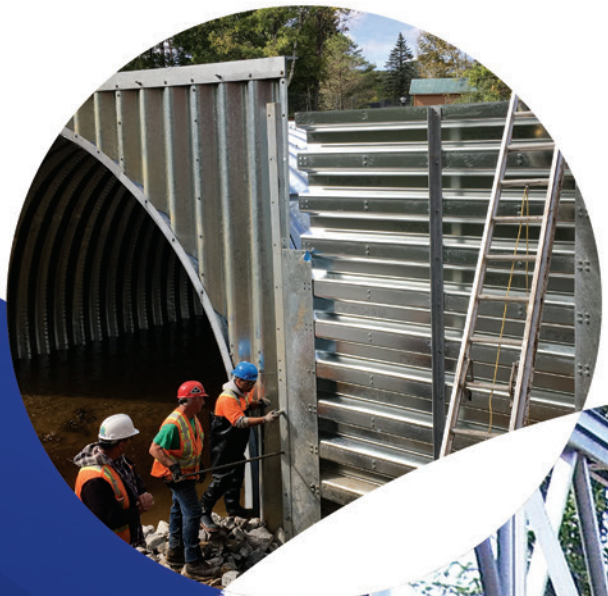
armtec

A division of
WGI Westman Group Inc.



BinWall

Bridge abutments offer
support for bridge super-structures
and vehicular loadings.

Bin Wall Bridge Abutments

Armtec's Bin Wall Bridge Abutments provide a durable, cost effective alternative to traditional concrete bridge abutments. Made of high quality galvanized steel, components are easily bolted together on-site or delivered pre-assembled in convenient lightweight loads. Waiting for formwork and curing time is a thing of the past with all-weather construction.

Bin Wall has been successfully installed at hundreds of crossings across Canada over the past 60 years. Let Armtec partner with you to develop a custom Bin Wall Abutment solution to meet your unique project needs.

BRIDGE ABUTMENTS FOR:

- Crossings at Remote Sites
- Logging, Mining and other Access Roads
- Provincial and Municipal Highways and Roads

VERSATILE

- Galvanized steel components can be easily bolted together to form various configurations

DURABLE

- Accommodates minor settlement and ground movement

QUICK INSTALLATION

- Installed without expensive lifting equipment
- Easily bolted together in the field

ECONOMICAL

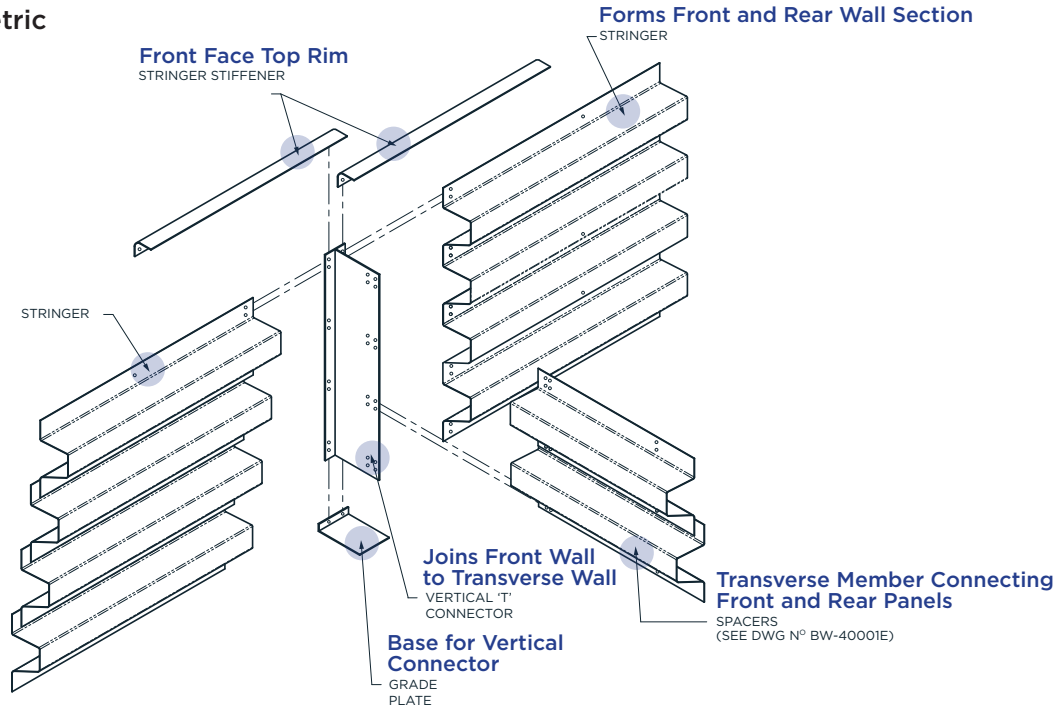
- Low material and installation costs
- Lightweight, nested components allow for economical shipping over long distances

