

Bin-Wall

Bin-Type Retaining Walls

What They Are

Armtec Bin-Type Retaining walls are a system of site assembled adjoining closed-face steel bins, each 3.05 m long. Once backfilled properly, they transform the soil mass into a permanent, economical, gravity-type retaining wall. The unique design, used worldwide for over 50 years, allows Bin-Walls to flex against minor ground movements that might damage or destroy rigid-type walls.



Where Used

Typical Bin-Wall applications include:

- Highway and railroad projects to gain right-of-way by either supporting the road or restraining an encroaching slope;
- Municipal, industrial and commercial sites to create usable flat areas that otherwise would be waste slopes;
- Protection against shore or bank erosion

- Docks and piers at marine facilities;
- Headwalls and wing walls for large drainage structures,
- Loading and dumping ramps; and
- Bridge abutments.

Why Used?

Principal reasons for using Bin-Wall are:

- lower initial cost and reduced maintenance expense
- a logical solution for a problem involving difficult or restrictive installation conditions.

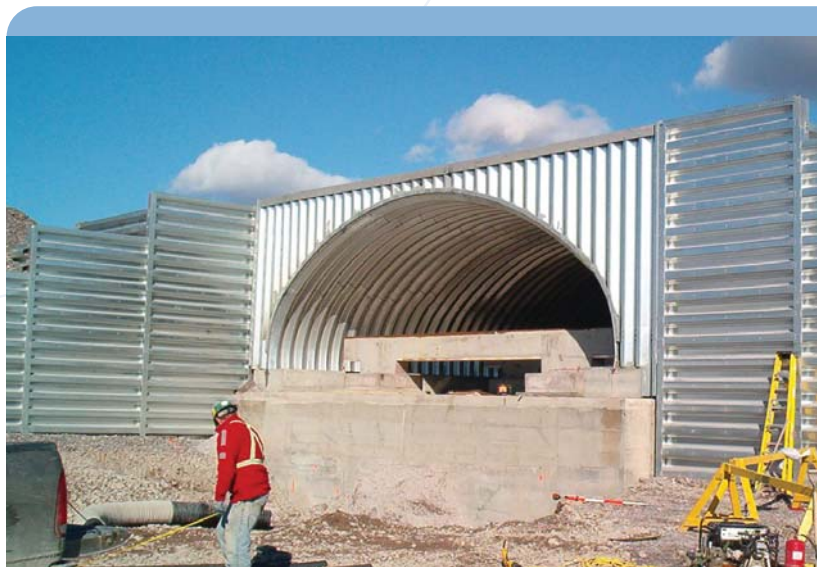
Contributing reasons include:

- greater strength and stability;
- easy installation without expensive equipment; and
- fast assembly, even with unskilled crews.

Strength with flexibility: Armtec Bin-Walls gain stability from the weight of the fill material plus the weight of the structure itself. Unlike



most other types of retaining walls, Armtec Bin-Walls are flexible and adjust themselves to minor ground movement without cracking or bulging. This is due to the fact that structural members have high tension and compression strength with positive bolted connections.



Features of Bin-Wall

Closed cell: All four sides of each Bin-Wall cell are composed of overlapping members. Bolted together they form an integral structure. The face of the Bin-Wall is fully enclosed to protect against loss of fill material.

Esthetics: The rugged modular look and strong horizontal lines of Armtex walls blend well with most environments. Landscaping can enhance the overall effect, especially on long walls. If required, the galvanized members can also be primed for field painting.

Facing: Bin-Wall can be concrete or wood faced, thus presenting a variety of architectural options. For example, reinforced concrete slabs, with different finishes and colours, can be inserted into flanges on the front face of vertical connectors; these slabs are installed once the Bin-Wall is



completely erected and backfilled. Alternatively, timber can be substituted for concrete.

Ice shield: A steel plate shield is available to protect the wall face should the Bin-Wall be subjected to strong ice forces in marine installations.

Dependable performance: The walls are designed to withstand temperature variations and the effects of ice and snow. Any expansion and contraction caused by temperature changes is safely absorbed by the all-steel construction with no danger of damage.



Extended Usage: Even after years of use at one location, Armtex walls can be salvaged, positioned elsewhere or easily lengthened to meet changing conditions at the site.

Durability: In areas of high potential corrosion alternative materials such as Aluminized Type II or polymer coated steel can be employed to provide extended service life.



