Banlaw FillSafe™
FillSafe Zero 2" Flow Control Valves

Thankyou 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.

Figure 1 - BFCV50 Model Flow Control Valve

1 PRODUCT DESCRIPTION

The range of patented and patents pending [#] **Banlaw FillSafe™** ***Zero*** overfill protection (OFP) systems is designed for the safe and reliable refuelling/refilling of diesel fuel tanks, commonly used in the mining, rail, port, construction and other off-road industries. The system comprises two (2) major assemblies;

- Banlaw Flow Control Valve (e.g. BFCV50 model);
  - Each Valve assembly includes a Receiver "front end" and Receiver Dust Cap.
- Banlaw Level Sensor (BVLS model);
  - Refer applicable documentation (e.g. PSG, PDS) for information on the range of FillSafe Zero Level Sensors.

[#] Patents and patents pending apply to this product and the FillSafe Zero system. Please see www.banlaw.com for details.

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 (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 HS&E hazard, 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 HS&E requirements are known and understood, and subsequently followed at all times.

The important subassemblies and features of the BFCV50 and BFTFCV50 model Flow Control Valves are illustrated in Figure 2 (Piston shown in closed/forward position).

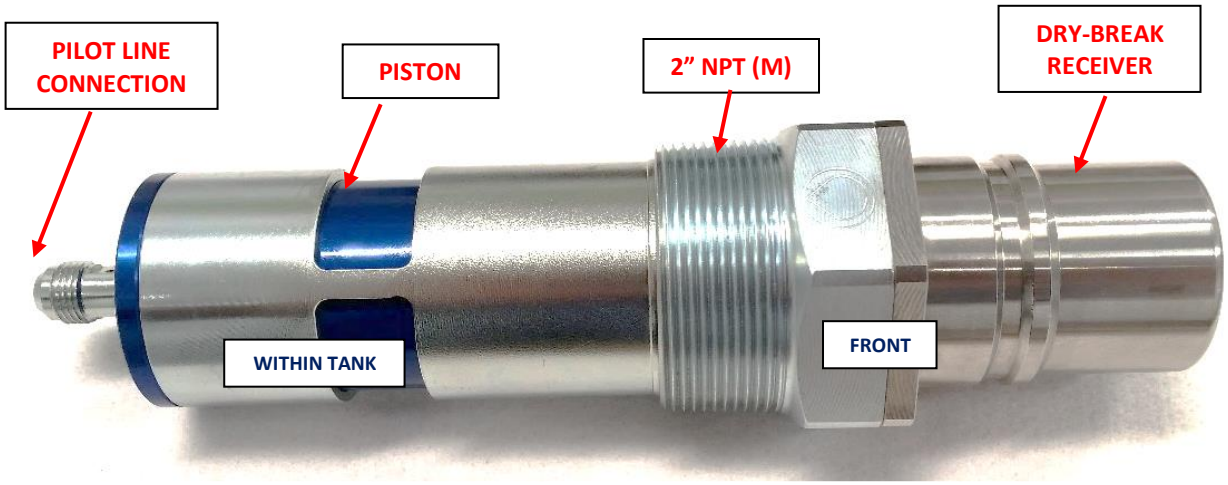

Figure 2 – Key Features of the Flow Control Valves (Dust Cap not shown)

The BFCV50 and BFTFCV50 model Valves consist of the following separate Flow Control Valve assemblies;

- **BFCV50**; "standard" spec flow control valve assembly. Receiver suits Banlaw "**mining**" dry-break refuelling nozzles, e.g. Banlaw **BNM800** model, and other "industry compatible" nozzles.
- **BFCV50R**; "railway" spec flow control valve assembly. Receiver suits only Banlaw "**rail**" dry-break refuelling nozzles, e.g. Banlaw **BNR800** model.
- **BFTFCV50**; Banlaw FuelTrack™ "auto ID" spec flow control valve assembly. Receiver incorporates passive electronic ID "tag" to suit only Banlaw **FuelTrack** dry-break "**mining**" refuelling nozzles, e.g. Banlaw **BNMF800** model.
- **BFTFCV50R**; Banlaw FuelTrack™ "auto ID" spec flow control valve assembly. Receiver incorporates passive electronic ID "tag" to suit only Banlaw **FuelTrack** dry-break "**rail**" refuelling nozzles, e.g. Banlaw **BNRF800** model.

"Arctic" (extreme cold temperature climate) Valve assemblies incorporate the suffix "-CT" in the part number, e.g. BFCV50-CT.

Figure 3 illustrates a standard dry-break receiver (front end) compared with a FuelTrack "auto ID" receiver.

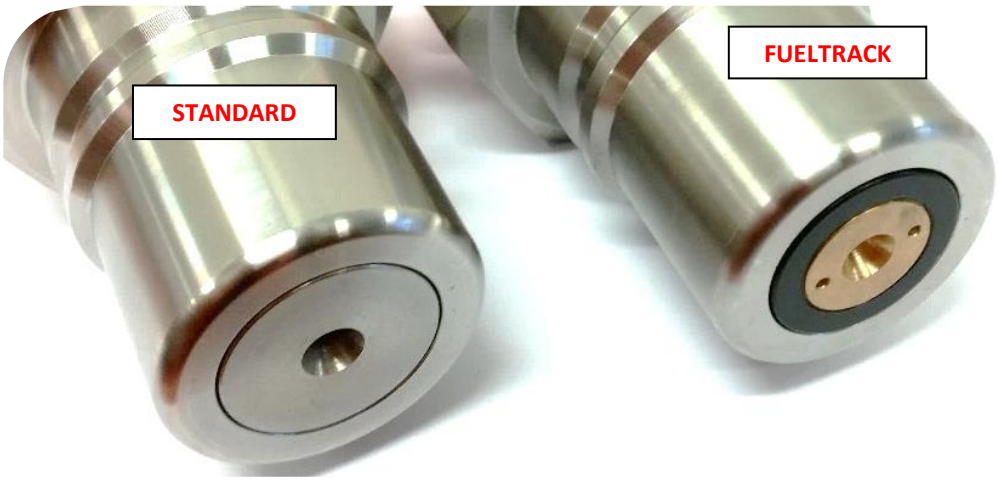

Figure 3 - "Standard" Receiver (left) and FuelTrack "Auto ID" Receiver (right)

The specific part number for each Valve is marked on each Assembly. **FuelTrack** Valves are also marked with the ID "tag" (code) unique to the assembly - refer Figure 4 as an example.

Figure 4 - Example (only) of FuelTrack Unique Tag ID Marking

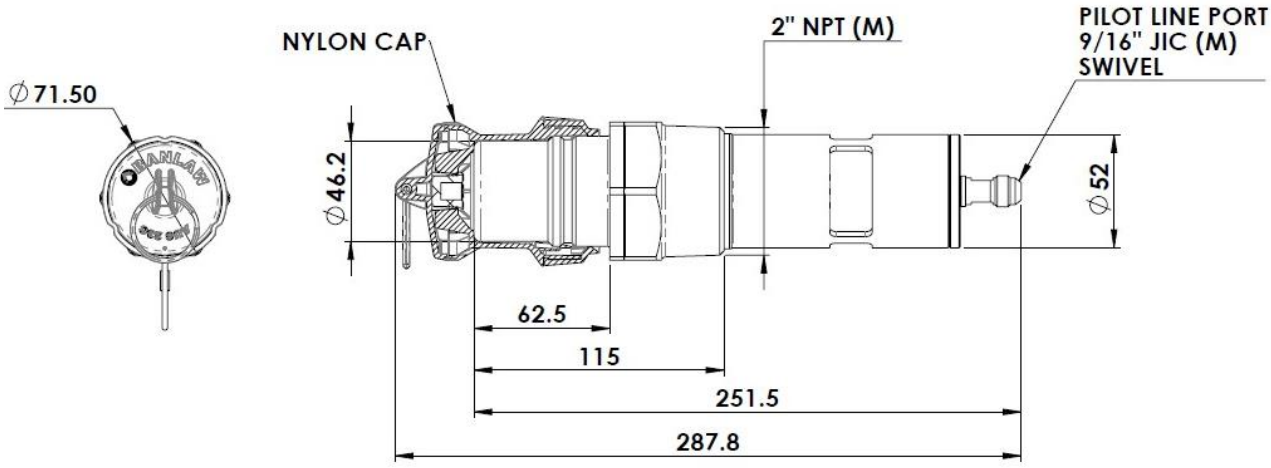

Figure 5 - Overall Dimensions of Valve (including Receiver Dust Cap)

2 KEY FEATURES AND BASIC OPERATION

The BFCV50 and BFTFCV50 model Valve assemblies incorporate 2 separate and independent means of diesel flow control;

- Normally closed (N/C) Receiver Poppet (front of Valve assembly);
  - Mechanically displaced into the open position upon actuation of the mating dry-break nozzle into the ON (open) position.
  - Returns to the N/C position upon actuation of the mating dry-break nozzle into the OFF (closed) position.
- Flow Control Valve Piston (rear of Valve assembly);
  - Open and closed status actuated by fuel flow (pressure).
  - Piston forced into the closed position upon actuation of the Level Sensor used in conjunction with the Valve assembly (specifically closure of the fuel trickle flow from the Valve to the Level Sensor via the Pilot Line).
  - The Flow Control Valve is *not* designed nor intended to act as a non-return (check) valve to prevent the discharge of fuel from the tank via the Receiver.