Bin Wall's LIGHTWEIGHT COMPONENTS ARE EASY TO HANDLE AND QUICK TO INSTALL

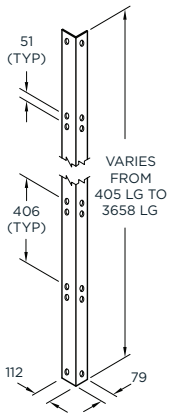
AN ECONOMICAL ALTERNATIVE TO CONCRETE BRIDGE ABUTMENTS

BIN WALL COMPONENTS

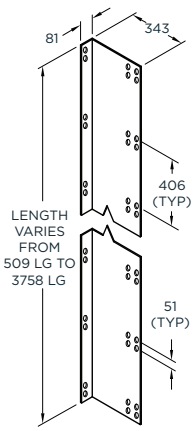
Exploded Isometric



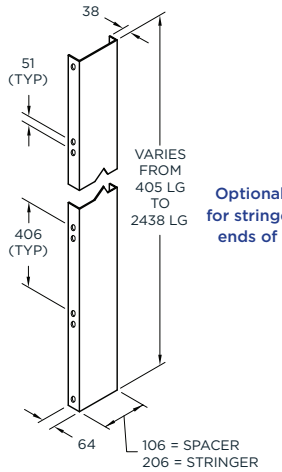
Split Vertical Connector



Corner Vertical Connector



Spacer and Stringer Closure



Optional closure piece for stringers / spacers at ends of wall or corner

Bin Wall DESIGNS

Wall Design	Spacer Depth (mm)
B	2,362
C	3,035
D	3,708
E	4,382
F	5,055

Proper Backfill Characteristics

The backfill will be a good quality, free draining, well-graded granular material possessing a minimum angle of internal friction = 33˚.

Backfill density = 22 kN/m^3. Backfill is compacted to 95% Standard Proctor Density.

