

life-line Documentation

Versión 1.0.0

© 2023, Michael Altfield and the Eco-Libre Team

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Welcome! This is the official documentation for the Eco-Libre Life-Line.

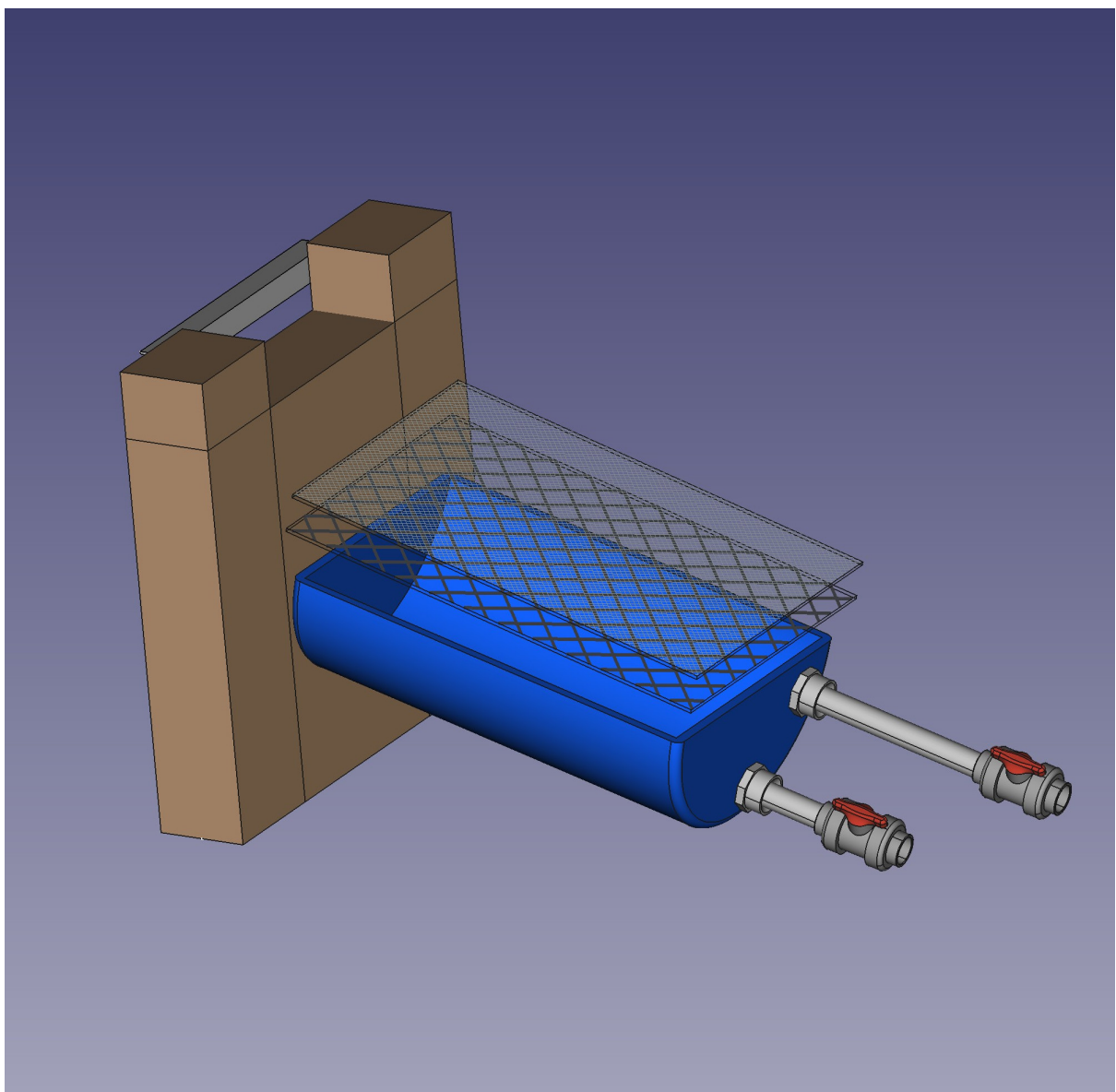


Figura 1. CAD Design of the Eco-Libre Life-Line

Nota Just want to know **how to build the Eco-Libre Life-Line?**

See our [Capítulo 5](#)

Introduction

The Eco-Libre Life-Line is a raw water intake, filtration, and storage system.

Theory

This section will describe the research behind this project and how it would benefit the lives of your community.

2.1 Concept

The Eco-Libre Life-Line project is a system designed to collect, filter, and store surface water for an off-grid community.

2.2 Design Goals

The water system should be:

1. Low-Maintenance
2. Hygienic

2.3 Low-Maintenance

Low-Maintenance means that low-tech automation and well-engineered, self-cleaning systems should be employed so that the system only needs routine maintenance once or twice per year.