Key Advantages of the Banlaw FillSafe Flow Control Valves;

- *Stainless steel* receiver body, providing superior durability and corrosion resistance.
- Unlike some competitor Receiver and Flow Control Valve combinations, the Banlaw Dry-Break Receiver (front end) and Flow Control Valve (rear end) have been *designed as a unitary assembly*, meaning the internal flow path through the Flow Control Valve assembly has been optimised to provide **lower resistance to fuel flow**, **increased flow efficiency**, and **reduced incidence of premature shut-off** of the mating dry-break refuelling nozzle.
- Achieves a higher (diesel) flowrate capability with lower resistance to fuel flow (pressure drop) when compared with some competitor OFP valves.
- Only a single fuel pilot (signal) line is required to connect the FillSafe Zero Flow Control Valve and Level Sensor assemblies.
- BFT (auto ID) variants available to suit the Banlaw FuelTrack™ FMS.
- *"Arctic"* variants rated for operation down to -51°C (-60°F).

Figure 6 illustrates an example of a FillSafe Zero system incorporating a BFCV50 or BFTFCV50 model Flow Control Valve in conjunction with a Banlaw BVLS model Level Sensor. The tank is being refilled in this illustration;

- **Level Sensor;** Pilot Line passage open, and BVLS venting air from the tank to atmosphere.
- **Flow Control Valve;** open, allowing fuel to enter the tank.
- **Dry-break Diesel Refuelling Nozzle;** securely connected and in the **ON** (open) position.

Note:

The Banlaw BVLS series "venting" Level Sensors incorporate features *not* illustrated nor covered within this document. For detailed information on the BVLS series - and other Banlaw products – please refer to Banlaw product specific literature, e.g. BVLS series Product Specification Guides (PSG's) and Product Data Sheets (PDS's).

Figure 7 now illustrates this same system once the tank has been filled to the nominated capacity;

- **Level Sensor;** Pilot Line passage closed.
- **Flow Control Valve;** closed, prohibiting fuel entering the tank.
- **Dry-break Diesel Refuelling Nozzle;** in the **OFF** (closed) position, awaiting disconnection.

