



Safety Iron[®] Manifold Trailer

Weir SPM's Safety Iron[®] Manifold Trailer provides the market with a uniquely designed manifold system that is ideally suited for stimulation operations, where vibration and side load have proven to be detrimental to the existing hammer union trailer models currently on the market.



Responsiveness to Customer Needs

The Next Generation of Manifold Trailers:

Weir SPM has worked with its customers to develop design features intended to address many of the common issues seen in the field with previously used trailer models.

Issue #1:

Alternative models were rigid in design with components mounted directly on the trailer, often resulting in cracked integral components during transport and operation.

Solution:

Weir SPM trailers feature flexible mountings, such as a coiled-cable suspension, at each of the integral mounting positions. This allows flexibility in the high pressure line, greatly reducing the chance of fatigue cracks caused by vibration of the flow line during transport or operation.

Issue #2:

Customers were in need of trailer designs that better fit their specific needs.

Solution:

Through ongoing conversation with our customers, Weir SPM has developed a range of trailer designs that customers can then choose between specific features to customize their trailer. Included in these features are number of inlets/outlets, number and size of flow lines, isolation valve positioning, and more...

Issue #3:

Customers sought to avoid losing valuable time on site re-tightening the hammer union connections that would sometimes loosen during transport due to constant flexing and vibration.

Solution:

Weir SPM's Safety Iron[®] has proven to be the ideal solution to this issue. When properly set to torque specifications, Safety Iron[®] has proven to maintain its seal through transport and throughout multiple frac stages during operation. The robust connection has greater vibration resistance when compared to traditional hammer union connections, making it the easy choice for semi-permanent applications such as manifold trailers, pump bridles, and stimulation vessels.

Issue #4:

Customers responded that during operation, they sometimes saw the low pressure line opposite of the end connected to the blender become starved, possibly resulting in cavitation to the pumps.

Solution:

Weir SPM developed "Anti-Starvation" lines which closed off the first few low pressure stations, feeding the stations at the end directly, leading to far less opportunity for starvation. These lines can be bypassed as needed, providing greater flexibility for customers while helping to protect their pumping equipment from the damaging affects of cavitation.

Flexible Design Configurations

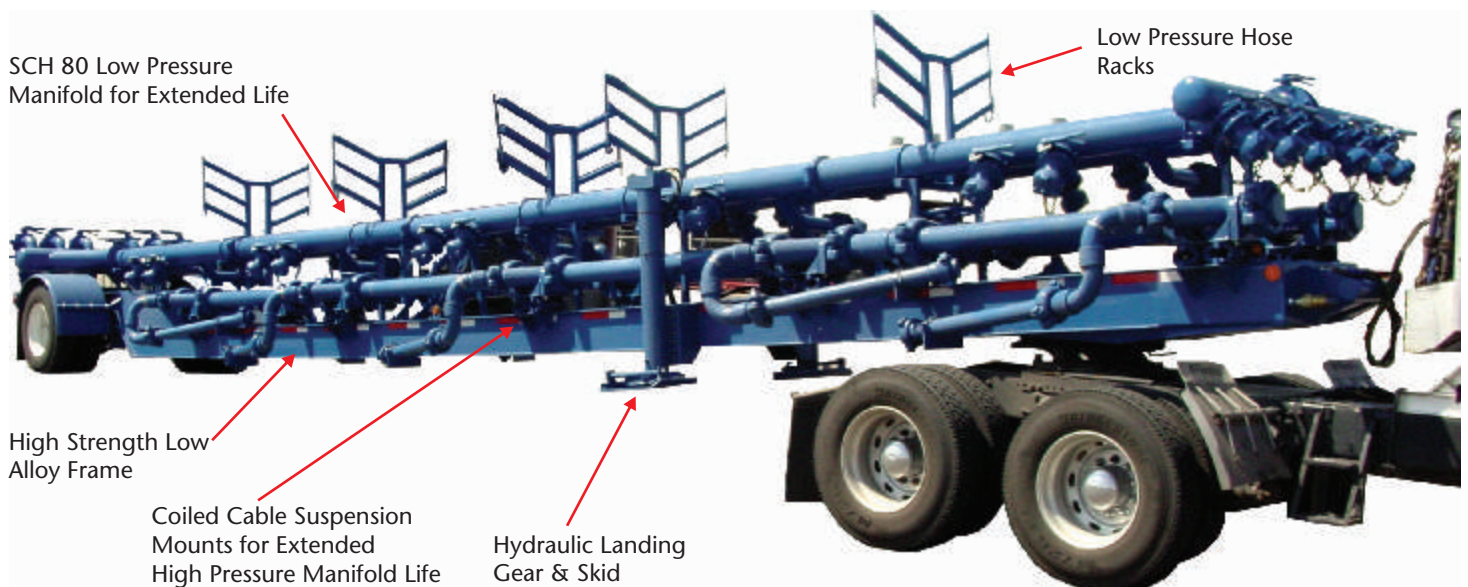
The flexible design features of the Weir SPM Safety Iron[®] Manifold Trailer along with the reliability and consistent sealing properties of the high pressure Safety Iron[®] connections results in a durable manifold designed to increase safety and operating efficiency during fracturing operations.