BIN WALL COMPONENTS

FIGURE 1: Typical Bin Wall abutment

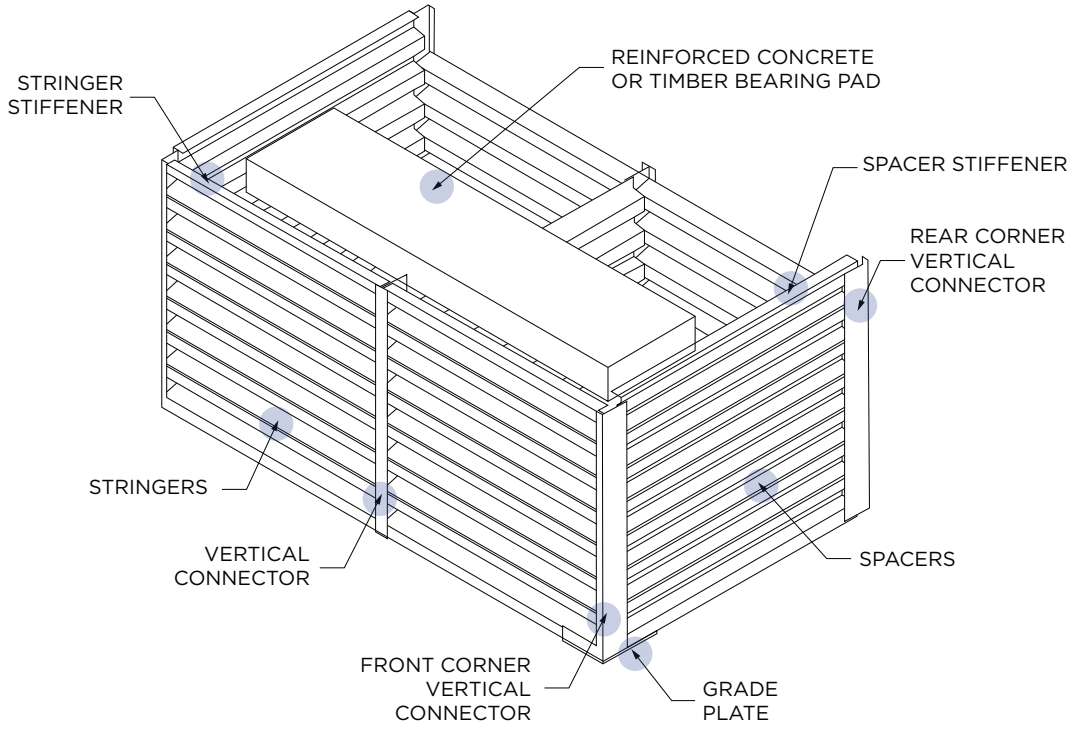
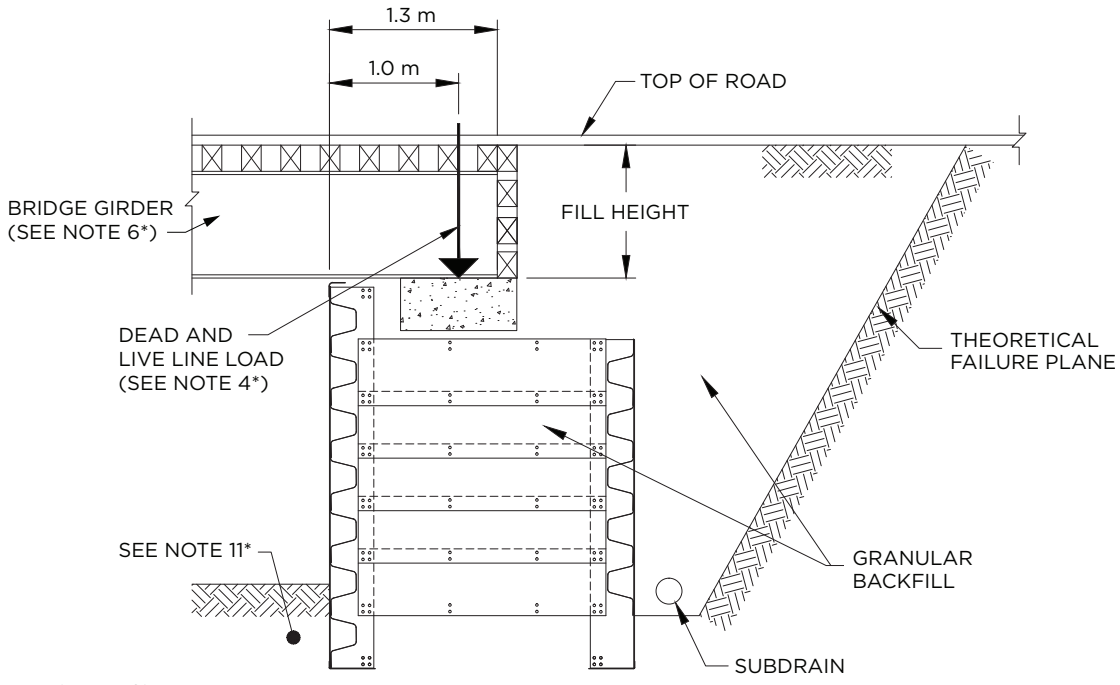