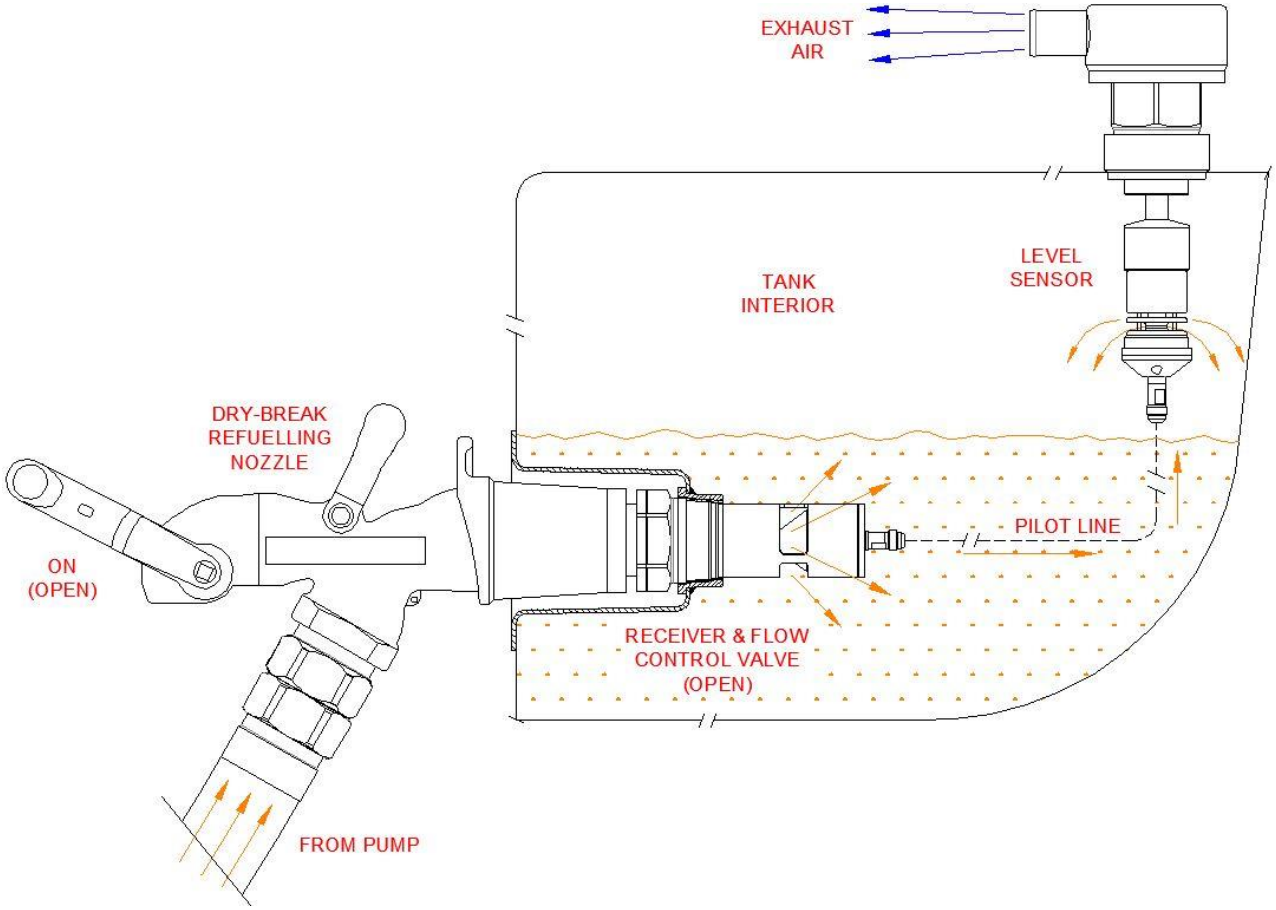

Figure 6 - Example of FillSafe Zero Install - Tank Filling

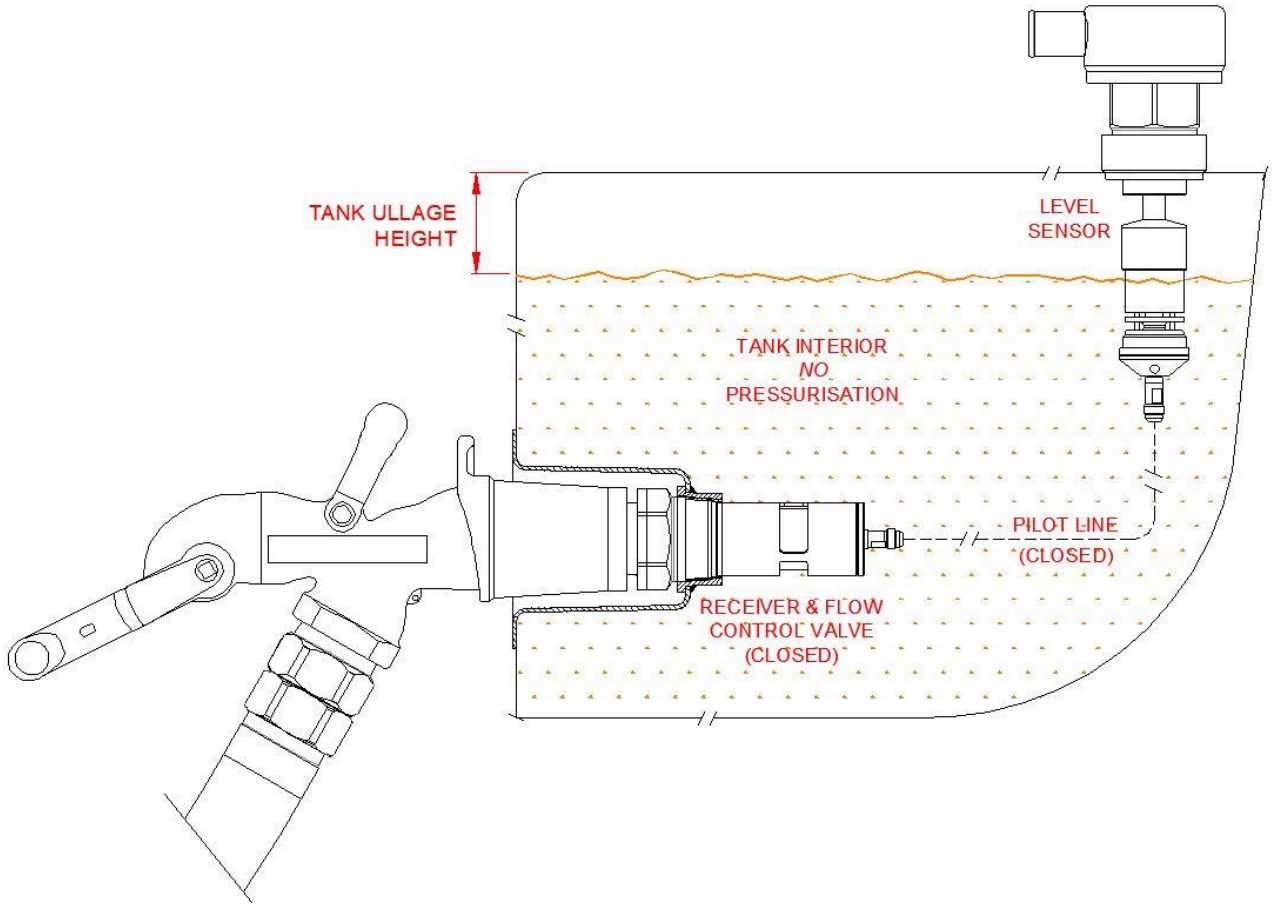

Figure 7 - Example of FillSafe Zero Install - Tank Full

Figure 8 illustrates an example of a FillSafe Zero Level Sensor – BVLS80 – compatible with a BFCV50 and BFTFCV50 model Flow Control Valves. The Flow Control Valve is connected to a Level Sensor via the Pilot Line routed ***internally*** (within) the tank. The BFCV50 and BFTFCV50 model Valves are ***not*** compatible with the Banlaw non-venting Level Sensors, i.e. the BLS series (e.g. BLS100B, etc.), as these only accommodate an ***external*** Pilot Line.

Figure 8 - Example of a Level Sensor (BVLS80 shown)

Figure 9 illustrates an example of a genuine Banlaw FillSafe Zero (Internal) Pilot Line. This specification of the Pilot Line has been selected and tested by Banlaw for routing within a diesel fuel tank. ***The use of a Pilot Line that does not comply with Banlaw specifications is not condoned by Banlaw, and may cause cause improper operation and inferior safety and reliability of a FillSafe Zero system*** – refer also section 4.1.

Figure 9 - Banlaw FillSafe Zero Internal Pilot Line

3 IMPORTANT RESTRICTIONS ON THE USE OF THIS PRODUCT

1. The safe installation and subsequent operation of a Banlaw product relies on the completion of all necessary ***"due diligences"*** for the assessment of the Banlaw product(s) being suitable for the intended application(s). Such an assessment is best achieved through the mutual 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. The Banlaw FillSafe Zero Flow Control Valves incorporate **internal** components manufactured from **aluminium**. Products containing **external (exposed) aluminium** are typically unsuitable for use within an underground coal mine, or otherwise within an area where the use of external aluminium components (or other materials within the product) are prohibited for use in such areas in accordance with applicable governances.

1. Unless noted otherwise by Banlaw, the Banlaw FillSafe Zero tank overfill protection (OFP) system has *not* been assessed under any Regulatory or Industry Standard, Code, Directive, Guideline or other governance which may apply to the use of this product in applications where a governance applies. Please consult Banlaw prior to installation if in doubt.
2. The male refuelling coupling (refuelling nozzle adaptor, or fuel "receiver") fitted to the front of a Banlaw FillSafe Zero Flow Control Valve must only be used (connected with) a compatible nozzle. **No alternative nozzle, fluid coupling or other attachment should be used with this product.**
3. The Banlaw FillSafe Zero system is designed for use only with ***clean*** (i.e. filtered) automotive grade diesel fuels, including commercial bio-diesel blends. This Banlaw product is ***not*** recommended for use with waste diesel fuel, or with diesel fuel containing contamination levels beyond those stipulated by governances and guidelines such as the current Worldwide Fuel Charter (WWFC) and fuel quality requirements of modern diesel engine manufacturers. *The use of this product with fuel of higher contamination levels may cause the improper operation (failure) of the product and other detrimental effects.* Banlaw recommends adequate fuel contamination controls (e.g. filtration) for all fuels passing through the Banlaw FillSafe Zero system.
4. Specifically for *"Arctic"* model Valves, noticeable physical changes (e.g. clouding, additive drop-out, agglomeration, thickening, etc.) in the diesel fuel passing through the Valve may cause reduced functionality of the Valve and the FillSafe Zero OFP system.

This product is unsuitable for use with AdBlue (DEF) or with an alternative fluid (or substance) whose properties may affect the safety, function or reliability of the product. Please consult with Banlaw to confirm fluid compatibility if in doubt.

4 PRODUCT SPECIFICATIONS

BANLAW BFCV50 and BFTFCV50 MODEL FLOW CONTROL VALVES	
Max. Diesel Flow Rate LPM (GPM)	800LPM (211GPM)
Min. Flow Rate LPM (GPM)	100LPM (26GPM)
Operating Temp. Range °C (°F)	-10°C (14 °F) to 55°C (131°F) *"Arctic"* (-CT) models; -51°C (-60°F) to 55°C (131°F)
Max. Internal SWP kPa (psi)	2,500kPa (363psi)
Compatible Fluid Types	***Clean*** (filtered) Automotive Diesel Fuels, incl. Bio-Diesel Blends
Principal Material Composition	Zinc Plated Steel, Aluminium, Brass, Stainless Steel, Viton®, Acetal, Fluorosilicone, Nylon (Dust Cap)
Process Connection (Outlet)	2" NPT (M)
Pilot Line Port Connection	9/16" JIC (M) - Swivel
Nom. Mass of Flow Control Valve	1.7kg (3.7lb)

Legend: **"SWP";** Maximum recommended Safe Working Pressure
"LPM"; Litres per minute (volumetric flowrate)
"GPM"; US Gallons per minute (volumetric flowrate)
"Max."; Maximum (upper limit)
"Min."; Minimum (lower limit)

Notes:

1. All pressure data refers to the ***internal*** fluid pressure, where each product is in "as new" condition.
2. The core function of *"Arctic"* model valves has been tested by an independent laboratory at -51°C (-60°F). These Valves are fitted with fluid seals rated for operation below -60°C (-76°F).

4.1 FillSafe Zero Pilot Lines

The Banlaw Vented Level Sensor (BVLS model) may be connected to the Banlaw Flow Control Valve 2" (e.g. BFCV50, BFCV50R, etc.) via an ***internal*** Pilot Line (i.e. routed within the tank), or to an array of alternate Flow Control Valves (e.g. BFCV23, BFCV43, etc.) via an ***external*** Pilot Line (i.e. routed external to the tank).