2.4 Hygienic

Hygienic means that the water stored in the clean water tanks and delivered to sinks should be free of contamination (bacteria, parasites) and be safe to drink.

2.5 Size

Pico (3-person) (the smallest Eco-Libre Life-Line water system) should provide sufficient water for 3-people.

Nano (15-person) The small-size system should be horizontally scalable by multiplying the number of filters and tanks to provide sufficient water for a 15-person community

Micro (30-person) To handle a community of up to 30-people, a larger system design is provided.

Milli (150-person) To handle a community of up to 150-people, the micro system is horizontally

scaled.

2.6 Components

2.6.1 Intake

The water intake will consist of a weir on a stream with two openings with turbulence bars that channel turbulent water down onto a screen-covered 220-liter barrel angled at a downward slope.

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Figura 2.1. CAD Design of the Eco-Libre Life-Line's «Intake» component

This is a common low-budget, self-cleaning intake design that will shed organic debris during high-flow (eg a heavy rain).

The distance from the bottom of the weir to the top of the screen should be at least 20 cm.

The size of the holes in the screen should be 1-5 mm (it should be supported by an expanded metal screen below it).

The screen on the barrel should be mounted on a hinge to allow for routine maintenance.

2.6.2 Settling Tank

A radial-flow settling tank should be located very near to the intake and will remove sediment that passed the intake screen.

2.6.3 Large Sediment Filter

A self-cleaning spin down filter (largest size micron available) will remove debris that passed through the settling tank.

The flush valve should be automatically opened electronically by a timer.

2.6.4 Pre-Filter

This pre-filter will remove turbidity from the water before it enters the slow sand filter.

This is **built** from a 220-litre HDPE drum that's filled with rocks and (mostly coarse) sand.

2.6.5 Slow Sand Filter

The **Slow Sand Filter** will remove harmful bacteria and parasites from the water.

This is **built** from a 220-litre HDPE drum that's filled with rocks and (mostly fine) sand.

2.6.6 Media Sediment Filter

A self-cleaning spin down filter (smallest size micron available) will remove filtering media debris (sand) that may have come-out of the filters

The flush valve should be automatically opened electronically by a timer.

2.6.7 Clean Water Tank

The clean water tank stores potable water.

2.6.8 Lifeline

Pipes supply clean water from the clean water tanks to the community.

This section will show example builds of the Eco-Libre Life-Line around the world.

3.1 Boris Plotkin

In Nov 2024, [Boris Plotkin](#) built the first prototype of the Life-Line at the [Fruit Haven](#) community in Morona-Santiago, Ecuador



Figura 3.1. Concrete Block, Rock, and Cement Weir for the Eco-Libre Life-Line at Fruit Haven in Morona-Santiago, Ecuador (attribution: [Boris Plotkin](#))

3.2 Vegan Beasts

In Apr 2025, [Vegan Beasts](#) built the second prototype of the Life-Line at the [Fruit Haven](#) community in Morona-Santiago, Ecuador



Figura 3.2. Rock and Cement Weir for the Eco-Libre Life-Line at Fruit Haven in Morona-Santiago, Ecuador (attribution: [Vegan Beasts](#))

3.3 Get Listed!

Did you build this? Please [let us know](#) and we'll add your build to this page.

Frequently Asked Questions

4.1 Q: How can I get updates about Eco-Libre?

You can [signup](#) for our Eco-Libre email newsletter or follow us on any of the following social media profiles:

- Twitter [@EcoLibreNews](#)
- Facebook [@EcoLibreNews](#)
- Mastodon [@ecolibre@chos.social](#)
- GitHub [Eco-Libre](#)
- YouTube [@Eco-Libre](#)

4.2 Q: How much does it cost to build this system?

See [Section 5.1.2](#)

4.3 Q: What do I need to buy to build this?

See [Section 5.1.2](#)

4.4 Q: Where can I find the instructions to actually build it?

See our [Capítulo 5](#)

4.5 Q: Has anyone else built this before?

Yes. See [Capítulo 3](#)

4.6 Q: Where can I download the 3D Models?

You can download our source [FreeCAD](#) files from our [GitHub](#) repo.

4.7 Q: Can I sell this?

Please do!

All of Eco-Libre's work is libre or open source, pursuant to the [Open Source Hardware Association definition](#).

You're welcome to take our designs and use them for commercial purposes, so long as

1. You provide prominent attribution back to Eco-Libre (link to [our website](#)) and
2. You must make public any modifications that you make to our work, and you must also license your derivative works under a compatible ShareAlike license.

For more information, see [Capítulo 9](#)

4.8 Q: My questions isn't listed. Where can I get support?

Please see [Capítulo 7](#)

Getting Started

This section will document how to build the Eco-Libre Life-Line.

Nota You can view the documentation to build a previous version by selecting a different version in the bottom-left menu

The Eco-Libre Life-Line project is made up of several distinct components. We have separated the build instructions into different sections to build each component.