FIGURE 2: Cross-section of Bin Wall abutment



*See Design Notes ***(page 6)***

MAXIMUM ALLOWABLE BIN HEIGHTS

TABLE 1: Highway loading

Fill Height	Maximum Allowable Bin Heights Design Vehicle L-60 or CL-625			
	Design B	Design C	Design D	Design E
mm	mm	mm	mm	mm
600	3,758	4,977	5,791	6,197
900	4,167	4,977	5,791	6,197
1,200	4,167	4,977	5,791	6,197
1,500	4,167	4,977	5,386	6,197

NOTES:

- LIVE LOAD BETWEEN 45–65 KN/M
- SEE DESIGN NOTES (NOTE 4)

TABLE 2: Off-Highway loading for logging trucks L-75

Fill Height	Maximum Allowable Bin Heights Design Vehicle L-75			
	Design B	Design C	Design D	Design E
mm	mm	mm	mm	mm
600	3,758	4,977	5,791	6,197
900	4,167	4,977	5,386	6,197
1,200	4,167	4,977	5,386	6,197
1,500	4,167	4,572	5,386	5,791

NOTES:

- LIVE LOAD BETWEEN 60–80 KN/M
- SEE DESIGN NOTES (NOTE 4)

TABLE 3: Off-Highway loading for logging trucks L-100

Fill Height	Maximum Allowable Bin Heights Design Vehicle L-100			
	Design C	Design D	Design E	Design F
mm	mm	mm	mm	mm
600	4,977	5,386	5,791	6,197
900	4,572	5,386	5,791	6,197
1,200	4,572	4,977	5,791	6,197
1,500	4,572	4,977	5,386	6,197

NOTES:

- LIVE LOAD BETWEEN 75–105 KN/M
- SEE DESIGN NOTES (NOTE 4)

TABLE 4: Off-Highway loading for logging trucks L-150

Fill Height	Maximum Allowable Bin Heights Design Vehicle L-150			
	Design C	Design D	Design E	Design F
mm	mm	mm	mm	mm
600	4,167	4,572	4,977	5,386
900	3,758	4,572	4,977	5,386
1,200	3,758	4,167	4,977	5,386
1,500	3,758	4,167	5,572	5,386

NOTES:

* LIVE LOAD BETWEEN 120–160 KN/M
- SEE DESIGN NOTES (NOTE 4)

TABLE 5: Off-Highway loading for logging trucks L-165

Fill Height	Maximum Allowable Bin Heights Design Vehicle L-165			
	Design C	Design D	Design E	Design F
mm	mm	mm	mm	mm
600	3,353	3,758	4,167	4,572
1,200	2,947	3,353	4,167	4,572
1,500	2,947	3,353	4,167	4,572
1,800	2,947	3,353	3,758	4,572

NOTES:

- LIVE LOAD BETWEEN 150–190 KN/M
- SEE DESIGN NOTES (NOTE 4)

DESIGN NOTES

1. The design procedure to determine the stability of the bins follows the Coulomb Wedge Analysis. Lateral earth pressures on the wall are based on the equilibrium of a failure wedge of soil behind the bin. The principle assumptions of this method are:

i. The backfill will be a good quality, free draining, well-graded granular material possessing a minimum angle of internal friction = 33˚.

ii. Backfill density = 22 kN/m^3. Backfill is compacted to 95% Standard Proctor Density.

iii. Soil failure plane is along a straight line originating at the heel of the bin.

