Franklin Fueling Systems
Fueling Innovative Solutions

APT XP-Series Flexible Pipe

General Pipe Specifications

Section 1 - Preface:

1.1. Franklin Fueling Systems (FFS) manufactures APT XP-Series flexible piping systems which are designed to provide containment and transfer of product in your fueling system. APT XP-Series piping can be used in either pressure or suction applications.

Section 2 – Compatible Fuels

2.1. UL Approved Fuels – XP-Series piping systems have been c UL us Listed for use in the following soil / fuel categories:

- External Soil And Environmental Fluids – All of the fuel listing categories require that the following soil fluids are compatible with the piping system. Fluids in this category include Ph 3.0 sulfuric acid, saturated sodium chloride, distilled water, air (except at 70°C), 1% hydrochloric acid, 1% nitric acid, Ph 10 sodium carbonate – sodium bicarbonate, Ph 12 sodium hydroxide.
- Motor Vehicle – Fuels in this category include diesel, unleaded gasoline, 30% ethanol / 70% unleaded gasoline, 15% methanol / 85% unleaded gasoline, 15% MTBE / 85% unleaded gasoline.
- Concentrated Fuels – Fuels in this category include 100% ethanol, 100% methanol, 100% toluene
- High Blend Fuels – Fuels in this category include 50% ethanol / 50% unleaded gasoline, 50% methanol / 50% unleaded gasoline
- Aviation and Marine Fuels – Fuels in this category include 100% premium leaded gasoline, 100% kerosene

Only pipe systems with a UL listing for Motor Vehicle, Concentrated, and High Blend fuels are listed by UL for use with E85 (85 % ethanol with 15% gasoline).

2.2. FFS Approved Fuels – XP-Series piping systems are approved for use by FFS for use in the following fuels:

- Jet Fuel (JP-4, JP-5, JP-8, JP-10)
- Fuel Oil (Numbers 1, 2 & 3)
- Biodiesel (B100) – Fittings must be stainless steel
- Mineral Spirits
- Stoddard Solvent
- 20% MTBE / 80% Gasoline
- 20% ETBE / 80% Gasoline
- 17% TAME / 83% Gasoline
- Pentane
- Iso-Octane
- Isopropyl Alcohol
- Contact FFS for the use of fuels that may not be listed here

Section 3 – Performance

3.1. Pressure / Vacuum Rating - The chart below shows the pressure ratings for all XP-Series piping by model number.

Pipe Style	Pipe I.D. (in)	Primary Pipe UL Rating Pressure (psi) / Vacuum (inHg)	Secondary Pipe UL Rating Pressure (psi) / Vacuum (inHg)
XP-100-D	1.00	100 / 29	N/A / N/A
XP-100-SC	1.00	100 / 29	8 / 29*
XP-150-D	1.40	100 / 29	N/A / N/A
XP-150-SC	1.40	100 / 29	50 / 29*
XP-175-D	1.65	100 / 29	N/A / N/A
XP-175-SC	1.65	100 / 29	8 / 29*
XP-200-D	2.04	100 / 29	N/A / N/A
XP-200-SC	2.04	100 / 29	8 / 29*

* Note: UL did not rate secondary vacuum on XP pipe, designation established by FFS.

3.2. Bend Radius – All models of XP-Series piping have a minimum allowable bend radius of 36".

3.3. Operating Temperature – XP-Series piping is suited for use up to 135° F (57° C). XP-Series piping can be used below 25° F (-4° C), however, the piping may become difficult to work with. Below 25° F (-4° C), the minimum bend radius may have to be increased to prevent kinking. When working with XP-Series piping below 25° F (-4° C), avoid kinking or impacting the pipe, as this may create damage to the primary and/or secondary layers.

3.4. Flow Capabilities – XP-Series piping systems have a very smooth surface and use low friction material for optimal product flow. Flow capabilities will vary depending on factors such as pipe size, temperature, pump size, and type of product being used.

3.5. Permeation – XP-Series piping has been tested to meet the permeation requirements called out in UL 971 (January 2nd, 2004 Revision).