Product Features:

- Multiple configurations allow for increased variability in flow rate, and inlet/outlet configuration.
- Greater vibration resistance compared to traditional hammer union alternatives.
- Large sweeping radii in high pressure components for increased strength at connections.
- More robust wall thickness to prevent failure in high risk areas.
- Available built-in coiled-cable suspension for high pressure component mounting increases flexibility and reduces risk of cracked integrals.
- Isolation valves available for flexibility in flow line communication and utilization.
- Available with crossovers at high pressure outlets for greater compatibility with existing inventories.
- DOT certified trailer.

Optional Design Configurations:

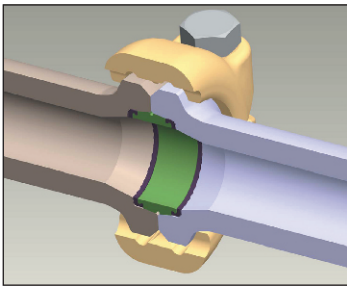
- Flexible high and low pressure line arrangements for various flow rates
- Flexible high and low pressure inlet/outlet arrangements for various station configurations
- High pressure iron size and pressure ratings (3" & 4" / 10K & 15K)
- Isolation valves between the high and low pressure lines
- Tee or lateral connections leading to swing arms
- Configuration of swing arms



Durable Connections That Resist Leaks

Weir SPM's Safety Iron® clamp connecting flow line iron is ideally suited for semi-permanent applications such as manifold trailers, ground manifolds and pump discharge manifolds.

Weir SPM's Safety Iron® connections provide a more reliable seal with increased vibration resistance when compared to traditional hammer union connections. Once properly assembled, Safety Iron® connections do not require the repetitive retightening that is often seen from hammer union connections loosening during transport and operation. This means less down time, and more efficient operation for its users.