- **Specifications (including limits/thresholds) apply to all FillSafe Zero Pilot Lines**, so please contact Banlaw at time of order to ensure correct Pilot Line selection.
- Please refer to the applicable **Banlaw FillSafe Zero System Installation Procedure** for details on the proper installation & commissioning of internal and external Pilot Lines.
- **The use of a non-genuine Banlaw Pilot Line, or otherwise, the use of a Pilot Line which does not conform with Banlaw specifications may cause the improper, unsafe and unreliable operation of the FillSafe Zero system.**

Figure 9 illustrates some of the key specifications of an *internal* Pilot Line, namely the means of mechanical protection to help avoid excessive wear & tear, rupture, and other damage to the hose assembly. ***Internal Pilot Lines are especially susceptible to damage (and subsequent failure) sustained within diesel fuel tanks due to contact with such structures as internal baffles, and also fatigue due to "flexing" of the line in response to the movement (i.e. turbulence and sloshing) of the fuel.*** Reference to the **Banlaw FillSafe Zero System Installation Procedure** must be made ***prior*** to any attempt to install an internal Pilot Line assembly to best avoid such failure modes. The Installation Procedure also includes hints on the most appropriate methods, tools & accessories to use.

Unless otherwise noted by Banlaw, some of the key ***internal*** Pilot Line specifications and requirements include:

1. Supplied by Banlaw, or otherwise manufactured strictly in accordance with Banlaw specifications.
2. Minimum ID (bore); 8mm (5/16").
3. Maximum recommended overall length; 3.5m (11.5'). Contact Banlaw for applications requiring an extended length.
4. Maximum recommended vertical head; 2.5m (8.2') between Flow Control Valve location (lower) and Level Sensor location (top). Contact Banlaw for applications requiring an extended head height.
5. Minimum (internal) safe working pressure (SWP); 2,500kPa (25 bar, 363psi).
6. Installed within a diesel tank;
    a. To achieve the *minimum* possible Pilot Line length. Excess Pilot Line length should be avoided.
    b. Via a routing (pathway) which minimises the probability for contact between the Pilot Line and structures within the tank, e.g. baffle plates, structural members, drop pipes, etc.
    c. If passing through a baffle plate port (or similar opening), every effort is made to ensure the Pilot Line is not held against the edge of such ports.
    d. Any twisting or sharp (small) radius bends of the Pilot Line must be avoided. The *swivel* action of the Pilot Line connections at the base of a BVLS model Level Sensor and at the rear of a 2" BFCV50 model Flow Control Valve are to be tested (verified) prior to connecting the Pilot Line – refer relevant PDS's.
    e. Other than the weight of the Pilot Line itself, no additional mass or tension (stretch) shall be added to the hose assembly.

5 INSTALLATION & COMMISSIONING GUIDELINES

This Installation & Commissioning 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 this Flow Control Valve assembly, e.g. BFCV50, etc. Whilst other FillSafe Zero products are mentioned – e.g. Level Sensors and Pilot Lines – end-users must refer to ***separate*** Banlaw documentation covering each product *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 FillSafe Zero system.
4. Conduct all necessary measures to ***prevent the ingress of contamination*** into the Banlaw Flow Control Valve and other parts.
5. Only engage threads of the same thread type. Ensure all threaded connections are clean and in good condition. Avoid over-tightening.
6. An appropriate thread sealant is recommended on the 2" NPT (M) process connection. Use ***sparingly*** and avoid excess use of Loctite and similar products – *residual thread sealants etc. may cause contamination and malfunction of the FillSafe Zero system*. No thread sealant is required on the JIC Pilot Line connection.

7. Use only proper ***handtools*** for the installation of all components – e.g. Banlaw **AUSRSOCKET**. Avoid the use of power or impact tools, and adjustable wrenches (e.g. stilsons).
8. 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.

5.1 Pre-Installation Guidelines

- The BFCV50 Flow Control Valves may be operated in any angular position, i.e. ± 90° from the horizontal.
- The outlet (i.e. back end) portion of the Flow Control Valve cannot be installed within a Pipe or some other "extended" socket or extension (>70mm, 2.7") which may impede the flow of diesel fuel from the array of circumferential ports on the forward (upstream) side of the Piston. It is recommended the Valve be installed within a 2" NPT ***half*** socket (***half*** coupling) – refer Figure 10.

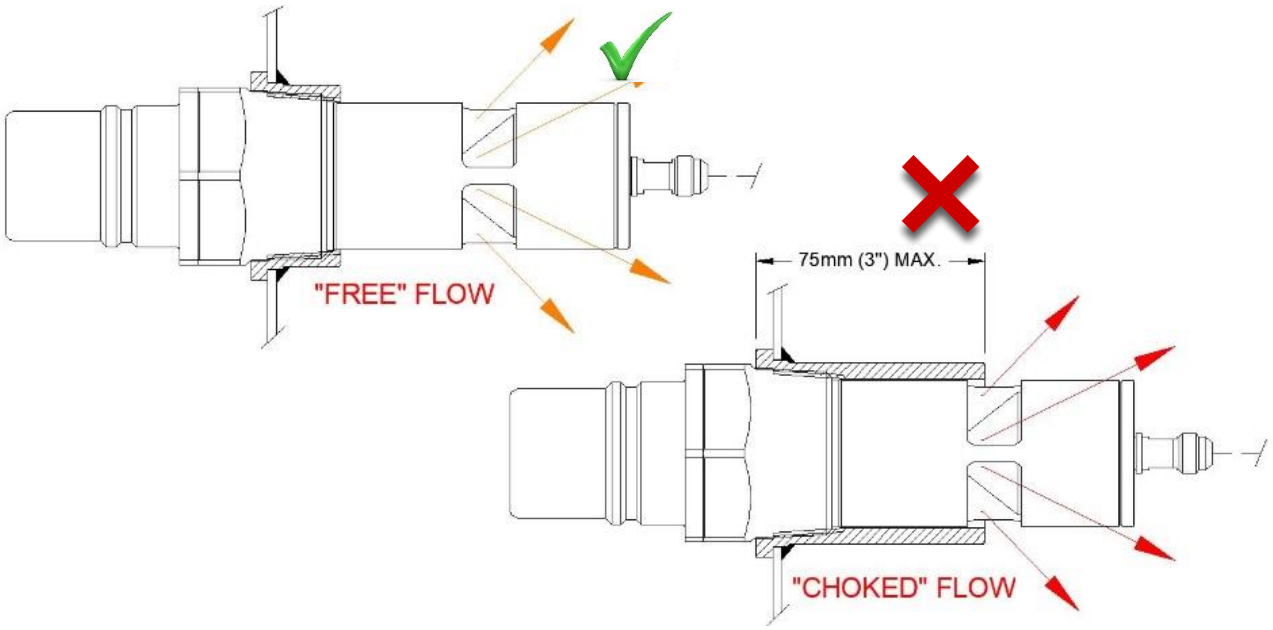

Figure 10 - Restrictions on Length of 2" NPT (F) Coupling for Valve

5.1.1 Fuel Discharge from Valve and Diesel Foaming

Figure 11 provides a basic illustration of the fuel discharge array from the Valve. This "spray-pattern" discharge requires consideration of 2 important issues which may affect the function and reliability of the FillSafe Zero OFP system;

1. **Diesel foaming;**
    a. The spray-like discharge of diesel fuel will increase the aeration (foaming) of the fuel and may also increase the generation of static electricity (charge) within the fuel tank. It is therefore important every available effort is made to install the Valve as close to the base of the tank as possible. This way, the fuel discharge will be below the surface of the liquid diesel for a longer period during refuelling of the tank minimising foaming and static charge. In smaller tanks or where the Valve position cannot be moved lower, the foaming may delay the actuation of the Level Sensor, cause some spillage of fuel from the Level Sensor or Tank Vent(s) until such time as *liquid* fuel actuates the Sensor, allowing the Valve to close.