Click on the component below to view its build instructions.

5.1 Intake

This section will describe how to build the «Intake» component of the Eco-Libre Life-Line system.

5.1.1 What is the «Intake» Component?

This section will describe how to build the «Intake» component of the Eco-Libre Life-Line system.

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Figura 5.1. CAD Design of the Eco-Libre Life-Line's «Intake» component

1. Weir 14
2. Turbulence Bar 14
3. Fine Mesh Screen 15
4. Expanded Metal Mesh 16
5. Outflow Pipe 16
6. Cleanout Drain Pipe 17
7. Drum 18

Nota Want to **view the 3D Model** of the Intake Component above?

You can download the `intake.FCStd` file from our [GitHub repo](#) and open it on your computer in [FreeCAD](#)

The «Intake» component is responsible for raw water capture from a stream. The design of $\geq 20\text{cm}$ falling, turbulent water is self-cleaning: the turbulent water falls onto the screen with sufficient force to clear debris off of the screen. This ensures constant raw water collection into the Life-Line system, without requiring periodic manual human intervention (or automatic moving parts) needed to remove debris blocking the ingest of water into the system.

The «Intake» component is made-up of several parts:

1. Weir

The Weir is a masonry structure (CEB, Concrete Block, or Steel-reinforced Concrete) that's built in the middle of a stream. It has a Weir Opening at the top, which channels falling water to flow ontop of a metal screen and into a water collection drum.



The distance between the bottom of the Weir Opening and the top of the Fine Mesh Screen atop the water collection drum must be at least 20 cm. If the water falls less than 20 cm, it will not have enough force to self-clean the screen of organic debris.

2. Turbulence Bar

The Turbulence Bar is a piece of steel angle that's bolted to the weir, bisecting the Weir Opening.

