Thank you for purchasing this high quality Banlaw product. Please read through and understand the information in this Product Data Sheet (PDS) BEFORE installation or operation to avoid accidental personal injury or property damage.

1 PRODUCT DESCRIPTION

Banlaw introduced their range of BAV's into the market in the mid 1990's in response to a requirement for a reliable and cost-effective means of reducing the consequences of hazards during a vehicle ***drive-away****.

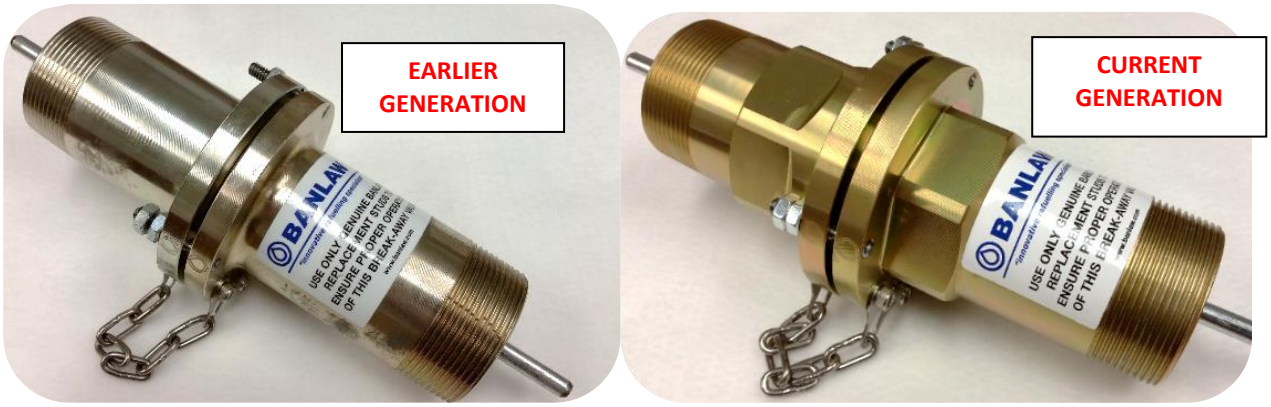


Figure 1 - Examples of Banlaw Break-Away Valves

Figure 1 shows examples of Banlaw break-away valves (BAV's). The left image illustrates the earlier Banlaw BAV design, whilst the right image depicts the latest BAV design. Unless noted otherwise, information within this document applies to ***both*** styles (designs) of BAV.

The range of 2" (DN50) and 3" (DN80) Banlaw Break-Away Valves (BAV) are available with either BSPT (M) or NPT (M) threaded process connections, and as a standard non-FuelTrack version or as a Banlaw FuelTrack™ version for use within the FuelTrack (or Banlaw ResTrack™) dry-break "auto ID" diesel refuelling system.

* **IMPORTANT:** The term "**drive-away**" refers to a hazardous event whereby either **unplanned or deliberate movement occurs between the fuel dispensing system and the plant equipment (vehicle).** One common example is when a vehicle moves away from the fuel dispensing location whilst the dispensing (refuelling) nozzle remains connected to the vehicle. An alternative example is when the mobile service/fuel truck moves away from the plant equipment whilst the nozzle remains connected to the plant equipment. **A Banlaw BAV does not prevent or reduce the *likelihood* of a drive-away occurring**, instead the role of the BAV is to reduce the magnitude of consequences (i.e. the hazard outcomes) during the event. In such cases ***"prevention is better than cure"***, and clients are urged to **consider appropriate means of avoiding a drive-away**.

CAUTION	
	***The content of this document is <u>not</u> meant to override or substitute any applicable Statutory, Regulatory, Customer/Site, etc. Health Safety & Environment (WHS, HS&E) requirements.***
	All works should only be performed by trained, qualified and competent personnel who are aware of the hazards associated with the constituent components of this installation in addition to the system as a whole. Failure to comply with these practices may result in death, serious bodily injury, loss of equipment and environmental damage.
	A risk assessment (job hazard analysis - JHA) should be conducted PRIOR to the start of any works or actions within this document. Whilst every effort has been made to ensure the execution of this document represents no additional hazard risk, Banlaw takes neither responsibility nor liability for the consequences and damages that may occur in the execution of works within this document.
	Persons conducting or otherwise involved with the execution of the works within this document and project have an obligation to ensure that all health, safety and environment requirements are known and understood, and subsequently followed at all times.

Listed below is the **normal sequence of events** during a drive-away;

1	**RELATIVE MOVEMENT BETWEEN PLANT EQUIPMENT AND FUEL DISPENSING POINT WHILST REFUELLING NOZZLE REMAINS CONNECTED**
2	**“STRETCHED” DISPENSING HOSE APPLIES REQUIRED FORCE TO SEPARATE BAV**
3	**3 OFF SACRIFICIAL STUDS FRACTURE CAUSING BAV TO SEPARATE**
4	**BAV “SEPARATES” WITH EACH SEGMENT QUICKLY SEALING/CLOSING (DRY-BREAK ACTION)**
5	**SAFETY CHAIN ARRESTS FALL OF VALVE UNTIL CONTINUED APPLICATION OF FORCE FRACTURES AT LEAST 1 SACRIFICIAL CHAIN MOUNT PLATE**
6	**REFUELLING NOZZLE, HOSE AND OUTLET SEGMENT OF BAV STAY CONNECTED TO PLANT EQUIPMENT REFUELLING POINT UNTIL REMOVED**

Each BAV incorporates **three (3) sacrificial metal studs** (also referred to as “shear studs”), configured to facilitate the forced “separation” of the BAV assembly in the event the required load is applied to the BAV. Once fully separated, each “half” (segment) of the BAV quickly forms a liquid tight (dry-break) seal to prevent any additional spillage of fuel from either segment of the BAV.

The Banlaw BAV also includes a “safety chain”, designed to arrest the fall of the downstream (outlet) segment of the BAV in the event the BAV separates due to means other than a drive-away. Examples may include;

- A person(s) applying excessive force to the fuel dispensing hose, enough to separate the BAV.

- The downstream segment of the BAV striking an object, e.g. plant equipment or fixed structure.
- Corrosion, erosion or fatigue (metal "creep") of the sacrificial metal studs.
- Internal fuel pressurisation more than the nominated maximum safe working pressure (SWP) of the BAV – this includes pressure spikes (i.e. fluid hammer).

1.1 Design Evolution - Earlier Generation and Current Break-Away Valves

A notable design change within the continuing evolution of Banlaw break-away valves – refer Figure 1 - includes the following new features;

- External (male) hex on each BAV body – refer Figure 3 – to assist in the installation and servicing of the BAV.
- An internal hex on the mating faces of each BAV body to provide a mechanical "lock" against any contra-rotation (i.e. twisting) of each body – refer Figure 2. The key benefit of this feature is basically to help preserve the integrity of the BAV shear studs during installation and servicing of a BAV assembly.

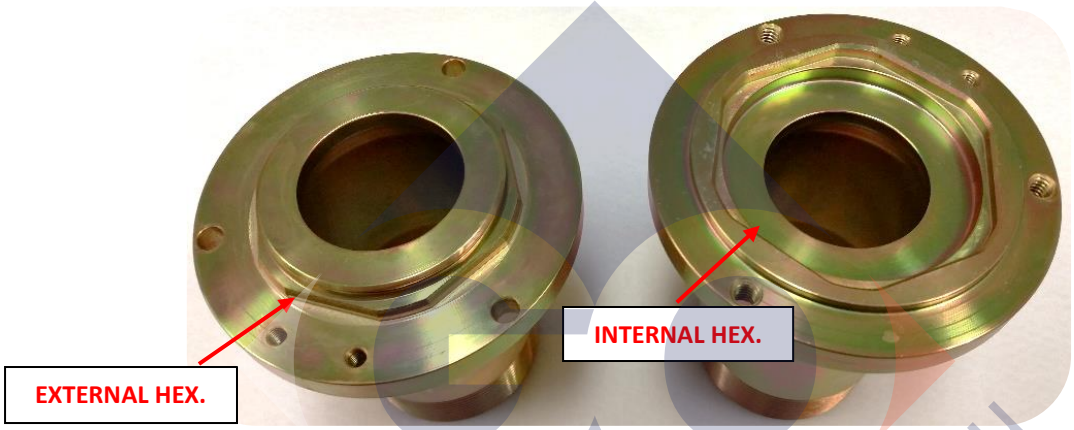


Figure 2 - Mechanical Lock Feature Between BAV Bodies (no other parts shown)

Further information on this design change is available in **Banlaw Product Alert BPA-25**.

