, and standard and custom pallet lifts. ECOA, based in Florida, offers hydraulic scissor lifts and loading dock equipment for the material handling industry.

Hydraulic or scissor lifts vary in size and shape to accommodate varying weight criteria. The lifts are powered by a connection to the electricity within nearby buildings, a separate power shed with a diesel or gas powered generator unit, or by connecting the truck's hydraulic system to the lift. In order for the lift to connect to the trucks, the trucks might have to be retro-fit so that the volume of the oil in the truck is enough to power the hydraulic lift. Based on the cost of retrofitting every truck, it may be more cost effective for the City to install auxiliary power units at the hydraulic lifts.

In concept, the hydraulic lift would be stationed in an installed subsurface precast concrete vault to lift 4 cy or 8 cy waste containers. A drainage system would be designed for the pit, so that there would be no standing water in the concrete pit. A top would be designed to cover the container based on determined loading criteria and finished with a receptacle for the garbage to be placed in. A maintenance access entry for any work to be done on the system during and after installation would also be incorporated into the design. The dimensions of the maintenance access have been assumed based on required service area.

Construction of these systems may require excavations of up to 14-feet below ground surface for installation. The methods of construction will vary at each waste disposal location depending on subsurface conditions of the soil. In the table below, approximate vault dimensions have been

provided based on research done of previous systems constructed and from conversations with hydraulic lift manufactures in the US. Two alternative waste containers and scenarios were sized. The first scenario is for a 4 cy waste container on wheels, where existing City front-loader trucks cannot maneuver into position. The second scenario is for an 8 cy waste container without wheels that can be accessed directly by the City front-end loader trucks.

Conceptually, the hydraulic lift would be powered by connections to existing utilities. The mechanical equipment would be installed beneath the platform and then wired to a secure control unit above ground to control the operation of the lift.

The steel surface platform, that supports the waste receptacle, is assumed to be connected to the underground system by four supports that will rise with the above ground components when the hydraulic lift is operated.

To incorporate the City's existing containers into the underground waste system design, consideration will be necessary for application of zinc or stainless steel to the hydraulic lift for corrosion resistance from possible leachate migration.

Based on the information presented above, the following assumptions and tables approximately summarize the required geometry of the underground waste system and the potential hydraulic lift supplied by ECOA.

Assumptions:

1. The hydraulic lift used will be either zinc or stainless steel coated in an effort to reduce possible leachate corrosion.
2. Concrete foundation slab with a thickness of 12-inches will be sufficient to support the weight of the system.
3. An access panel will be provided for maintenance.
4. Hydraulic control unit will be secured in a vandal resistant steel column nearby.
5. Excavation height includes height of a 4 cy or 8 cy container, required 2 foot clearance, 12-inch slab, and hydraulic lift, and 2 foot undercut for slab base material.

<u>Item</u>	<u>4 cy Container</u>	<u>8 cy Container</u>
Excavation Depth	11 feet	14 feet
Hydraulic Lift	ECO A DSL Scissor Lift	ECO A DSL Scissor Lift
Hydraulic Lift Travel Height	104 – inches	134 – inches
Hydraulic Lift Capacity	4000 lbs / 2 ton	4000 lbs / 2 ton
Hydraulic Lift Base Frame	48” x 72”	54” x 96”
Hydraulic Lift Slab	1’ x 10.5’ x 13’	1’ x 13’ x 13’
Hydraulic Lift Platform Dimensions	7’ x 9.5’	9.5’ x 9.5’
Surface Platform Dimensions	8.5’ x 11’	11’ x 11’
Maintenance Access	5’ x 5’ x 8’	5’ x 5’ x 11’
Vault Dimensions (interior)	7.5’ x 10’ x 8’	10’ x 10’ x 11’
Power Source	Existing utilities	Existing utilities

The hydraulic system outlined above provides a conceptual basis for design of an underground system. Based on discussions with hydraulic manufacturers, hydraulic lifts can be easily incorporated into a system to provide COT-ES with the style of underground system that was seen with the European manufacturers in a larger scale to meet the existing conditions of COT-ES trucking and equipment. Additional information on subsurface conditions, utilities, loading conditions, the type of cover, and ancillary items will be required. Issues involving operation and maintenance, access to working components, confined spaces, other safety considerations would need to be incorporated in the design of a subsurface lift system. A detailed engineering analysis would need to be conducted to determine the site conditions, constraints, and detailed design considerations.

Conclusions

Although underground waste collection and storage systems have been used in Europe for years, no comparable systems have been identified in the U.S. The off-the-shelf systems currently being used in Europe will not meet the City’s expressed needs due to the size and types of waste containers and potential vendor support. The potential design of an underground waste collection and storage system based on U.S. manufactured hydraulic systems that could employ the City’s current equipment appears to be feasible. The design of a custom system for the City would require close coordination between the City, manufactures, vendors, and designers.

Enclosed with this letter, is additional material from companies Malcolm Pirnie contacted. Please do not hesitate to call me at 914-641-2685, or Glenn C. Hoeger in our Tucson Office at (520) 629-8282, if you have any questions.