TYPICAL TRANSPORTATION APPLICATIONS

<p>Eliminating excessive fills with the use of walls</p>	<p>Repairing break in roadway after slide</p>
<p>Preventing encroachment on highway embankment at river bend</p>	<p>Solving right-of-way problem on grade separation with twin walls</p>
<p>Wave wall to prevent washout of highway during storms</p>	<p>Road widening made possible through the use of walls</p>
<p>Solving right-of-way problem when highway is relocated</p>	<p>Avoiding encroachment of street fill on adjacent property</p>
<p>Stabilizing elevated track on adjacent railroad lines</p>	<p>Preventing encroachment of approach fill on railroad</p>

Design of Gravity Type Retaining Walls

Bin-Type Retaining Wall is a gravity retaining wall in which a free draining granular mass inside the bins acts as the gravity wall and steel members hold the earth mass intact. These two components combine to resist overturning and sliding forces imposed by the retained soil and other super-imposed loads. Because of this design, support for the wall is needed under the earth mass. Normal practice is to provide a compressible cushion under the grade plates with approximately 200 mm of loose fill.

Individual walls should be designed for stability in accordance with established criteria for gravity walls. Recognized texts are available which thoroughly cover the design of gravity retaining walls, and these should be consulted by the engineer responsible for the design of the wall. Design Chart A, while no substitute for individual site design, presents long-used gravity wall criteria for depth-to-height ratio

under the typical loading conditions listed in Table 1. However, they are presented here only as suggested guidelines for estimating purposes.

A critical factor in wall design is the adequacy of the foundation. The resistance of the foundation to the overturning and sliding forces acting on the wall is a sophisticated engineering evaluation. Proper site investigations and analyses should be carried out for any retaining wall.

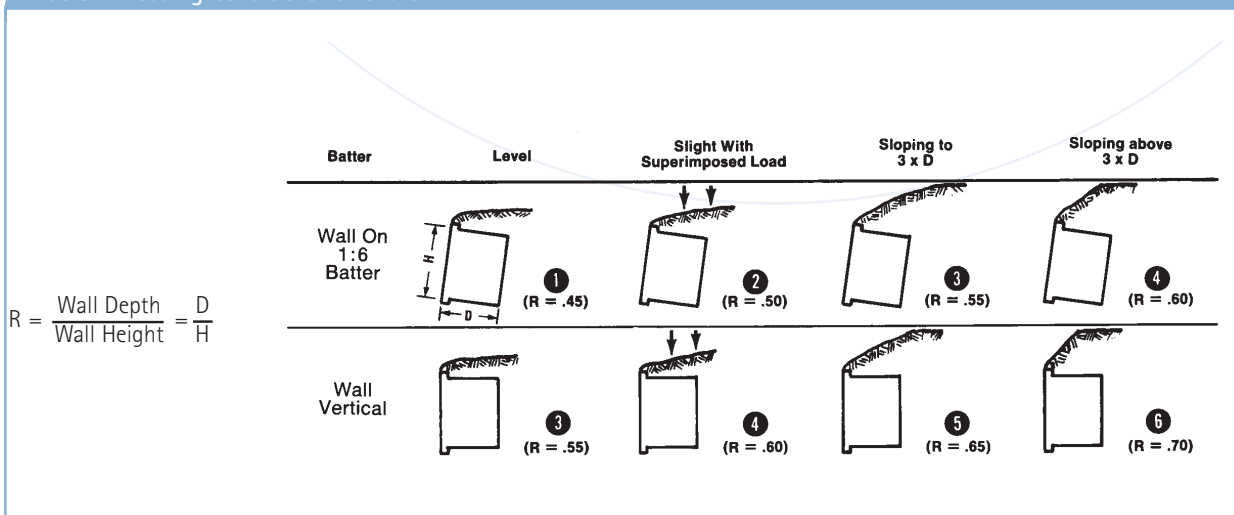
Batter vs Vertical: While battered walls should always be considered first, the advantages of vertical Bin-Walls, where other considerations permit their use, should not be overlooked.