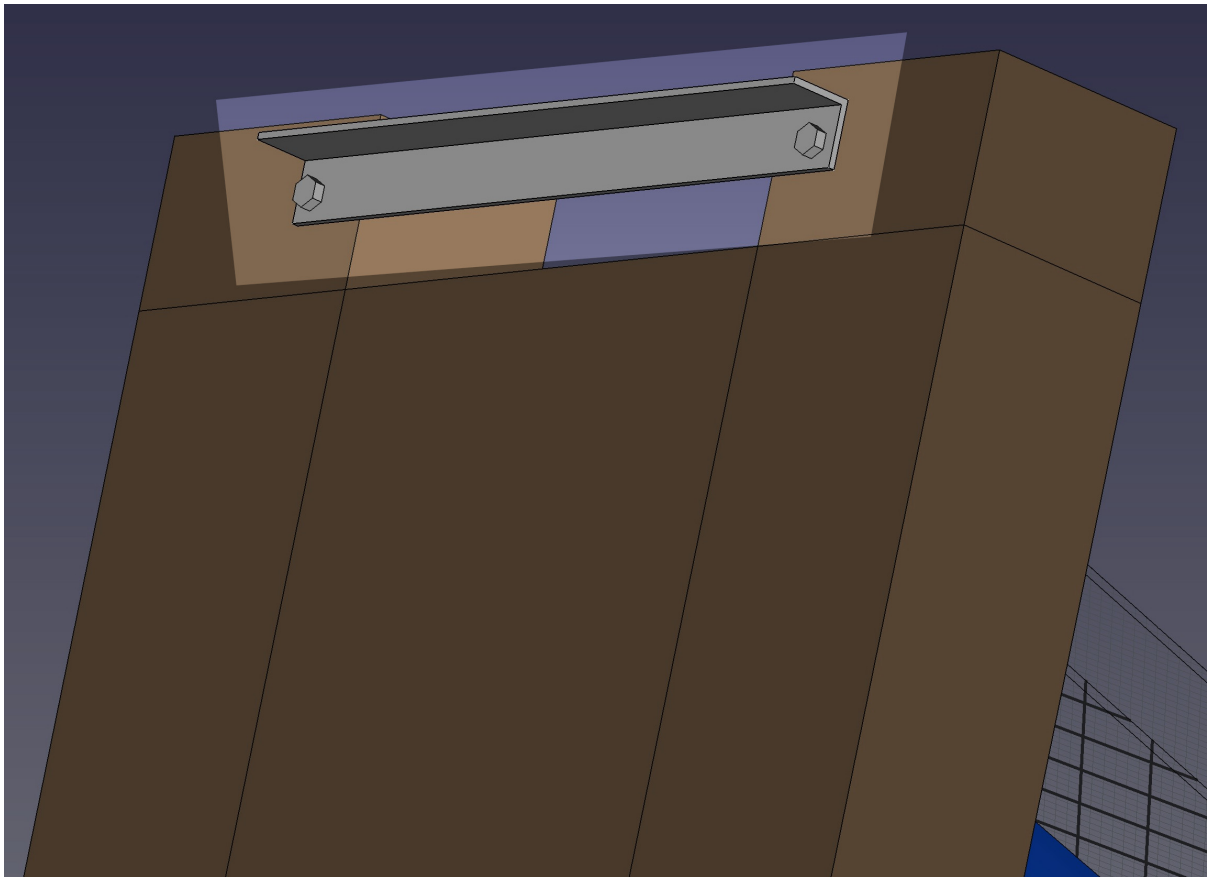


Figura 5.2. The Life-Line «Intake» component's Turbulence Bar

The Turbulence Bar changes the flow of the water as it passes through the Weir Opening, creating turbulence. This turbulent water is more effective at self-cleaning the [screen](#) below of organic debris than non-turbulent falling water.

3. Fine Mesh Screen

The Fine Mesh Screen is a very fine metal screen that's designed to filter-out large organic materials (eg leaves, sticks, stones, grass, etc) from entering the [drum](#).



The Fine Mesh Screen should be made of Stainless Steel, and the holes in the screen should be approximately 0.85 mm large (20 [US Mesh](#))

4. Expanded Metal Mesh

The Expanded Metal Mesh is a strong grate made of Expanded Metal that sits below the [Fine Mesh Screen](#) and atop the Drum

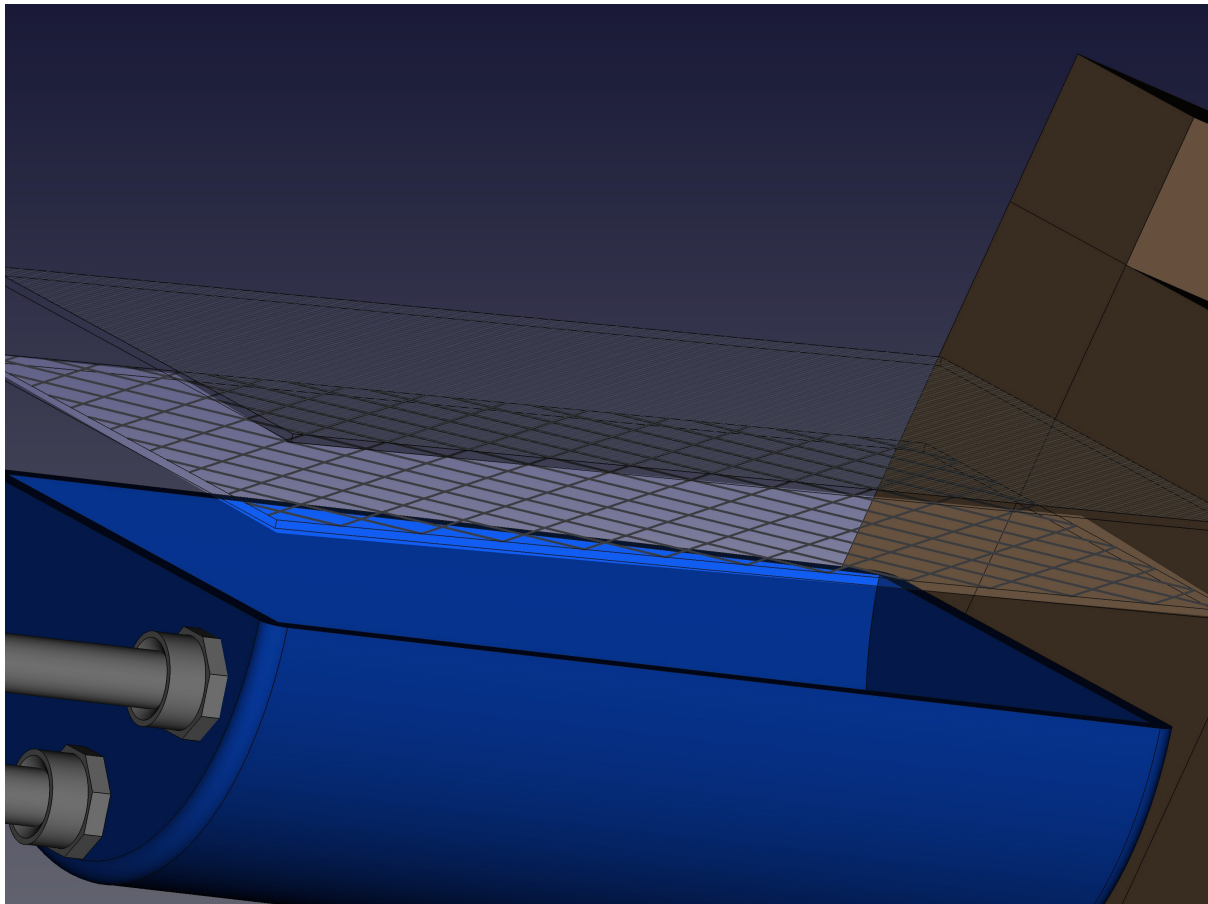


Figura 5.3. The Life-Line «Intake» component's Expanded Metal Mesh

The purpose of the Expanded Metal Mesh is to provide a physical support structure for the [Fine Mesh Screen](#) above it.