1.2 Standard (Non-FuelTrack) Break-Away Valves

The key external features of the current Banlaw BAV are shown in Figure 3.

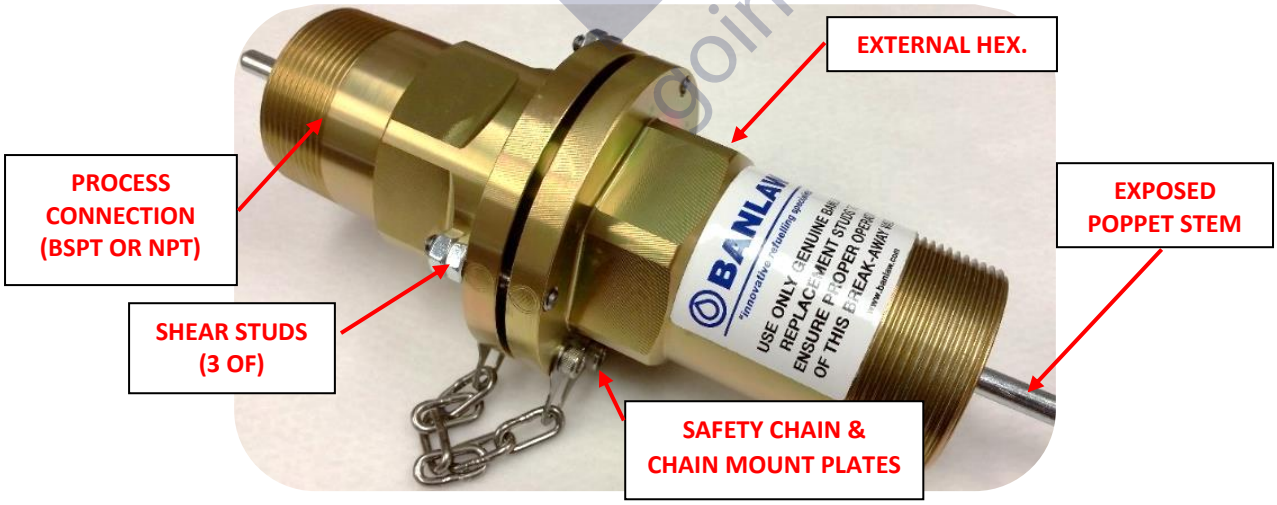


Figure 3 - Key External Features of a Banlaw BAV

Figure 4 shows the main internal features of a Banlaw BAV. The profile of the Poppets may vary in some instances.

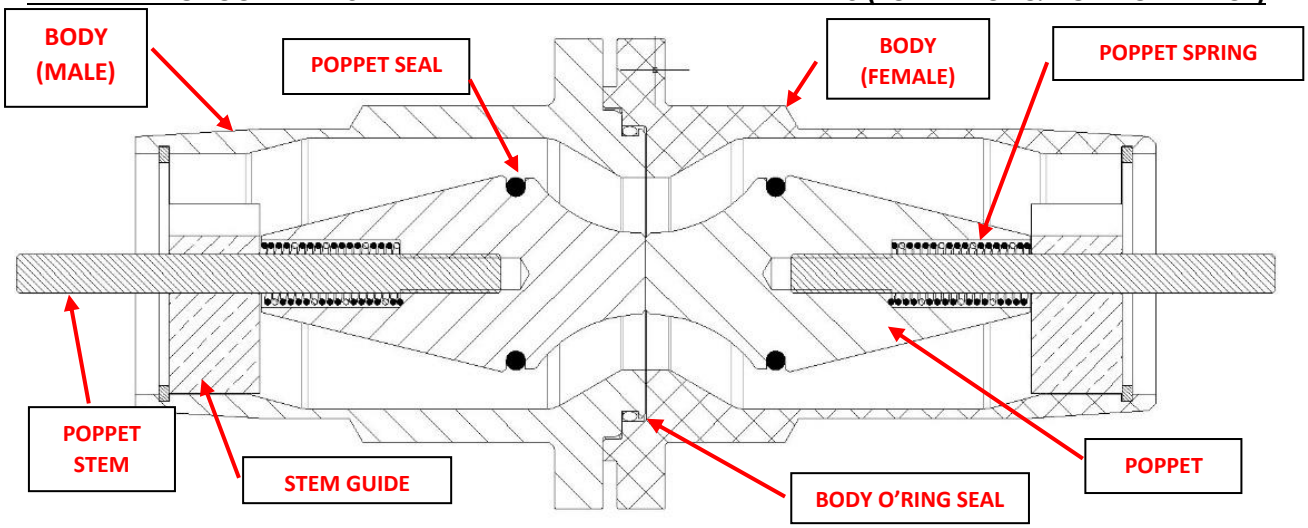


Figure 4 - Sectioned View of Banlaw BAV

Whilst the BAV assembly remains intact, the fluid flow path through the Valve is fully "open". In the event the BAV separates, each of the opposing spring biased Poppets seal each "half" of the Valve, providing a dry-break feature. The flow path through the "standard" (non-FuelTrack) BAV's is bi-directional and can thus be installed in either direction with respect to the fluid flow.

1.3 Banlaw FuelTrack™ (Auto ID) Break-Away Valves

The key external features of a Banlaw **FuelTrack** BAV are also shown in Figure 3. The external (male) hex on each BAV body are not included on earlier FuelTrack BAV's (refer Figure 1).

The key differences between a standard and FuelTrack model BAV are internal – refer Figure 5. Other internal features common to both models are shown in Figure 4.

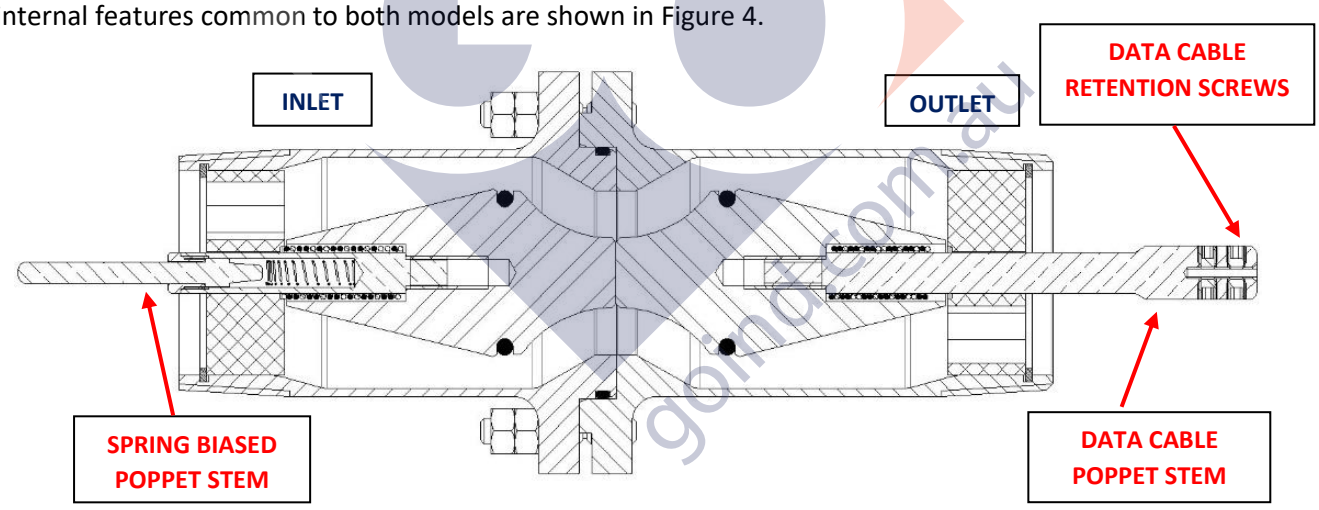


Figure 5 - Sectioned View of Banlaw FuelTrack BAV (R2 version shown)

The flow path through the FuelTrack "R2" BAV's is bi-directional, however the configuration of the 2 **Poppet Stems** (refer Figure 5) defines the **required orientation** (inlet & outlet) of the BAV when installed.

There is no restriction on the direction (orientation) of the earlier FuelTrack BAV's as identical spring biased poppet stems extend out each end of the BAV.

1.4 Banlaw Break-Away Valve Part Numbers

Table 1 lists the Banlaw BAV's currently available.

