



HIGH PERFORMANCE LINING MATERIAL FOR BULK SOLIDS



AARETE
Liner

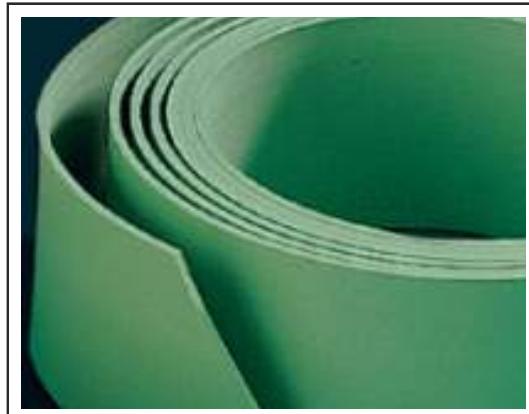
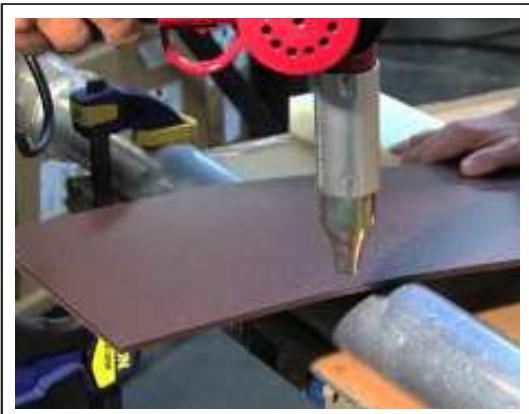
INTRODUCTION

The Arete range are polymer engineering plastics that solve the problems of friction, wear and the flow of material in many sectors of the industry.

An exceptional low friction surface, outstanding wear resistance, high impact strength, excellent chemical resistance and superior performance in demanding applications characterize the key properties of the product. The new formulation of Arete that has specifically been developed for the bulk material handling and mining industry to reduce the typical flow problems of bulk solids in bins, hoppers, chutes, truck beds and other applications.

The products of the Arete range combine the best surface friction qualities with abrasion resistance not only to promote bulk material flow but also to withstand the abrasion resistance of flowing bulk materials in rugged application under different environmental conditions.

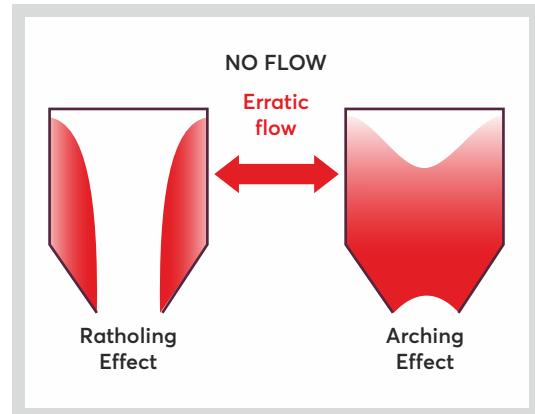
The Arete grades are based on a specific formulation of Ultra-High Molecular Weight Polyethylene (PE-UHMW/PE 1000) that has been developed for the use as a lining - material either in new construction or a retrofit.



PROBLEMS ASSOCIATED WITH BULK SOLIDS FLOW

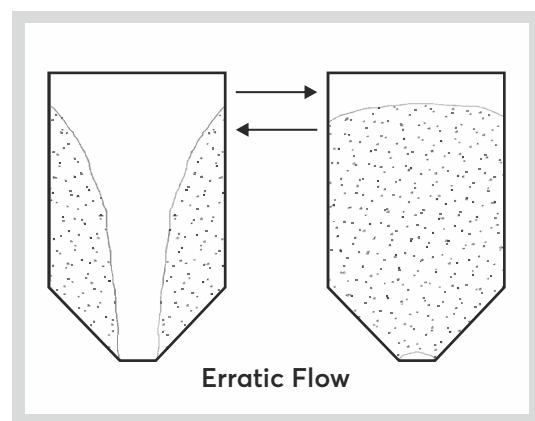
1. NO FLOW:

A stable arch (bridge) or rathole forms over the hopper outlet as shown in the arch is strong enough to support the weight of material above it and it must be broken by some method in order to induce flow again. Generally, sledgehammers, air lances and air balusters are used to break the arch. Vibrators have a tendency to strengthen the arch because, in most cases, they promote compaction. A rathole is formed when a cylindrical flow channel develops in the center of the bin and the remaining material is stationary along the hopper walls. This generally occurs when the walls are not steep and smooth enough.