3.6. Interstitial Volume Of Secondary –XP-xxx-SC piping utilizes a secondary containment layer with an interstitial space that can be monitored for leakage. The chart below gives the average interstitial volume per foot by pipe size.

Pipe Size	Interstitial Volume (in^3/foot of pipe)
XP-100-SC	1.29
XP-150-SC	1.93
XP-175-SC	2.19
XP-200-SC	2.41

Section 4 – Pipe Composition

4.1. Layer Breakdown – XP-Series piping is offered in different sizes in two options, primary pipe (-D suffix) and integral primary/secondary pipe (-SC suffix). The chart below highlights each component of the two options.

XP-xxx-D	XP-xxx-SC
Black Nylon 12 Vestamid L2124	**Black Nylon 12 Vestamid L2124**
Primary Pipe Inner Tube - The inner tube is extruded to form a seamless and continuous single wall inner tube. Material is Vestamid L2124. Color is black.	Primary Pipe Inner Tube - The inner tube is extruded to form a seamless and continuous single wall inner tube. Material is Vestamid L2124. Color is black.
Aluminum Mylar with 2 sided adhesive	**Aluminum Mylar with 2 sided adhesive**
Layer Over the Primary Pipe Inner Tube - A layer of an aluminized Mylar with an adhesive coat on both outsides is wrapped (minimum of 1/2 in. overlap) around the extruded inner tube.	Layer Over the Primary Pipe Inner Tube - A layer of an aluminized Mylar with an adhesive coat on both outsides is wrapped (minimum of 1/2 in. overlap) around the extruded inner tube.
Nylon 6 Fiber 9-12 Picks/in	**Nylon 6 Fiber 9-12 Picks/in**
Nylon Fiber Reinforcement Layer - Nylon 6-6 with a density of 9-12 picks/inch spun on top of the aluminum Mylar.	Nylon Fiber Reinforcement Layer - Nylon 6-6 with a density of 9-12 picks/inch spun on top of the aluminum Mylar.
Light Blue Nylon 12, Vestamid L2124	**Light Blue Nylon 12, Vestamid L2124**
Primary Pipe Outer Cover - A light blue layer of Vestamid L2124 is extruded over the fiber reinforcement.	Primary Pipe Outer Cover - A light blue layer of Vestamid L2124 is extruded over the fiber reinforcement.
Mylar	**Mylar**
N/A	Layer Over the Primary Pipe Outer Tube - A layer of Mylar is wrapped (minimum of 1/2" overlap) around the extruded outer tube.
Med Blue Nylon 12, Vestamid L2124	**Med Blue Nylon 12, Vestamid L2124**
N/A	Secondary Pipe Inner Tube - The inner tube is extruded to form a seamless and continuous single wall inner tube. The inner diameter of this tube is ribbed to allow fluid to travel between the inner diameter of the Secondary Pipe and the outer diameter of the Primary Pipe. Material is Vestamid L2124. Color is medium blue.
Aluminum Mylar with 1 sided adhesive	**Aluminum Mylar with 1 sided adhesive**
N/A	A layer of an aluminized Mylar with an adhesive coat on one side is wrapped (minimum of 1/2" overlap) around the extruded inner tube.
Dark Blue Nylon 12, Vestamid L2124	**Dark Blue Nylon 12, Vestamid L2124**
N/A	Secondary Pipe Outer Cover - A dark blue layer of Vestamid L2124 is extruded over the aluminized Mylar.

Section 5 – Shipping Information

5.1. Pipe Storage – XP-Series piping primary and secondary jackets should not be exposed to direct sunlight at any time. XP-Series pipe is delivered on reels with a protective wrap which inhibits UV damage to the pipe during shipment. XP-Series secondary contained (SC) pipe incorporates a scuff guard layer which protects the pipe in transit and adds a degree of UV protection to the pipe jackets. APT recommends that the scuff guard layer not be exposed to direct sunlight for more than three months or UV degradation may occur.

5.2. Shipping Dimensions – All XP-Series piping is shipped on one of four different size reels. The reel size that is used is determined by the pipe size and length, and is shown in the XP Piping Catalog. The dimensions of each reel are shown in the chart below.