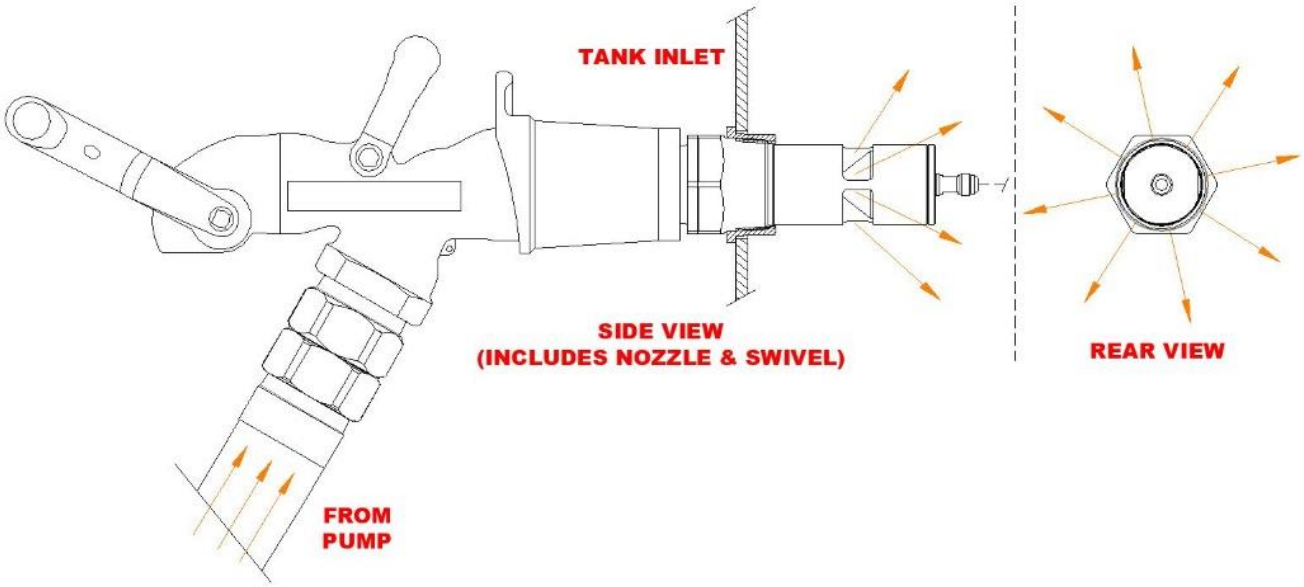

Figure 11 - Fuel Discharge from Valve

2. Location of Valve relative to Level Sensor and Tank Vent(s);

a. Figure 12 illustrates the Valve discharge impacting the Level Sensor or Tank Vent(s). This situation should be avoided as it may cause;

i. Discharge of liquid fuel from the venting passage(s) to atmosphere during tank refuelling.

ii. Malfunction of the Level Sensor and/or Tank Vent(s).

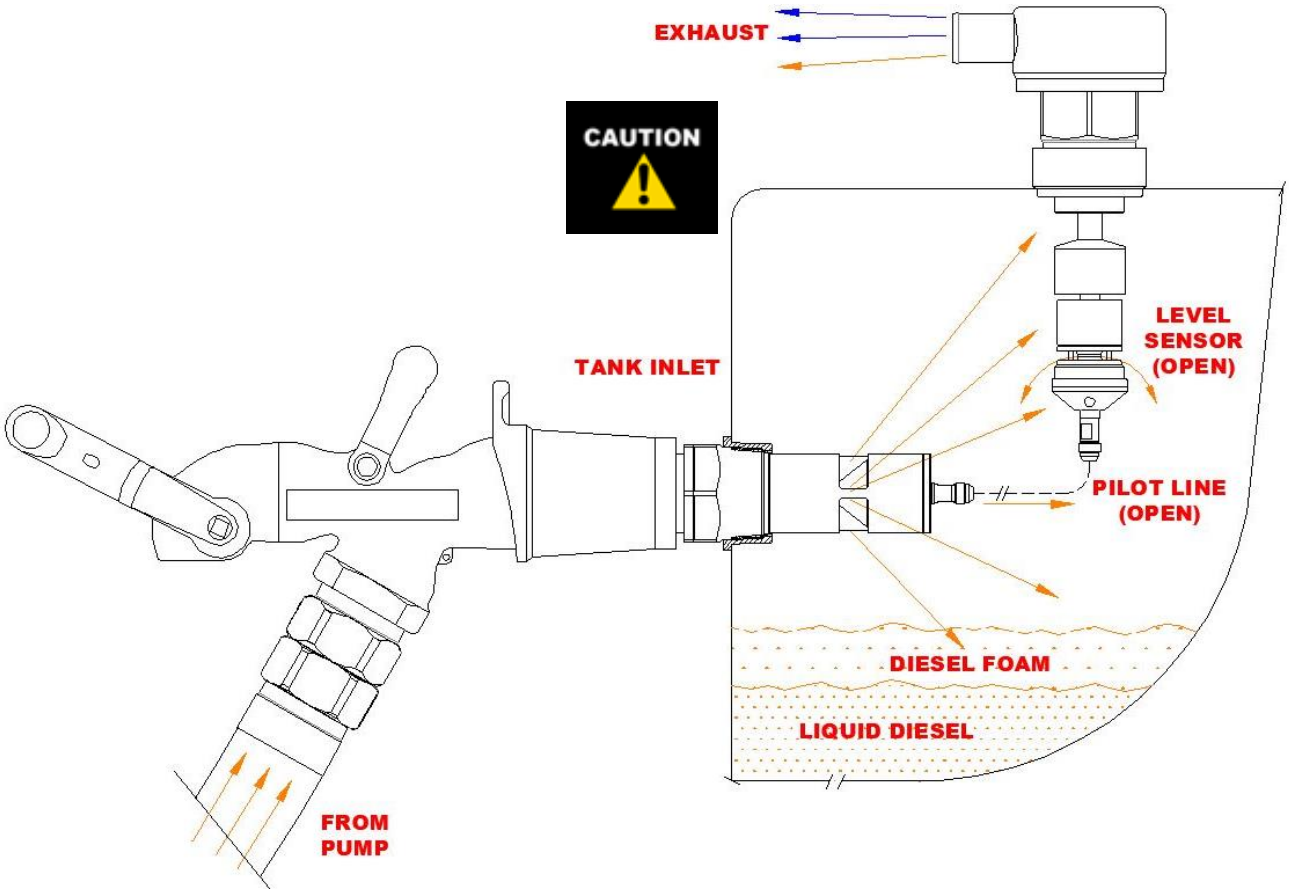

Figure 12 - Fuel Discharge Impacting Level Sensor (BVLS series shown)

5.2 Installation Procedure

CAUTION

In preparation for the installation of this new FillSafe *Zero* Valve, *the fuel level within the tank must be **below** the tank fill point.* This will prevent the discharge (spillage) of fuel from the tank once the existing Valve, Receiver or other tank refuelling coupler is removed. If necessary, drain fuel from the tank into a clean reservoir for reuse, or otherwise dispose of in a responsible manner. The flow control valve (piston) within the BFCV50 is not designed nor intended to act as a non-return (check) valve.

1. Complete all necessary hazard mitigation, monitoring and control actions as per the JHA.
2. Once the tank is ready to accept this new Flow Control Valve, remove the Valve from its packaging (leave within packaging until just prior to install). Remove any dust caps, plugs etc. from ports.
3. Check that the Valve piston is freely sliding within the Valve body.
4. Inspect the Pilot Line and Pilot Line connection for visual damage or defects. If condition is unsatisfactory, do ***NOT*** attempt to repair a damaged Pilot Line – instead replace with a new Pilot Line assembly constructed *in accordance with Banlaw specifications*.
5. Verify 9/16" JIC (M) pilot line connection at rear of Valve "swivels" (rotates) when moderate torque is applied by hand. If jammed or excessive torque is required, do ***NOT*** install this Valve but instead replace the Valve assembly and return the faulty Valve assembly to Banlaw for warranty assessment.
6. Using suitable hand tools – i.e. 19mm and 10mm spanners – secure the Pilot Line to the Valve – refer Figure 13. ***Tighten securely but do not overtighten***. Typical recommended tightening procedure (torque) for a 9/16" JIC connection is; hand tighten firmly (up to wrench resistance), then tighten using hand tools by an additional 1.5 hex flats (i.e. 90°).

Figure 13 - Tightening of JIC Pilot Line Connection

7. Ensure the (unused) ***external*** Pilot Line port on the BVLS series Level Sensor is plugged (sealed).

Figure 14 - BVLS Series Level Sensor External Pilot Line Port (sealed)

8. Ensure the Receiver Dust Cap (AUS23C) lanyard is secured by installing the supplied spring loaded clip around the ***top*** (major diameter) of the 2" NPT (M) thread – refer Figure 15. Alternatively – particularly with recessed tank fill points (i.e. "Shells") – the spring clip may instead be removed and the lanyard loop secured adjacent the tank fill point using a secure fastener. Banlaw recommends the Dust Cap lanyard is properly secured to help prevent discarding of the Dust Cap.