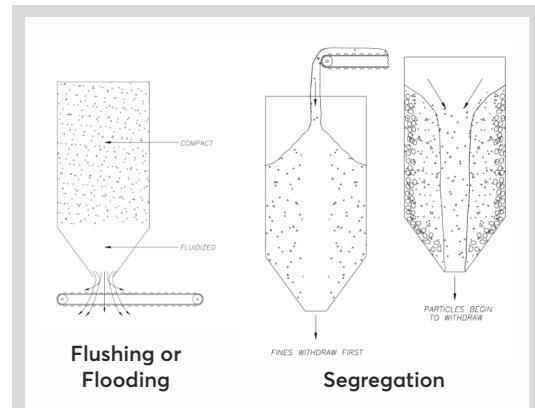
2. ERRATIC FLOW:

Alternating formation and collapse of arches and ratholes result in fluctuating discharge. The causes thumping and vibrations that can damage or destroy the integrity of a bin, leading to structural failure and potential personnel injuries or deaths.



3. FLUSHING OR FLOODING:

Fine powders become aerated and discharge uncontrollably from the bin, behaving like a liquid as shown in . This can happen when a rathole collapses allowing the solids to fall into the open channel under pressure.



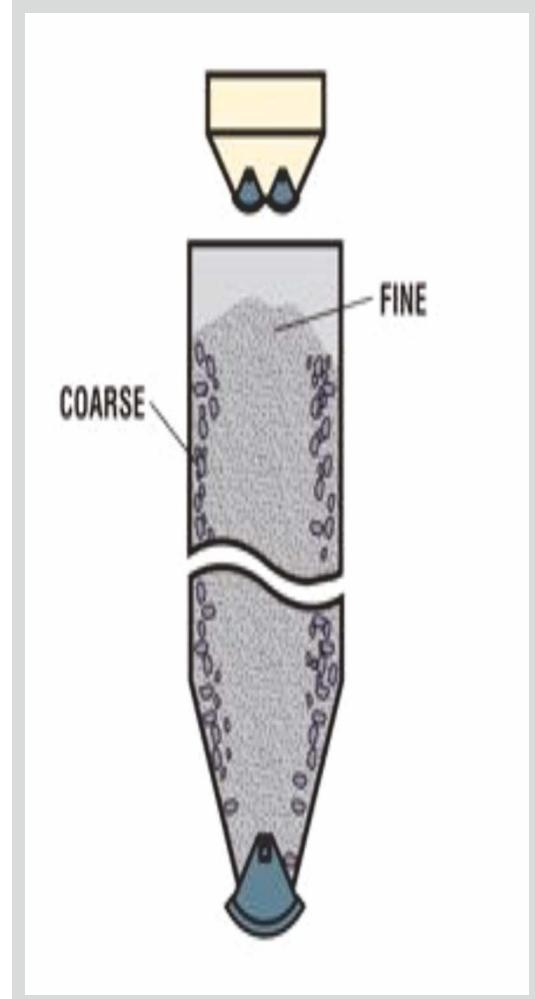
PROBLEMS ASSOCIATED WITH BULK SOLIDS FLOW

4. LIMITED DISCHARGE RATE:

The flow from the hopper outlet is not adequate for process requirements.

5. SEGREGATION:

Solid particles have a tendency to separate during the filling of a bin, as shown in. The fine particles will be predominate in the center of the bin and the larger particles will roll and collect against the bin wall. If flow dose not occur along the bin wall during discharge, the finer particles discharge first and the coarse particles last. This flow pattern can be referred to as first-in , lost-out. if a cohesive bulk solid is handled in this fashion a rathole may develop.