Reel Size	Width (in / cm)	Inner Diameter (in / cm)	Hub Diameter (in / cm)
Small Standard	27 / 68.6	65 / 165.1	84 / 213.4
Standard (Std.)	46 / 116.8	64 / 162.6	86 / 218.4
Master	34 / 86.4	74 / 188.0	91 / 231.1
Super Master (S. Mast.)	52 / 132.1	74 / 188.0	91 / 231.1

5.3. Shipping Weight – The shipping weight is a combination of the reel weight and the pipe weight. To determine shipping weight, find the reel size you are ordering in the chart below. Next, find the pipe size you are ordering and multiply the weight/foot for that size by the length of pipe ordered. Add the pipe weight and the reel weight for the total estimated shipping weight.

Reel Size	Weight (lbs / kg)
Small Standard	292 / 132
Standard (Std.)	431 / 195
Master	522 / 237
Super Master (S. Mast.)	720 / 327

Pipe Size	Weight Per Foot (lbs / kg)
XP-100-D	0.20 / .09
XP-100-SC	0.45 / .20
XP-150-D	0.35 / .16
XP-150-SC	0.55 / .25
XP-175-D	0.40 / .18
XP-175-SC	0.65 / .29
XP-200-D	0.60 / .27
XP-200-SC	0.95 / .43

Section 6 – Fittings

6.1. Termination Fittings - The piping below ground shall be continuous. There shall be no fittings or pipe connections in either the primary or the secondary piping which are not visible or accessible from a liquid tight containment sump. Appropriate model and size fittings are required for installation with XP-Series piping. The installation of fittings should be done in accordance with the current installation procedures published by FFS. XP-Series piping uses two styles of fittings to connect itself to the plumbing inside containment sumps; clamshell and swage.

6.1.1 Swivel & Non-Swivel Clamshell Fittings – The XP-Series swivel and non-swivel termination fittings are manufactured from solid brass. Grey iron clamps with blue powder coating compress the outside of the pipe onto the brass fittings inside the pipe. Each brass fitting has a barbed end that is installed into the pipe and a threaded connection on the opposite end. Fittings are available as swivel or non-swivel with male NPT connections. Fittings do not require special tools required for installation.

- Fitting Fuel Compatibility – XP-Series clamshell fittings are approved under the same UL listed fuels as the XP-Series piping (see section 2.1) and are approved by FFS for the same fuels as the XP-Series piping (see section 2.2).

- For applications utilizing fuels such as E85, M85, E100, M100, and Biodiesel, FFS offers stainless steel in place of the brass fittings. Due to varying chemical compositions of some new fuels, our stainless steel fittings are strongly recommended to ensure maximum chemical compatibility for your piping system.

6.1.2 Swage Fittings - The XP-Series swage termination fittings are manufactured from stainless steel. A stainless steel collar supports the piping on the outside. Each swage fitting has a barbed end that is installed into the pipe and a threaded connection on the opposite end. A mandrel is pulled through the inside of the barbed fitting and expands it into the pipe, while the collar supports the pipe from expanding on the outside. Swage fittings are only available in a swivel option with male NPT connections. Swage fitting installations must be done using the FFS swage fitting expansion tooling. Using other manufacturer's expansion tooling will result in improper assembly and potential fitting failure.

- Fitting Fuel Compatibility – XP-Series swage fittings are approved under the same UL listed fuels as the XP-Series piping (see section 2.1) and are approved by FFS for the same fuels as the XP-Series piping (see section 2.2).

- Standard XP-Series swage fittings are designed for use in applications utilizing fuels such as E85, M85, E100, M100, and Bio-Diesel.

Section 7 – Installation Requirements

7.1. Bury Depth – In installations with traffic meeting AASHTO H20 wheel loading requirements, the pipe must be buried at least 12" (30.48 cm) deep with a minimum of 6" (15.24 cm) of backfill above the pipe and 6" (15.24 cm) of concrete above the backfill. For installations using asphalt or other burial material, the pipe must be buried at least 18" (45.72 cm) deep with a minimum of 6" (15.24 cm) of backfill above the pipe and 12" (30.48 cm) of asphalt and/or other burial material above the backfill.