**MALCOLM
PIRNIE**

INDEPENDENT ENVIRONMENTAL
ENGINEERS, SCIENTISTS
AND CONSULTANTS

Lynne Birkinbine
City of Tucson
Environmental Services
May 16, 2008
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Very truly yours,

MALCOLM PIRNIE, INC.



Robert J. Glazewski
Project Engineer

Enclosures

CC: Greg Druback, WHI
Glenn Hoeger, TUC

ENCLOSURES

OTTO
HYDRAULIC LIFT SYSTEMS

Hydraulic lift

Underground Waste System



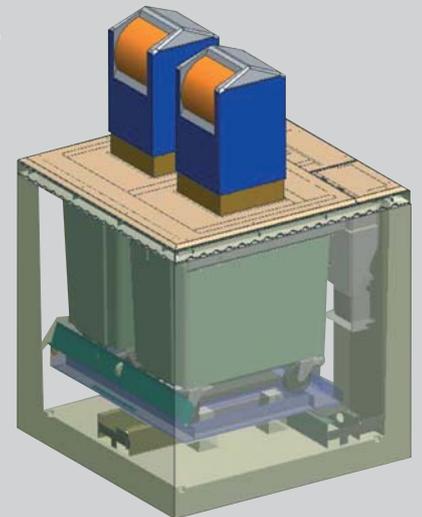


a new concept for the Underground Waste Systems

Storing waste or recycling material out of sight has several benefits for the community and waste collector. The new hydraulic lift version from OTTO uses standard wheeled containers to collect the waste. The containers can be emptied by a standard 'comb lift' refuse vehicle, rather than requiring a specialist crane lift vehicle which may not be available or suitable for certain installations. The unit can then be converted to the standard system when a crane becomes available for emptying. The lift system is powered by either 240 V or by the hydraulic supply from the collection vehicle. A control unit can be mounted on a wall or in a vandal resistant housing near to the columns.

features:

- Attractive streetscene
- Unpleasant odours reduced
- Less noise
- Reduced vehicle movements
- Reduced fire risk
- Vandal resistant



Your OTTO contact:
OTTO (UK) Limited
Beacon House, Reg's Way,
Bardon Hill, Coalville,
Leicestershire, LE67 1GH