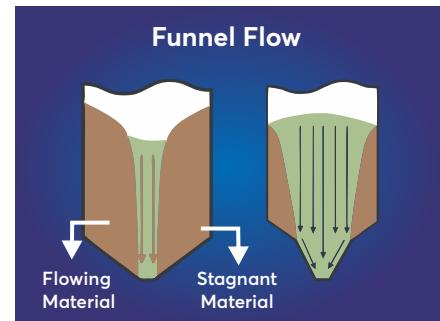
TYPES OF FLOW

There are two types flow pattern have been identify :

1. FUNNEL FLOW

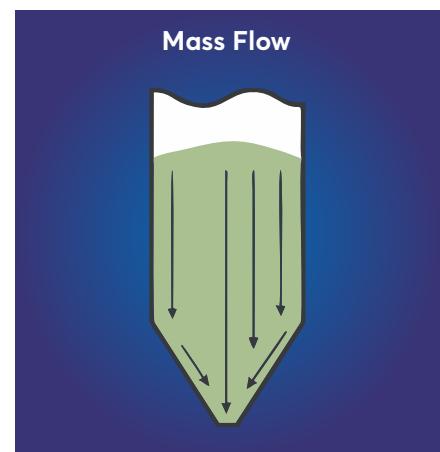
2. MASS FLOW

both have different characteristics & must be understood in ordered to address bulk solids flow challenges.



1. FUNNEL FLOW :

This flow pattern can be referred to as first-in , last-out. if a cohesive bulk solid is handled in this fashion a rathole may develop.

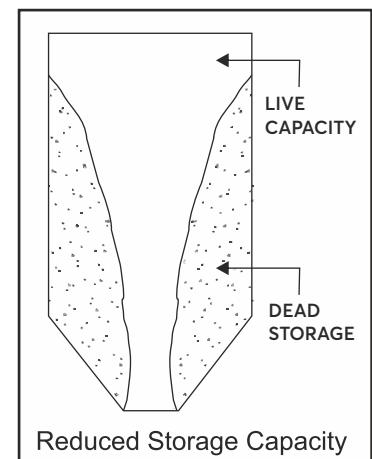
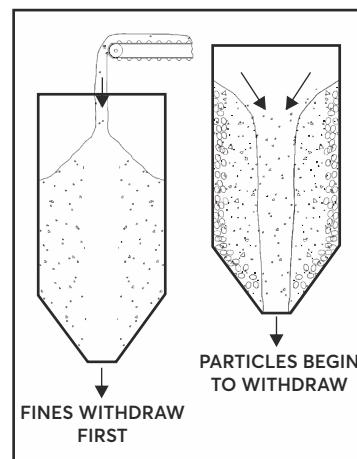


2. MASS FLOW :

This is a first-in, first flow pattern in which all of the bulk solid is in motion when any of it is withdrawn.

RESULTS OF FLOW PROBLEMS

1. Reduced Storage Capacity
2. Segregation of Material
3. Process out of Control
4. Decreased throughout of material
5. Silo Vibrating and Shaking
6. Structural Damage
7. Lower Productivity
8. Spontaneous Combustion.



ADVANTAGES OF ARETE LINERS

- **LOWER COST**

The Cost For lining an existing bin with liner is only about one third of the cost for construction steel.

- **LOWER WEIGHT**

For example, for the refurbishment of a 200m² steel bin, re-lining it with Liner would achieve a reduction in weight of almost three tons compared to the steel sheets (S235JR) (see table) Liner reduces the load on the structure and makes installation work much simpler

- Longer life volumetric sand slurry
- Better Flow low coefficient of friction
- Outperforms polished stainless steel to promote flow of bulk materials to increase productivity.
- High impact strength
- No corrosion
- Water repellent (hydrophobic)
- Chemical resistant

