

# Armtec Construction Products for the Mining Industry

Today, few industries combine so many of their past practices with present day technology than that of the mining industry. Mining processes have advanced at an ever increasing pace, providing faster extraction and more efficient material transport. The mining industry has proven itself a leader in



providing quality products, quality jobs, and economic benefits through safe reliable working conditions, and major improvements to environmental protection.

It has only been through years of experience and product advancements that the mining sector has reached this position. Armtec, in cooperation with the mining industry, has introduced many innovative products and mining solutions.

Armtec's range of solutions are designed to meet the specialized needs of today's mines, including unsurpassed strength, high mobility, easy installation, reliability, functionality, versatility and lightweight handling. Our products provide engineered solutions for mine development, materials handling and mining operations, including:

- Mine access roads – bridges and drainage
- Mine portals
- Load-out and reclaim tunnels
- Conveyor covers, conveyor galleries and tunnels
- Underground rockfall protection
- Tunnel liners for soft ground or drift protection
- Geosynthetics for environmental protection, slope reinforcement and soil stabilization
- Raisebore liners for vertical shaft protection
- HDPE pipe for drainage and heap leach collection

The Armtec products outlined in the following pages deliver cost effective solutions, quick and simple installations to meet the demands of the mining industry.



# Site Development

Before any mine can start producing revenue, the site must first be developed. Armtec has a number of products for a variety of mine site applications.

Included in this list of applications are the following:

- Drainage
- Soil Stabilization
- Erosion Control
- Earth Retention
- Site Remediation.



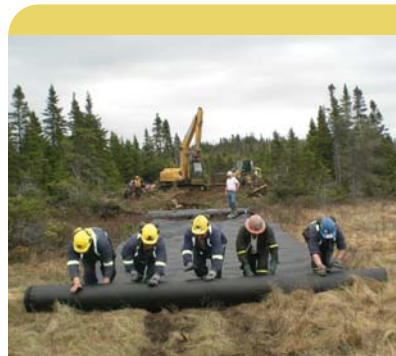
## Drainage

Since 1908, Armtec has been manufacturing corrugated steel pipe. Today, Armtec is able to offer a wide range of pipe products in a variety of materials. Depending upon site conditions, the material of choice can be Galvanized Steel, Aluminized Type II Steel, Polymer Coated Galvanized Steel or High Density Polyethylene Pipe.

## Soil Stabilization

In situations where access roads, airfields, or even mine operations are

constructed on weak sub-grade soils, cost effective geosynthetic solutions include high tenacity woven geotextiles or geogrids. These products can reinforce and confine the engineered fill materials, while limiting the amount of sub-excavation and volume of engineered fill required.



## Vegetated Erosion Control

From slope protection to channel linings, rolled erosion controlled products such as Turf Reinforcement Mats and Erosion Control Blankets are highly effective in protecting seed, fertilizer and soil from erosive wind and water forces until well after a permanent root matrix is established.

## Earth Retention

Armtec offers a wide range of retaining wall solutions utilizing both steel and geosynthetic products. Steel retaining wall options include: Sheet Piling and the Bin-Wall gravity retaining wall system.

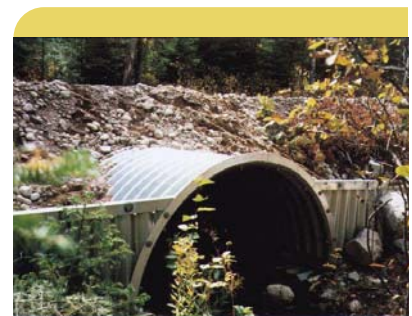
Geosynthetic retaining wall solutions generally utilize uni-axial geogrids

as the soil reinforcement combined with a variety of facing options. These fascias include: welded wire mesh, cellular confinement, and geosynthetic wrapped face and over-steepened slopes.



## Remediation and Decommissioning

Geotubes offer a fast and cost effective solution when dealing with dewatering of sludge and containment ponds. Fabricated using high tenacity woven geotextiles, geotubes act as the containment vessel for the dredge spoil until the dewatering process is complete.