9. Apply thread sealant – e.g. Loctite 567 – ***sparingly*** to the 2" NPT (M) thread of the Valve. Ensure the mating 2" NPT (F) port on the tank inlet is in good condition, clean, dry and free from any debris and contamination. Align the Valve concentrically with the port and carefully install the Valve and attached Pilot Line into the tank port. Using a 63.5mm AF hex long socket – e.g. Banlaw AUSRSOCKET – place the socket ***fully*** onto the Valve (refer Figure 15) and tighten into the port as per;

    a. Hand tighten firmly.

    b. Tighten by no more than an additional 6.5mm (1/4") thread length.

Note:

- Avoid overtightening.
- Do ***NOT*** use power tools, i.e. impact wrenches etc.
- Do ***NOT*** grip the front cylindrical section of the Receiver for tightening or untightening purposes (refer Figure 16 – use only the ***full*** hex of the Valve body (refer Figure 15).

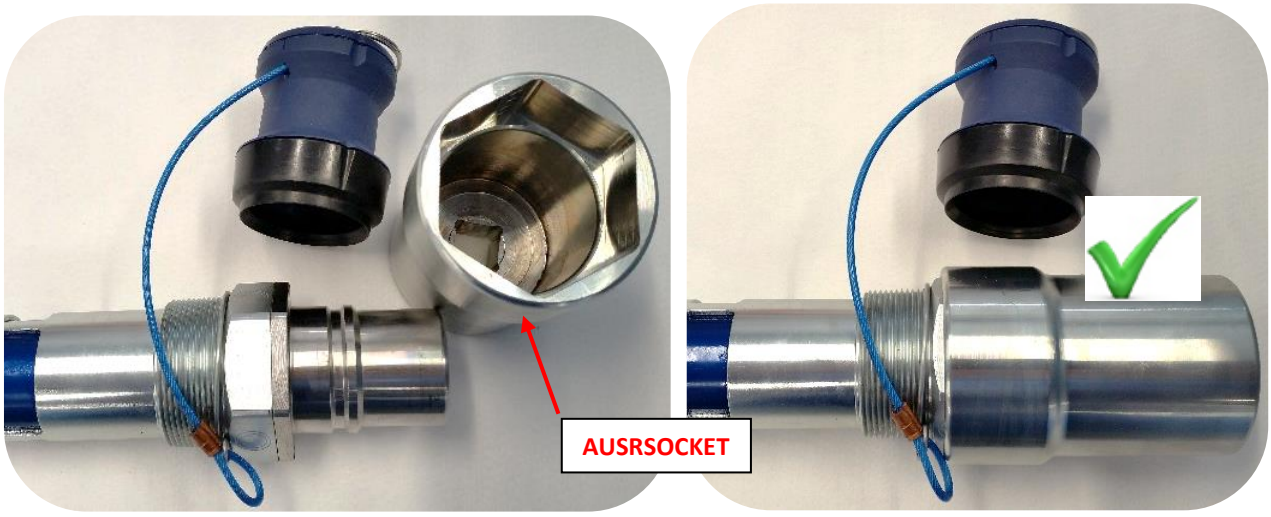

Figure 15 - Banlaw AUSRSOCKET used to Install BFCV50 Valve

Figure 16 - Improper use of Hand Tool on BFCV50 Front End

10. Fit the Dust Cap to the Receiver – refer Figure 17.

Figure 17 - BFCV50 Installed (Dust Cap Fitted)

5.2.1 Installation – FuelTrack (BFT) Series Flow Control Valves

Banlaw FuelTrack™ "auto ID" flow control valves – e.g. BFTFCV23 and BFTFCV23R – incorporate a unique serial ID tag device, whose ID tag (code) is assigned to the tank or plant equipment (asset) onto which it is installed. Once the tag is assigned, the onsite Banlaw FuelTrack management system (FMS) automatically identifies the code and assigns any fuel dispensed into the tank/equipment to its asset number. FuelTrack incorporates a number of security features which include the prohibition of fuel dispensing into a tank/equipment which does not have a Banlaw BFT receiver fitted, or whose ID tag is not registered within the FMS database. It is therefore important that **the installation process of a BFT series flow control valve includes the entry of the unique receiver tag into the FMS database** – please liaise with your site FMS manager (e.g. fuel champion) for assistance. Figure 4 illustrated an example (only) of a BFT ID tag, clearly marked on the receiver.

5.3 Commissioning

1. ***Pre-commissioning checks*** for a dry-break diesel refuelling system comprising FillSafe Zero;
    a. Ensure ***all*** dry-break nozzles to be used with the installed system are compatible with the Banlaw Receiver fitted to the FillSafe Zero Flow Control Valve – refer section 1.
    b. Ensure the process conditions will be maintained within the Valve Specifications – refer section 4.
    c. Inspect the tank vent breather for excessive contamination ingress, which may restrict the free flow of exhaust air duting tank refuelling. If a breather hose is installed, inspect the hose outlet for contamination build-up and the hose of damage, kinking and distortion which could also affect airflow. If a filtered breather system is used, inspect the serviceable filter element for condition and replace if necessary.

Inspect the fuel tank(s) for signs of visible damage, distortion and fuel leakage which may indicate the past over-pressurisation of the tank(s) due to a failure with the overfill protection system previously used. *If the root cause of such failure has not been identified and will not be mitigated by the installation of this new Valve, commissioning of the new Valve shall **not** commence until all such failures are identified, mitigated, controlled and/or managed.*

2. When this FillSafe Zero Valve assembly is completely installed, and all other refuelling "system" components are all properly installed and awaiting commissioning, the initial (maiden) tank refuelling event shall serve as the means of commissioning the FillSafe Zero system.
3. ***Prior*** to any attempt to refuel the tank, ensure the fuel level is below the SFL and subsequently, the OFP system will permit fuel to enter the tank for a period of no less than approx. 30secs (i.e. adequate time for system commissioning).
4. For ***FuelTrack "auto ID" Valves***, (only) e.g. BFTFCV50 and BFTFCV50R;
    a. Ensure the unique receiver tag ID (code) is loaded into the onsite FMS database and assigned to the applicable plant equipment (tank) asset number.
    b. Once the mating Banlaw FuelTrack 800 series dry-break nozzle is connected, verify the local FMS depot (controller) reads (receives) the unique ID tag by referring to the depot screen.
5. Remove the Receiver Dust Cap from the Receiver and securely connect a Banlaw (or other compatible) dry-break refuelling Nozzle to the Receiver. Now disconnect and reconnect the nozzle to confirm ease of engagement with the receiver. In the event of a problem connecting or

disconnecting the nozzle, please refer to section 8. Prepare to refuel the tank as per ***normal refuelling procedure.***

6. Any air entrained within the FillSafe Zero system will need to be bled from the system until the system is fully operable. This is best achieved by throttling (reducing) the maximum achievable refuelling flowrate to approx. 50% and steadily oscillating the flowrate between zero and 50% - this can be readily achieved by manually cycling the operating (open/closed) handle of the refuelling nozzle, or similar means. Continue this for approx. 10-15sec.
7. Once the system is completely bled, the nozzle can be fully opened. If the nozzle automatically closes ***prior*** to the tank reaching capacity and the FillSafe Zero system closing, refer to section 8. Do ***NOT*** manually or otherwise forcibly maintain the nozzle operating handle in the ON (open) position. Automatic shut-off of a Banlaw nozzle prior to the FillSafe Zero system closing is an issue known as premature nozzle shut-off, and should be addressed/corrected in accordance with Banlaw guidelines – contact Banlaw for further guidance.
8. Whilst the tank is being refilled, carefully check the FillSafe Zero system for any signs of fuel leakage. Mark/record any sources of leakage for prompt corrective action after the tank is refilled. If the degree of leakage is unacceptable, manually close the refuelling nozzle, disconnect it from the receiver and rectify the leak. If the fuel leakage occurs from between the nozzle and receiver, please refer to section section 8.
9. As the tank level approaches the nominated capacity (or SFL), remain next to the refuelling nozzle. *Closely monitor the fuel level to ascertain whether the FillSafe Zero OFP system automatically terminates the inflow of fuel into the tank at the required level.* In the event of a failure, ***promptly*** close the refuelling nozzle or otherwise stop the fuel supply before the tank(s) is overfilled – refer section section 8. ***Only for this commissioning procedure***, manually reopen the Banlaw nozzle and hold it fully open for approx. 5sec. Confirm negligible (no greater than approx. 10LPM/4GPM) fuel can enter the tank by observing the flow meter measuring fuel dispensed via the nozzle. If additional fuel enters the tank, please refer to section 8.
10. At the completion of refuelling, remove the Nozzle from the Receiver and return the Nozzle to its nominated holster or storage location. Replace the Receiver Dust Cap on the BFCV50.
11. After the above commissioning procedure has been successfully completed, the FillSafe Zero system may be placed into service. A system that does not perform correctly should not be placed into service, but instead quarantined until the problem is identified and rectified.