7.2. Trenches – Trenches should be dug straight when possible. If changes in direction are required, trench corners should be cut at 45 degree angles to allow for the piping run's proper bend radius. There must be a minimum of 6" (15.24 cm) of space between the outside of a piping run and a trench wall. The minimum allowable pipe bend radius for all XP-Series piping is 36".

7.3. Backfill Material – Only clean compacted sand, clean pea gravel, or clean ¾" (1.91 cm) or smaller crushed rock (without sharp edges) can be used as backfill material. Backfill materials listed above with sharp edges are prohibited from use with XP-Series piping as it can cause damage to the piping over time. Backfill material must not be contaminated with any petroleum product, any additives found in petroleum products, and/or any other contaminant adversely affecting backfill integrity.

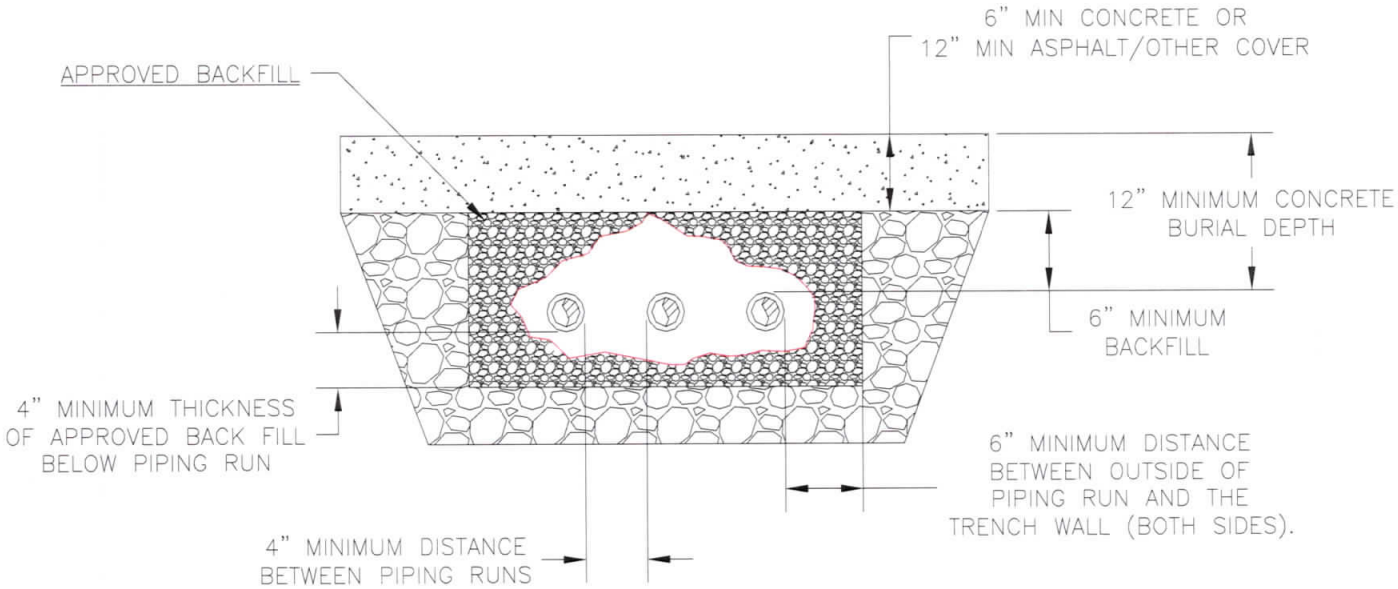
7.4. Pipe Slope – XP-Series piping that is being used to transfer fuel should slope back to the tank field at a minimum of 1/8" per foot (0.32 cm per 30.48 cm). Piping runs that have multiple sumps (dispenser, transition, etc.) in series should be pitched at a slope of 1/8" per foot (0.32 cm per 30.48 cm) with each run draining back towards the tank field.

7.5. Piping Crossovers – Avoid pipe crosses, but if they are unavoidable, keep them close to, but not over, the tanks. For pipe crossovers, keep a minimum of 4" (10.16 cm) of backfill between the two pipe runs. The backfill above the highest crossover pipe must be a minimum of 6" (15.24 cm). The backfill on each side of the piping must extend a minimum of 6" (15.24 cm) from the side of the pipe.