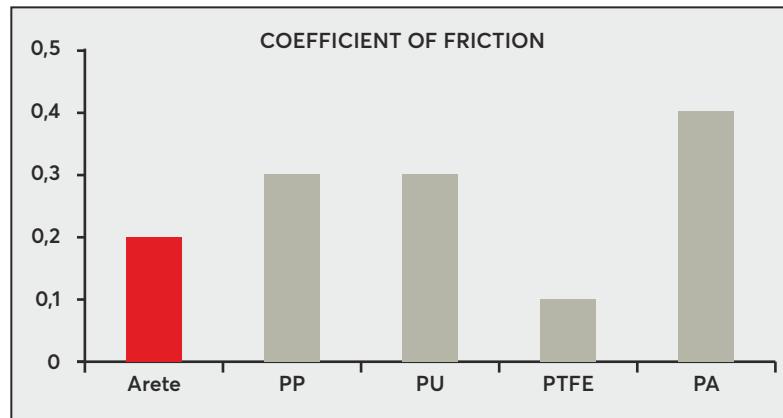
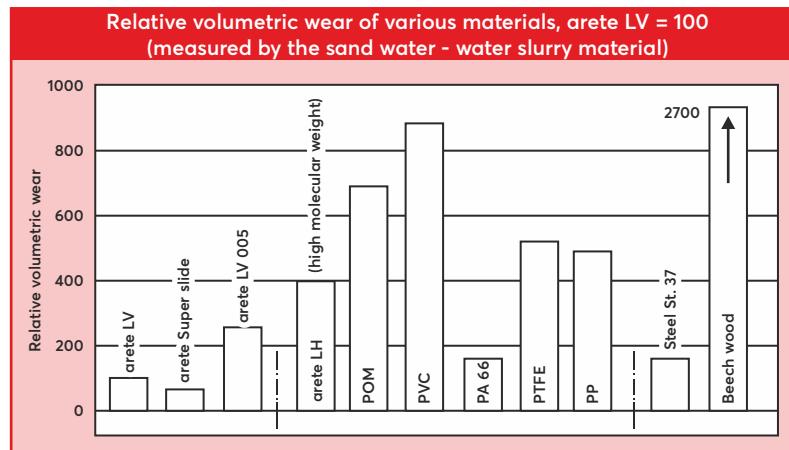
	Material thickness	Specific gravity thickness g/cm ³	Weight for 200m ³ /kg
Steel	3 mm	7.85	4,710
Liner	10 mm	0.93	1,860
Weight reduction with Liner			2,850 kg ~ 60%

ARETE LINING FOR LONGER LIFE

Relative volumetric wear according to the sand- slurry process : In the sand- slurry test, a mixture of sand and water is used to test resistance to abrasion of a test sample compared to a defined reference material of PE-UHMW with a molecular weight of 5 million g/mol to which a fixed value of 100 is assigned. The volume lost by the test sample during the test is then stated as an index compares with that of the reference material. The lower the value achieved, the better the resistance to abrasion.

Arete is also an excellent material for sliding applications. Arete possesses self lubricating properties which allow it to Arete perform very well in "dry sliding" situation such as against metal surfaces like steel, brass or copper.

Abrasion resistance and natural lubricity make Arete the perfect material for bushings which are liners in cylinders with rotating shafts. In addition to minimizing friction, Arete is also tolerating foreign particles (e.g. Dust, sand, etc.) which can cause misalignment.



TYPICAL APPLICATION

MINING

1. Truck bed liners
2. Hopper Liners
3. Chute Liners
4. Stacker/ Reclaimer Bucket Liners
5. Front End loader Buckets



TRANSPORTATION

1. Ship Hold
2. Rail Cars
3. Truck Bed Liners



STORAGE AND HANDLING

1. Silos, bins, bunkers
2. Reclaim hoppers
3. Vibratory Feeder Pens
4. Receiving Hoppers
5. Silos, bins , bunkers
6. Belt Scrapers



PROCESSING

1. Day Bins
2. Surge Bins
3. Batch Hoppers
4. Storage Silos and Bins
5. Hoppers
6. Chutes
7. Feeders
8. Screw Conveyors

MATERIALS THAT CAN BE HANDLED

- Coal • Iron Ore • Copper concentrates • Clay • Limestone • Soda Ash
- Chemicals and fertilizers • Nickel Ore • Gypsum • Silica sand • Bauxite

ARETE RANGE OF PRODUCTS

In the lining technology, the name arete stands for highest quality with regards resistance to wear and regard to resistance to wear low sliding friction.

ARETE SUPERSLIDE:

Arete is the classic lining material in our range and has general characteristics of a very low coefficient of sliding friction which is particularly important for the bulk transport and storage of glutinous or tacky material. Expert and users in developing more lining materials which are ideal for use in many different of application.

CHARACTERISTICS	FIELD OF APPLICATION
<ul style="list-style-type: none"> Very low coefficient of sliding friction Very high resistance to wear and abrasion High notched-bar impact strength Very low water absorption High resistance to chemicals High resistance to temperature 	<ul style="list-style-type: none"> Transport industry Truck bed lining Bin and hopper linings

ARETE L-V-AS:

Because of its permanently anti static quality, arete L-V-AS is especially suitable for application in areas where there is a risk of explosion. The material also has a high impact resistance and excellent UV stability, this means that it is ideal for outdoor use e.g. in open-cast mining

CHARACTERISTICS	FIELD OF APPLICATION
<ul style="list-style-type: none"> Permanently anti-static High resistance to wear High impact strength UV resistant 	<ul style="list-style-type: none"> Open cast-mining Truck beds Excavator - shovel liners Conveyor duct Hopper Lining

ARETE LV-030:

The good wear and sliding properties of Arete LV-030 are ideal for use with certain types of bulk solids such as peat or sand.