Tel: 01530 277900
Fax: 01530 277911
Email: sales@otto.co.uk
www.otto.co.uk

Walk-on Platform

Underground Waste System

Granulated rubber

Galvanised chequer plate

Surrounding surfacing material



Hydraulic lift

24 DC / 240 AC Electrical power

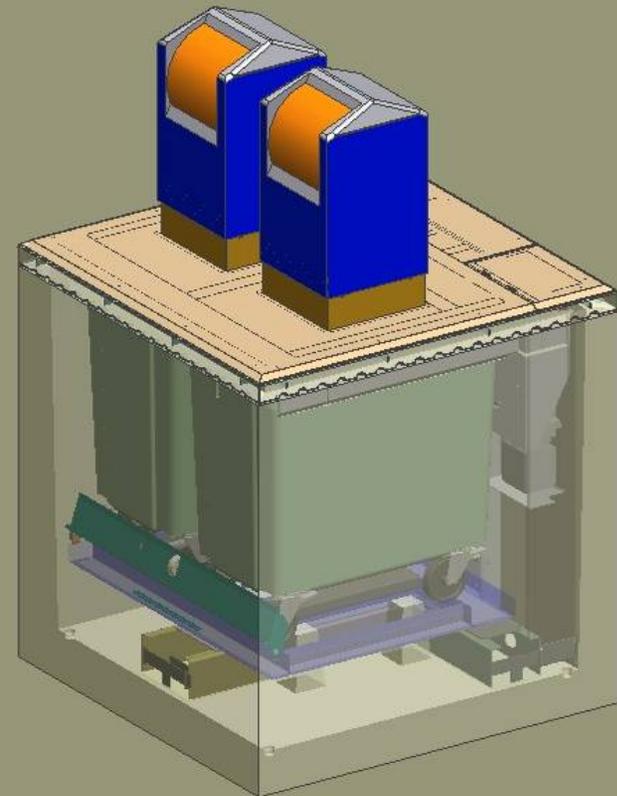
Hydraulic power from vehicle

2 x 770 litre containers

1, 2 or no columns

Standard concrete casing – can be easily converted to crane lift version

Underground Waste System



OTTO
CRANE LIFT SYSTEMS

Underground Waste System



.....the smarter solution

Lifting system

Underground Waste System