BANLAW PART No.	DESCRIPTION
AUS4W-50	Standard (non-FuelTrack) BAV assembly, 2" BSPT (M)
AUS4W-50N	Standard (non-FuelTrack) BAV assembly, 2" NPT (M)
AUS4W-50N-CT	Standard (non-FuelTrack) BAV assembly, 2" NPT (M), "Arctic" series
BFT4WR2-50	FuelTrack BAV assembly, 2" BSPT (M)
BFT4WR2-50N	FuelTrack BAV assembly, 2" NPT (M)
BFT4WR2-50N-CT	FuelTrack BAV assembly, 2" NPT (M), "Arctic" series
AUS4W-75	Standard (non-FuelTrack) BAV assembly, 3" BSPT (M)
AUS4W-75N	Standard (non-FuelTrack) BAV assembly, 3" NPT (M)
AUS4W-75N-CT	Standard (non-FuelTrack) BAV assembly, 3" NPT (M), "Arctic" series
BFT4WR2-75	FuelTrack BAV assembly, 3" BSPT (M)
BFT4WR2-75N	FuelTrack BAV assembly, 3" NPT (M)
BFT4WR2-75N-CT	FuelTrack BAV assembly, 3" NPT (M), "Arctic" series

Table 1 - Banlaw BAV Details

Please refer to section 6 for details on genuine Banlaw BAV Service Kits. Table 2 details the range of Banlaw threaded **Adaptors** available to adapt a process connection of the BAV to a hose coupling or other connection. Banlaw does not recommend connecting a parallel thread to the tapered threaded connections on a BAV – use only the same thread types.

BANLAW PART No.	DESCRIPTION
BFT4W029	Adaptor – 3" BSPT-F x 2-1/2" JIC-M
BFT4W030	Adaptor – 2" BSPT-F x 2-1/2" JIC-M
BFT4W031	Adaptor – 3" NPT-F x 2-1/2" JIC-M
BFT4W032	Adaptor – 2" NPT-F x 2-1/2" JIC-M
BFT4W033	Adaptor – 2" BSPT-F x 1-7/8" JIC-M
BFT4W034	Adaptor – 2" NPT-F x 1-7/8" JIC-M

Table 2 - Banlaw BAV Adaptors

Figure 6 illustrates the marking on each BAV denoting the process thread connection type, whether "**N**" for NPT-M or "**B**" for BSPT-M. **NOTE;** some earlier BSPT valves may not include the "B" marking.

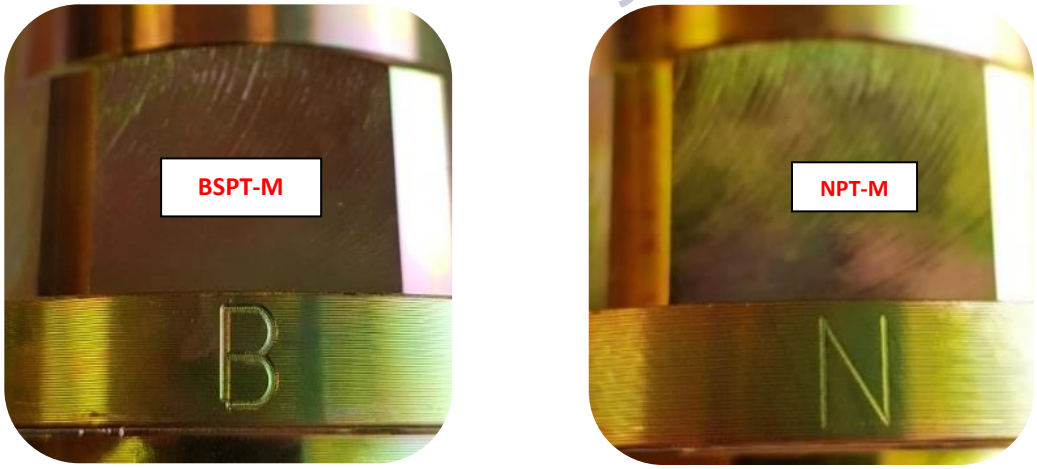


Figure 6 - Marking for Thread Type

2 IMPORTANT RESTRICTIONS ON THE USE OF THIS PRODUCT

WARNING
DANGER

1. The safe installation and subsequent operation of a Banlaw product relies on the completion of all necessary ***"due diligences"*** (particularly risk management) for the assessment of the Banlaw product(s) being suitable for the intended application(s). Such an assessment is best achieved through the cooperation of the supplier/OEM (Banlaw) and the customer or end-user. Once such an assessment deems the Banlaw product(s) to be suitable, the customer or end-user shall ensure effective ***"change management"*** applies should any prominent or influential aspect of the application (upon which the initial assessment was based) be subject to change and may affect the ongoing suitability (i.e. safety and proper function) of the Banlaw product.
2. **A drive-away is an event involving potentially serious health, safety and environmental consequences (hazards).** Applications in which a Banlaw BAV are used typically include a ***flexible hose*** linking the BAV and refuelling nozzle. In the event of a drive-away, the "elastic" nature of the "stretched" hose stores potential energy which when rapidly released upon separation of the BAV, causes the hose and attached segment of the BAV to violently "whiplash" in the direction of the moving vehicle in an uncontrolled manner.
3. **The use of parts other than genuine Banlaw spare parts within a Break-Away Valve jeopardises the intended function and specifications of the Valve.** As a BAV is a product designed to reduce the consequences of a hazardous event – i.e. a drive-away – the use of non-genuine parts will affect the safety benefits this product is intended to provide.

CAUTION

1. When installed and maintained/serviced in accordance with Banlaw guidelines, a Banlaw BAV is intended to ***reduce*** the **consequences** of a drive-away. A Banlaw BAV is neither designed or intended to reduce the ***probability*** (likelihood) of a drive-away. Banlaw recommends appropriate drive-away prevention (or deterrent) measures are employed to minimise the probability of this event (contact Banlaw for advice).
   "PREVENTION IS BETTER THAN CURE" *– i.e. means to* ***prevent*** *a drive-away provide far superior health & safety benefits than the reliance on a break-away valve (BAV).*
2. Banlaw BAV's are designed and intended for use with clean automotive grade diesel fuels and within installations (applications) as specified by Banlaw. A Banlaw BAV shall not be used with a fluid type or within an application whose properties may affect the proper, safe and reliable function of the BAV. Please consult with Banlaw prior to use if in doubt.
3. Various governances (Regulations, Codes, Standards etc.) applicable to applications in which a Banlaw BAV is to be used may mandate or recommend a dedicated (e.g. certified, accredited or approved) "safety device" which complies with requirements of these governance(s). Banlaw makes no assertion nor claim that a Banlaw BAV meets any such requirements, unless such a requirement is specifically included (addressed) within a written statement by Banlaw.
4. Ensure all genuine Banlaw spare parts are serviced and installed in accordance with Banlaw guidelines – e.g. BAV shear studs are installed correctly to the required torque.

Note:

This product is unsuitable for use with AdBlue (DEF).

3 PRODUCT SPECIFICATIONS

Operating Temp. Range °C (°F) [2]	Standard BAV's; -10°C (14°F) to 55°C (131°F) Arctic "CT" spec BAV's; -51°C (-60°F) to 55°C (131°F)
Max. Recommended Temp.	120°C (248°F)
Max. Safe Working Pressure (SWP) [1]	2" (DN50) BAV's; 2,000kPa(g) (290psig) 3" (DN80) BAV's; 1,250kPa(g) (181psig)
Min. Burst Pressure (BP) [1]	2" (DN50) BAV's; 8,000kPa(g) (1,160psig) 3" (DN80) BAV's; 5,000kPa(g) (725psig)
Force to Fracture Chain Plate [3]	2,395N (538lbs) approx.
Max. Recommended Flowrate (Diesel)	2" (DN50) BAV's; 800LPM (211GPM) 3" (DN80) BAV's; 1,100LPM (291GPM)
Principal Material Composition	Zinc Electroplated Steel, Stainless Steel, Acetal, FKM (Viton), Brass, NBR (Nitrile), Fluorosilicone
Process Connections (inlet and outlet)	2" (DN50) BAV's; 2" BSPT (M) or 2" NPT (M) 3" (DN80) BAV's; 3" BSPT (M) or 3" NPT (M)
Compatible Fluid Types	***Clean*** Automotive Grade Diesel Fuels (Contact Banlaw to confirm compatibility of other liquids)
Mass (approx.)	2" (DN50) BAV's; 2.8kg (6.2lbs) 3" (DN80) BAV's; 5.5kg (12.1lbs)

Table 3 - Key Specifications of Banlaw Break-Away Valves

Table 3 Legend: 1. All BP and SWP pressure data refers to the ***internal*** fluid pressure within an "as new" BAV (tested at approx. 25°C (77°F)) and fitted with "Standard" genuine Banlaw Studs. Add 18% to the SWP and BP for a BAV fitted with "Higher Tensile" genuine Banlaw Studs.
2. "CT" refers to the "Arctic" (i.e. Cold Temperature) variant of a BAV, denoted by "CT" as a suffix in the part number.
3. The force required to fracture a Chain Mount Plate was determined ***after*** all 3 of Shear Studs had fractured.