5. Outflow Pipe

The Outflow Pipe is where water flows out of the Intake [drum](#) and into the next component of the Eco-Libre Life-Line system (the [Section 5.2 Component](#))

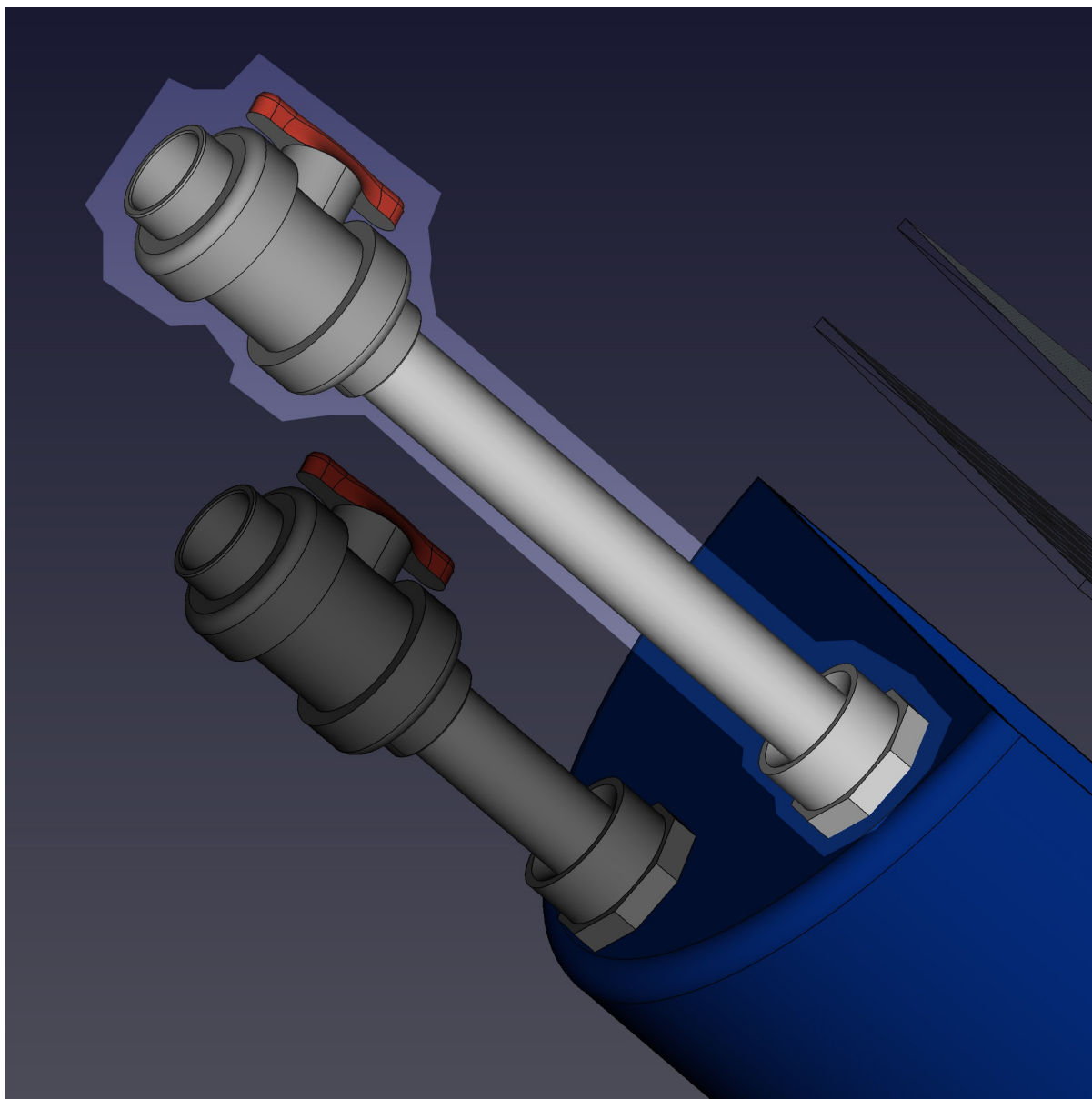


Figura 5.4. The Life-Line «Intake» component's Outflow Pipe

The outflow pipe consists of a Bushing, Pipe, and Valve.

6. Cleanout Drain Pipe

The Cleanout Drain Pipe is located at the bottom of the [drum](#), next to the [Outflow Pipe](#).