CHARACTERISTICS	FIELD OF APPLICATION
<ul style="list-style-type: none"> Good resistance to wear Good sliding characteristics Suitable for outdoor use 	<ul style="list-style-type: none"> Port construction Conveyor and installation Wood transport

ARETE RANGE OF PRODUCTS

ARETE L-V:

Coarse grained solids with sharp edges make extreme demands on the lining materials. That is why we have developed ARETE-LV. This is our premium product and possess the highest hardness and resistance to wear of all the members of the Arete product family.

CHARACTERISTICS	FIELD OF APPLICATION
<ul style="list-style-type: none"> Excellent resistance to abrasion Very high surface hardness Good sliding characteristics High impact strength Very good resistance to chemicals 	<ul style="list-style-type: none"> Mining Truck vehicles Hopper Linings

ARETE L-V-CERA:

It is a special formulation developed for severe service conditions. It out performs all the grades in highly abrasive industrial environments.

CHARACTERISTICS
<ul style="list-style-type: none"> Extremely high rear resistance Low co-efficient of friction Very good strength Fields of application

ARETE L-V-001:

It is a low abrasion resistance grade which can be welded to provide seamless joints

CHARACTERISTICS
<ul style="list-style-type: none"> High Impact strength FDA Approved Low co-efficient of friction Field of application

ARETE RANGE OF PRODUCTS

ARETE L-V005:

With its official approval Arete L-V005 is ideal as a lining material for contact with bulk goods, in the food stuff industry.

CHARACTERISTICS		FIELD OF APPLICATION					
<ul style="list-style-type: none"> • FDA Approved • Low resistance to wear • High impact strength • Very low coefficient of sliding friction • Very good resistance to chemicals 		<ul style="list-style-type: none"> • Food stuffs industry • Goods wagon • Bin Lining 					

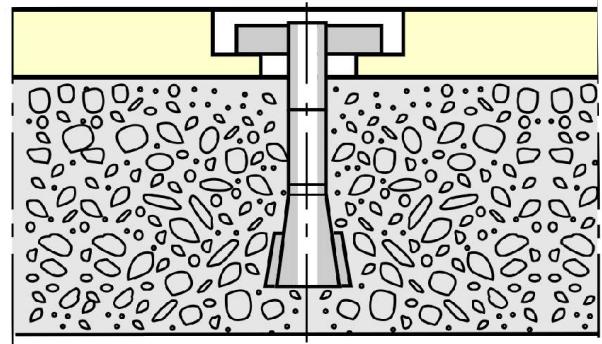
Property	Test Method	Unit	Arete Superslide	Arete L-V	Arete L-V030	Arete L-V005	Arete L-V001
Density	ISO 1183	g/cm3	0.93	0.93	0.935	0.945	0.96
Melecular Weight	-	Mil/mol	> 9	> 6.5	> 3.5	> 05	> 05
Tensile Strength	ISO 527-1	Mpa	≥ 17	≥ 17	≥ 20	≥ 20	≥ 21
Breaking Strength	ISO 527-1	Mpa	≥ 35	≥ 35	≥ 30	≥ 30	25
Elongation at Break	ISO 527-1	%	>300	> 350	> 200	100	100
Modulus of Elasticity	ISO 527-1	Mpa	680	720	750	1060	1020
Impact Strength 15 V Notch	ISO 179	Kj/m2	≥ 130	≥ 210	≥ 150	> 50	> 50
Shore Hardness D 15 S	ISO 868		63	62	62	63	63
Wear resistance by send slurry method	Internal test method		70	100	120	195	250

FIXING SYSTEMS

Arete is installed by mechanically fastening it to the substrate using bolt-thru or weldable fasteners. Both types are acceptable and are usually chosen based on the requirements of the application and the structure being lined.