3.1 Break-Away Valve "Separation" Forces

Section 3.1 provides data on the indicative (approximate) forces required to cause "separation" (i.e. disconnection) of a BAV assembly. This data has been determined at an ambient temperature of approx. 25°C (77°F) using both independent laboratory measurement and testing conducted by Banlaw. This data is subject to variation in response to several factors, including;

- Variations in the inherent mechanical properties (i.e. stress and strain) of the raw materials of sacrificial elements, i.e. shear studs and chain plates.
- Variations in the inherent mechanical properties (i.e. stress and strain) of sacrificial elements, i.e. shear studs and chain plates, in response to changes in the ambient (operating) temperature.
- Changes in the rate (i.e. speed) at which the force is applied, and the subsequent effect(s) this has on the fracture of sacrificial elements.

As such, the data within this section should be used as a guide (only).

A Banlaw Break-Away Valve (BAV) is designed to be installed within a configuration as per Figure 8, specifically within a ***bending moment*** (i.e. cantilevered) orientation to the attached dispensing hose during a drive-away. A Banlaw BAV is not designed to be oriented in an axial (direct pull) arrangement. As a guide, *peak* axial (direct tensile) loads exceeding 25kN (5,620lbs) have been measured during laboratory testing of BAV's by Banlaw

depending on the speed at which the force is applied.

The inlet (i.e. upstream) half of the BAV must be securely fastened to a **fixed** structure. The inlet of the BAV must not be installed onto a swivel or some other attachment which allows the BAV to move from a bending moment load into an axial load during a drive-away. The outlet (i.e. downstream) half of a BAV must ***NOT*** be fixed to a structure or any other items other than the inlet half of the BAV and the dispensing hose assembly. I.e. do not attempt to restrain the outlet half of the BAV by alternate means.

The primary benefits of the Banlaw BAV are jeopardised in the event the following requirements are not monitored and maintained;

- Any "equipment" – i.e. structure, fastening, piping system, loading arm, anchorage, etc. - onto which the ***inlet*** of the BAV is attached must be rated to withstand the anticipated maximum load (forces) during a drive-away. Banlaw recommends a Factor of Safety is applied between the anticipated load and the rated (design) load rating of this equipment to help prevent irreversible damage or structural failure of this equipment.
- Further, any "equipment" – i.e. liquid transfer or dispensing hose, refuelling (or fuel dispensing) couplings, recipient tank inlet, etc. – onto which the ***outlet*** of the BAV is attached must also be rated to withstand the anticipated maximum load (forces) during a drive-away. Banlaw recommends a Factor of Safety is applied between the anticipated load and the rated (design) load rating of this equipment to help prevent irreversible damage or structural failure of this equipment.

Banlaw recommends ***all*** connected equipment – upstream of BAV inlet and downstream of BAV outlet – is closely inspected for damage, strain and unplanned movement after each drive-away event, ***prior*** to the liquid (fuel) dispensing system and the Banlaw BAV being placed back into service. Failure to conduct such an inspection will increase the threat of hazards such as leakage of fuel, and the premature (unplanned) failure (e.g. rupture) of the equipment. **This is particularly relevant to hoses**, which are especially prone to damage during a drive-away. Any damaged equipment shall be replaced or repaired prior to the system being returned into service.

Add 18% (i.e. multiply by 1.18) to the data in this section for a BAV fitted with genuine Banlaw "Higher Tensile (HT)" Shear Studs.

The following data details the bending moment required to cause separation (disconnection) of a BAV. Note the data varies according to the orientation of the studs, with the basic arrangement in Figure 8 illustrating a bending moment (i.e. cantilever action) applied to a BAV in a "12 o'clock" stud position (i.e. a stud is located opposite the direction of the applied load via the hose).

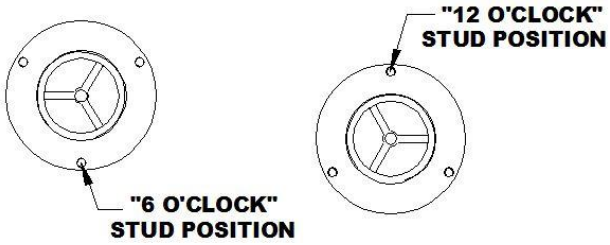


Figure 7 - Illustration of BAV Stud Position (end view of BAV)

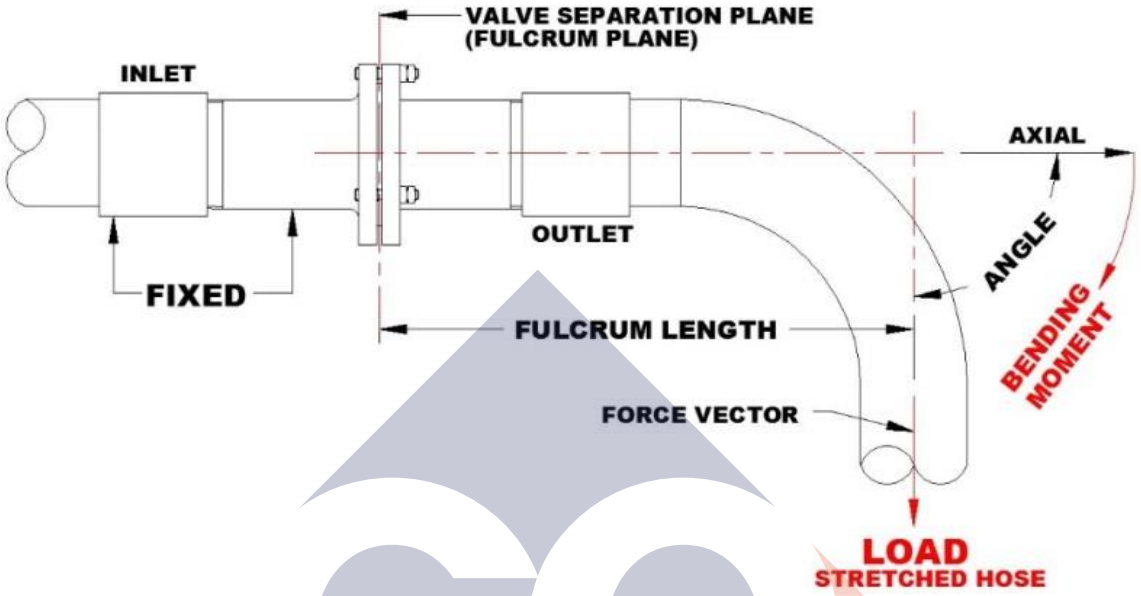


Figure 8 - Illustration of BAV subjected to Cantilevered Load (Bending Moment)

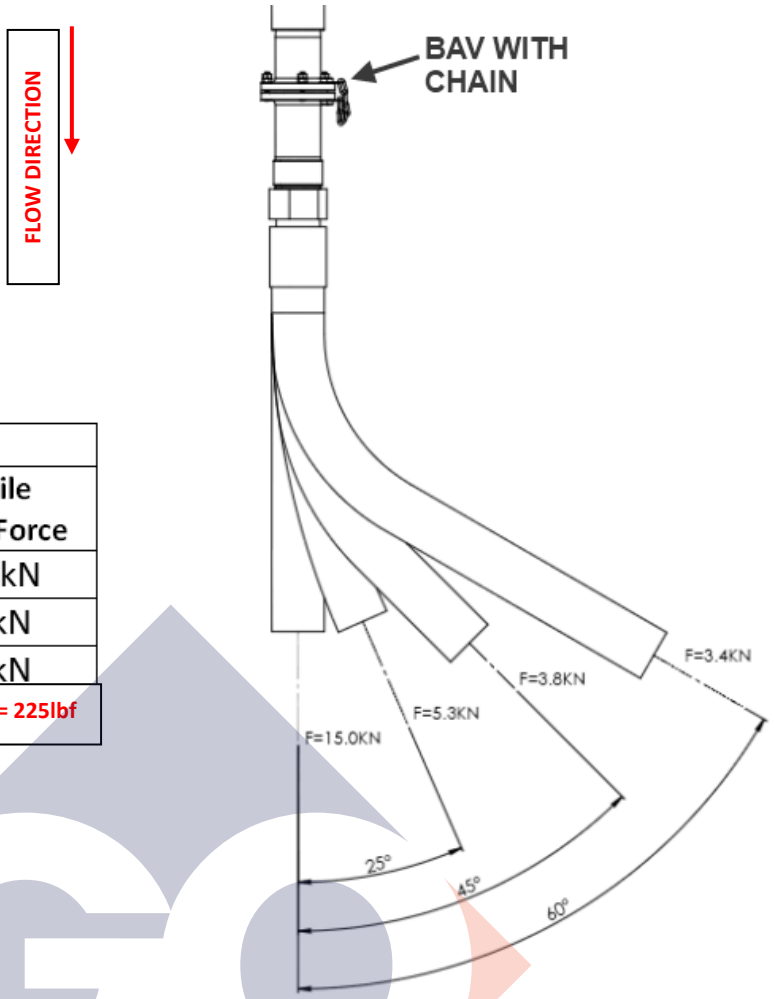
	BAV STUD POSITION	
VALVE SIZE	**6 O'CLOCK**	**12 O'CLOCK**
2" (50mm)	1080Nm (797ft.lbf)	770Nm (568ft.lbf)
3" (75mm)	1325Nm (977ft.lbf)	945Nm (697ft.lbf)

