Banlaw FillSafe™
FillSafe Zero 3" Inline Flow Control Valve

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 of the product to avoid potential health safety (WHS) & environment risks or property damage.

Figure 1 - FillSafe Zero BFCV80 Flow Control Valve

1 PRODUCT DESCRIPTION

The range of **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. BFCV80 model) – refer Figure 2;
- Banlaw **Level Sensor** (e.g. BVLS80 model);
    - Refer applicable documentation (e.g. PSG, PDS) for information on the range of FillSafe Zero Level Sensors.

Aspects of the FillSafe Zero products are subject to IP protection - Patents Pending PCT/AU2015/050802 and AU2016903857.

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.

This document covers the Banlaw FillSafe Zero **BFCV80** Flow Control Valve. Figure 2 illustrates the key external features of the Valve.

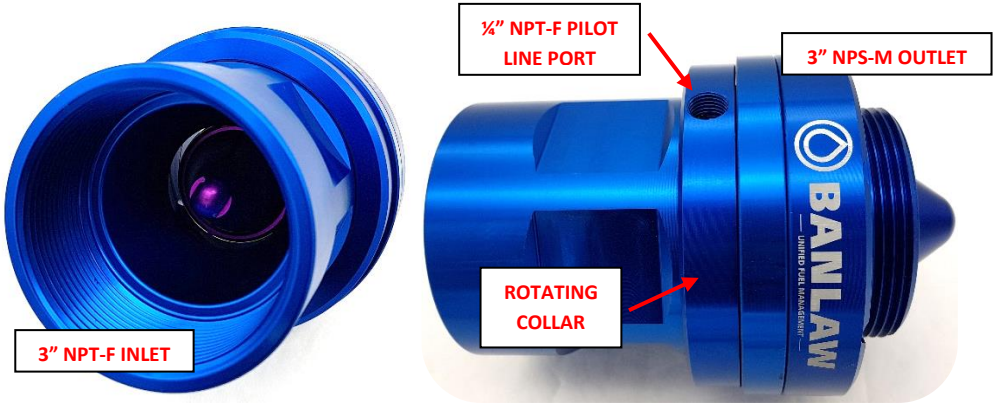

Figure 2 – Key External Features

Each Valve is marked with a serial code for identification and traceability purposes – refer Figure 3 as an example.

Figure 3 - Example of Unique Serial Code for Each Valve Assembly (VA171 shown)

The principal function of this Valve is to work in unison – or in communication - with the Banlaw FillSafe Level Sensor via the Pilot Line. Figure 4 illustrates an example of a FillSafe Zero system.

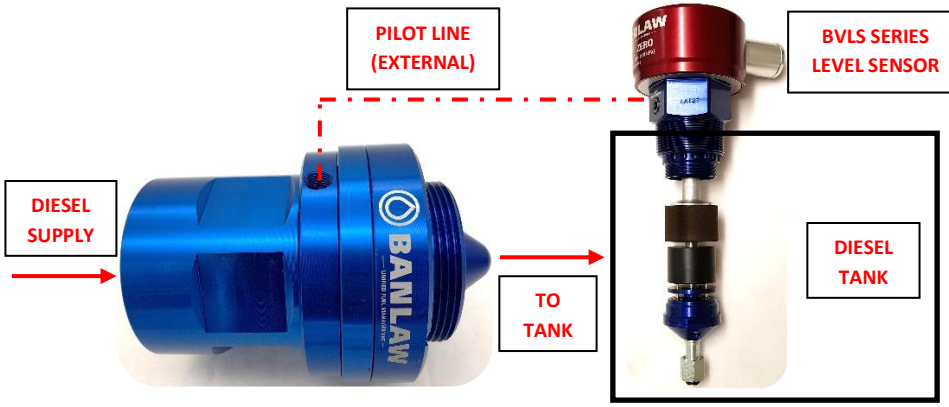

Figure 4 - Basic Example of a FillSafe Zero System

Key Advantages of the Banlaw FillSafe BFCV80 Flow Control Valve;

- Achieves a ***higher (diesel) flowrate capability*** and lower resistance to fuel flow (i.e. lower 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.
- The option of either a Banlaw "non-venting" Level Sensor (i.e. BLS model - Figure 6) or "venting" Level Sensor (i.e. BVLS model - Figure 5) via an ***external*** Pilot Line.
- Can be used with non-Banlaw (third party) Level/Float Sensors – please contact Banlaw for advice ***prior*** to installation of a Banlaw Valve.
- Suitable for extreme cold (*arctic*) climates – Valve incorporates fluid seals rated for operation down below -51°C (-60°F);
    - Basic function of the Valve tested by an independent (third party) test laboratory at -51°C (-60°F).

