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				Revision:
	Document Title:	<p style="text-align: center;">Mechanical Cable Operated Emergency Valve System Schematic</p>	Date:	<p style="text-align: center;">July 2, 2021</p>
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Description of Bulletin: This bulletin is intended as a general guide and offers basic schematics for typical mechanical cable operated emergency valve systems for use on over-the-road cargo tankers. A typical Cargo Tank System consists of multiple components that are designed to work in conjunction with one another. It is imperative that this system is configured to ensure it meets all regulatory, safety and performance requirements.

Bulletin Instructions: Several configurations are shown on the following pages and each one may satisfy a certain application better than the others. It is the responsibility of the tank manufacturer and owner/operator to fully understand the specific configuration utilized.

A typical Mechanical Cable Operated System consists of the following components:

Primary Loading/Unloading Outlet is typically an Internal Self-closing Stop Valve (Emergency Valve) mounted in the bottom of the cargo tank that includes a shear section that satisfies 49CFR178.345-8 tested per TTMA RP 84. A mechanical cable operated system utilizes a manually actuated valve.



Remote-Control Trip Lever (35603SL) is a mechanically activated remote means of closure for the Emergency Valves. When mounted and installed correctly, this Remote-Control satisfies requirements of US DOT 49CFR§178.345-11(b)(1)(i).



Vapor Recovery Valve (Push Vent) is located on the top of the cargo tank. This valve is used to facilitate the transfer of displaced air/vapor during loading and unloading.



Fusible Link (19724BR) is included with each operator lever to release cables if temperature exceeds 250°F to satisfy US DOT 49CFR§178.345-11(b)(1)(iii) and CSA B620-14 clause 5.6.12.3(e). If additional thermal protection is desired, Fusible Link (21050A) can be installed at the point where the cable attaches to the Emergency Valve.



Mechanical Operator is used to manually open valves and is available in multi-compartment versions. Each lever cams over independently to pull a wire cable that actuates an Emergency Valve. Operators include a trip lever that closes valves when the Remote-Control Lever is pulled to satisfy US DOT 49CFR§178.345-11. Each lever also includes a fusible link to release cables if temperature exceeds 250°F to satisfy US DOT 49CFR§178.345-11(b)(1)(iii) and CSA B620-14 clause 5.6.12.3(e).




Cable Bushing (19588BR) can be installed in the mechanical operator endplate or emergency valve cable bracket to reduce wear and/or friction on flexible wire cable (wire rope).



Flexible Wire Cable/Rope, Tubing, Pullies and Clamps are not provided by Betts but are used to tie all the components together. Ultra-flexible wire cable/rope with a diameter of 3/16" is recommended. Friction should be minimized at every opportunity to ensure smooth operation. Installations may utilize exposed cables with pullies or completely enclosed cables with tubing and grease fittings.

See the following pages for various configurations.