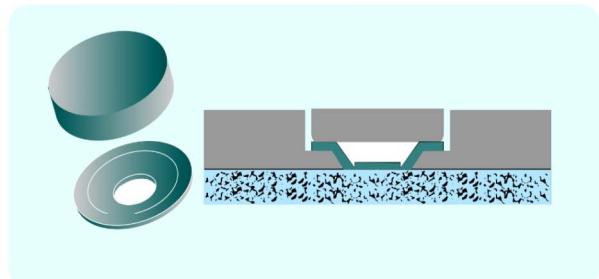
Advantages:

- Quick and easy installation
- Cover caps prevent accumulation of material at the fixing points.



Type of Systems:

1. **Fixing to concrete :** A system consisting of weld washers, countersunk screws and expansion dowels is particularly suitable for attaching arete sheets to concrete walls or masonry.
2. **Fixing System : Weld Washer** With the so called "Weld Washer" fixing system, a plate-shaped pre-stamped metal disk is welded directly to the base through the hole in the material sheet. Only one operation is necessary. This fixing system can be used for sheet thicknesses of up to 15mm. An even lining surface is then created by covering the weld washers with matching plastic caps supplied by arete.



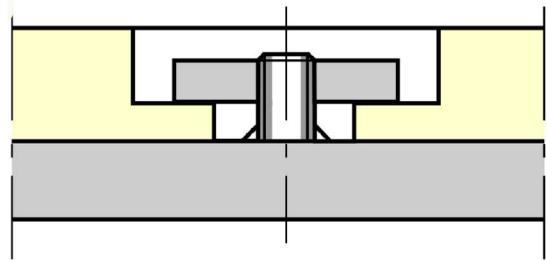
Advantages:

- Quick and easy installation
- Cover caps prevent accumulation of material at the fixing points.



FIXING SYSTEMS

3. Fixing System : Stud welding In order to fix linings in position, the sheet of material is always pre-drilled at the fixing points using a special drill. The distance between the individual fixing points depends on the geometry and the material of the container being lined , the operating conditions and the type of fixing process selected. when the sheets are bolted into position with bolts and disk nuts, we recommend a distance of 200 mm. The distance between the holes and the edge of the sheet should not exceed 20-30mm. When the pre-drilled sheet of material is positioned in the container it is used as a template for welding . For stud welding , a threaded bolt is welded to the metal surface below through a hole in the sheet of lining material . A hexagon nut or an anti-loosening disk nut is then screwed onto the bolt. For lining purposes, nuts and threaded bolts the size M10 have proved to be most suitable . We supply these in various lengths. For simpler installation on uneven surfaces, we have special threaded bolts with pre-determined breaking points .



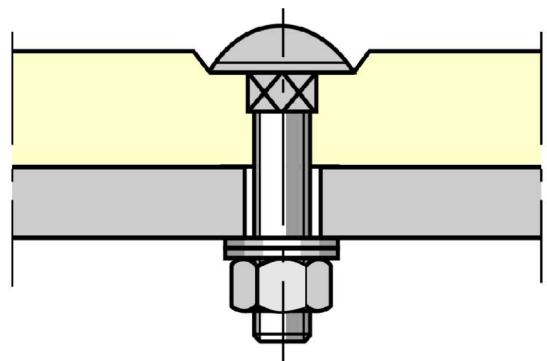
Advantages :

- Easy removal of sheets

4. Fixing System : Nuts and Bolts

Advantages :

- Quick and easy installation
- Cover caps prevent accumulation of material at the fixing points.

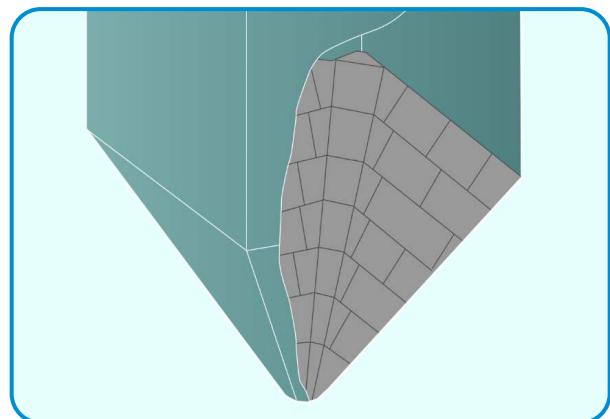


LAYING TECHNIQUES

LAYING TECHNIQUE:

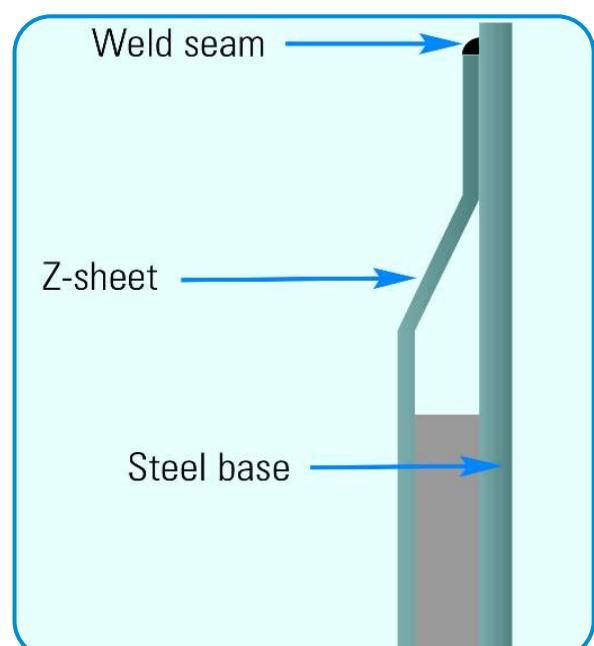
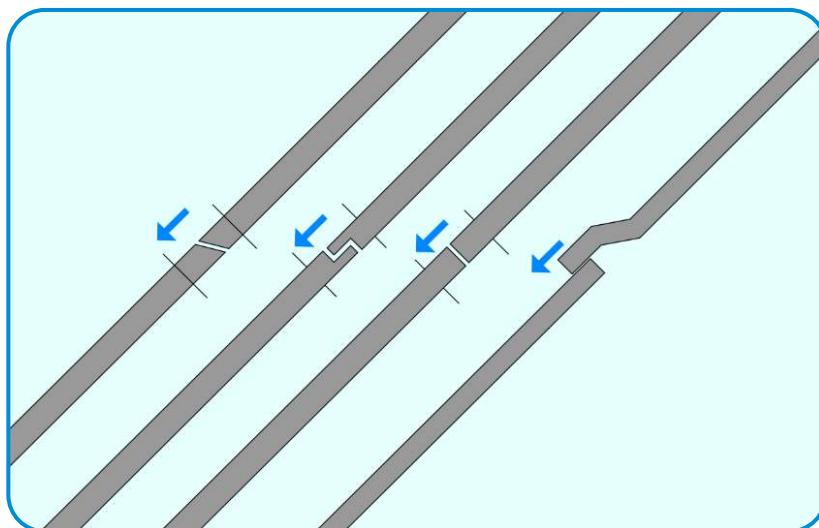
When lining hoppers and bins , the liner sheets are laid horizontally starting at the bottom and working upwards . we recommend off-setting the vertical joints of the sheets . Depending on the type of bulk solid in question , it may be necessary to improve the material flow by overlapping the lining sheets. This also prevents fine-grained material from working its way under the lining .

The diagram shows the methods which can be used for the overlap. The direction of flow is indicated by the arrow . Alternatively the joints may be sealed with a special extrusion welding device.



EDGE PROTECTION:

When installing all types of lining, the top row of sheets must be protected by a sealing strip to prevent material from working its way under the sheets.



INSTALLATION OF LINER

INSTALLATION OF LINER:

We ahve an expert team to do the installation of liners. The team has vast experience in site installation and have executed than hundred of installation

FEW PROJECTS EXECUTED BY US:

Name	Location	Area	Year
Ultratech Cement	Dankuni	200	2015
Maiher Cement	Maiher	179	2015
Jindal Steel & Power	Raigarh	460	2015
Ultratech Cement	Patna	83	2015
Ultratech Cement	Patna	60	2016
TATA Metalik	Kharagpur	200	2017
JSW Cement	Vidyanagar	75	2017
Sanghi Industries	Kachh	200	2017
Jindal Steel & Power	Raigarh	600	2017
Ultratech Cement	Bara	130	2018
Ultratech Cement	Dhar	150	2018
Jai Balaji Steels	Durgapur	200	2019
Bhilai Steels	Rajra Mines	30	2019
Ultratech Cement	Patna	200	2022
JSPL	Angul	200	2021
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Ultratech Cement	Dankumi	150	2022
Jai Balaji Steels	Durgapur	200	2022



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