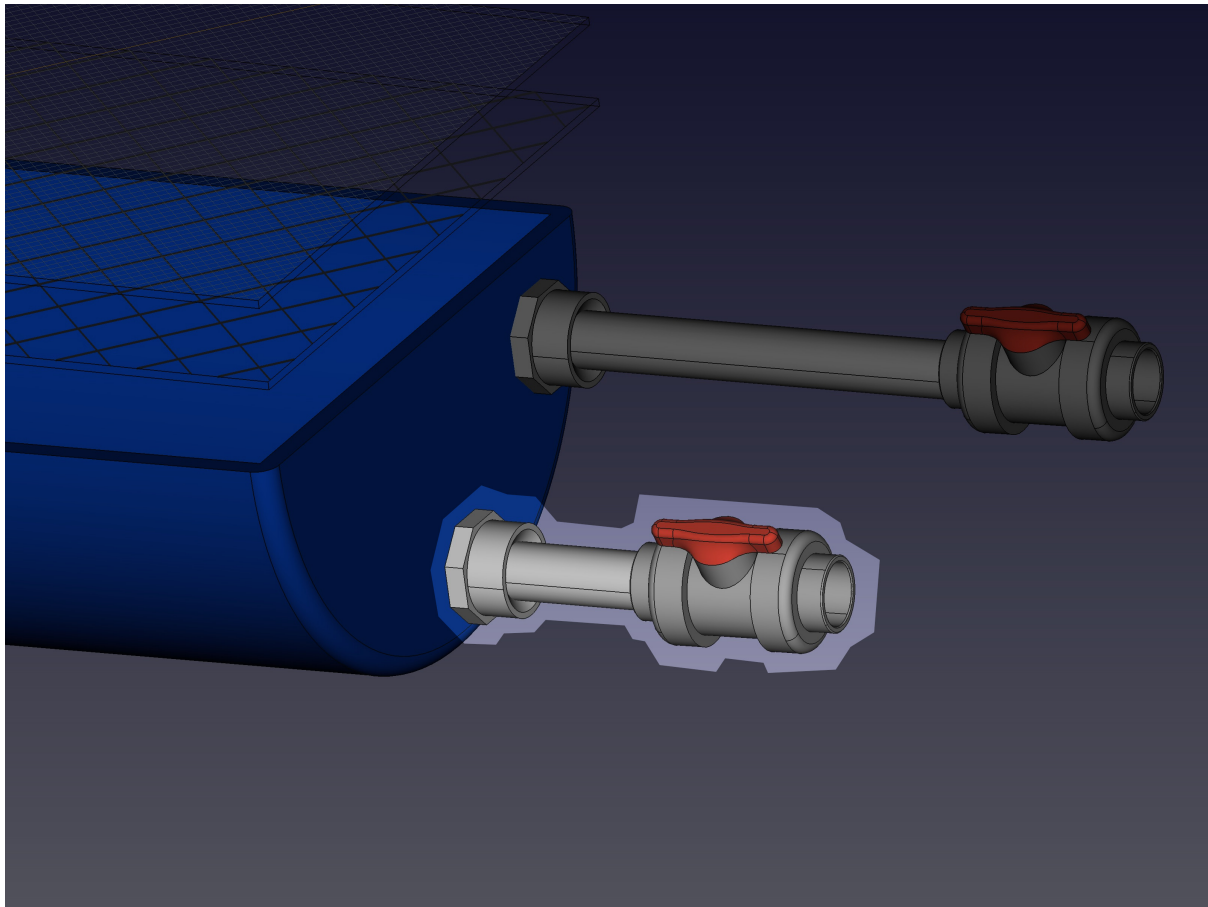


Figura 5.5. The Life-Line «Intake» component's Cleanout Drain Pipe

The Cleanout Drain Pipe consists of a Bushing, Pipe, and Valve.

The purpose of the Cleanout Drain Pipe is to flush small debris (eg sand) that have collected at the bottom of the drum. In normal operations, the valve should be closed. During routine maintenance (at least once per year), the Cleanout Drain Pipe should be opened, to flush-out any debris that have settled at the bottom of the drum.

If possible, a valve actuator (eg a simple electronic sprinkler system on a timer) could be placed after the valve to automatically flush the drum on a routine basis.

7. Drum

The Drum is a standard 220L (55 gallon) HDPE barrel drum that's been cut in half length-wise.