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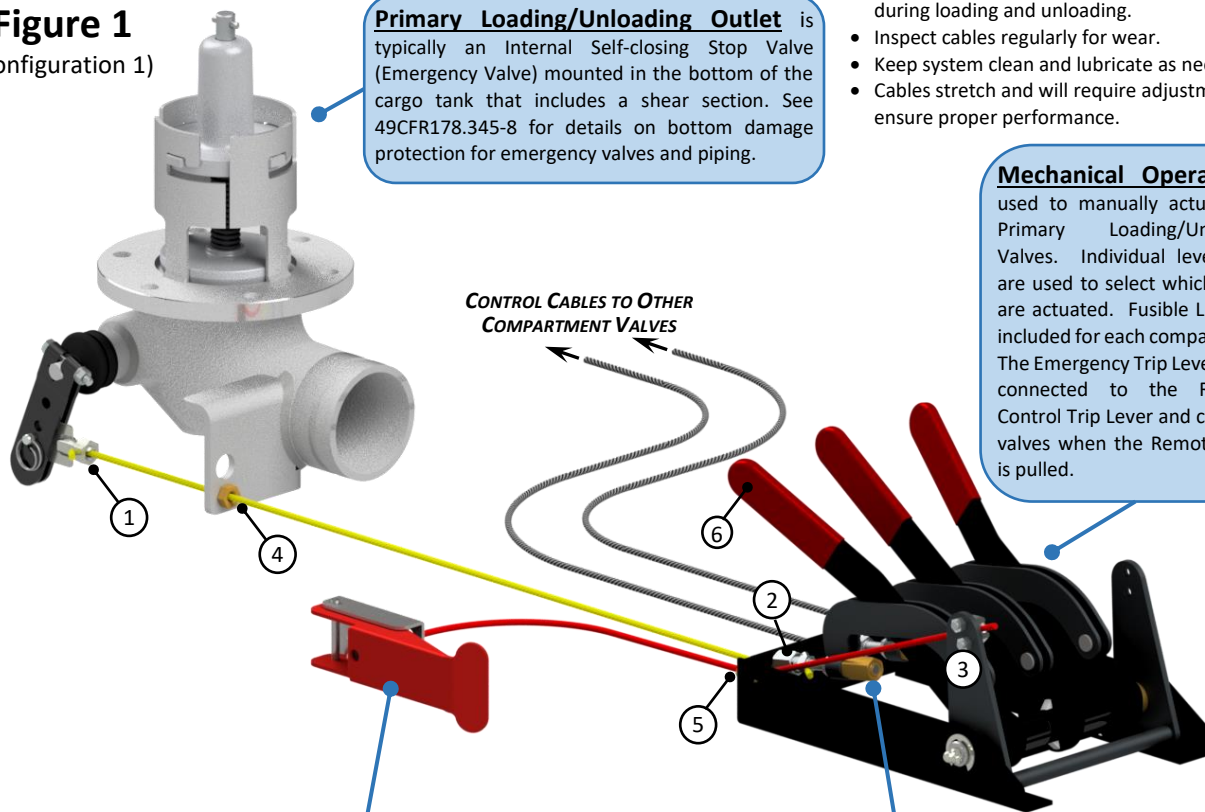
Configuration 1: (Figure 1) This configuration utilizes a mechanical Primary Loading/Unloading Outlet (Emergency Valve), a Remote-Control Trip Lever and a Mechanical Operator which includes Fusible Links. Components are connected together utilizing 3/16" diameter flexible wire cable/rope and the system must be configured to minimize cable friction to ensure smooth operation and reduce wear. The control cable (shown in yellow) is connected to the valve at point #1. Various connection holes are provided at the valve lever arm and can be utilized to best fit the stroke of the operator. The control cable connects to the Operator Adjustment Bolt at point #2. The Adjustment Bolt is used to fine tune the tension on the cable which should be taut but provide enough slack to account for the appropriate amount of thermal contraction for longer cables. The Remote-Control Trip Lever is installed as shown and connected via cable (shown in red) to the Operator Emergency Trip Lever at point #3. Function of the Remote-Control Trip Lever should be tested to make sure the actuation of the lever closes all valves. Optional set-ups: An optional Fusible Link (21050A) can be installed at point #1 and Cable Bushings (19588BR) can be installed at point #4 and #5 to reduce cable wear. Some configurations utilize cable sleeves or solid tubing to encompass the cables. Large bend radii are recommended to reduce cable friction.

To actuate a specific compartment valve, pull the corresponding Handle (Item #6) on the Operator until it cams-over to lock in place. Release the Handle to the original position to close valve.

General Notes:

- This configuration does not show a vapor valve. Venting must be provided to protect tank during loading and unloading.
- Inspect cables regularly for wear.
- Keep system clean and lubricate as needed.
- Cables stretch and will require adjustment to ensure proper performance.

Figure 1
(Configuration 1)




Primary Loading/Unloading Outlet is typically an Internal Self-closing Stop Valve (Emergency Valve) mounted in the bottom of the cargo tank that includes a shear section. See 49CFR178.345-8 for details on bottom damage protection for emergency valves and piping.

Mechanical Operator is used to manually actuate the Primary Loading/Unloading Valves. Individual levers (#6) are used to select which valves are actuated. Fusible Links are included for each compartment. The Emergency Trip Lever (#3) is connected to the Remote-Control Trip Lever and closes all valves when the Remote Lever is pulled.