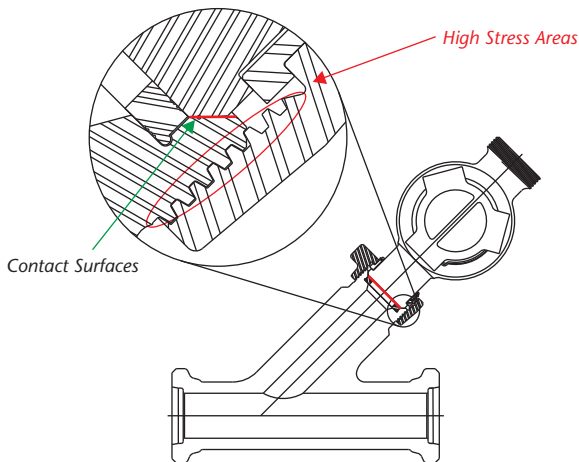


Weir SPM Safety Iron® connection

Benefits of Safety Iron® over Hammer Union Connections

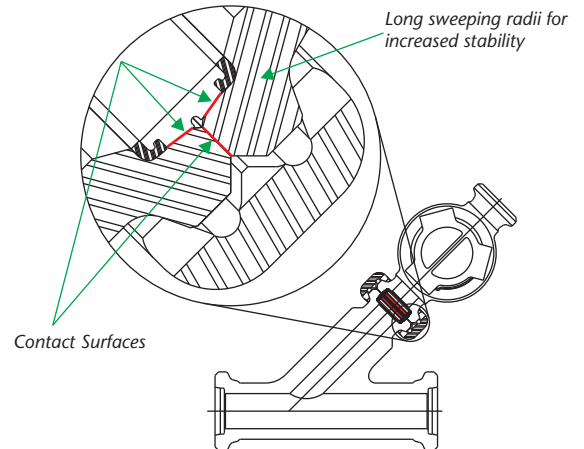
- Safety Iron® eliminates many of the dangers associated with traditional hammer union connections:
 - Striking oneself or others with a hammer
 - Flying shrapnel when striking the iron
 - Sharp edges from striking iron
 - Physical fatigue
- The combination of a soft seal and tapered metal seal creates a more reliable connection.
- Assembly is more consistent due to the verification of its nominal torque value through the use of a torque wrench.
- Only one style end, no male or female. All integrals are universal components.
- Longer life due to robust design.
- Resistant to vibration and shock.
- Large sweeping radii for additional strength at the connection.
- Heavy wall sections to reduce failure in erosion prone areas.

Traditional Hammer Union Connection



Hammer union connections are limited to only one contact seal surface, greatly reducing the integrity of the connection. Hammer unions, with their thinner wall section at vital points and higher stress areas due to the jagged grooves of the threads, are more susceptible to damage as a result of vibration or side loading.

Safety Iron® Connection



Safety Iron® connections have a greater surface contact area for a much more stable connection compared to hammer union seals. Safety Iron® flanges are also more robust with larger sweeping radii for additional strength and vibration resistance.

Unique Design Features

Weir SPM Safety Iron® Manifold Trailers have optional features designed to increase the life of the trailer and its high pressure iron components, as well as the pumping units on site.



**Weir SPM's
"Anti-Starvation" Low Pressure Line**

Weir SPM offers an optional "Anti-Starvation" low pressure line designed to consistently and adequately feed the low pressure pump outlet stations at the far end of the manifold trailer. These stations can sometimes be starved by competitors' single source low pressure line designs if proper charge pressure is not maintained. This design feature can help alleviate issues such as cavitation which can cause catastrophic damage to pumping units. The "Anti-Starvation" line can be disabled through the use of an isolation valve if needed.

Competitor Model



Some competitors' trailers are designed with high-pressure iron mounted directly to the trailer's frame. Discussion with multiple customers has allowed Weir SPM to determine that this is a major cause of cracking and severe damage to high pressure components that have minimal flexibility against vibration during transport and operation. Weir SPM has addressed this concern from our customers with the availability of a suspension mounting system for the integral components.