In the event the root cause(s) of the OFP system failure cannot be identified and rectified prior to the next refuelling event, ***alternate means shall remain in place to prevent overfilling of the tank*** until such root cause(s) are identified, mitigated, controlled and/or managed.

6 PRINCIPLES OF OPERATION

The FillSafe Zero system itself is fully "automated" and requires no manual operation or manipulation. Whether using a Banlaw FuelTrack system, a "standard" Banlaw dry-break system, or an alternative dry-break system, the installation of the FillSafe Zero system onto a tank requires ***no change to the normal operating procedure of the dry-break refuelling system*** (i.e. the procedure by which a tank is normally refuelled).

It is the typically a legal responsibility of the person(s) who has identified the potential hazard to isolate the part of the system whose continued may result in an unacceptable risk to health, safety and environment. Complete the applicable procedure for the proper and positive isolation of the system and inform worksite management immediately.

Refuelling couplings, e.g. nozzle and receiver, that are contaminated with dust and other buildup ***must be cleaned prior to use***. This will help prevent;

- Contamination entering the FillSafe Zero system, subsequently increasing the probability of system failure.
- Contamination from entering the fuel stream, increasing the probability of engine fuel system problems.
- Accelerated wear & tear of mating parts.
- Damage to fluid seals, creating fuel leakage.
- Difficulty in properly engaging/connecting the nozzle and receiver.

The following process flow diagram illustrates a typical operating sequence for a dry-break refuelling system incorporating a Banlaw (or similar) refuelling nozzle refilling a tank fitted with FillSafe Zero (OFP system). This sequence is a guideline and is not meant to replace an existing safe refuelling procedure for a specific application. Equipment that is damaged, leaking or otherwise unfit for operation must not be used, but must instead be replaced or repaired prior to use of a diesel refuelling system.

1	REMOVE RECEIVER DUST CAP. REMOVE NOZZLE FROM ANCHOR OR HOLSTER
2	RETRACT NOZZLE ACTUATOR AND PUSH ONTO RECEIVER. RELEASE ACTUATOR AND ALLOW IT TO RETURN FORWARD. PULL BACK SLIGHTLY ON NOZZLE TO CONFIRM SECURE CONNECTION WITH RECEIVER
3	START FUEL DISPENSING PUMP
4	MANUALLY OPEN REFUELLING NOZZLE. IF NOZZLE IMMEDIATELY SHUTS OFF, MANUALLY CYCLE NOZZLE BETWEEN OPEN AND CLOSED FOR APPROX. 2-3SECS. IF NOZZLE WILL STILL NOT REMAIN OPEN, CONFIRM TANK IS NOT ALREADY FILLED TO CAPACITY. IF NOT, REFER SECTION 8
5	ALLOW TANK TO REFILL. IF REQUIRED BY SITE REFUELLING PROCEDURE, WITNESS ENTIRE REFUELLING EVENT WHILST VISUALLY MONITORING RISING FUEL LEVEL
6	ONCE TANK REACHES CAPACITY, THE FILLSAFE ZERO LEVEL SENSOR WILL "CLOSE", PROMPTING THE FLOW CONTROL VALVE TO CLOSE. THE BANLAW NOZZLE WILL THEN PROMPTLY CLOSE. ENSURE NOZZLE OPERATING T-HANDLE IS LATCHED IN "OFF" (CLOSED) POSITION PRIOR TO DISCONNECTION
7	STOP FUEL DISPENSING PUMP. RETRACT NOZZLE ACTUATOR AND DISCONNECT FROM RECEIVER. REPLACE RECEIVER DUST CAP AND RETURN NOZZLE TO STORAGE HOLSTER/ANCHOR

Figure 18 - Tank Filled with Nozzle Closed (OFF)

7 MAINTENANCE & SPARE PARTS

Banlaw product warranty is void in the event;

- Non-genuine spare parts are used for product repair/servicing.
- Repairs are carried out by unauthorised personnel.
- Any attempt is made to repair/service a product deemed as non-servicable by Banlaw.
- Products are subjected to abuse, tampering, neglect, or improper operation and maintenance.
- As per the terms and conditions of Banlaw product warranty - refer section 10.

The following genuine Banlaw spare parts are available to suit the BFCV50 and BFTFCV50 model Valves.

CAUTION

- To maintain the safety, performance and reliability of Banlaw products;
  - Only genuine Banlaw spare parts are to be used.
  - Products should not be tampered with or modified in any manner not endorsed by Banlaw.
- The Product Data Sheet (PDS) for the Receiver (Front End) Service Kits contains important information on the safe and proper installation of the Kit onto an existing Flow Control Valve. ***Please refer to the PDS for the Kit prior to installation.***

BANLAW PART No.		DESCRIPTION
Standard	*"Arctic"*	
AUS23C		Receiver Dust Cap
BFCV50-KIT	BFCV50-CT-KIT	Receiver (Front End) Service Kit - Mining
BFCV50R-KIT	BFCV50R-CT-KIT	Receiver (Front End) Service Kit - Rail
BFTFCV50-KIT	BFTFCV50-CT-KIT	Receiver (Front End) Service Kit – FuelTrack (auto ID) Mining
BFTFCV50R-KIT	BFTFCV50R-CT-KIT	Receiver (Front End) Service Kit – FuelTrack (auto ID) Rail
(Contact Banlaw)	*(Contact Banlaw)*	Internal Pilot Line assembly

Table 1 - Genuine Banlaw Spare Parts

Note:

When installed within a recessed tank fill point (e.g. Receiver Shell), it is often difficult to view the manufacturer (OEM) and part number of a "Receiver" assembly. This situation may arise when distinguishing between a Banlaw Check Valve Receiver assembly, e.g. BCVR23KR2 and a Banlaw FillSafe Zero 2" Flow Control Valve assembly, e.g. BFCV50. Figure 19 illustrates a visual means of identifying a ***FillSafe Zero Valve*** assembly – specifically the array of ***dimples*** (shallow holes) on the front face of the Receiver Body – which are present on both non-FuelTrack and FuelTrack (auto ID) Valves – refer also Figure 3. ***It is important to identify the correct Valve assembly when ordering Banlaw Receiver (front end) Service Kits.***

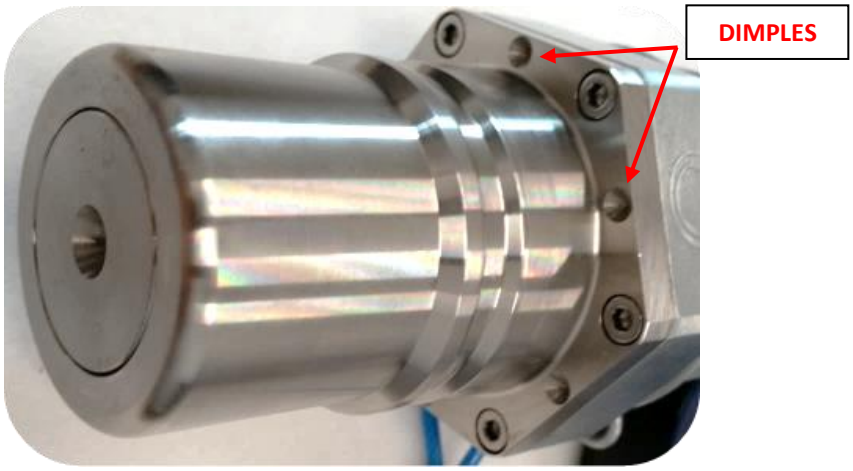

Figure 19 - Visual means of FillSafe Zero Flow Control Valve (BFCV50 shown)

7.1 Preventative Maintenance

The integrity (sound working condition) of refuelling couplings and tank overfill protection systems is critical to ensure all equipment can be operated in a safe and proper manner.