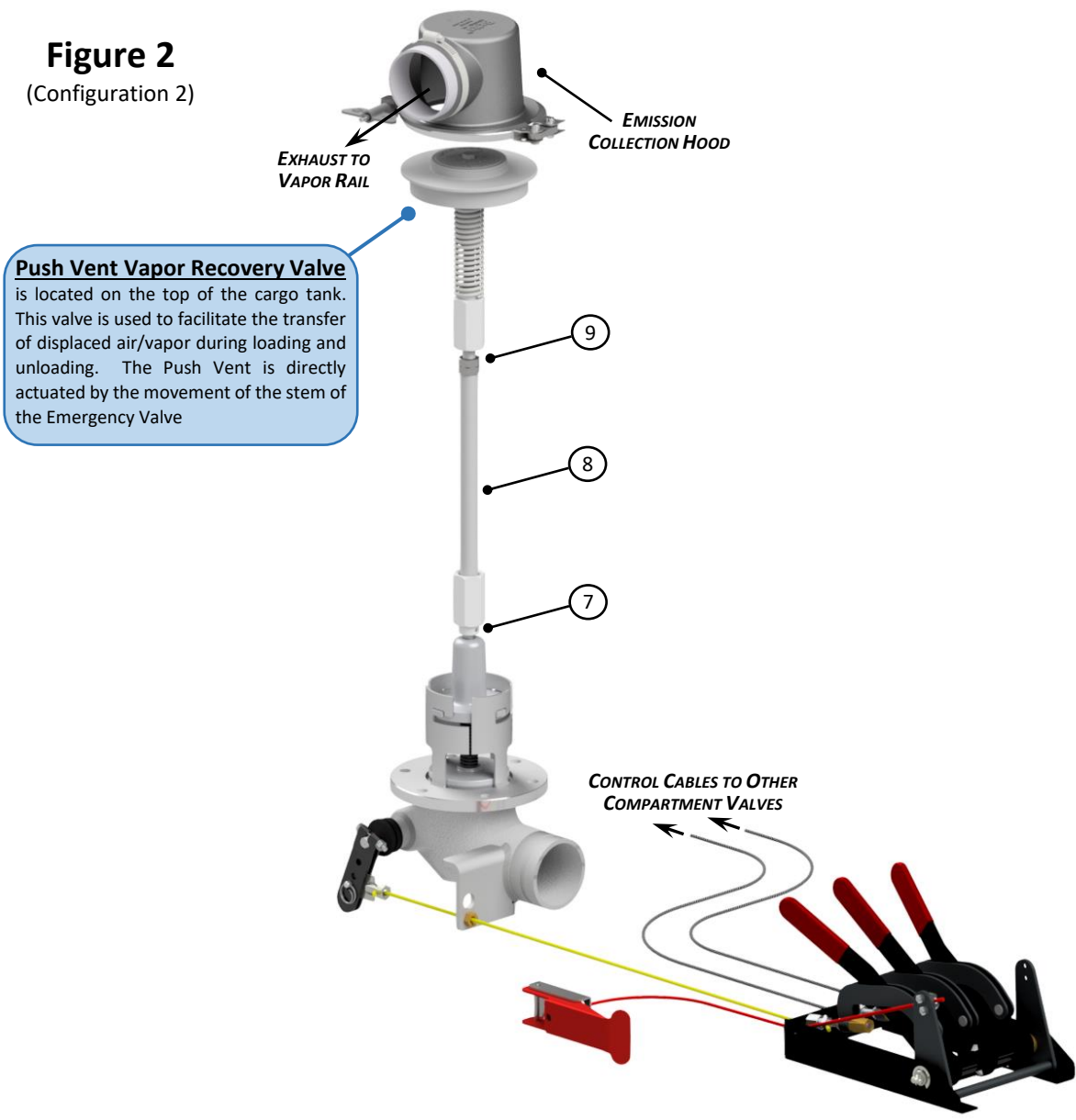
Remote-Control Trip Lever (35603SL) is a mechanically activated remote means of closure for the loading/unloading outlet. It must be located at least 10 feet from the loading/unloading outlet where vehicle length allows or on the end of the cargo tank farthest away from the loading/unloading outlet to satisfy US DOT 49CFR§178.345-11(b)(1)(i). The Remote Control is connected to the mechanical operator via flexible cable. Pulling the lever trips the Operator Emergency Trip Lever at location #5 and closes ALL Emergency Valves.

Fusible Link is a thermally activated release for the cable that connects the operator to the Loading/Unloading Outlet. Fusible melts at temperature not over 250°F. to satisfy requirements of US DOT 49CFR §178.345-11(b)(1)(iii). Operator includes one Fusible Link for each compartment.


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Configuration 2: (Figure 2) This configuration is similar to Configuration 1 but utilizes a Mechanical Push Vent to facilitate the transfer of displaced air/vapor during loading and unloading. The Push Vent must be located directly above the Emergency Valve to function properly and is installed in the top of the tank to a flange or mounted on the manhole cover. The Lower Spring Retainer is attached to the Stem of the Emergency Valve at point #7. The Push Vent Rod (item # 8) is supplied 60 inches long and can be cut to fit specific cargo tank sizes. The Adjusting Bar (item #9) is used to fine tune the fit so there is approximately 1/8" play in the Push Rod when the Emergency Valve is in the closed position. Due to the added load of the Push Vent spring, it is crucial to reduce cable friction for this configuration. Lower cable friction will lead to smoother operation of the Mechanical Operator.

Figure 2
(Configuration 2)



Push Vent Vapor Recovery Valve is located on the top of the cargo tank. This valve is used to facilitate the transfer of displaced air/vapor during loading and unloading. The Push Vent is directly actuated by the movement of the stem of the Emergency Valve

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Configuration 3: (Figure 3) This configuration is similar to Configuration 1 but utilizes a Mechanical Delta 1 Operator with a Three-Way Air Valve to actuate Air Operated Vapor Recovery Valves. The Three-Way Air Valve (20761ALBN), shown as item #10, is attached to the Delta 1 Operator. Constant air-supply (shown as the green tubing) is plumbed to the “IN” port of the Three-Way Air Valve. Cable Stop Bushings (item #11) are secured on the cables as shown to ensure that when any of the Operator Handles (Item #6) are pulled, the Delta 1 Plate (item #12) actuates the Three-Way Air Valve. When the Three-Way Air Valve is actuated, air is provided to the “IN” port of the Air Operated Vapor Valve via the airline shown in blue. Depending on the application, multiple Vapor Valves can be plumbed together in parallel or sequential.

Figure 3
(Configuration 3)