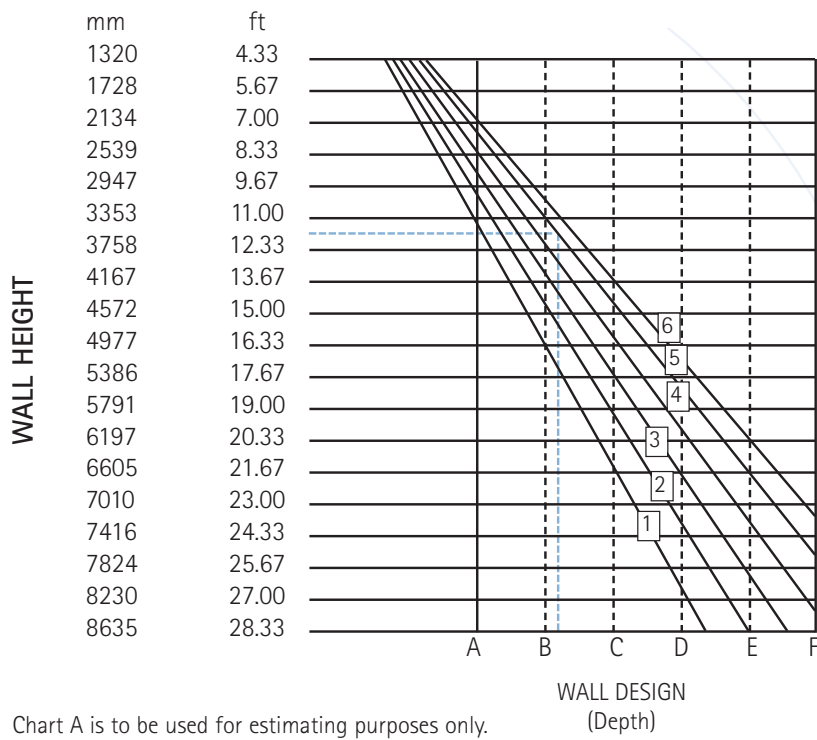
Invariably, it is easier to construct a vertical Bin-Wall on a curve. Short stringers can be used in adjacent bins, for example, without restriction. If sharp bends are required, the special plates required are much simplified and more economical.

Under some circumstances, the obvious gain in usable space, by use of a vertical wall, will assume importance. For example, a vertical 7 m wall will provide 1.2m² of valuable land for every metre of wall, as compared to a 1 to 6 batter wall with its toe in the same location.

It must be remembered that Armtec Bin-Walls are flexible structures that will adjust to minor ground movements. To allow for this, as well as normal construction tolerances, vertical walls are sometimes installed on a slight batter.

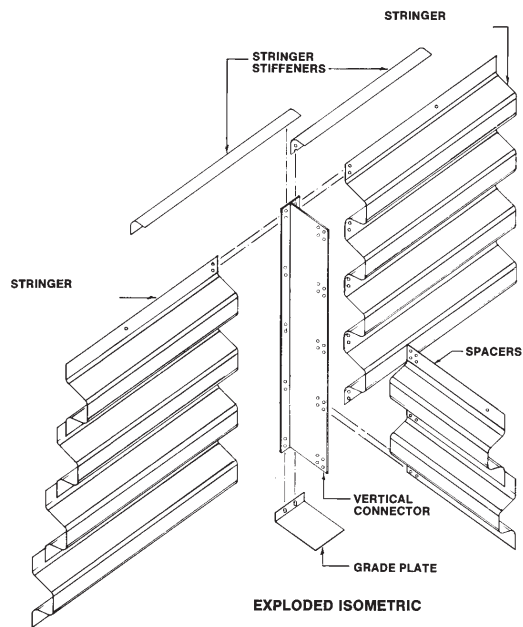
Table 1: Loading Conditions for Chart A



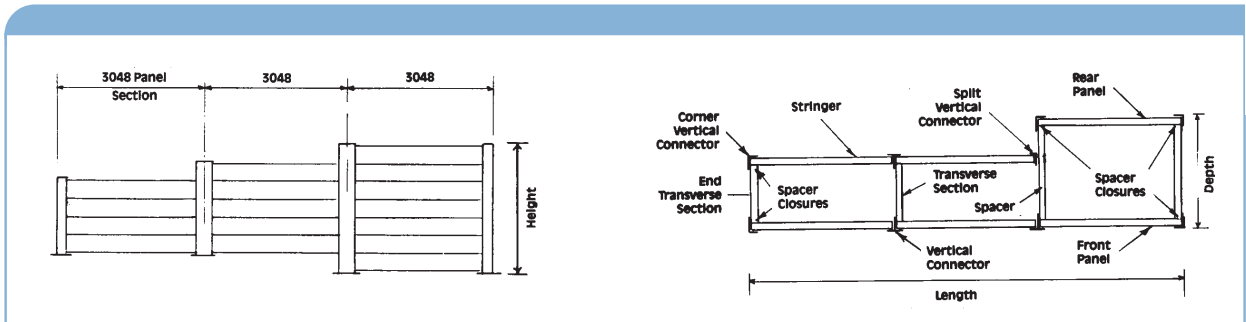


For example:
 Wall height: 3500 mm
 Loading Condition: 5
 Wall Design: C
 Actual Height: 3758 mm