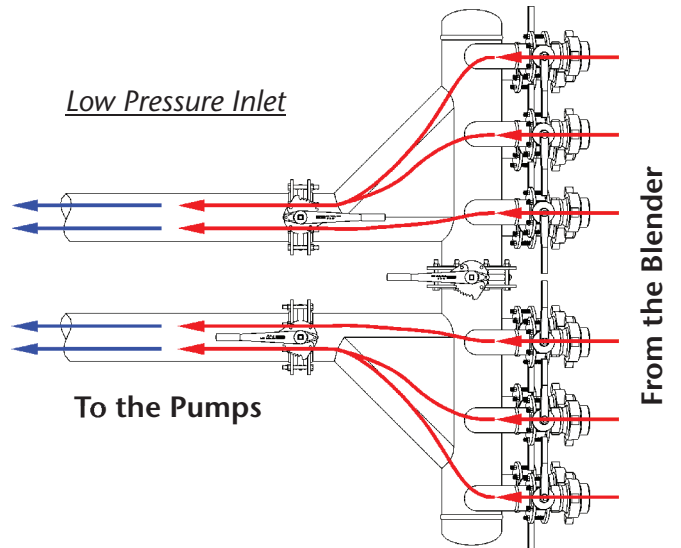
Weir SPM



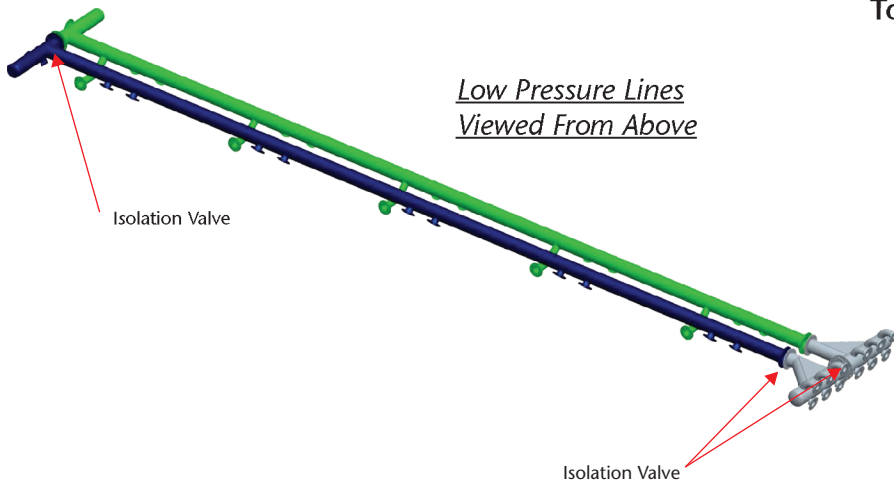
Weir SPM Safety Iron® Manifold Trailers are available with flexible mounts, such as a coiled cable suspension mounting, for high pressure components, greatly reducing the chance of fatigue cracks in integral components due to the vibration caused during transport and operation.

Unique Design Features

Weir SPM Safety Iron® Manifold Trailer low pressure inlets are designed with a sweeping angle from the blender to the pumps. This greatly reduces turbulence in the media being pumped, creating a consistent flow, reduced erosion, and extending the life of the trailer's low pressure lines, compared to standard "L Shaped" inlet designs seen in competitive models.

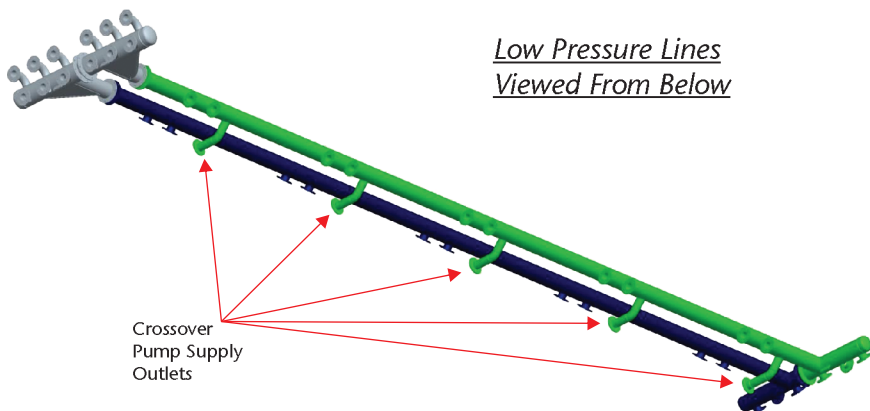


Low Pressure Lines Viewed From Above



Weir SPM Safety Iron® Manifold Trailers can be configured with isolation valves positioned on the low pressure lines designed to disable one of the lines in the instance where fewer pumps are required for a specific operation.

Low Pressure Lines Viewed From Below



Unlike competitor offerings, Weir SPM Safety Iron® Manifold Trailers can be configured with crossover outlets on the low pressure side allowing the customer to "shut down" one low pressure line using the above mentioned isolation valves, yet still operate pumps from both sides of the manifold trailer for increased flexibility in equipment layout on site.

Examples of Previously Manufactured Trailers



For more information on Weir SPM Safety Iron® Manifold Trailers, please contact your nearest Weir SPM representative:

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