# Mining Operations

## Mine Portals

Mine Portals keep ramps safe despite weather conditions and allow crossings at the surface.

Armtec Mine Portals are generally constructed of Bridge-Plate or Multi-Plate to form the desired shape. The structural plate is erected on a ramp from the ground level to the portal face.

The most common shapes used are:

- High profile arch
- Semi-circular arch

Sizes are available that will accommodate either a single or double lane of traffic. These structures can be designed for very high covers by utilizing the soil arch concept.



## Conveyor Tunnels

Conveyor tunnels are usually circular pipes or simple arches on concrete footings. Other shapes are available.

For very high stockpiles, circular Multi-Plate is the preferred design. Required hopper and feeder openings can be shop or field installed.



# Armtec Mineways

Armtec Mineways are used in conjunction with cementitious hydraulic backfill and provide an economical method of forming passageways for miners, safe material handling and ventilation.

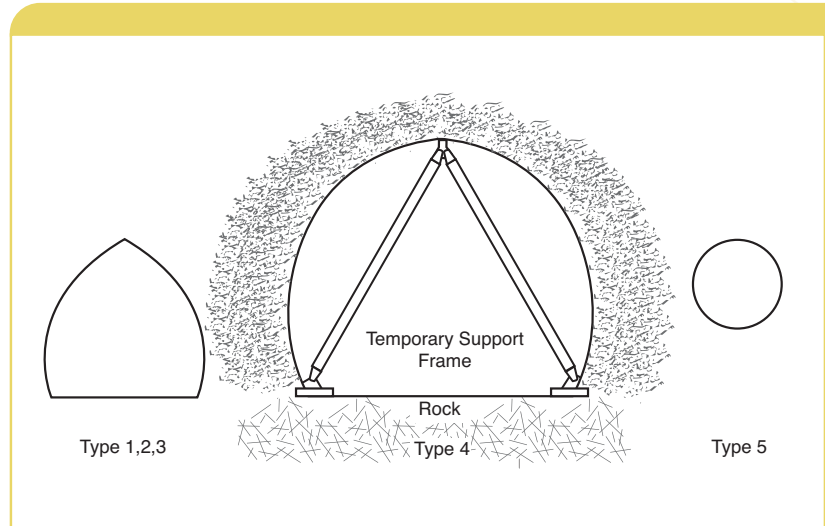
**Features:**

- Lightweight
- Easily handled and erected
- Can be nested and easily transported within the mine
- Economical construction
- Heavy Duty Galvanized for longer service life

Types 1, 2 and 3 are made up of three sections to form the Mineway – the floor and two half arcs. The longitudinal seams are bolted but the circumferential seams are secured by self-tapping screws.

Types 1, 2 and 3 are designed as three hinged arches and are manufactured in three sizes:

- Type 1 – 1500 mm span x 1700 mm rise



- Type 2 – 2100 mm span x 2100 mm rise

- Type 3 – 2800 mm span x 2700 mm rise

Type 4 Mineway is a 4200 mm span x 4000 mm rise arch, utilized primarily for the movement of LHD equipment. To provide temporary support during hydraulic filling or blasting, a tubular steel frame can be utilized. This structure has no corrugated steel

floor, but is mounted on special support channels anchored to the rock.

Type 5 Mineways are circular corrugated steel pipes ranging from 900 mm to 1800 mm in diameter. They are supplied usually in two pieces and the seams are fastened with bolts and self-tapping screws.



## Armtec Raisebore Linings



Armtec Raisebore Linings provide a safe, simple, easily installed and economical lining for raise construction by the boring method. Diameters ranging from 1200 mm, in lengths up to 120 metres can be installed with semi-circular sections.

Raisebore Linings are constructed using galvanized corrugated steel sections in metal thicknesses ranging from 2.0 mm to 4.2 mm. The sections are bolted together to form a

complete ring and the lining is then lowered into place. In this manner, no personnel are required to enter the unprotected portion of the Raisebore itself. Armtec Raisebore Linings can be supplied with a lowering ring, ladders, platforms, steel skids and other accessories as required.