Match your existing bottle banks



1 Hook



Kinshofer



2 Hook



2 Hook
parallel

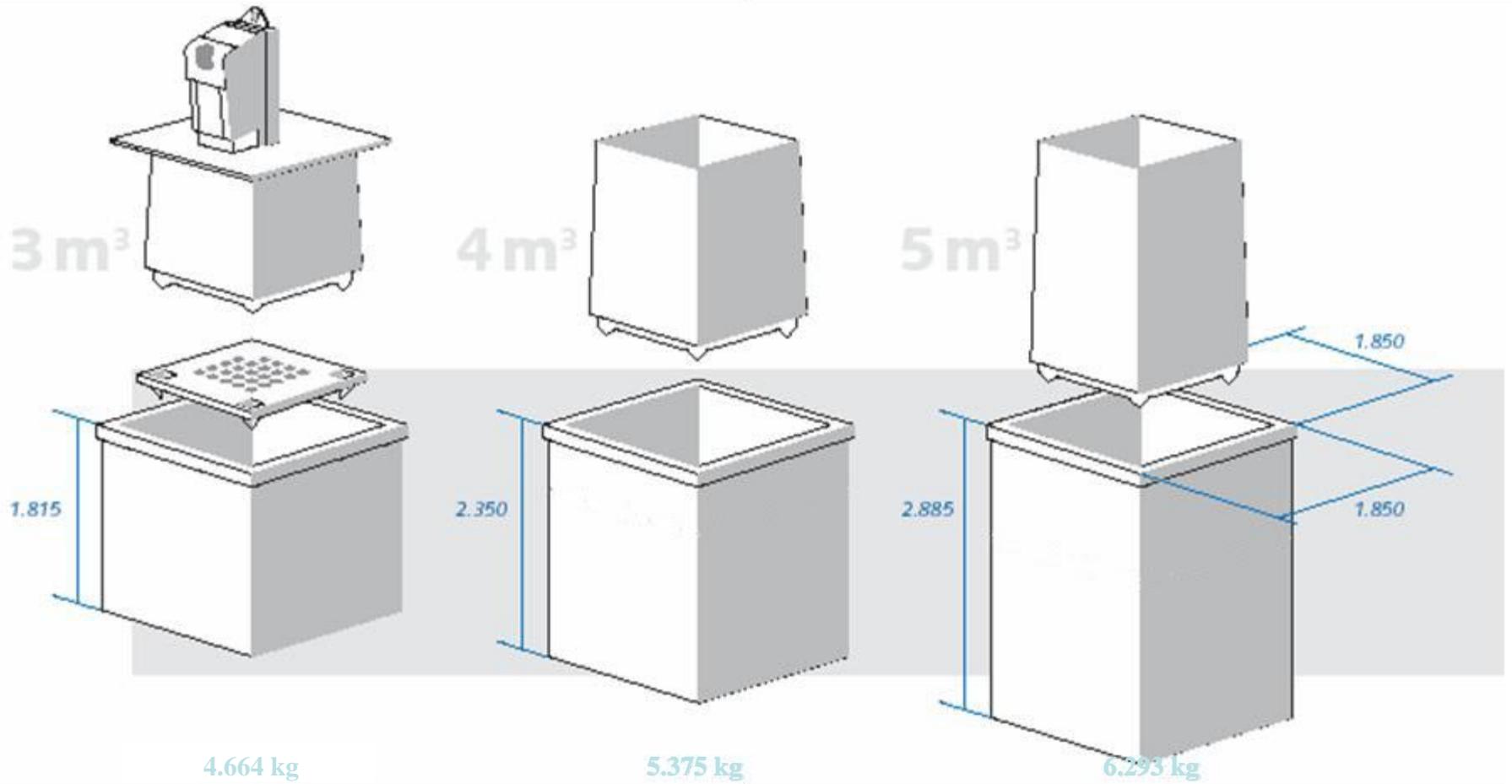


3 Hook



Volume

Underground Waste System



Walk-on Platform

Underground Waste System

Granulated rubber

Galvanised chequer plate

Surrounding surfacing material

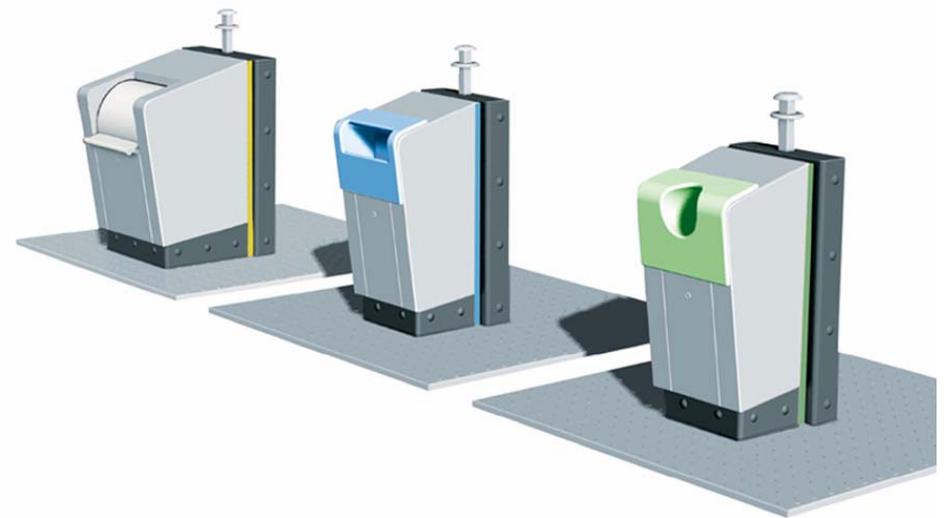


Underground Waste System

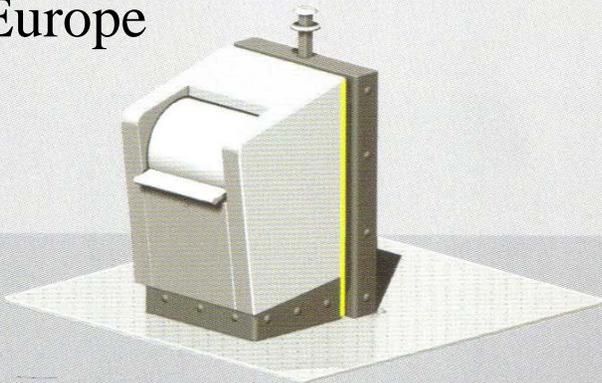
Drum for domestic waste or clothing

Paper/cardboard slot

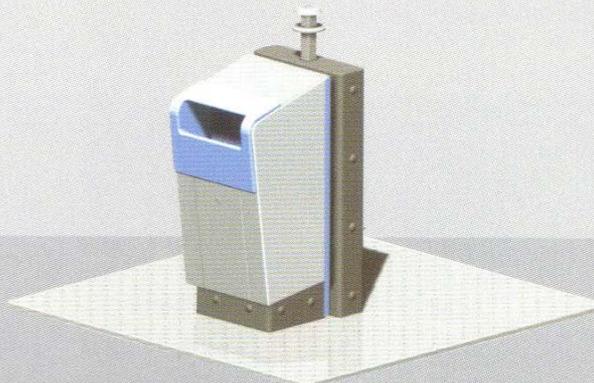
Glass/plastic/can aperture



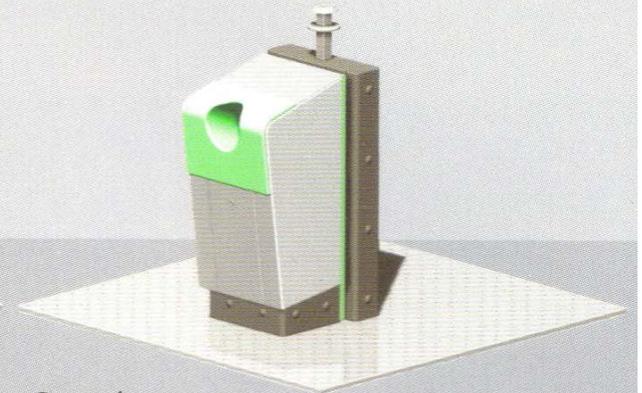
Europe