Table 4 – Bending Moment data for BAV's fitted with "Standard" Banlaw Studs

VALVE SIZE	6 O'CLOCK	12 O'CLOCK
2" (50mm)	1273Nm (939ft.lbf)	907Nm (559ft.lbf)
3" (75mm)	1560Nm (1151ft.lbf)	1113Nm (821ft.lbf)

Table 5 – Bending Moment data for BAV's fitted with "Higher Tensile (HT)" Banlaw Studs

Figure 9 illustrates a 2" BAV and the approx. force required to cause valve separation with respect to the angle at which the force (load) is applied relative to the central axis (i.e. fulcrum plane) of the BAV. All data is based on a 2" BAV in "as new" condition, fitted with genuine Banlaw parts, and a fulcrum length (refer Figure 8) of approx. 340mm (13.4"). This data is for the fracture of the 3 of Studs only, with a ***subsequent*** force required to fracture a Chain Mount Plate (refer Table 3).



50mm BAV	
Angle to Vertical	Tensile (axial) Force
0°	15.0 kN
25°	5.3 kN
45°	3.8 kN

UNITS CONVERSION: 1kN = 225lbf

Figure 9 - BAV install onto a Loading Arm with "Break-Away" Forces (2", DN50 BAV)

CAUTION

The data referenced in Table 4, Table 5 and Figure 9 is approximate (guide only), and will vary according to a number of factors (variables), including;

a. The rate (speed) at which the force is applied to the BAV. Higher rates of (more rapid) force application are likely to achieve peak (spike) forces exceeding the data quoted.
b. The size (2" or 3") of the BAV (for Figure 9).
c. Whether "standard" or "higher tensile" (HT) Banlaw studs are installed.
d. The effective fulcrum length between the (applied) force vector and the lateral axis (fulcrum plane) of the BAV (refer Figure 8).
e. Corrosion or erosion of parts, specifically the Shear Studs.
f. Angular orientation of the Shear Studs.

4 INSTALLATION GUIDELINES

This Installation Guide is general and is not meant to replace or override installation guidelines that arise out of a *due diligence* assessment of a Banlaw product for a specific (intended) application.

The scope of this section applies to the range of Banlaw Break-Away Valves. Where other Banlaw products are to be installed, the specific documentation associated with those products must be reviewed ***prior*** to installation.

Note:

General Installation Notes;

1. Conduct a **Job Hazard Analysis** (JHA) ***prior*** to install to mitigate health, environmental and equipment hazards.
2. Do ***NOT*** install any parts that are damaged or are otherwise faulty.
3. Do ***NOT*** install parts which are not compatible with mating parts or parts which do not satisfy the specifications of the application (installation).
4. An appropriate thread sealant is recommended on the process connections (inlet & outlet). Use ***sparingly*** and avoid excess use of Loctite and similar products.
5. Use a suitable Adaptor (e.g. Banlaw Adaptor) to connect each BAV process connection to incoming and outgoing piping and hose.
6. Conduct all necessary measures to ***prevent the ingress of contamination*** into the BAV and other parts.
7. Only engage threads of the same thread type. Ensure all threaded connections are clean and in good condition. Avoid over-tightening.
8. Use only proper ***hand-tools*** for the installation of all components. Avoid the use of power or impact tools.
9. Use consumables (e.g. Loctite products) strictly in accordance with the OEM Safety Data Sheet (SDS) and operating guidelines. Do not use consumables beyond their expiry date.

4.1 Pre-Installation Guidelines

A Break-Away Valve (BAV) may be installed in any angular position, on the important condition the required cantilever (i.e. bending moment) style loading will be applied to the BAV during a drive-away – refer section 3.1.

4.2 Installation Procedure

CAUTION

Figure 10 and Figure 11 illustrate examples of a BAV installation;

- The "upstream" (inlet) segment of the BAV is affixed to a stable and secure structure, rated to withstand loads (forces) in excess of the loads required to "separate" the BAV during a drive-away. The "downstream" (outlet) segment of the BAV is unrestrained, i.e. ***not*** itself affixed to such a structure. Refer section 3.1 for further information.
- In the event of a drive-away, the path (routing) of the dispensing hose between the BAV and dispensing nozzle must not be impeded by objects upon which the hose may "catch" or otherwise come into contact. This helps to ensure the "full" force within the hose is transferred to the BAV, allowing the Valve to separate. In the event the hose or some other equipment downstream of the BAV outlet should contact another object the force applied to the BAV may be reduced, causing excess forces – i.e. forces exceeding those in section 3.1 – to be applied to the dispensing equipment. This is likely to cause failure of such equipment – e.g. mechanical failure of the hose or dispensing (refuelling) couplings – prior to the BAV separating. The lack of a "dry-break" feature – as provided by the separation of the BAV – can then lead to other hazards such as the uncontrolled spillage (drainage) of fuel (liquid) from the tank inlet onboard the plant equipment to which the couplings are (or were) attached.
- A Banlaw BAV is unsuitable for installation onto a hose-reel.