Once the Raisebore Lining is lowered into place, the lining is anchored into the sidewalls with rock bolts or anchor pins. In some cases the void

between the sidewall and the lining is grouted or filled with aggregate. Raisebore Linings have many advantages compared to other methods of construction:

- Sections can be nested for easy transportation to the site.
- Miners work inside the protected raisebore.
- All sections are plant-fabricated which reduces construction time.
- Sections are easily transported within the mine.
- Easy and fast to install.
- Proven performance.
- Culvert quality galvanizing for long service life.
- Economical material and installation.
- Many uses – manways, ventilation ducts, ore and waste passes, fill raises and service shafts.

## Conveyor Covers

Armtec conveyor covers are available for belt widths from 300 mm to 2100 mm and manufactured in heavy galvanized steel thickness from 1.3 to 3.5 mm. Covers are normally set at 1200 mm centres and are available in full and 3/4 hinged and non-hinged arrangements to allow easy access for belt and idler repair. The zinc coating is 610 g/m<sup>2</sup>, resulting in life expectancies as much as five times other covers. The fully corrugated 68 x 13 cross corrugation of both support band and cover provides high strength to resist heavy wind loads common in remote installations.



# Rock Protection

As roof fall related accidents and development costs in some types of mines continue to rise, it is imperative that safer and more efficient mining methods be established. The issue of protecting work areas requires a protection system that can be easily, safely and economically installed.

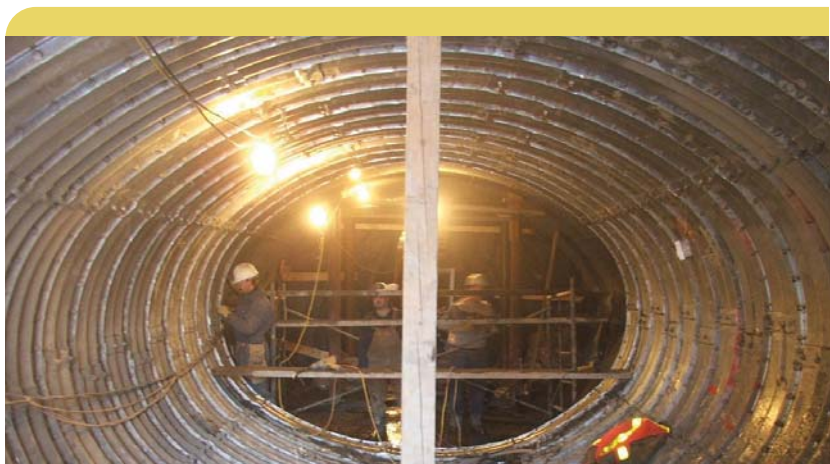
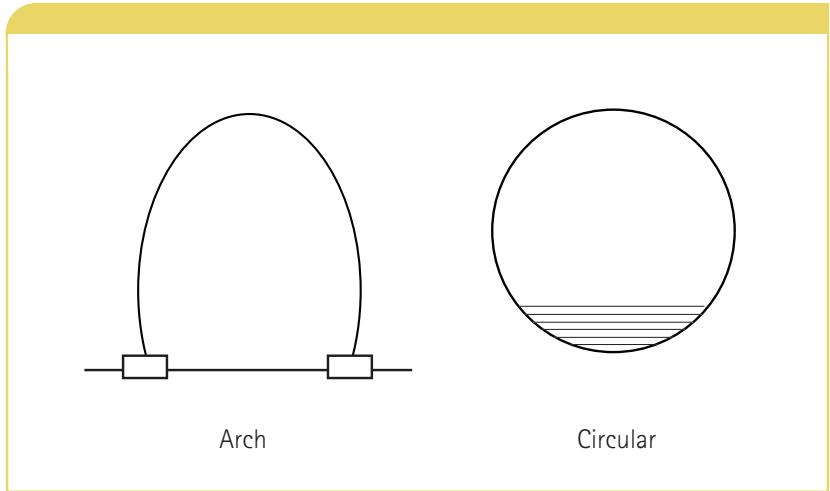
## Tunnel Liner Plate

Two products suitable for this critical application are Bridge-Plate and Tunnel Liner Plate. Both of these products are available in a variety of sizes and shapes to suit a wide range of conditions.