The working life of equipment depends on many factors, including the environment in which it operates. Dusty and dirty environments more prone to contamination buildup in equipment such as refuelling couplings cause accelerated wear & tear, as does excessive contamination within the fuel stream. Due to the many varied operating environments in which Banlaw equipment is used, any preventative maintenance information provided within this document shall be used a guide – unless noted otherwise.

These Valves contain relative moving parts and fluid seals which will wear after a period of use. Such wear will be accelerated by contamination within refuelling couplings and within the fuel stream itself. Excessive contamination within the fuel stream may even cause malfunction of the dry-break refuelling equipment and FillSafe Zero system.

The following preventative maintenance guidelines apply to these Flow Control Valves;

1. Ensure adequate controls and condition monitoring are in place to ensure the contamination levels (and other specifications) of your fuel supply are maintained – ***PREVENT*** poor quality fuel entering your sites fuel infrastructure and plant equipment.
2. Install inline (bulk) filtration on all diesel dispensing lines – contact Banlaw for advice.
3. Maintain the use of the Receiver Dust Cap and Nozzle Anchors, Holsters, or Dust Caps.
4. Remove any contamination from the dry-break Receiver (front end) ***prior*** to connecting a Nozzle.
5. Visually inspect the Receiver for excessive wear & tear or damage ***prior*** to connecting a Nozzle.

6. Install a new (genuine Banlaw) front end Receiver Kit;
    a. When the Receiver is excessively damaged.
    b. When fuel leakage occurs from the front (Poppet seal) of the Receiver.
    c. Otherwise, no later than every 3 years (mining) and 5 years (rail).
7. Replace the complete Valve assembly no later than every 8 years.
8. Replace the Internal Pilot Line no later than every 2 years.

7.2 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 a FillSafe Zero system 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.***

8 TROUBLESHOOTING

This section provides troubleshooting recommendations for the BFCV50 Valve and FillSafe Zero system when installed, operated and maintained in accordance with Banlaw guidelines.

PROBLEM	PROBABLE CAUSE AND SOLUTION
Premature nozzle shut-off at the *start* of or *during* the refuelling.	• Zero system requires bleeding (to remove air). With the supply pump running, cycle nozzle T-handle between ON and OFF several times to resolve this issue (also refer section 5.3). • Residual pressure in Pilot line. Cycle nozzle T-handle between ON and OFF several times to resolve this issue. • Pilot line blocked/obstructed, kinked or undersized. Check Pilot line size and connections for blockages or obstructions. Avoid the use of restricted bore style fittings, sharp elbows etc. within the Pilot Line routing between the Flow Control Valve and Level Sensor. • Level Sensor installed too high (over 4m (13')) above the Flow Control Valve). • The BVLS model "venting" Level Sensor is not installed correctly onto the tank, e.g. installed within an "extended" socket or riser pipe etc. Refer to BVLS requirements (i.e. PDS document) and rectify. • Float Valve at base of Level Sensor is "stuck" in the closed (up) position. Remove Level Sensor, investigate, identify root cause and rectify. • Faulty Level Sensor. Replace Level Sensor. • Fuel flow out of the Flow Control Valve outlet ports is "choked" – i.e. the Valve is installed within a pipe, extended socket, etc. or installed too close to the side of the tank or internal tank baffle (plate). Refer section 5.1. • Piston mechanism within Flow Control Valve is "stuck" in the closed (forward) or otherwise restricted in its "free" reciprocating action. Remove Valve, investigate, identify root cause and rectify. • Faulty Flow Control Valve. Replace Flow Control Valve. • Flow rate below recommended minimum. Increase delivery flow rate. • Flow rate above recommended maximum. Reduce delivery flow rate. • The shut-off setting of the nozzle & receiver *combination* is too "low" (i.e. too light) for this application. Contact Banlaw or your nearest Banlaw agent for advice.

	○ Unless instructed otherwise, Banlaw recommends a fuel Receiver with a "Light" spring setting when used with a FillSafe Zero system. • Faulty nozzle. Replace nozzle. • Excessive restriction to the "free" discharge of air from the tank's venting (breather). Check vent(s), vent exhaust, breather hose, and filtered breather system (if fitted) for the source of the restriction. Also confirm the venting system is rated for the tank refuelling flowrate. • Excessive restriction in the refuelling line connecting the Receiver to the Flow Control Valve. Upsize line size (bore) and remove short radius bends and unnecessary chokes to fuel flow. • Accidental/premature activation (closure) of the Level Sensor by fuel movement (sloshing) in the tank. Pause for 1 min and restart refuelling.
Nozzle shut-off and/or Flow Control Valve closure as tank approaches SFL (capacity).	• Accidental (premature) trigger of the Level Sensor by fuel movement in the tank. Pause for 1 min (60 seconds) to allow fuel to settle and try again. • Incorrect Level Sensor for the required ullage. Contact Banlaw or your nearest Banlaw agent for advice.
Fuel discharged from vent outlet during refuelling	• Fuel discharge from Flow Control Valve is impacting the tank venting passage – refer section 5.1.1 for guidance. • Pilot Line fuel flow discharged from Level Sensor into tank is impacting the tank venting passage. Refer to the Level Sensor PDS for guidance.
Tank overfilling	• Incorrect Level Sensor (length) for the required ullage. Refer Level Sensor PDS or contact Banlaw or your nearest Banlaw agent for advice. • Leakage from Pilot Line and/or connections. Check Pilot line and connections. • Float Valve within Level Sensor has failed to close. Remove Level Sensor, investigate, identify root cause and rectify. • Faulty Level Sensor. Replace Level Sensor. • Piston mechanism within Flow Control Valve is "stuck" in the open (rearward) or otherwise restricted in its "free" reciprocating action. Remove Valve, investigate, identify root cause and rectify. • Faulty Flow Control Valve. Replace Flow Control Valve. • Flow rate below the recommended minimum. Maintain flowrate within the recommended minimum and maximum range. • Excessive foaming of the diesel fuel during refuelling – refer section 5.1.1 for guidance.
Fluid Leakage between Nozzle and Receiver during Refuelling	• Worn Receiver and/or Nozzle preventing effective locking of Nozzle to Receiver. Install new Receiver Kit or replace and/or Nozzle. • Dirt and debris interfering with locking action and/or fluid seals. Clean both Nozzle and Receiver and ensure that the Receiver Dust Cap and Nozzle Plug are always used. • Front face of Receiver is damaged. Install new Receiver Kit. • Seals worn out on Nozzle. Replace Nozzle and return to Banlaw repair agent for servicing.

Fluid Leakage From Flow Control Valve – around Receiver	• Worn O'Ring between Receiver and adjacent Flow Control Valve Body. Install new Receiver Kit.
Fluid Leakage from front of Receiver	• Worn Poppet Seal in Receiver or debris on Seal. Remove Receiver sub-assembly and inspect seal. If damaged, install new Receiver Kit.
Nozzle accidently uncouples from Receiver during refuelling	• Incorrect combination of Nozzle and Receiver. Confirm compatibility. **Only use the correct combination of Nozzle and Receiver.** • Worn ball lock mechanism on Nozzle and/or Receiver. Inspect both equipment and replace if necessary. • Contamination within ball lock groove on receiver body. Clean thoroughly and reconnect nozzle. • Nozzle improperly coupled to Receiver. Try again.
Fuel drains from Tank via the Flow Control Valve	• The Piston within the Flow Control Valve is not designed nor intended to act as a normally closed check (one way) valve. Fuel must be drained within the tank to a level below the Valve prior to installing or removing the Valve or a Receiver Front End Kit.
No fuel issued via Nozzle	• Supply (source) tank is empty, or valve on fuel dispensing line closed. • Banlaw FuelTrack receiver ID tag (code) has not been entered into the onsite FMS database and/or properly configured within the database. • Banlaw FMS is installed at fuel dispensing location, but a non-Banlaw "Auto ID" Receiver is installed on the tank refuelling point. Contact Site Management • FuelTrack receiver ID tag has not been received by local FMS depot; a. Existing fault with auto ID dry-break system – investigate and rectify. b. Faulty auto ID chip in receiver – install new Banlaw receiver kit. c. Turn nozzle on (open) and verify code is read. d. Contact your onsite FMS "champion" or Banlaw Helpdesk.

9 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 the Banlaw FillSafe Zero system, please refer to section 4.

10 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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