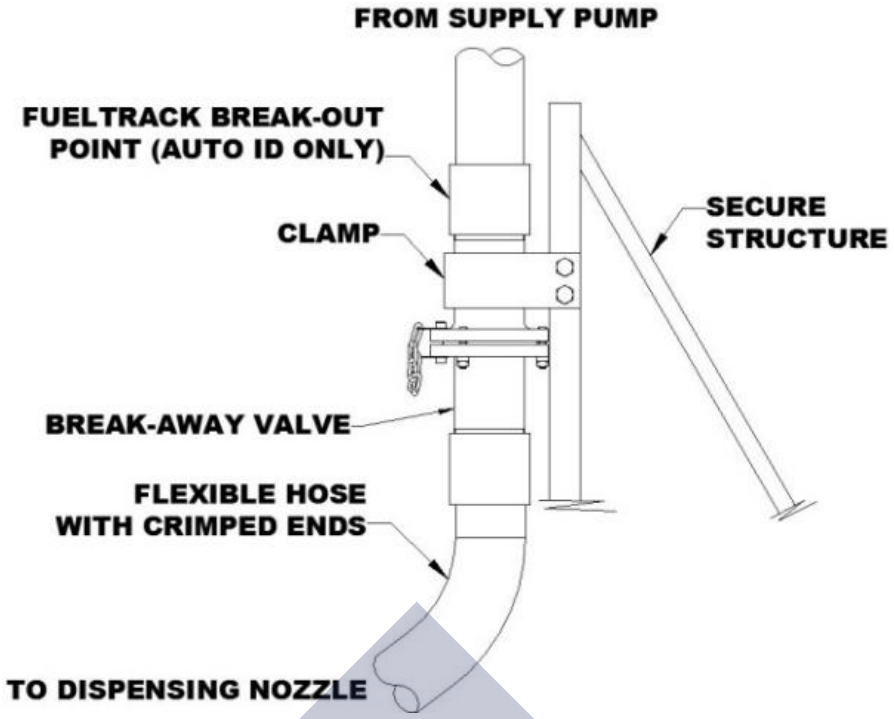


Figure 10 – Basic Arrangement of a BAV Installation

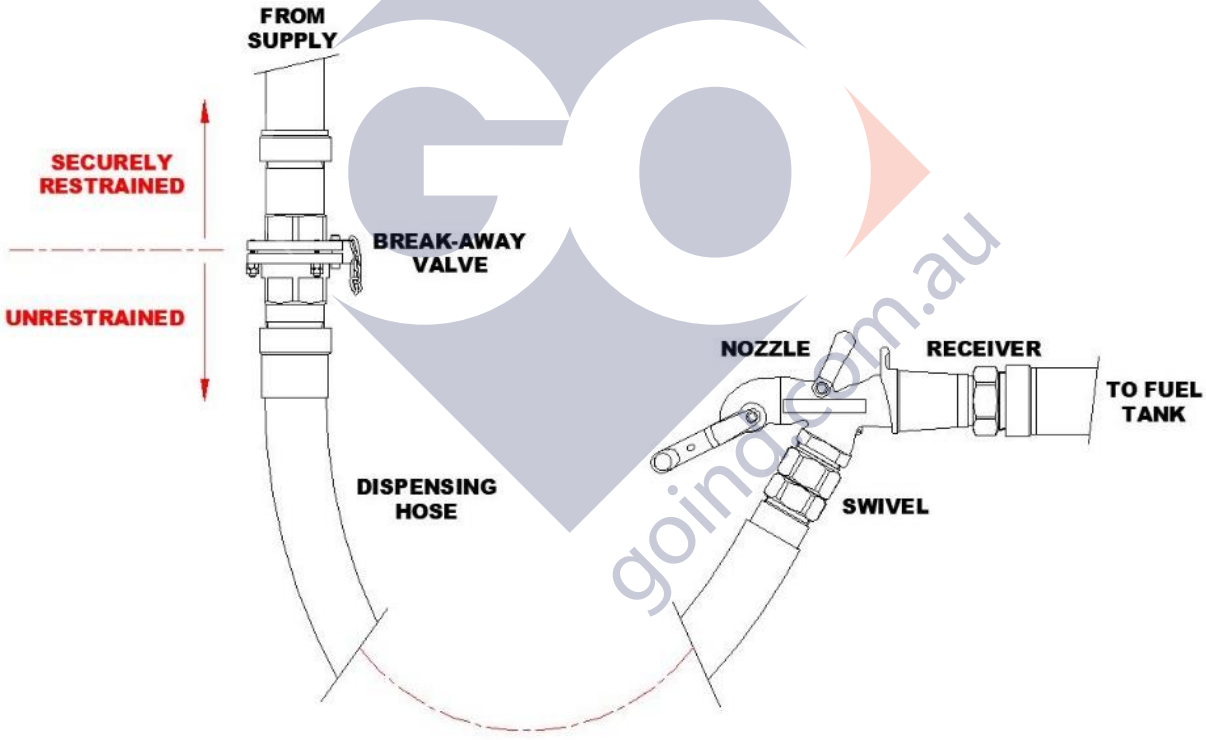


Figure 11 - Example of a Refuelling System

1. Complete all necessary hazard mitigation, monitoring and control actions as per the JHA, or SWMS, etc. This will include positive isolation of all fluid supply energy (flow and pressure) sources to the inlet and outlet fuel lines prior to BAV installation.
2. Inspect the BAV assembly for any damage, missing parts or other defect. Do ***NOT*** install the BAV if the defect is deemed to be unsafe.
3. **Apply appropriate thread sealant – e.g. Loctite 567 – to threads required to be sealed** (i.e. liquid tight) during this assembly process. Avoid the use of excessive thread sealant, as this will increase the electrical resistance across threaded joints and reduce the effectiveness of grounding/earthing within the dispensing system. Minimising the resistance across such joints is especially important for FuelTrack installations.

4. **To prevent premature failure (fracture) of a BAV stud(s), avoid exposing the BAV assembly to any undue load, torque or bending moment during the entire installation process.**
   a. When installing process connections onto each segment (inlet and outlet) of the BAV, securely hold ***only*** the segment onto which the connection is being made.
   b. Handle the BAV with care. Do not drop the BAV during installation.

Note:

If damage to a stud(s) is caused (or suspected) during installation, replace all serviceable parts using a genuine Banlaw BAV Service Kit.

5. For **Banlaw FuelTrack** BAV's;
   a. Align the spring biased ***male*** probe at the inlet of the BAV with the mating ***female*** probe within the outlet of the data **Break-Out Point (BOP)** – refer Figure 12.

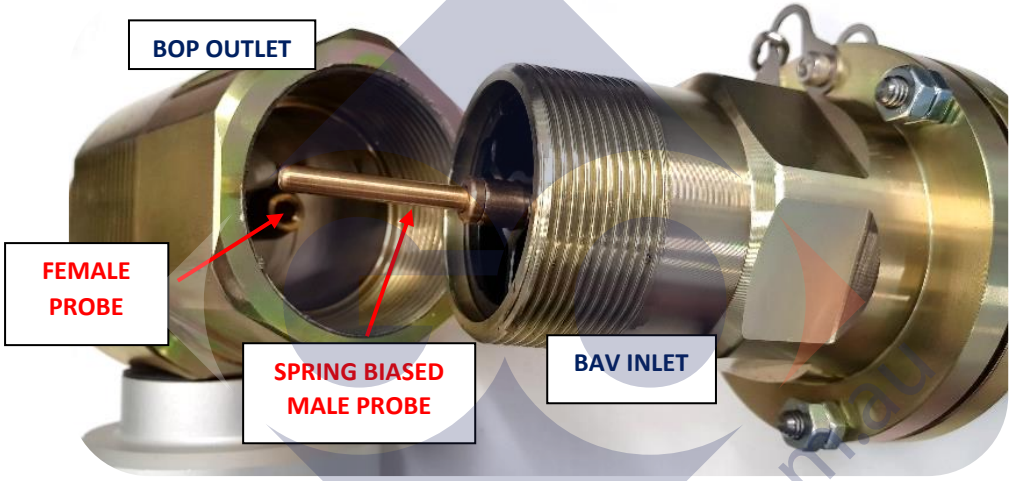


Figure 12 - Aligning FuelTrack BAV Inlet with Break-Out Point Outlet

   b. Secure the Data Cable routed within the dispensing hose to the Data Probe extending from the outlet of the BAV by following the steps below within Figure 13 to Figure 17;
      i. Inspect the end of the Data Cable. Figure 13 illustrates the required condition of the Cable end, specifically no visible damage to the wire strands. If damaged, renew the tip of the Cable by cutting off the damaged strands and removing 15mm (5/8") of insulation from the end of the Cable.
      ii. Slide the Adaptor over the Cable.
      iii. Remove all 4 Grub Screws from the Probe tip.
      iv. Apply 1 drop of Loctite high strength thread-locker (e.g. 277) to the thread of each Grub Screw.
      v. Insert Data Cable into the tip of the Probe.
      vi. Install all 4 Grub Screws and tighten ***moderately*** by hand – avoid over-tightening.