In situations where Tunnel Liner is used, its light weight makes for easy handling so it can be used almost anywhere in a mine that requires a tunnel, shaft or enclosure. Liner Plate can be used to form circular pipes, arches or elliptical shapes. Liner Plate is a versatile product for use in mine applications because it is entirely erected from inside.

## Bridge-Plate

For more demanding applications and larger spans, Bridge-Plate may be the product of choice. The deeper corrugation and heavier gauge of steel provides more strength over larger spans.

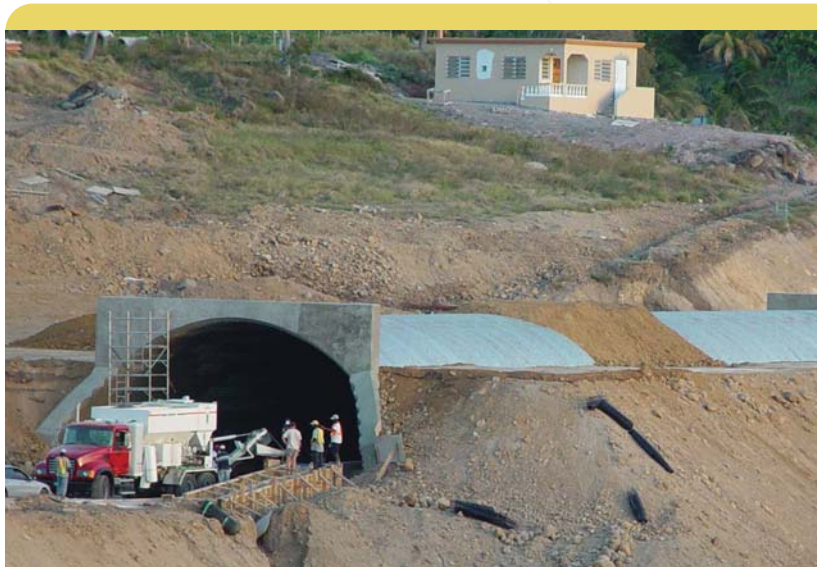


# Products

## Bridge-Plate®

Armtec Bridge-Plate offers the deepest, strongest structural plate corrugation on the market today. It is ideally suited for the rigors of heavy mine equipment and is used extensively around the world for haul road crossings, deep buried mine portals, long span grade separations and high cover reclaim tunnels. At ten times the stiffness and three times the strength of other similar products, it supports today's high capacity mine trucks with a wide range of sizes and shapes, from 4 metre box culverts to 20 metre single and double radius arches.

Recognized by ASTM, AASHTO, and CSA, Armtec's unique 400 mm x 150 mm corrugation is set on 1200 mm plates, the widest available.



## Multi-Plate®

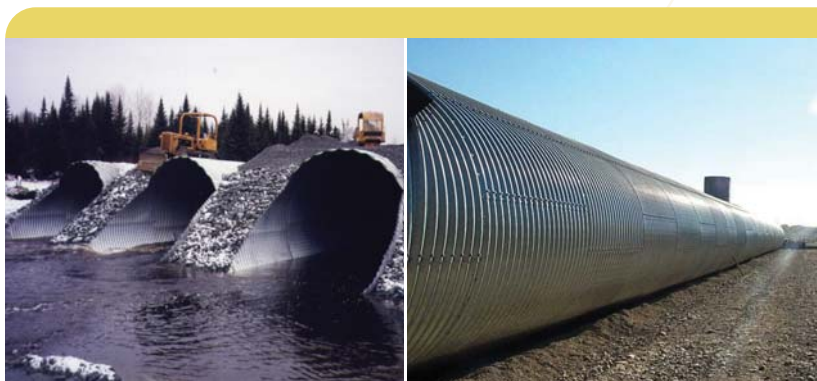
Armtec Multi-Plate was first introduced in Canada in 1934 for culvert applications. Since then, the product has gained wide acceptance not only for culverts but for many uses in mining both above ground and in the mine.