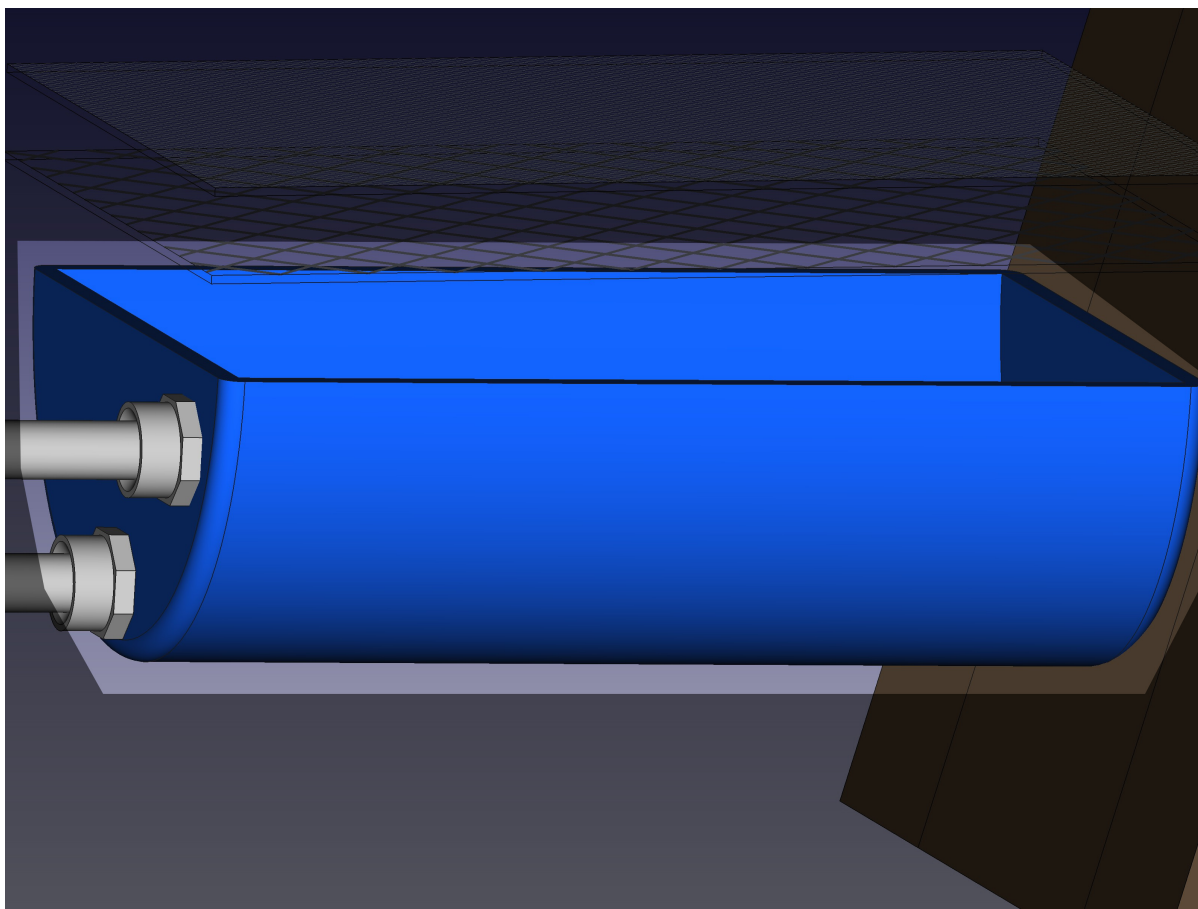


Figura 5.6. The Life-Line «Intake» component's Drum

The drum collects water as it spills over the weir and onto the [metal mesh screen](#) that sit atop the cut-open face of the drum.

Two holes are cut on the downstream side of the drum, where through-wall bushings are placed for the [Cleanout Drain Pipe](#) and the [Outflow Pipe](#).

5.1.2 Bill of Materials

This section will list the materials needed to build the Intake component of the Eco-Libre Life-Line project.

Qty	Item	Price (EUR)	Material	Weight (kg)	Dimension (mm)	Capacity	Tolerances	Product URI (with price)	Other Notes
2	Weir	759.69	Rocks, CEBs, Concrete Blocks, Bricks, and /or Steel-Reinforced Concrete		1035 x 1000 x 500			https://brooksonline.ie/kil-saran-kpro-crete-multi-purpose-concrete-25kg-un0427	Highly variable; price is minimum in just concrete

1 Drum	109	HDPE	5.5	Blue	493 745	220 Liters	https://www.denios.ie/plastic-drums-with-bung-hole-120-220-litre-volume-10300300451400/266140	
2 Steel Angle	11.825666666666667				650 x 60 x 6		https://mybuildingsupplies.ie/shop/building-supplies/steel/steel-beams-steel-lengths-steel-sheets/steel-angle/	
4 M16 Concrete Anchor Bolt	8.664	Galvanized Steel			M16 x 100 mm		https://www.screwfix.ie/product/rawlplug-through-bolts-r-xpt-m16-x-100mm-25-pack/657vc	
2 Fine Mesh Screen	17.1792010250685	Stainless Steel			1000 x 665	0.85 MVOYTLARG-304-stainless-steel-mesh-47in-x-10ft-20-mesh-nev-large-rust-sturdy-metal-mesh-screen-work-even-wire-mesh-roll-for-window-screen-replacement-door-air		
2 Expanded Metal	186.067	Galvanized Steel			1000 x 665		https://www.lenehans.ie/steel-expanded-metal-sheet-1000mm-x-500mm.html	
4 Through-Wall Bushing (aka "bulk-head")	120.68	PVC			50 mm (2 inch)		https://www.recifart.com/en/fitting/572-bulkhead-50mm.html	
2 50 mm Pipe	15	PVC			1000 mm + 500 mm		https://percolationsupplies.ie/product/50mm-pvc-piping/	
4 50 mm Valve	55.32	PVC					https://www.peservices.ie/product/ball-valve-pvc-u-50mm	

Nota Want to **view the original spreadsheet** of the BOM above?