2. Minimum allowable factors of safety against overturning and sliding are 2.0 and 1.5 respectively.

3. The maximum bin contact pressure on the foundation for the wall heights listed is 230 kPa. For allowable soil bearing capacities less than 230 kPa, consult your Armtec representative.

4. The dead load and live load end reactions from the bridge superstructure are applied as line loads over the top of the bin. The line load equals the bridge reaction divided by the bearing pad length. The maximum allowable bin heights listed in the tables are based on a bridge dead load between 10 to 30 kN/m. The bridge live load is noted directly below each table. (See Cross-Section Figure 2 for location of applied dead and live line loads).

5. Bearing pads must not be in contact with Bin Wall members.

6. Bridge girder extends into the abutment by 1.3m (see Cross-Section Figure 2).

7. All loads are unfactored.

8. Bin Wall stringers and/or spacers may require reinforcement—consult your Armtec representative for details.

9. It is the owner's responsibility to ensure that actual site conditions meet or exceed the above requirements. It is also the owner's responsibility to check design for global stability.

10. CL-625 is a typical design live load in the CSA Group Code CAN/CSA-S6 for the design of highway bridges. L-75, L-100, L-150 and L-165 are off-highway truck loading designations for the Province of British Columbia's Ministry of Forests and Lands, for the logging Industry.

11. For walls constructed in or near water, the foundation elevation (bottom of the Bin Wall) must be established such that it is below potential scour depths. It is important to prevent the loss of foundation material supporting the bins and the loss of fill being retained by the wall. The design of an appropriate embedment (depth below grade to the foundation) and of scour protection is the responsibility of others.

BIN WALL COMPONENTS ARE EASILY BOLTED TOGETHER TO FORM A VARIETY OF CONFIGURATIONS

BIN WALL UTILIZES DURABLE GALVANIZED STEEL COMPONENTS

ERECTION INSTRUCTIONS

Drawings BW40001E and BW40002E are provided with every order

1. Preliminary Steps

i. Separate the parts and stack like parts together. See drawings for nomenclature of parts. Bundles and stacks should be positioned so that water will drain off parts. After parts are stacked and accessible, all parts should be checked against the bill of material.

ii. The Part Number is stenciled on each stringer and spacer. For thickness identification, see Bin Type Retaining Wall Type 2 Standard Details and Components Drawing BW40001E.

Bin Type Retaining Wall Type 2 Standard Depth and Height Combinations Drawing BW40002E shows the location of each stringer by thickness. Note that stringers are counted from the top of the wall, not from the bottom.

As an example, a 2.539m high wall will have six 1.6mm thick stringers in the front and four 1.6mm thick stringers in the rear face. A 4.572m high wall will have eight 1.6mm thick and three 2.0mm thick stringers in the front and six 1.6mm thick and three 2.0mm thick stringers in the rear face. Spacer thickness does not vary within any one wall depth. All spacers for a Design D wall, for example, are 2.8mm thick and 3,264mm long.

iii. Establish the front and rear lines of the wall and the location of each vertical connector. If wall is on a curve, or contains specially fabricated corners, a supplemental drawing is furnished.

Prepare a bed for each grade place at the proper elevation, as determined from drawing BW40002E. Note that for Design B walls on a one to six batter, the front grade plate is lower than the rear plate. On all other one to six batter walls, the rear grade plate is lower.

If the base of the wall is below existing ground level, 450mm – 600mm wide trenches may be dug for the lower wall members. Trenches must be wide enough, in relation to depth, to allow for proper compaction of backfill adjacent to the members. If solid rock or other unyielding soil is within 200mm of the final elevation of the grade places, this must be removed at grade plate locations for an area of approximately 600mm x 600mm and replaced with a 200mm thick layer of uncompacted fill.