Multi-Plate consists of galvanized corrugated steel plates which are bolted together to form various mine structures such as:

- Mine portals
- Conveyor tunnels
- Super-Span Bridges and Underpasses
- Storage bins
- Aerial galleries
- Culverts
- Reclaim Tunnels

Features of Multi-Plate:

- Wide range of sizes and shapes
- Delivered nested for easy transportation especially to remote areas
- Can be erected by unskilled workers
- Fast construction
- Galvanized for long service life
- Can be dismantled and re-used
- High stiffness to resist compaction loads
- Handles the heaviest mine haulers



## Super-Span® Bridges

Super-Span bridges were developed by Armtec during the early 1960's and the first structure, a 12.7 metre span arch, was built in Whitby, Ontario in 1967. These structures are a specialized application of Armtec Multi-Plate.

Since then, over 500 Super-Span bridges have been built in Canada with over 2000 built throughout the world. The largest such structure ever built is an 18-metre span arch at Rothsay, Ontario.

Super-Span bridges are soil-steel structures, in which the soil plays a critical role in its structural performance.

Today, Super-Span is used for bridges over rivers and creeks, roadway underpasses and railway underpasses. They are used for conveyor tunnels and mine portals.

For mining applications, Super-Span has been used extensively. A primary reason is that the individual plates and other parts which make up the structure can be shipped or even flown into remote areas. Except for small amounts of concrete for the thrust beams, collars and footings, the only other material required is the granular backfill.

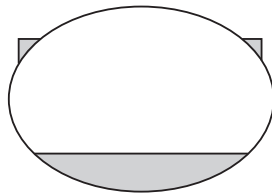
Super-Spans have been used in

place of conventional bridges with single spans of up to 18 m. Armtec structures have been designed to carry mine vehicles of over 2 million pounds.

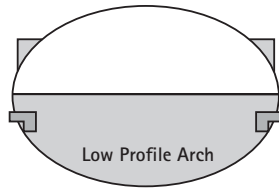
There are many other advantages in using Super-Span. Time saved in construction and lower total cost are certainly two important benefits.

Super-Span bridges are installed in four basic shapes as illustrated below:

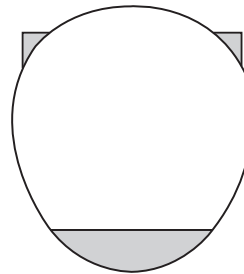
### 4 Basic Shapes of Super-Span Bridges



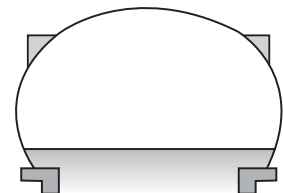
Horizontal Ellipse



Low Profile Arch



Inverted Pear



High Profile Arch



# Bin-Wall® Ramps, Dumping Platforms and Retaining Walls

Armtec Bin-Wall is made up of individual steel members – stringers, spacers, vertical connectors and accessories that are erected on site into a series of inter-connected bins. The bins are 3.05 m long (parallel to the overall wall length) varying in 6 standard designs from 1.7 m depth to more than 5 m depth and heights of more than 9 m.

Bin-Wall can be erected at the mine site to form a ramp and level platform for dumping ore and other materials into transport vehicles, rail cars or a storage bin. Usually the platform has a reinforced concrete slab onto which trucks back for dumping.

- Individual members are nested for easy shipping and unloading to remote sites.

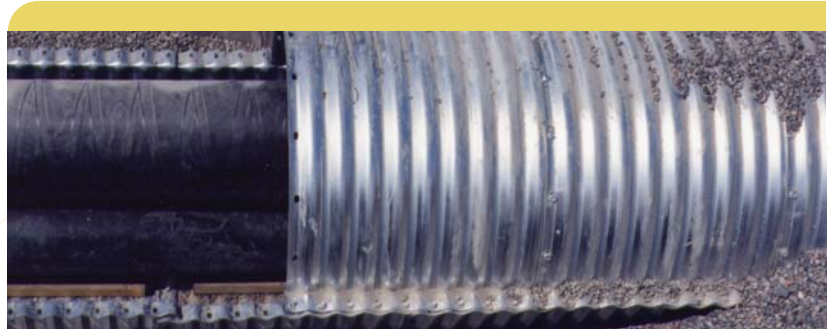
- Total construction time is very low compared to conventional reinforced concrete design.
- Simple and easy to erect. No special skilled labour required. Parts can be manhandled.
- Can be dismantled and rebuilt elsewhere.
- Fast delivery on all Bin-Wall parts.
- No concrete footings required.
- Bin-Wall can be used for bridge abutments for access roads.
- Bin-Wall is a proven product with 50 years of installations worldwide.