Standard version

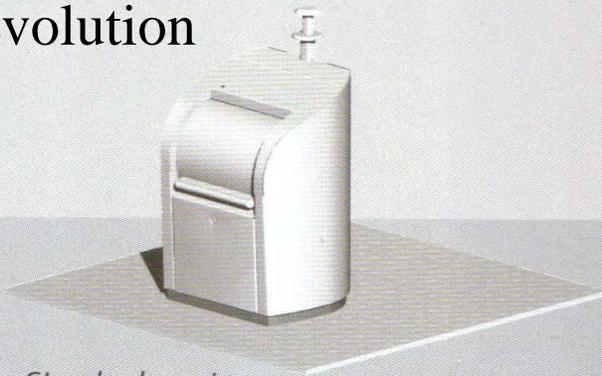


Slot version

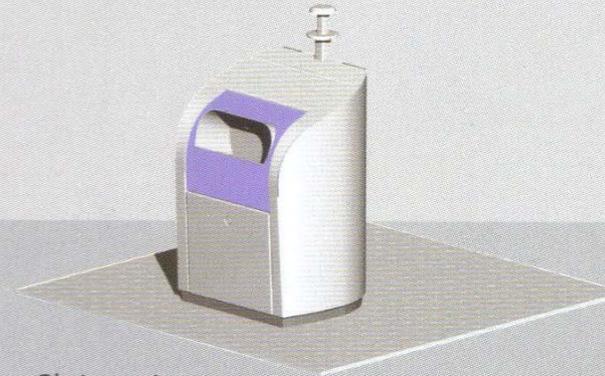


Round version

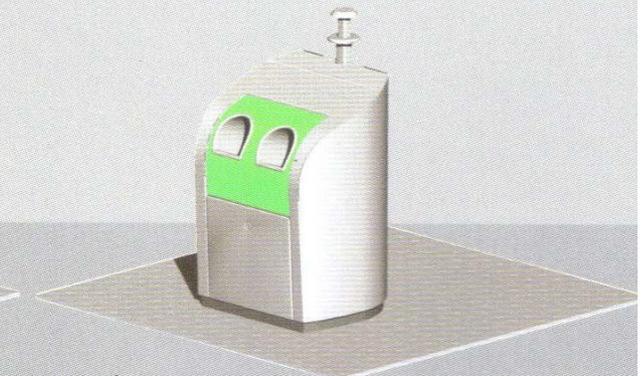
Evolution



Standard version

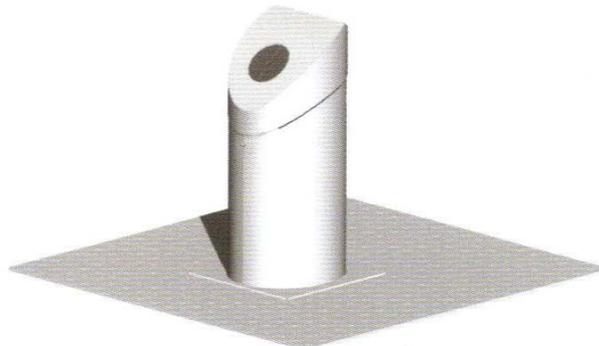
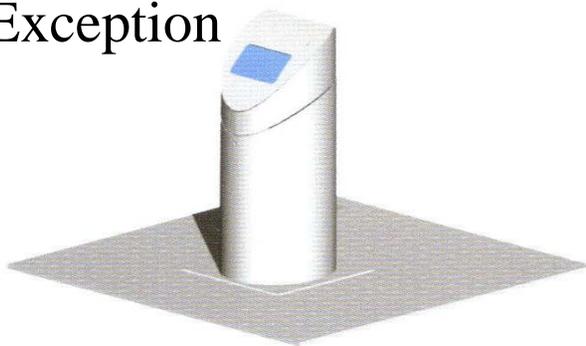


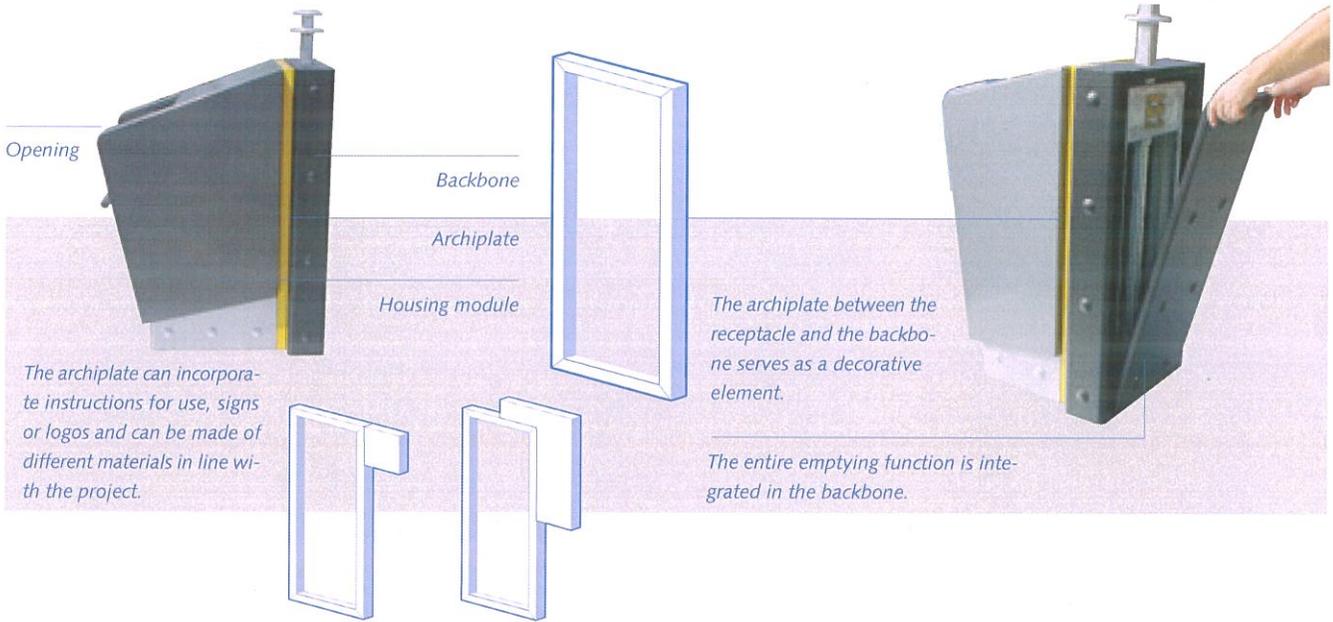
Slot version



Round version

Exception





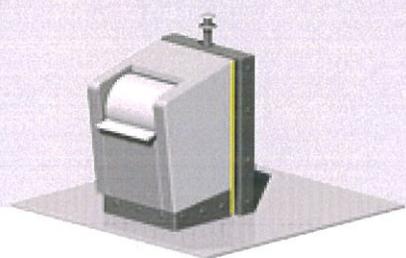
Housing with opening for glass



Housing with opening for paper and packaging



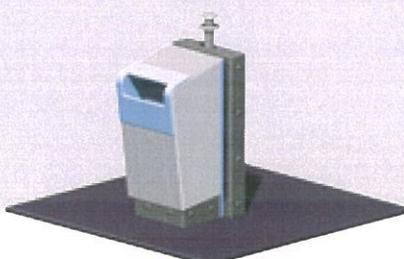
Housing with opening for waste with limited volume