Figure 5 - Example of a Banlaw "Venting" Level Sensor (BVLS80 shown laying on its *side*)

Figure 6 - Example of a Banlaw "Non-Venting" Level Sensor (BLS100B shown laying on its *side*)

- Valve assembly incorporates a rotating collar, specifically designed to allow the ¼" NPT-F Pilot Line connection to be oriented in the desired location once the Valve has been installed. This feature allows the Pilot Line (e.g. hose) to be routed in the safest and most convenient manner.

The BFCV80 Flow Control Valve incorporates an internal Piston, responsive to the diesel fuel supply pressure and the "open/closed" status of the Level Sensor float valve;

- Open and closed status of the Piston actuated by the pressurised fuel flow.
- Piston forced into the closed position upon actuation (closure) of the float valve within the Level Sensor, causing closure of the trickle (bleed) 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.

Under normal operation, there are **2 operating states** of a FillSafe Zero system;

1. **Tank *Filling*;**
    a. Level Sensor float valve "**open**".
    b. Bleed flow through Pilot Line.
    c. Flow Control Valve "**open**".
    d. Liquid flow into tank.
2. **Tank *Filled* (full);**
    a. Level Sensor float valve "**closed**".
    b. **No** bleed flow through Pilot Line.
    c. Flow Control Valve "**closed**".
    d. Valve terminates (closes) liquid flow into tank.

Figure 7 provides an example of a FillSafe Zero system comprising a BFCV80 connected to a ***non-venting*** BLS series Level Sensor and a separate Tank Vent (BFV225 "filtered" 3µm Vent shown).

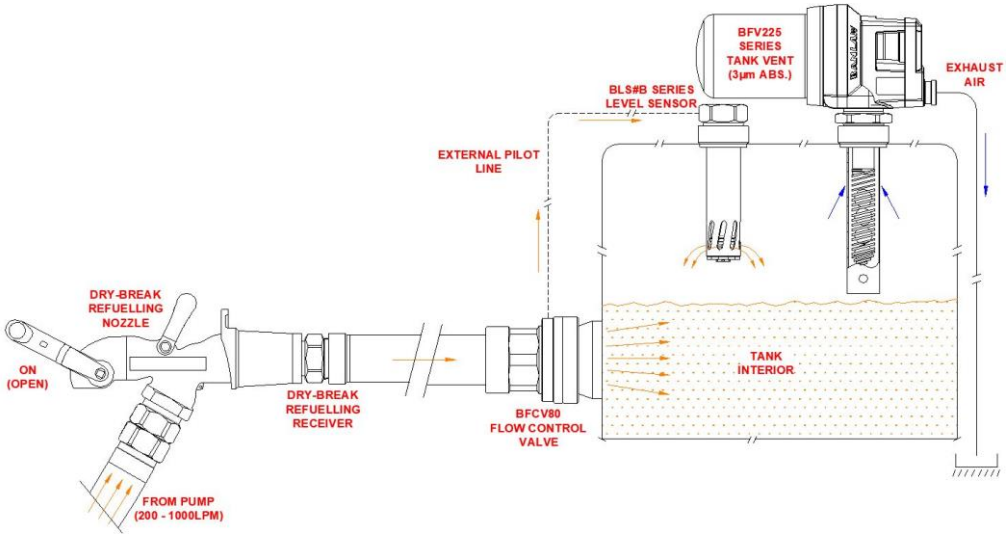

Figure 7 - Example System with BFCV80 and BLS Series Level Sensor and Tank Vent (3µm Filtered)

Figure 8 provides an alternate example of a FillSafe Zero system comprising a BFCV80 connected to a ***venting*** BVLS series Level Sensor and a BRFB01A remote filtered (3µm abs.) breather.