TYPICAL TOOLS REQUIRED

- Structural wrenches (spud wrenches)
- Drift pins
- Socket wrenches with ratchet handles
- Transit and level
- Carpenter's level
- Chalk-lines, tapes, etc.
- Power or impact wrenches
- Mobile crane or "cherry-picker"
- ¾ electric drill with bits and reamers
- Hacksaw or other metal-cutting saw

NOTE:

IN THE HORIZONTAL OVERLAPS OF SPACERS, DOUBLE HOLES ARE PUNCHED, BUT FOR INSIDE SPACERS (FILL ON BOTH SIDES) ONLY SINGLE BOLTING IS REQUIRED.

Bin Wall'S LIGHTWEIGHT AND MODULAR ASSEMBLY MAKES IT THE PERFECT BRIDGE ABUTMENT SOLUTION FOR REMOTE LOCATIONS

2. Assembly

i. Distribute grade plates and vertical connectors to proper locations. Vertical connectors longer than 3,758mm will contain 2 or more pieces. See drawing BW40001E for make-up of vertical connectors.

Note that on normal walls, rear vertical connectors are 812mm shorter than front connectors. For two-piece (or three-piece) vertical connectors, erection will often be easier if the entire length is not preassembled. The upper corner connector type on one corner will be the same as lower corner connector on the opposite corner.

ii. Attach grade plates to vertical connectors (finger tight) then attach two lower spacers (finger tight) to front and rear vertical connectors. Stand up first two units and brace. (For preassembly, refer to Erection Instructions Note 4, Alternate Methods of Assembly).

iii. Attach two stringers (finger tight) in both front and rear. Refer to drawing BW40002E for proper stringer thickness.

iv. Now, check alignment of this first bin. Make sure vertical connectors are plumb (for vertical walls) or on proper batter. The temporary attachment of a stringer stiffener at the top of each face is advantageous. When alignment of all parts is correct, tighten all bolts except top bolts in top stringers and spacers. On high walls use more than one stringer to ensure that connectors are parallel.

Note that if the Bin Wall is a standard configuration, the spacers must be parallel to each other and perpendicular at 90˚ for correct installation.

v. Continue wall assembly, checking subsequent bins for alignment before tightening bolts. The sequence of operations is not critical, and may vary. Some precautions should be observed, however, for ease of assembly. These are:

v.1 Make sure vertical connectors are the proper distance apart at top before tightening any bolts.

v.2 Backfilling, particularly of tall bins, is less difficult if bin sides are not built too high.

v.3 End transverse sections require spacer closures over ends of all spacers which do not have earth on both sides. Closures should be installed with spacers.

v.4 Some special corners will require stringer ends to be closed with stringer closures. This detail will be shown on special drawings or instructions.

v.5 Double check that all bolts in areas to be backfilled have been finally tightened.

v.6 On spliced vertical connectors, the splice plate should be on the side of the web opposite the spacers.

vi. Special corners or other details will be shown on supplementary drawings. Study these thoroughly before starting erection of the special sections.

Procedures will vary, but in general, it is desirable to erect and fix firmly in position one of the vertical connectors at such a point. The special plates and attachments, plus the second vertical connector will then be supported during assembly.

vii. Under some conditions, spacers in end transverse sections require reinforcing with tie rods to the next transverse section. Special details are furnished for this procedure. Rods must be placed before any backfilling of end bins is started.

viii. When walls of different design depth join, a split vertical connector is used to connect the stringers of the narrower wall to the spacers of the next bin. The split vertical connector is the length of the lower wall height, and is bolted to the spacers with its longer leg against the spacers. Backfilling in this area must be done with special care, to avoid losing fill material through the open corrugations of the spacers.

WOOD FACING ENHANCES THE NATURAL APPEARANCE OF THIS **BIN WALL** BRIDGE ABUTMENT

A DURABLE AND ECONOMICAL BRIDGE ABUTMENT SOLUTION

3. Backfilling

i. Backfill material—a good granular material is recommended as per Design Notes point 1.

ii. If the design calls for drains behind or through the wall, install these before starting to backfill.

iii. Backfilling should start in the bins, and generally 1,200mm high or more of Bin Wall should be in place before filling outside or behind the bin. Next, fill the area immediately in front of the wall, to the approximate final grade if possible.

iv. Backfill should be placed in maximum 200mm layers, and each layer must be leveled and thoroughly compacted before the next is placed. Leave no voids anywhere, in the bins or outside. Fill all corrugations in spacers and stringers, but do not damage wall members with dumping or compaction equipment.