Paved ground surface



Rubber ground surface



Metal ground surface



Product / Elements

Underground Waste System

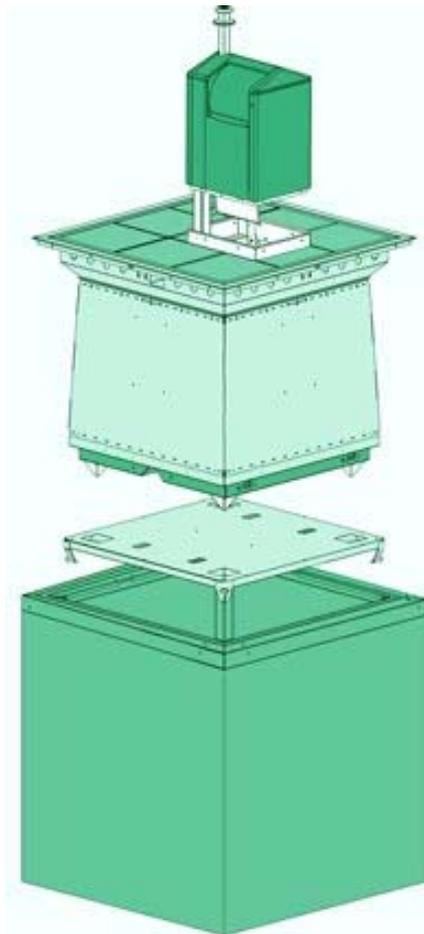
Lifting system

Column with apperature

Container

Safety floor

Pre-Cast concrete pit



SULO

HYDRAULIC ICEBERG

The Underground Bin System



The hydraulic lift version of the ICEBERG underground refuse system allows waste or recycled material to be emptied by a standard 'comb lift' vehicle.

The unit is in the same type of concrete as the standard ICEBERG solution making it possible to change it to a container system at a later stage. It also looks identical above ground with a walk-on platform and column.

This system is raised using either a 240V supply or a hydraulic connection to the vehicle. A control unit is used for the 240V system, either wall mounted or in a vandal resistant steel column

SULO MGB Ltd.

Century Point, Halifax Road, Cressex Business Park, High Wycombe, Bucks, HP12 3SL

Tel: 01494 511055 Fax: 01494 511044 E-mail: sales@sulo.co.uk

www.sulo.com

ICEBERG

The Underground Container System



SULO MGB Ltd.

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Tel: 01494 511055 Fax: 01494 511044 E-mail: sales@sulo.co.uk

www.sulo.com

The Iceberg - Underground Container System

The main features are:

- One-piece concrete casing
 - Prevents water ingress
 - It also makes is very easy to install
- Collection container arrives assembled inside concrete casing
 - Cheaper and further enhances the ease of installation
- The collection container is bolted together rather than welded
 - Easy and inexpensive to exchange components in the event of damage
- Several emptying options
 - Compatible with a range of different vehicle systems
- Aesthetically pleasing
 - Environmentally friendly, neat and clean
 - Suitable for housing areas
- Less frequent emptying required
 - Cost effective and easy to maintain

We offer two different versions:

- Crane lift version
 - As mentioned and shown below
- Hydraulic version
 - Uses wheeled container underground, carried to the surface by a hydraulic lift.
 - Used where crane lift vehicles are not available



SULO MGB Ltd.

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www.sulo.com

KZT

KTZ

collecting technology



Terberg Machines in collaboration with the firm of Kliko has placed an exceptionally effective, reliable and safe waste collection system for underground containers on the market with the development and implementation of the KTZ system in which the latest, but fully tested technologies have been used.

The system consists of two main components.

First, the underground waste container with the design waste insertion pillar above this with no hydraulic components so that the system is near enough maintenance-free and thus provides a considerable saving in comparison with conventional underground systems.

Second, the collection vehicle
This exceptionally sophisticated vehicle, that has been developed by Terberg Machines, is fitted with an automatic side-loader allowing 5m³ inner containers to be emptied automatically by just one driver/operator.
The most important principles used for the design are safety and working conditions. This brochure describes the technical aspects of the KTZ system.
The collection system developed by Terberg and Kliko offers municipalities, architects and town and country planners possibilities that have not been available up to now because of its compactness, the design and the efficiency.

For more information, or to see the system demonstrated, please contact us at:

Terberg Machines B.V.
Baronieweg 23
3403 NI IJsselstein
Phone +31 (0)30 2100600.

The KTZ system can be used everywhere both in new and also in existing housing areas (town centres, redevelopment areas) and in shopping centres.

The underground site consists of a concrete pit fitted with a frame and hinged lid formed from a hinged top plate and a waste insertion pillar on this.

A galvanized top-emptying inner container with capacity 5m³ hangs in the concrete pit.

The design waste insertion pillars are available in a wide variety of shapes and colours. Maintenance costs are reduced to a minimum by the careful selection of materials.

The underground site can be fitted with a chip as optional extra which among other things can communicate with a central server by means of GPS to indicate when the container is 80% full.

The driver/operator knows well beforehand through his daily route planning that the particular container must be emptied.

This system prevents citizens being faced with a full container and then depositing their waste next to the waste insertion pillar.

An energy point is positioned next to the underground site.

This is activated by an energy transmitter from the collection vehicle to allow a 24 V maintenance-free spindle motor to open the hinged lid to more than 90°.



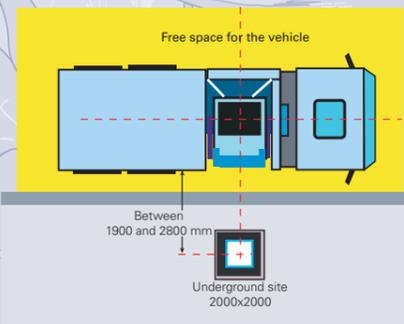
The top-emptying inner container is brought automatically to the collection vehicle in an upright position by means of the docking system (twist lock principle).