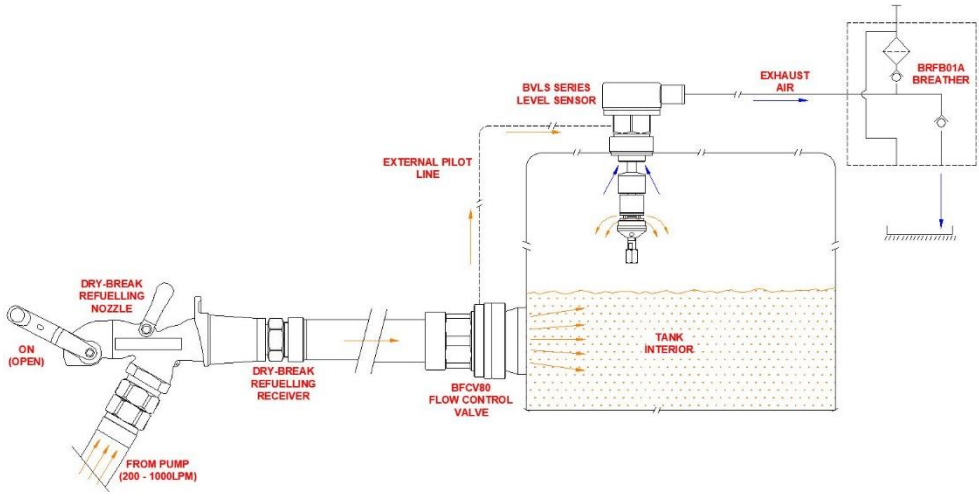

Figure 8 - Example System with BFCV80 and BVLS Series Level Sensor and Remote Breather (3µm Filtered)

Figure 9 now illustrates the example system in Figure 8 but with the tank filled.

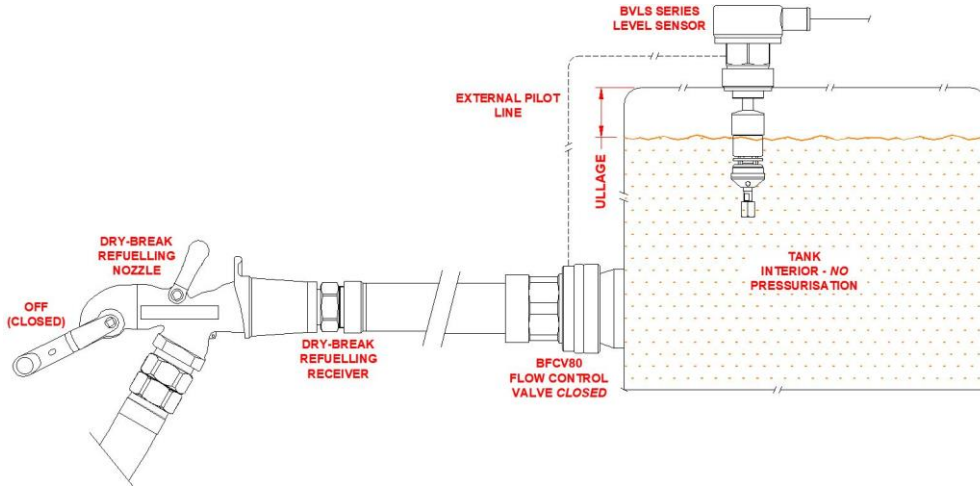

Figure 9 - Tank Filled

2 CRITICAL 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"*** 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. The Banlaw FillSafe Zero Flow Control Valves incorporate 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.

CAUTION

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 such a governance applies. Please consult Banlaw prior to installation if in doubt.
2. 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.
3. Specifically for *"Arctic"* (i.e. cold temperature) environments, 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.

Note:

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.

3 PRODUCT SPECIFICATIONS

BFCV80 FLOW CONTROL VALVE	
Max. Diesel Flow Rate LPM (GPM)	950LPM (251GPM)
Min. Flow Rate LPM (GPM)	200LPM (53GPM)
Operating Temp. Range °C (°F)	-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	Anodised Aluminium, Fluorosilicone, Zinc Plated Steel
Process Connections (Outlet)	3" NPT-F (Inlet), 3" NPS-M (Outlet)
Pilot Line Port Connection	¼" NPT-F
Nom. Mass of Flow Control Valve	2.4kg (5.3lb)

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 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 **BFCV80** Flow Control Valve. 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 their 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 3" NPT inlet 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 or the 3" NPS-M thread (O'ring seal used).
7. Use only proper ***hand tools*** for the installation of all components. Avoid the use of power or impact tools.
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.