7.6. Pipe Run Spacing – Piping runs can be done with only one pipe per trench, or multiple pipe runs per trench.

7.6.1 One Pipe Per Trench - There must be a minimum of 4" (10.16 cm) of backfill material below the piping run. There must be a minimum of 6" (15.24 cm) of backfill on each side and above of the piping run.

7.6.2 Two Or More Pipes Per Trench - There must be a minimum of 4" (10.16 cm) of backfill material below and between piping runs. There must be a minimum of 6" (15.24 cm) of backfill above the pipe and on the outside of the outermost piping runs. The figure below shows an example of the required spacing between three pipes in a single trench.

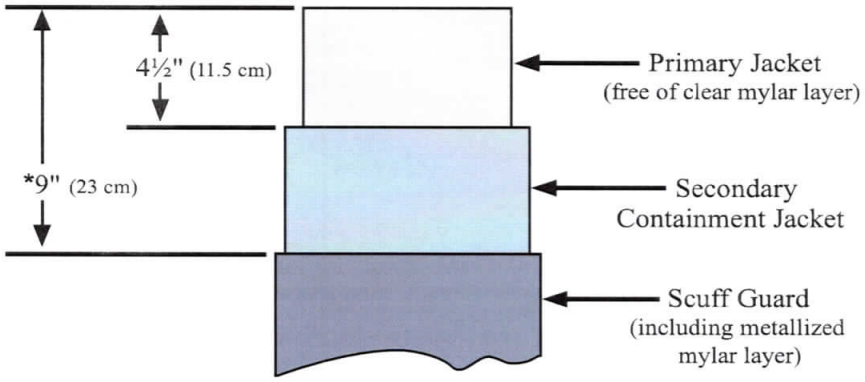


7.7. Containment Sumps – The containment sump shall encapsulate each termination fitting, prevent outside surface and ground water from entering it, and prevent fluids inside it from escaping into the environment.

7.8. Sump Penetrations – XP-Series piping should be installed perpendicular to the sump wall it is passing through whenever possible. The maximum angle that the pipe can deviate from this perpendicularity is 15 degrees. All containment sumps are required to be fit with pipe or conduit seals that are semi-absorbent to ground movement and sufficiently flexible enough to permit angled entries. Sump entries shall create a water tight seal capable of withstanding head pressures of up to 6 ft (1.8 m). FFS entry boots should be used for maximum system compatibility. In order to create a water tight seal, the scuff guard on XP-xxx-SC pipe must be cut back so that it does not enter the sump.

7.9. Pipe Cutback - Once the pipe run is pulled and each section is cut to length, square off the end of the pipe and de-burr it. If you are using SC (Secondary Contained) piping, the scuff guard layer should be cut back so that it does not enter the sump (typically 9" (22.9 cm)) and the SC layer should be cut back 4½" (11.5 cm) from the end of the pipe. Below is a view of what the pipe will look like after performing the proper cutback.

Pipe Layers



* A 9" cutback is the approximate distance for a dispenser sump cutback. However, in tank sumps the cutback dimension could be more. The scuff guard must always be cut back so that entry boots seal on the secondary containment jacket, not the scuff guard. In order to ensure a proper seal, it is best to cut back the scuff guard so that it is outside of the sump wall.

Section 8 – Testing Requirements

8.1 Installation Testing - Once the XP-Series piping has been connected to the plumbing inside the containment sumps, it should be pressure tested prior to burial. Below are the recommended pressures for testing the primary piping, secondary containment, and ducting (if applicable). The installation testing should be done in accordance with the current procedures published by FFS. Your system may or may not incorporate all of these components.

8.1.1 Primary Carrier Piping – Primary piping pressure testing should be done between 50 to 100 psi (3.45 to 6.89 bar).

8.1.2 Secondary Containment Testing – Secondary containment pressure testing should be done between 5 to 8 psi (.34 to .55 bar).

8.1.3 Ducting Testing – Ducting pressure testing should be done between 2 to 4 psi (.14 to .28 bar).

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