Care must be taken not to use power compactors inside the bins within 300mm of front stringers.

v. Keep the bin filling well above the fill level behind the wall (1200mm minimum). This ensures the stability of the wall. However, if the rear face of the wall is close to an earth or rock face and working room is unduly restricted, that area should be backfilled before the rear stringers are installed too high for access.

4. Alternate Methods of Assembly

i. With adequate handling equipment, a fast, economical method of erection is to preassemble the transverse sections (spacers), wholly or in part. All work is at a good working level and bolting is downhand and therefore faster whether hand or power wrenches are used.

i.a Sawhorses and timber generally make an adequate assembly table.

Spacers are laid (holes up) with ends square and flush, and bolted together through the intermediate holes.

i.b Vertical connectors are then laid on the spacer ends, checked for parallel, and then bolted tight to the spacers. Grade plates are then attached loosely to vertical connector bottoms.

i.c The assembled transverse section is then set on the prepared foundation and loosely connected to the previous transverse section or bin by one or two stringers at bottom, front and rear, and stringers or stringer stiffeners at the top. Plumb the new transverse section, then tighten bolts. The rest of the stringers are then bolted into place.

ii. Under some circumstances, the level preassembly of section of front and rear walls will be extremely advantageous.

If lifting equipment is available, and an adequate working area is accessible, this method should be considered.

ii.a Provide a working platform of sawhorses and timbers.

ii.b Lay out vertical connectors with legs of tees up, and loosely bolt on top and bottom stringers (or stringer stiffeners).