4.1 Pre-Installation Guidelines

The BFCV80 Flow Control Valve can be installed in any orientation, i.e. at any angle, as per Figure 10.

The BFCV80 Valve may be installed directly onto the tank inlet port (3" NPS-F) or "inline" within a piping system leading into the tank inlet. All possible means shall be made to install the Valve as close to the tank inlet as practicable.

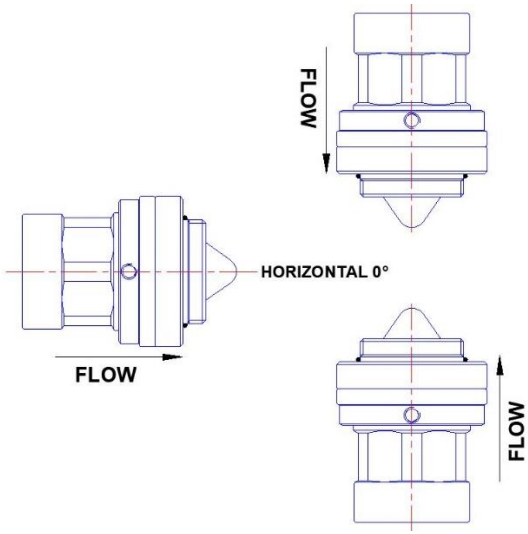

Figure 10 - Angular Limits of Valve Operation

Where ever possible, process connections to the BFCV80 inlet and outlet should avoid sudden enlargements and contractions – i.e. sudden changes in flow area (excepting the tank inlet port). The use of connections with more controlled flow area transitions will improve the overall performance of the Valve and help to maximise the flow efficiency of the refuelling system. **The use of short (sharp) radius bends and other unnecessary "chokes" should be avoided.**

Note:

As per Figure 10 the BFCV80 may be operated at any angle, however to improve reliability, **all reasonable means shall be made by end-users to operate the Valve as close to horizontal as possible.**

4.1.1 External Pilot Lines

Important limitations apply to the **Pilot Line** – please also refer to Banlaw document PRH-OFP-30 for further detail. Internal Pilot Lines are incompatible with the BFCV80 Valve. **External Pilot Lines** used with a BFCV80 shall comply with the following key requirements;

1. Supplied by Banlaw, or otherwise manufactured strictly in accordance with Banlaw specifications.
2. Recommended hose specification;
   i. AS/SAE 100 R1AT, or 100 R2AT.
   ii. Rated to environmental and process temperature range.
3. Minimum ID (bore size);
   i. 3/8" (DN10) up to a maximum length of 4m (13').
   ii. ½" (DN12) up to a maximum length of 10m (33').
4. Maximum recommended vertical head; 4m (13') between Flow Control Valve location (lower) and Level Sensor location (top). Contact Banlaw for applications requiring an extended head height.
5. Hose couplings (crimped); ¾" JIC-F (or as per other Banlaw recommendation).
6. Minimum (internal) safe working pressure (SWP); 2,500kPa (25 bar, 363psi).
7. Installed external to the diesel tank;
   i. To achieve the *minimum* possible Pilot Line length. Excess Pilot Line length should be avoided.

ii. Adequately supported using hose clamps (or similar) – refer Figure 11.

iii. Via a routing (pathway) which minimises the probability of damage due to sharp edges, impact, excessive wear & tear, and relative movement (e.g. rubbing) between the hose and another surface. Any potential contact with sharp edges or movement against a surface should be mitigated by improved routing or support of the hose, or by inclusion of a protective sheath (outer cover) over the hose.

iv. Any twisting or sharp (small) radius bends of the Pilot Line must be avoided.

v. Other than the weight of the Pilot Line itself, no additional mass or tension (stretch) shall be added to the hose assembly.

vi. Routing between 2 relative moving surfaces, e.g. through an articulated region of a vehicle (e.g. front-end loader, etc.), should be avoided where possible. If not, routing and support of the hose over this region must be as per the hose OEM guidelines for such applications to avoid accelerated wear and fatigue of the hose.