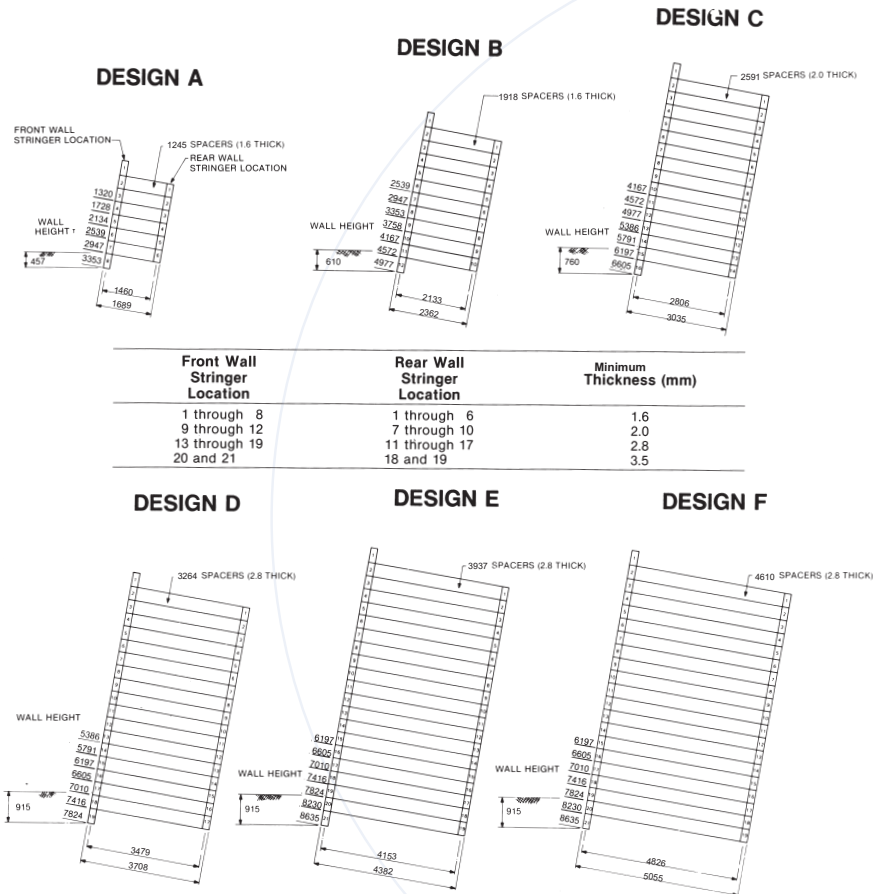
Part	Function
Vertical connector	Connects stringers and spacers
Grade Plate	Base for vertical connectors
Stringer	Forms front and rear panel sections
Stringer Stiffener	Front face top trim
Spacer	Forms transverse sections and connects front and rear panels



Plan and Elevation of Typical Bin-Wall



USUAL DEPTH/HEIGHT COMBINATIONS



Installation

Armtec Bin-Wall can be quickly and easily assembled using an unskilled crew. There is no framework to build, no curing delays, no forms to be stripped or extra finishing required for the front wall face material.

Individual parts are light weight, allowing easy handling and positioning with light equipment.

Minimal Excavation

It is unnecessary to excavate the complete area to the elevation of the wall base. However, sufficient room must be available to bolt and backfill properly. It is extremely important that the wall be set on the correct elevations to ensure a straight, level front face at the correct batter.

Fully Bolted Assembly

A wrench is the only required tool for erecting a Bin-Wall. Power wrenches and hoisting equipment may also prove useful, particularly on large, high walls. While small walls can be erected in place, it is

recommended that larger walls be ground-assembled and sections lifted into place. Sub-assembly on "saw-horses" is recommended to facilitate access to either side of the section being pre-assembled.

Backfill Material

Quality structural backfill and proper compaction properties are critical to the ultimate performance of the wall.

An excellent backfill material is a graded, granular, material with less than 10 percent fines in 200 mesh size. Relatively clean bank-run or crusher-run stone is also suitable.

If the wall is being used as a dock, pier, breakwater, or in any similar water-contact application, the gradation should be modified to eliminate material smaller than 3 mm. Alternatively, bins can be lined with Armtec non-woven geotextile prior to backfilling.

Compaction

Compaction should be a minimum of 95 percent Standard Proctor Dry Density both within the bins and

behind the Bin-Wall.

Drainage

The backfill must be free draining in and behind the walls. Perforated pipe, surrounded by non-woven geotextile and porous aggregate, should be placed behind and below the rear base with a positive outlet.

Grade the slope above and in front of the wall to ensure water does not pond or flow through the backfill.

The ground under the toe of the wall must not be softened by ponding water as this is the point of maximum load.

Backfill Placement

Place fill material in and behind the bins in 100 to 200 mm layers, and thoroughly compact. Avoid segregation of materials.



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Retaining Wall Solutions



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