Figure 13 - End of FuelTrack Data Cable

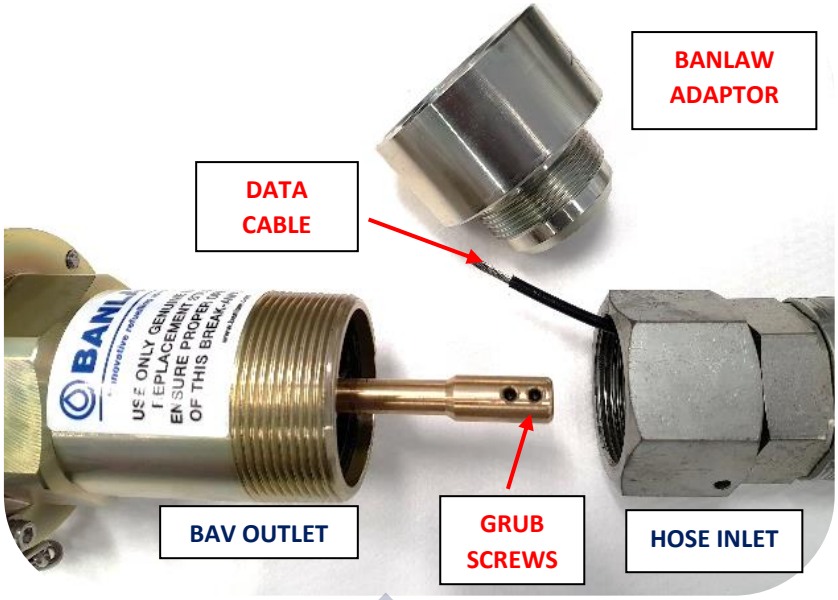


Figure 14 - Parts Connecting FuelTrack BAV Outlet into Dispensing Hose

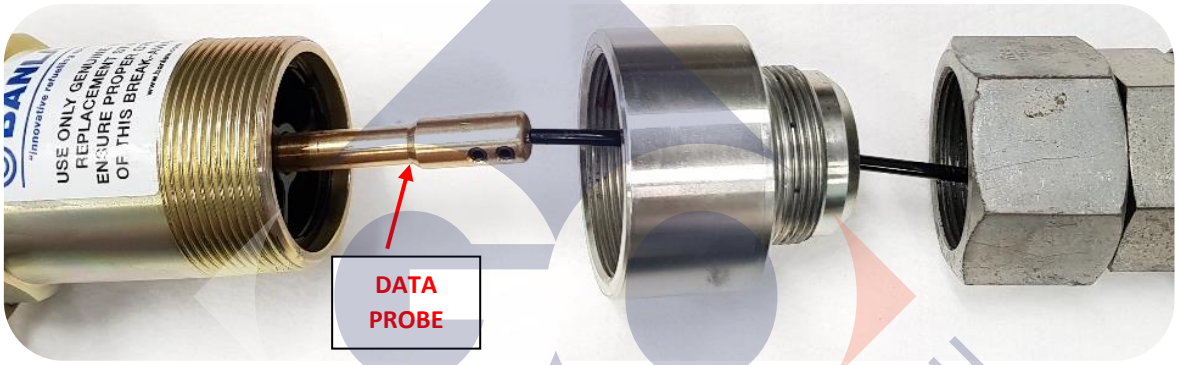


Figure 15 - Data Cable Secured into BAV Outlet Probe

Figure 16 – Adaptor on BAV Outlet - Awaiting Hose Connection

Figure 17 - FuelTrack BAV Installed

6. Attach the fuel dispensing hose securely to the BAV outlet by holding only the downstream (outlet) segment of the BAV. Engage only threads of the same type. Use a Banlaw **Adaptor** – refer Table 2 - if required between the hose coupling and the outlet of the BAV – refer example in Figure 15 and Figure 16.
7. Place the BAV and attached hose into the desired mounting location. If applicable, securely fasten the upstream (inlet) segment of the BAV to the mounting structure using a clamp.
8. Holding only the upstream (inlet) segment of the BAV, securely fasten the supply attachment to the BAV inlet. If especially important, confirm the desired BAV Shear Stud orientation is achieved.
9. Confirm all 3 shear studs are undamaged.
10. Deisolate the liquid supply to the BAV and ***gradually*** reintroduce liquid (e.g. fuel) pressure into the inlet and outlet lines of the BAV. Avoid pressure spikes (fluid hammer).
11. Confirm no fluid leaks.
12. For **Banlaw FuelTrack** systems, confirm the automatic identification (auto ID) function is operating correctly.

There are no specific **commissioning** requirements for a Banlaw BAV. Figure 18 illustrates an example of a BAV installation. Note the direction of vehicle travel with respect to the BAV, which provides the required cantilevered action on the BAV in the event of a drive-away.

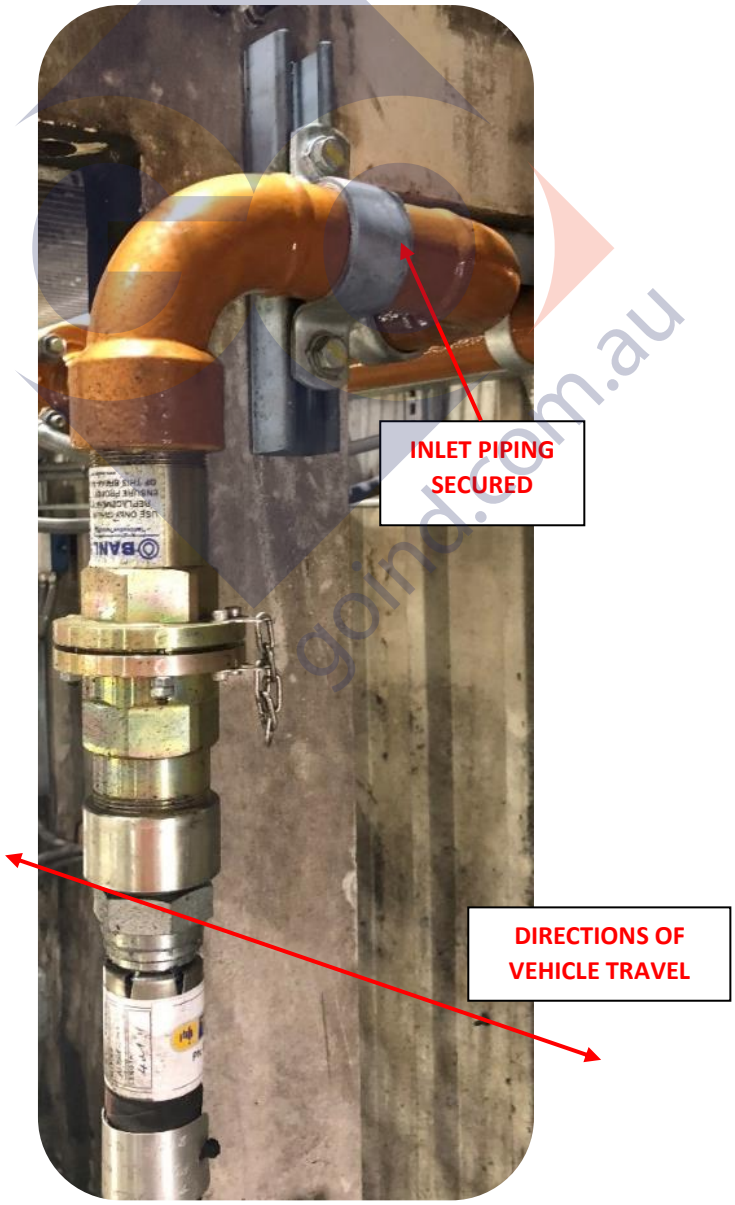


Figure 18 - Example of BAV Installation

5 PRINCIPLES OF OPERATION

The primary function of a Banlaw BAV is to provide a sacrificial mechanical “link” within a liquid (fuel) dispensing system. The “dry-break” feature of the BAV also prevents the discharge (spillage) of liquid from the supply line connected to the BAV inlet and the dispensing hose connected to the BAV outlet. Figure 19 to Figure 22 illustrate the stages of BAV separation.