Figure 11 - Example of External Pilot Line Retention

4.2 Installation Procedure

CAUTION

Conduct a Job Hazard Analysis (JHA) prior to commencement, including the positive isolation of any energy sources (e.g. fuel pressure). Ensure the installation of the BFCV80 does not create unexpected and unmanaged risks.

Figure 12 - 3" NPS-M Outlet and O'Ring (BS238 FVMQ)

1. Complete all necessary hazard mitigation, monitoring and control actions as per the JHA.

2. Once the tank is ready (i.e. drained) 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, by gently rocking the Valve assembly back & forth. The Piston should reciprocate under the effect of its own weight.

4. Ensure the 3" NPS-M **outlet** thread is clean and undamaged and confirm the **O'ring** is present and undamaged – refer Figure 12. Apply a thin smear of grease to the O'ring. No thread *sealant* is required on this thread, although a small amount of thread-locker may be used if deemed necessary. Ensure the mating 3" NSP-F connection is also clean and undamaged - particularly the O'ring sealing surfaces – then securely tighten the BFCV80 outlet into its process connection.

5. Ensure the 3" NPT-F **inlet** thread and mating 3" NPT-M process connection are clean and undamaged. Apply a modest amount of a suitable thread sealant (e.g. Loctite 567) to the first 3-4 threads of the *male* thread, then securely tighten into the Valve inlet. ***Avoid the use of excessive Loctite.***

6. Rotate the Pilot Line collar to the desired location. Inspect the external 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* – refer section 4.1.1.

Figure 13 - Example of BFCV80 Installed

4.3 Commissioning Procedure

CAUTION

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 resolved 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.*

1. 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 Valve and remaining FillSafe Zero system.

2. ***Prior*** to any attempt to refuel the tank, ensure the fuel level is below the safe fill level (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).

3. Remove the Receiver Dust Cap from the Receiver and securely connect a Banlaw (or other compatible) dry-break refuelling Nozzle to the Receiver. Prepare to refuel the tank as per ***normal refuelling procedure.***

4. 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.

5. 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 0. 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.

6. Whilst the tank is being refilled, carefully check the BFCV80 Valve, Pilot Line and remaining 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, terminate the refuelling process, manually close the refuelling nozzle, disconnect it from the receiver and rectify the leak.

7. 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* ***without*** *(internal) tank pressurisation.* 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 0. ***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 0.

8. 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.**

9. 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, resolved, controlled and/or managed.

It is generally the legal responsibility for the person(s) who has identified the potential hazard to isolate the part of the system whose continued use 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.

5 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).

Refuelling couplings, e.g. nozzle and receiver, that are contaminated with dust and other build-up ***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 system refuelling a tank fitted with a FillSafe Zero (OFP system). 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 the system.

REMOVE RECEIVER DUST CAP. REMOVE NOZZLE FROM ANCHOR OR HOLSTER

↓

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

↓

START FUEL DISPENSING PUMP

↓

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 0

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ALLOW TANK TO REFILL. IF REQUIRED BY SITE REFUELLING PROCEDURE, WITNESS ENTIRE REFUELLING EVENT WHILST VISUALLY MONITORING RISING FUEL LEVEL

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ONCE TANK REACHES CAPACITY, THE FILLSAFE ZERO LEVEL SENSOR WILL “CLOSE”, TERMINATING FUEL FLOW THROUGH THE PILOT LINE & 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

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STOP FUEL DISPENSING PUMP. RETRACT NOZZLE ACTUATOR AND DISCONNECT FROM RECEIVER. REPLACE RECEIVER DUST CAP AND RETURN NOZZLE TO STORAGE HOLSTER/ANCHOR

↓

ENSURE NO FUEL LEAKAGE FROM TANK. *PROMPTLY* REPORT ANY INCIDENTS.

6 MAINTENANCE & SPARE PARTS

The BFCV80 Flow Control Valve is a ***non-serviceable*** Banlaw product. Banlaw warranty is void in the event an attempt is made to repair, modify or otherwise tamper with the Valve assembly. Further, tampering with the Valve may increase the risk of hazards jeopardising the operation of the Valve and OFP system, and subsequent safety of the refuelling system.