## Nestable Culvert

When there is difficulty in transporting materials to a remote mine site, it may be beneficial to use nestable culvert pipe.

The pipe is available in two types, notched or flanged, in which half sections are bundled together to simplify delivery and for easy assembly at the site.



## Storage Bins

Multi-Plate or Liner Plate can be erected to form circular storage bins. The bins should be supported on a reinforced concrete slab.

Multi-Plate requires less bolting than Liner Plate because of the larger plate size.

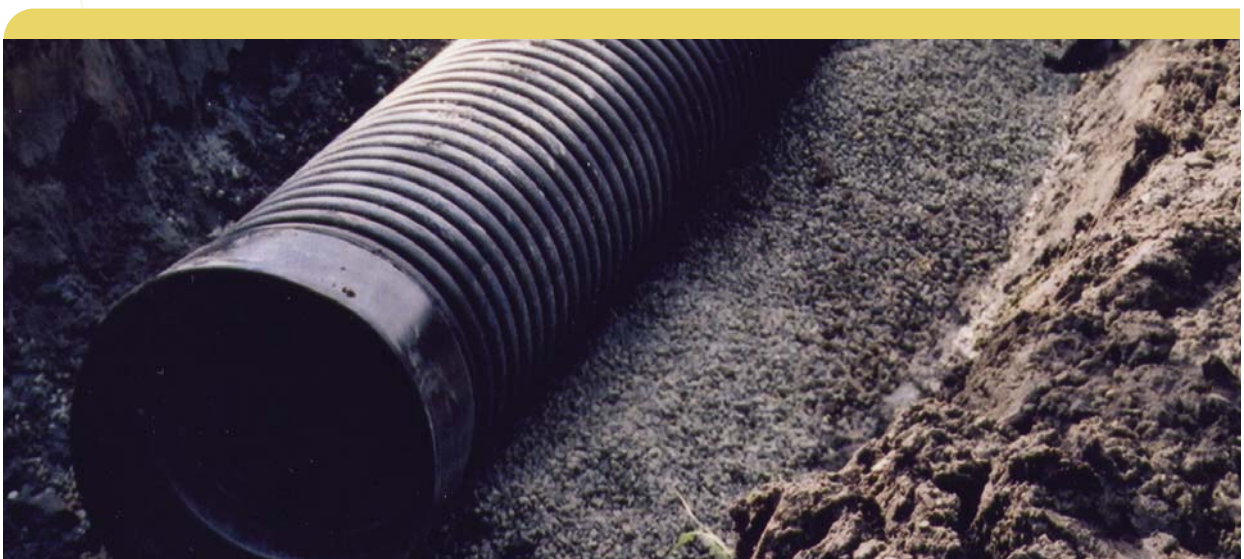
Liner Plate can be erected entirely from the inside using relatively light plates. Maximum plate weight is 45 kg.

## BOSS 2000 High Density Polyethylene Leachate Pipe

Armtec BOSS 2000 corrugated High Density Polyethylene Pipe (HDPE) is used extensively for the collection of liquids in heap leach mining operations. Standard or high strength leachate pipe is available for both watertight bell and gasket, and soil

tight split coupling systems. The double wall, smooth interior construction meets the hydraulic and the high strength required of leachate pad installations. Armtec manufactures BOSS 2000 in solid and perforated pipe, fully compliant with

AASHTO, ASTM, and CSA requirements in sizes from 100 mm to 900 mm in diameter. Armtec BOSS 2000 HDPE pipe is available with a full line of fittings.





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**[www.armtec.com](http://www.armtec.com)**

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# Mine Site Solutions