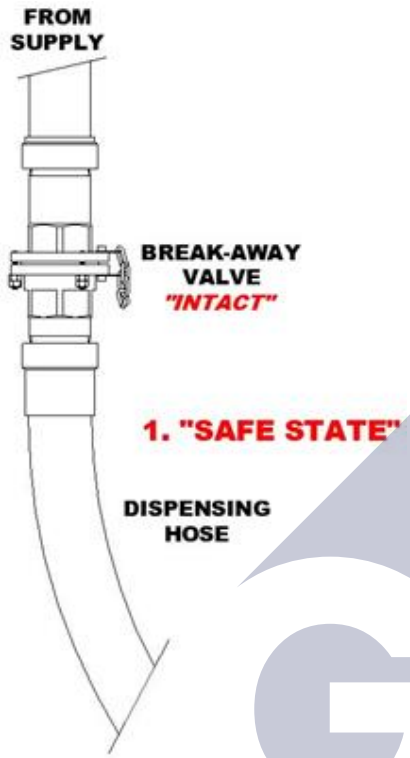


Figure 19 - BAV Intact

Figure 20 - Drive-Away Starts

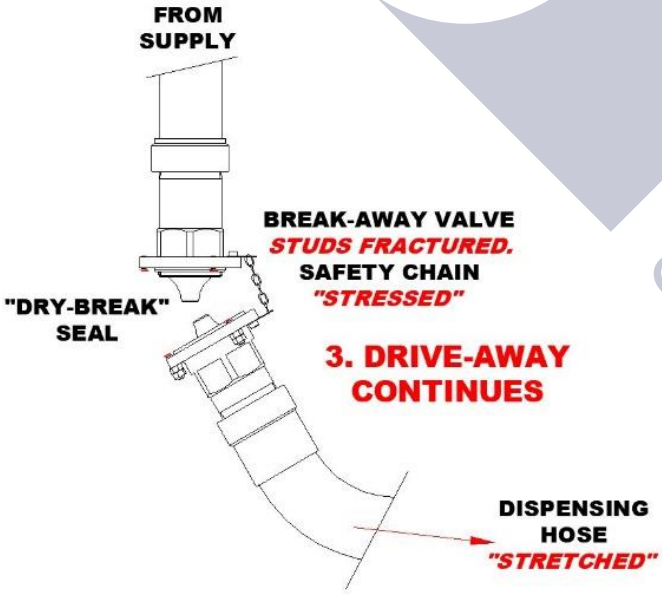


Figure 21 - Initial BAV Separation

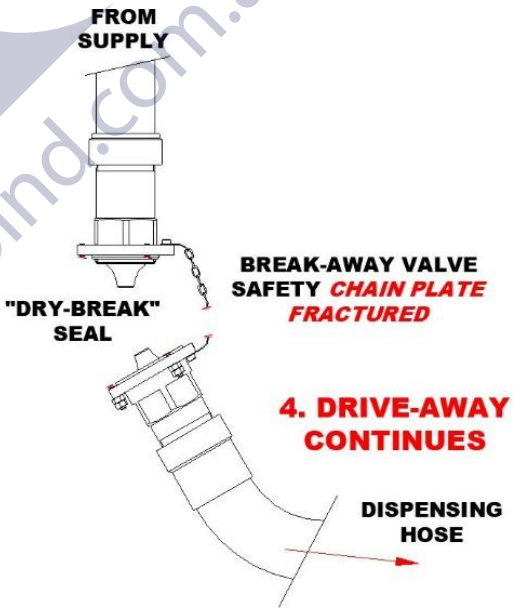


Figure 22 - Complete BAV Separation

Figure 19 is a “safe” operating state prior to the start of a drive-away. Figure 20 is the start of a drive-away, where the hose is stretched prior to separation of the BAV. Figure 21 illustrates the fracture of all 3 Shear Studs, the dry-break sealing of each BAV segment, and the BAV safety chain now under load (i.e. stressed). The final (complete) stage of the BAV separation is shown in Figure 22 where one of the sacrificial Safety Chain Plates has fractured, allowing the downstream (outlet) segment of the BAV to travel with the attached dispensing hose. The forces required to separate the BAV are stored within the “stretched” hose

as potential (i.e. elastic) energy. This energy is rapidly released (as kinetic energy) in Figure 22, often causing an uncontrolled "whiplash" effect of the dispensing hose and the attached BAV segment.

The degree of energy typically involved in such incidents will create a **serious health and safety hazard** to personnel and equipment within the same area, particularly within the trajectory (path) of the hose and BAV segment.

To Safety and Engineering personnel; Banlaw BAV's do not prevent drive-aways. Banlaw recommends appropriate drive-away prevention (or deterrent) measures are employed to minimise the probability of a drive-away (contact Banlaw for advice). Such prevention (or deterrent) measures shall be designed to provide a primary "layer of protection" to minimise the likelihood of a drive-away event. A Banlaw BAV shall only be deemed to provide a reasonable secondary layer of protection by reducing damage to plant and equipment in the event of a drive-away.

"PREVENTION IS BETTER THAN CURE" *– i.e. means to* ***prevent*** *a drive-away provide far superior health & safety benefits than the reliance on a break-away valve (BAV).*

6 MAINTENANCE AND SPARE PARTS

Banlaw supplies service kits to suit our range of Break-Away Valves – refer Table 6. Instructions on their installation will be included in the Kit packaging.

Kit Part No.	Description	Stud Nut Torque (max.)
AUS4WKIT	Standard repair kit for all Banlaw 2" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-HT	Repair kit containing higher tensile studs for all Banlaw 2" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-75	Standard repair kit for all Banlaw 3" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-75HT	Repair kit containing higher tensile studs for all Banlaw 3" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-CT	Cold temperature (i.e. arctic) repair kit for all Banlaw 2" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-HT-CT	Cold temperature (i.e. arctic) repair kit containing higher tensile studs for all Banlaw 2" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-75-CT	Cold temperature (i.e. arctic) repair kit for all Banlaw 3" break-away valves.	2Nm (1.5 lbf.ft)
AUS4WKIT-75HT-CT	Cold temperature (i.e. arctic) repair kit containing higher tensile studs for all Banlaw 3" break-away valves.	2Nm (1.5 lbf.ft)

Table 6 - Genuine Banlaw BAV Service Kits and Stud Nut Tightening Torque Values

CAUTION

To maintain the safety, performance and reliability of Banlaw products;

- Only **genuine** Banlaw spare parts are to be used. The use of non-genuine spare parts – specifically the (3) Shear Studs – will affect the forces required for the separation of the BAV;
  - *Lower* separation forces; premature separation of the BAV, and lower SWP and BP.
  - *Higher* separation forces; failure of the BAV to separate, increasing the likelihood of damage to the liquid (i.e. fuel) dispensing system.
- Products should not be tampered with or modified in any manner not endorsed by Banlaw.
- It is imperative each of the Stud Nuts is tightened to the **required torque** within Table 6 – use a calibrated torque wrench (hand tool);
  - Under tightening (*lower* torque); loosening of a Stud(s), causing leakage of fluid from the BAV and premature Stud failure and BAV separation.
  - Over tightening (*higher* torque); mechanical yielding of a Stud(s), premature Stud failure and BAV separation.
- Higher tensile (HT) Shear Studs should only be used;
  - In applications where the use of the standard (non-HT) Shear Studs is causing the unwanted (and unwarranted) separation of the BAV, and;
  - After a reasonable assessment has been made and deemed it both necessary and safe to use the HT Studs – refer specifications in sections 3 and 3.1.

6.1 Preventative Maintenance

The service life of a Banlaw BAV will depend on several factors, particularly environmental elements in each BAV application. Overly corrosive and erosive environments will cause accelerated corrosion of external metal surfaces and components. Users should perform periodic inspection of a BAV – 6 monthly inspections as a guide – to assess issues such as excessive corrosion of the Shear Studs and Stud Nuts and perform the appropriate corrective maintenance – e.g. installation of a new Banlaw BAV Service Kit, or replacement of the BAV assembly.

6.2 Banlaw Site Service and Preventative Maintenance

Clients can benefit from a **Banlaw Service Level Agreement (SLA)** to assist in the preventative and corrective maintenance of Banlaw products onsite, in addition to other diesel, fuels, oils and coolant infrastructure. Clients with an SLA can *focus on their core business activities* and allow experienced Banlaw technicians and engineers to help keep such infrastructure operating at optimum ***safety, performance and reliability.***

7 TROUBLESHOOTING

This section provides troubleshooting recommendations for the Banlaw Break-Away Valves when installed, operated and maintained in accordance with Banlaw guidelines. Any fault should be rectified at the earliest possible opportunity. Faults deemed by the end-user to be unsafe must be rectified before the fluid dispensing system is again used.

PROBLEM	PROBABLE CAUSE AND SOLUTION
Fluid leakage from flange of BAV	• Faulty seal. Install replacement Banlaw Service Kit. • SWP is being exceeded. Reduce maximum attainable pressure. • Use outside of recommended operating temperature range. Install Banlaw “arctic” (cold temperature) Service Kit for lower temperatures. Discontinue use of BAV for temperatures above maximum limit.
Fluid leakage from process connection of BAV.	• Disconnect & clean the mating threads. Apply thread sealant to the clean & dry threads and reconnect. Tighten appropriately.
Premature failure of 1 or more Shear Studs	• Improper care and attention during BAV installation caused damage to Shear Studs. Install new Banlaw Service Kit. • BAV supporting too much weight. Reduce the unsupported weight held below the BAV. • BAV has suffered impact with another object – more likely on loading arm installations. Assess situation and implement means to prevent such contact. • SWP is being exceeded. Reduce maximum attainable pressure. • Studs were corroded. Install new Banlaw Service Kit and implement replacement of the Service Kit into the routine preventative maintenance program for the dispensing system. • Studs were overtightened during installation. Replace studs with a new Kit and ensure the correct tightening torque is used – refer Table 6.
BAV failed to separate during a drive-away event – instead, failure of another dispensing system component	• Review load rating of all dispensing equipment downstream of the BAV. Upgrade equipment as required to achieve a rating exceeding the maximum expected BAV separation force – refer section 3.1. • Assess whether the hose or some other component of the dispensing system has contacted another object, e.g. a handrail, during the event. Reconfigure the relative location of such objects to ensure the hose etc. will not be hindered by another object during a drive-away. • Assess whether the required cantilever style loading was applied to the BAV. Reconfigure BAV as required – refer section 3.1. • Confirm genuine Banlaw shear studs are within the BAV. If not, install a Banlaw Service Kit and implement strategy to prevent use of non-genuine parts. • If Banlaw Higher Tensile (HT) Studs are within the BAV, assess the suitability of using the Banlaw “Standard” Studs on an ongoing basis.

8 PRODUCT RECYCLING & DISPOSAL

Banlaw values and supports the sustainable use of resources, and the safe, responsible and proper disposal or recycling of all materials within its products. For a description of the principal materials within this Banlaw product, please refer to section 3.

9 PRODUCT WARRANTY

Banlaw is committed to providing quality products and services. To provide further assurance, our products and services are backed by generous warranties.

A copy of the Banlaw product warranty terms and conditions is available from Banlaw, the Banlaw website, or your nearest authorised Banlaw agent.

END OF DOCUMENT

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