6.1 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 refuelling equipment depends on many factors, including the environment in which it operates, and the care by which such equipment is used and maintained. Dusty and dirty environments more prone to contamination build-up 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.

The BFCV80 Valve contains relative moving parts 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 (OFP) system;

- *Excessive* fuel contamination levels could best be expressed as automotive grade diesel fuel containing contamination levels beyond those stipulated by governances and guidelines such as; the Australia Fuel Standard (Automotive Diesel) Determination, the current Worldwide Fuel Charter (WWFC), and fuel quality requirements of modern diesel engine (or plant equipment) manufacturers.

The following preventative maintenance guidelines apply to the BFCV80 Flow Control Valve;

- 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.
- Install inline (bulk) filtration on all diesel dispensing lines – contact Banlaw for advice.
- Maintain the use of the Receiver Dust Cap and Nozzle Anchors, Holsters, or Dust Caps.
- Remove any contamination from the dry-break Receiver (front end) ***prior*** to connecting a Nozzle.
- Visually inspect the Receiver for excessive wear & tear or damage ***prior*** to connecting a Nozzle.
- Replace the BFCV80 Valve assembly no later than every 8 years.
- Replace the External Pilot Line no later than every 5 years.

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 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*.

7 TROUBLESHOOTING

This section provides troubleshooting recommendations for the BFCV80 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 the refuelling.	• 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. affecting its venting function. Refer to BVLS requirements (i.e. PRH-OFP-22) and rectify. • Flow rate below recommended minimum. Increase delivery flow rate. • Flow rate above recommended maximum. Reduce delivery flow rate. • Nozzle spring setting too low (i.e. too light) for application. Contact Banlaw or your nearest Banlaw agent for advice. • Receiver Spring setting too heavy, replace with a "Light" spring setting. • 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. • 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. • 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 BFCV80 Valve. Assess and upsize/upgrade line size (bore) and remove short radius bends and unnecessary chokes to fuel flow.
Premature nozzle shut-off during refuelling.	• Accidental activation (closure) of the Level Sensor by fuel movement (sloshing) in the tank. Pause for 1 min and restart refuelling. • Nozzle setting too low (i.e. too light) for application. Contact Banlaw or your nearest Banlaw agent for advice. • Receiver Spring setting too heavy, replace with a "Light" spring setting. • The BVLS model "venting" Level Sensor is not installed correctly onto the tank, e.g. installed within an "extended" socket or riser pipe etc. affecting its venting function. Refer to BVLS requirements (i.e. PRH-OFP-22) and rectify. • 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 BFCV80 Valve. Assess and upsize/upgrade line size (bore) and remove short radius bends and unnecessary chokes to fuel flow.
Premature nozzle shut-off towards the end of refuelling.	• 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.
Tank overfilling	• Incorrect Level Sensor for the required ullage. Contact Banlaw or your nearest Banlaw agent for advice. • Leakage through 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 (aeration) of the diesel fuel during refuelling. Relocate tank inlet closer to the base of the tank, or install a drop pipe/tube in tank.
Fluid leakage between Nozzle and Receiver during refuelling	• Worn Receiver and/or Nozzle preventing effective locking of Nozzle to Receiver. Assess root cause(s) and rectify. • 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 or Receiver. • Seals worn out on Nozzle. Replace Nozzle and return to authorised Banlaw repair agent for servicing.
Fluid leakage from front of Receiver	• Worn Poppet Seal in Receiver or debris on Seal. If damaged, install new Receiver Kit or Receiver.
Nozzle uncouples 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.
No fuel issued via Nozzle	• Banlaw FuelTrack receiver ID tag (code) has not been entered into the onsite FMS database and/or properly configured within the database. • FuelTrack receiver ID tag has not been received by local FMS depot; • Existing fault with Banlaw auto ID dry-break system – investigate and rectify. • Faulty auto ID chip in receiver – install new Banlaw Receiver Kit or Receiver. • Turn Nozzle on (open) and verify code is read. • Contact your onsite FMS "champion" or Banlaw Helpdesk.

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 the Banlaw FillSafe™ Zero system, 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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