The space necessary for emptying the underground container is shown in the figure below.

The minimum distance between the sides of the vehicle and the middle of the pit is ± 1900 mm.

The maximum distance between the sides of the vehicle and the middle of the pit is ± 2800 mm.

The underground site is positioned parallel to the road with the lid hinged at the back of the concrete pit.



The collection vehicle is fitted with the necessary instruments to allow emptying of the container to take place accurately with a maximum of safety and effectiveness. TNO Work has investigated the system paying special attention to safety and working conditions in accordance with the standards in force at present.

Terberg Machines also issues a CE IIA declaration for the collection vehicle in accordance with the European Machine Directive.

The side loader is operated

Step by step



The collection vehicle approaches and is positioned alongside the container pit. Both safety arms fold out and give an acoustic and visual signal. The hinged lid is then opened automatically by the energy point.



The emptying cycle begins after the collection vehicle has been supported automatically (levelled by means of the hydraulic supporting legs).



The arms of the side loader go down and both heads lock on to the inner container automatically by means of twist locks. The inner container is brought out upright and without any danger of the contents blowing away and emptied into the collection vehicle.



KTZ

automatically from the cabin by one driver/operator.

A moveable ergonomic operating console is provided for this and all actions are followed by two monitors. Hand and foot controls are used so that the operator must keep his attention on the monitors at all times. The foot control incorporates a dead man's switch that stops the side loader immediately if the foot is taken off the switch.

The vision system ensures that the docking system locks accurately and fully automatically onto the inner container.

The collection pressure container has a volume of about 22m³ or ± 11 tons effective load capacity. The emptying cycle takes about ± 180 sec.

Emptying one inner container is equivalent to 20 minicontainers with a volume of 240 l.

TERBERG
MACHINES

The collection vehicle has a side loader consisting of the following parts.

- Assembly frame and guide shafts for the side shift that are fitted to the truck chassis
- Lifting frame and tipping frame with hydraulic cylinders
- Two pick-up frames fitted with twist locks and cylinders for the vehicle supports
- Two safety arms to protect the working area
- Safety cameras, optical and acoustic signalling to warn other traffic
- Control cameras for the driver/operator for all actions to be taken with the side loader
- The side loader complies with European standard EN 1501-2.

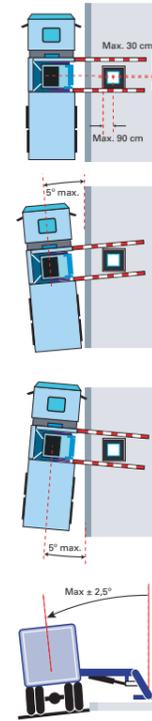


Advantages of the KTZ collection system in combination with underground sites are:

- Simple top-emptying inner containers, completely liquid-sealed at the bottom
- No dripping on other objects when tipping up the inner container
- Clear and safe working area, protected all round
- Ergonomically responsible one man operation from the cabin
- Operating errors are practically impossible
- Very reliable docking system (twist lock principle)
- Rapid emptying cycle ± 180 sec., so that there is minimum blocking of other traffic
- Low operating costs
- Very low maintenance and cleaning costs for the inner containers
- Manoeuvrable vehicle, short wheelbase



Positioning the vehicle relative to the underground site



The collection vehicle must be positioned reasonably accurately relative to the collection container.

- The vehicle must be positioned to an accuracy of 30 cm relative to the pit in the driving direction. This is easy to do with the aid of the side-view camera with reference line.
- The side of the vehicle must end up at a distance of between 1.90 and 2.80 m relative to the heart of the collection container, so that there is a possible play of 90 cm.
- The vehicle does not have to be positioned exactly parallel to the collection container: a deviation of maximum 5° in both directions can still be corrected by the loading system.

The vehicle may be tilted 2.5° off level both to the front or the back and to left or right. The vehicle will be automatically levelled when the supports are put out.

KTZ

COLLECTING WASTE TECHNOLOGIE



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KTZ engels 05-007

TERBERG MACHINES

HYDRAULIC LIFT SYSTEM



TablLift™

ECO A DSL Series Scissor Lift Tables



High Travel Double, Electrohydraulic 2,000 to 6,000 lb. Capacity For Surface or Pit Installation

DSL-60-072-48072 Scissor Lift Table with Optional Beveled Toeguards

Model Number Format

DSL-60-072-48072

Series "DSL" _____
 Double Hydraulic Lift Table _____
 Capacity _____
 60 = 6,000 lbs.
 Vertical Travel _____
 072 = 72 inches
 Platform Size _____
 48072 = 48"W x 72"L

Description

ECO A DSL Series Lift Tables are high travel double electrohydraulic scissor lifts with capacities of 2,000 to 6,000 lbs., travel distances of 60 to 144 in. with platform sizes of 30 x 48 to 72 x 132 in.

All ECO A Lift Tables are designed and constructed for heavy-duty applications under the toughest working conditions, offering years of trouble-free operation.