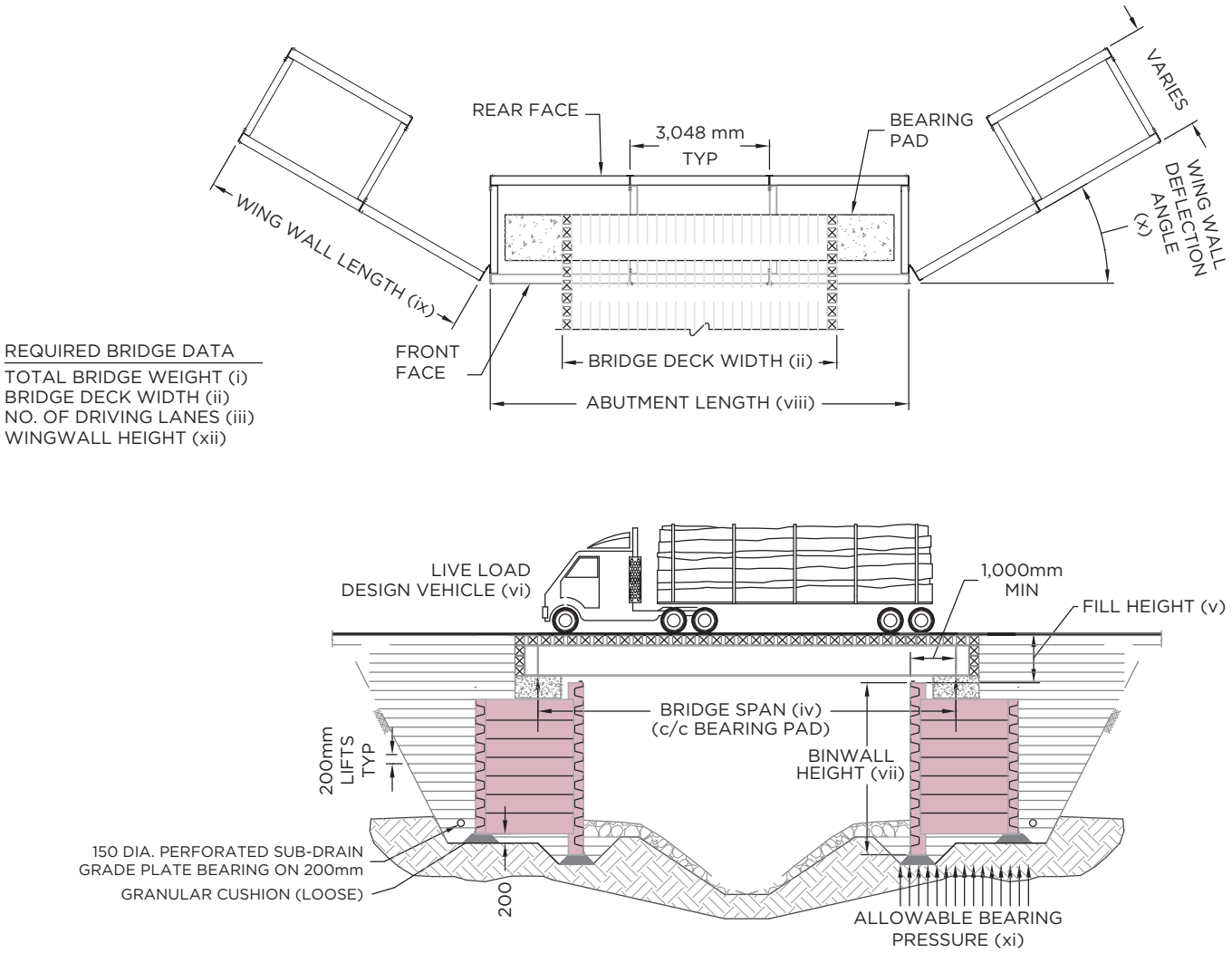
ii.c Check that vertical connectors are parallel and square to stringers then continue installing stringers, tightening nuts as you go. Attach grade plates.

ii.d Lift completed section of front or rear wall into place on prepared grade plate beds, check for proper batter, and brace.

ii.e Lift other face similarly, and tie to already erected face with spacers, starting at bottom.

FLEXIBLE ABUTMENTS ACCOMMODATE MINOR SETTLEMENT AND MOVEMENT

BIN WALL BRIDGE ABUTMENT INQUIRY SHEET



Required Data					
i	Total Bridge Weight		vii	Abutment (Bin Wall) Height	
ii	Bridge Deck Width		viii	Abutment (Bin Wall) Length	
iii	No. of Driving Lanes		ix	Wingwall Length	
iv	Bridge Span		x	Wingwall Deflection Angle	
v	Fill Height		xi	Allowable Bearing Pressure	
vi	Live Load Design Vehicle		xii	Wingwall Height (Not Shown)	

Typical Design Vehicles Select	
CL-625 (Highway)	
CL-800 (Highway)	
Logging Truck - 75 Ton	
Logging Truck - 100 Ton	
Logging Truck - 150 Ton	
Other (Specify)	

Armtec is environmentally conscious
by supporting limited paper usage.

ATLANTIC

Shediac, NB
Sackville, NB
Truro, NS
Bishop's Falls, NL
St. John's, NL

CENTRAL

Cambridge, ON
Comber, ON
Forest, ON
Guelph, ON
Orangeville, ON
Peterborough, ON
Sudbury, ON
Thunder Bay, ON
Walkerton, ON
Woodstock, ON
St-Augustin, QC
St-Clet, QC

PRAIRIES

Calgary, AB
Edmonton, AB
Grande Prairie, AB
Ponoka, AB
Redwater, AB
Winnipeg, MB
Regina, SK
Saskatoon, SK

WESTERN

Dawson Creek, BC
Genelle, BC
Langley, BC
Nanaimo, BC
Prince George, BC

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