You can download the docs/build/intake/bom.ods file from our [GitHub repo](#) and open it on your computer in [LibreOffice](#)

5.2 Settling Tank

This is a section that will talk about how to build the «Settling Tank» component of the Eco-Libre Life-Line system.

5.2.1 What is the «Settling Tank» Component?

This is a section that will talk about how to build the «Settling Tank» component of the Eco-Libre Life-Line system.

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Figura 5.7. CAD Design of the Eco-Libre Life-Line's «Settling Tank» component

Nota Want to **view the 3D Model** of the Settling Tank Component above?

You can download the `settling-tank.FCStd` file from out [GitHub repo](#) and open it on your computer in [FreeCAD](#)

The «Settling Tank» component is responsible for raw water capture from a stream. It's made-up of several parts:

1. TODO

TODO

2. TODO

TODO

5.2.2 Bill of Materials

This section will list the materials needed to build the Settling Tank component of the Eco-Libre Life-Line project.

TODO

For an overview of what each component is, see [Section 2.6](#)

Contributing

Thank you for considering to help us!

As an open-source project, we depend on the work of volunteers to stay alive, and your time helping to improve our project is very much appreciated :)

6.1 Wish List

Below is a list of items on our TODO list. If you'd like to help us tackle these tasks, please [contact us](#) as there may be someone already working on a given task that you may be able to collaborate with.

Please be aware that any contributions you make will be made open-source. See [Capítulo 9](#) for more info.

TODO

6.2 Donate

Running the Eco-Libre project has many fees, including

1. Server & domain infrastructure fees
2. Purchasing hardware items for testing & iterating

If you have more money than free time, you can also help Eco-Libre by making a donation. We accept Bitcoin and Monero.

BTC 1DXyJpmu2KQMw2v4QJVzzjZo6f87BBndu6
--

:: TODO: Open-collective

Donations of any amount are **greatly** appreciated. Thank you!

Support

As an open-source project, we try to keep all of our support requests on GitHub. If you

1. have a question that is not answered by this documentation,
2. discover a bug in the software, or
3. would like to request a feature in the software

then please [create an issue](#) on our GitHub.

If you don't want to register for an account on GitHub or you'd like to remain anonymous, then you can [email us](#). We'll put the issue on GitHub for you.

Changelog

Eco-Libre Life-Line Changelog

[v2025.10]

<https://www.eco-libre.org/life-line-2025-10-released/>

- * first formal release (very alpha)
- * changed expanded metal to hatch of solid (optimization)
<https://www.eco-libre.org/expanded-metal-hatch-freecad/>
- * simplified other objects, reducing (compressed) intake.FCStd **from** 15 MB to 0.212 KB
- * reduced total (uncompressed) MemSize about 172x **from** 114.8 MB to ~0.7 MB
- * added fine metal mesh (**as** hatched solid)
- * thank you to Michael Altfield, Jack Nugent, Boris Plotkin, **and** Vegan Beasts

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Version 3, 29 June 2007

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The "System Libraries" of an executable work include anything, other than the work as a whole, that (a) is included in the normal form of packaging a Major Component, but which is not part of that Major Component, and (b) serves only to enable use of the work with that Major Component, or to implement a Standard Interface for which an implementation is available to the public in source code form. A "Major Component", in this context, means a major essential component (kernel, window system, and so on) of the specific operating system (if any) on which the executable work runs, or a compiler used to produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all the source code needed to generate, install, and (for an executable work) run the object code and to modify the work, including scripts to control those activities. However, it does not include the work's System Libraries, or general-purpose tools or generally available free programs which are used unmodified in performing those activities but which are not part of the work. For example, Corresponding Source includes interface definition files associated with source files for the work, and the source code for shared libraries and dynamically linked subprograms that the work is specifically designed to require, such as by intimate data communication or control flow between those subprograms and other parts of the work.

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Attribution

Thank you to the following folks who have contributed to the Life-Line project!

- [Michael Altfield](#)
- [Jack Nugent](#)
- [Boris Plotkin](#)
- [Vegan Beasts](#)

This project would not have been possible without the following tools and services:

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10.1 Similar Projects

The reader may be interested to investigate the following similar projects:

- [Gaviotas](#)