Standard Features

- Smooth steel tops
- Straight toeguards with yellow and black safety stripes
- Internally-mounted 1½HP, 230V, 1PH, 60Hz TENV intermittent duty super torque motor or externally-mounted 4.8HP, 230/460V, 3PH, 60Hz continuous duty motor
- High-pressure gear pump

- On 4.8HP units, manifold with check valve, relief valve, pressure-compensated flow control valve, solenoid valve, suction and return filters. On 1½HP power units, valves are internally mounted on gear pump
- NEMA-4X constant-pressure (water-tight, dust-tight and corrosion-resistant) "UP-DOWN" pushbutton control station with 20 ft. coil cord
- NEMA-12 prewired controls (dust/drip-tight industrial type) with liquid-tight electrical connectors. Control box contains magnetic starter, control transformer, thermal overload and fuses
- All controller components are UL and/or CSA approved
- 24V operating control voltage
- Hydraulic flow limiter valve at the base of each cylinder
- Optional upper travel limit switch

- Hard, chrome-plated, polished shafting, hydraulic cylinder piston rods and axles
- Lifetime self-lubricating, PTFE lined, composite bearings at all pivot points
- Mechanical upper travel stops
- 10 ft. power cord, connector not included (For internal power unit only)
- Safety restraint maintenance bars
- Surfaces degreased, oxide primed and finished with two coats of enamel
- Includes hydraulic oil (internal power units only).

Limited Warranty Policy

Refer to Warranty Form for specific details. Specifications are subject to change without notice. DSL Series Lift Tables are one of a group of ECO A Lift Tables and other materials handling products.

Selector Table for DSL Series. Capacities 2,000 to 6,000 lbs.

Travel	Model	Capacity (pounds)	Edge Load* Maximum		Platform Sizes (inches)		Base Frame (inches)	Height (Inches)		Up Speeds (seconds)	Motor Std. HP**	Cylinders (qty.)	Ship* Weight (pounds)
			Static	Rolling	Standard	Maximum		Lowered	Raised				
60"	DSL-20-060	2,000	1,000	670	30 x 48	48 x 72	30 x 48	10¼	70	16	1½	1	1,500
	DSL-40-060	4,000	2,000	1,340	30 x 48	48 x 72	30 x 48	11¼	72	21	1½	1	1,800
	DSL-60-060	6,000	3,000	2,000	30 x 48	48 x 72	30 x 48	13¼	73	32	1½	2	1,900
72"	DSL-20-072	2,000	1,000	670	30 x 60	48 x 84	30 x 60	10¼	82	21	1½	1	1,600
	DSL-40-072	4,000	2,000	1,340	30 x 60	48 x 84	30 x 60	11¼	84	28	1½	1	1,875
	DSL-60-072	6,000	3,000	2,000	30 x 60	48 x 84	30 x 60	13¼	85	42	1½	2	2,000
90"	DSL-20-090	2,000	1,000	670	48 x 72	60 x 96	48 x 72	14	104	35	1½	2	1,900
	DSL-40-090	4,000	2,000	1,340	48 x 72	60 x 96	48 x 72	14	104	28	4.8	2	2,050
	DSL-60-090	6,000	3,000	2,000	48 x 72	60 x 96	48 x 72	16	106	40	4.8	2	2,350
108"	DSL-20-108	2,000	1,000	670	54 x 84	72 x 108	54 x 84	14	122	30	4.8	2	2,700
	DSL-40-108	4,000	2,000	1,340	54 x 84	72 x 108	54 x 84	14	122	40	4.8	2	3,100
	DSL-60-108	6,000	3,000	2,000	54 x 84	72 x 108	54 x 84	16	124	60	4.8	2	3,700
120"	DSL-20-120	2,000	1,000	670	54 x 96	72 x 120	54 x 96	14	134	30	4.8	2	3,400
	DSL-40-120	4,000	2,000	1,340	54 x 96	72 x 120	54 x 96	14	134	40	4.8	2	3,800
	DSL-60-120	6,000	3,000	2,000	54 x 96	72 x 120	54 x 96	16	136	60	4.8	2	4,200
144"	DSL-20-144	2,000	1,000	670	54 x 108	72 x 132	54 x 108	16	160	35	4.8	2	3,600
	DSL-40-144	4,000	2,000	1,340	54 x 108	72 x 132	54 x 108	16	160	40	4.8	2	4,000
	DSL-60-144	6,000	3,000	2,000	54 x 108	72 x 132	54 x 108	18	162	60	4.8	2	4,500

*Standard platforms. Oversized platforms, beveled toeguards, roller shades, accordion skirting and electrical tape switches will affect overall size. Power requirements depend upon frequency and type of operation and require specific selection. Standard power supply for ¾ and 1½HP power Unit is 230V/1PH/60Hz. Optional power supply for ¾ and 1½HP Power Unit is 208/230/460/3PH/60Hz. Standard power supply for 4.8HP power units is 230/460/3PH/60Hz. Optional power supply for 4.8HP power unit is 230V/1PH/60Hz (increases upspeed by 33%). Note: Where available power supply is 208V/3PH, booster transformers are required for 240V/3PH at motor, see options. Conforms to or exceeds ANSI standard MH29.1-1994. See page 21 for options and accessories.