Eureka Fuel Storage Product Transfer Areas Analysis Report

Environment Canada

PROJECT NO. 1053181

Stantec

PROJECT NO. 1053181

FINAL REPORT TO

Environment Canada
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FOR **Eureka Fuel Storage Product Transfer Areas Analysis Report**

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EXECUTIVE SUMMARY

Jacques Whitford Stantec Limited (JWSL) completed an assessment of the Fuel Storage Product Transfer Areas (PTAs) of the Environment Canada (EC) Eureka Weather Station located in Eureka, Nunavut (the Site). The Site is also occupied by the Department of National Defence (DND) and the Natural Resources Canada (NRCan) Polar Continental Shelf Project, who are also responsible for the operation of fuel storage systems.. The work included a site visit held between August 10 to 14, 2009, a review of various refueling operations for the different systems (EC, DND, NRCan) based on photographs supplied by EC as well as interviews, a general review of site and equipment conditions, preparing a report detailing the recommended approach to mitigate risks associated with the product transfer areas, and a review of drum storage areas for containment considerations as appropriate.

JWSL has conducted a risk-based assessment of the Product Transfer Areas at selected petroleum storage systems at the Eureka Weather Station. The results of the assessment classify the risk levels of the PTAs in the order of ***Medium*** and ***High*** (Table 4). The assessment also highlights that there are a number of activities that can be put into action to further reduce product transfer spills through the implementation of various plans, policies and spill prevention equipment.

In our opinion, the implementation of the recommended corrective actions identified in this report would satisfy the requirements of Sections 15 of the Federal Regulations with respect to the requirement for containment at product transfer areas.

Further assessment of the systems using the risk-based assessment matrix revealed there is a limited amount of measures that can be implemented to reduce the risks associated at these PTAs. These measures include but are not limited to the following:

- Awareness training;
- Provision of spill kits at selected location;
- Provision of Standard Operating Procedures for the transfer of petroleum products;
- Retrofitting of spill containment at fill pipes;
- Regular compliance assessments;
- Storage tank Environmental Management Plans (STEMPs); and
- Environmental Emergency Response Plans (EERPs).

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1 INTRODUCTION

Jacques Whitford Stantec Limited (JWSL) completed an assessment of the Fuel Storage Product Transfer Areas (PTAs) of the Environment Canada (EC) Eureka Weather Station located in Eureka, Nunavut (the Site). The Site is also occupied by the Department of National Defence (DND) and the Natural Resources Canada (NRCan) Polar Continental Shelf Project, who are also responsible for the operation of fuel storage systems.. The work included a site visit held between August 10 to 14, 2009, a review of various refueling operations for the different systems (EC, DND, NRCan) based on photographs supplied by EC as well as interviews, a general review of site and equipment conditions, preparing a report detailing the recommended approach to mitigate risks associated with the product transfer areas, and a review of drum storage areas for containment considerations as appropriate.

2 APPROACH AND METHODOLOGY

2.1 Federal Code Requirements

In accordance with the *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (Code) developed by the Canadian Council of Ministers of the Environment (CCME), the *Canadian Environmental Protection Act* (CEPA) *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (Federal Regulation) define a product transfer area as the area around the connection point between a delivery truck, railcar, or vessel and storage tank system with a capacity of 2500 litres or more. Petroleum product and allied petroleum product transfer areas need to be designed to contain spills that would occur during the product transfer process as detailed in the Federal Regulations:

> ***15.*** *(1) The owner or operator of a storage tank system must ensure that petroleum product and allied petroleum product transfer areas (> 2,500 L) are designed to contain spills that occur during the transfer process.*
>
> *(2) Subsection (1) applies to storage tank systems installed before the coming into force of these Regulations (June 12, 2008) four years after the day on which these Regulations come into force.*

2.2 Site Description and Background

Eureka Weather Station is located on the north side of Slidre Fiord, at the northwestern tip of Fosheim Peninsula, Ellesmere Island, Nunavut (NU). The location coordinates are 79º 59’ 41” N and 85º 48’ 48” W and is accessed primarily by air with an all season air strip located about 1.5 km northeast of the site. The station is hundreds of kilometers from the nearest community and is therefore self-contained. Power is generated using diesel generators. Buildings are heated by either heat recovered from the diesel power plant or from oil furnaces. An annual sea lift provides the station with the majority of bulk goods and supplies. Typically sea lift departs Valleyfield, Quebec, mid July by commercial cargo vessel. Goods are transported to Nanisivik, NU, arriving mid August. From Nanisivik, goods, including the stations annual diesel fuel supply, are loaded onto a Canadian Coast Guard (CCG) ice breaker and transported to Eureka arriving in late August or early September.

2.3 Description of Product Transfer Areas Assessed

Table 2: Description of PTAs

System I.D.	System Location	System Description	PTA Federally Regulated	Description of Product Transfer Area (PTA)	PTA Areas of Concern	Recommendations	Estimated Initial Cost of Recommendations	Expected Life Cycle Costs of Recommendations
1	North section of Station Area, upgradient behind Operations Complex	Main diesel tank farm (nine 59,000 L, one 790,000 L ASTs)	Yes	PTA consists of a shoreline manifold with 102mm fill connection point (transfer hose with a camlock fitting) within a metal containment dyke of approximately 0.69 m^3 capacity. General ground surface is gravel throughout with the water's edge approximately 15m from the fill connection point.	PTA has limited spill containment capability. The uncharged section of the fill pipeline (i.e. up to a check valve 206m upgradient of the fill connection) should also be considered part of the PTA as it is only charged with fuel during transfers and is therefore not checked for leaks on a regular basis. Overfill protection is by tank gauging and dipping.	Appendix C – Diagram #1 and 2	Containment Boom – 84,255.76 USD (See quote in Appendix D)	Visual inspections are required as the booms are being deployed. Cost will depend if the booms are deployed.
1	Inside the powerhouse building, west of old Operations Complex	Generator day tanks (two 680 L ASTs)	Yes	Tanks are filled from a pipeline drawing fuel from the Diesel tank farm.	The PTA assessment is limited to the transfer of fuel to the bulk tanks, not to day tanks(under 2500 L).	Appendix C – Diagram #1 and 2	$3,000	Visual inspection of the connection sump.
2	West of warehouse beside Operations Complex	Operations Complex heating oil AST (9000 L)	Yes	The tank is elevated ~1-2m on a gravel mound with a sloped ramp at the fill end of the tank. The tank has a spill box which is accessed by a steel ladder attached to the tank. The tank is filled by the mobile tank.	PTA does not have Engineered spill containment capability. The tank has a 4" overfill valve which is the wrong size for this use and would likely not work when filling from the mobile tank.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
3	Northwest corner of Old Garage	Old Garage heating oil AST (9000 L)	Yes	The tank is elevated ~1m on a gravel mound. The tank has a spill box which is accessed by a steel ladder attached to the tank. The tank is filled by the mobile tank.	PTA does not have Engineered spill containment capability. The tank has a 4" overfill valve which is the wrong size for this use and would likely not work when filling from the mobile tank.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
4	South of the incinerator, north of Building 12	Incinerator AST (9000 L)	Yes	The tank is elevated ~1m on a gravel mound. The tank has a spill box which is accessed by a steel ladder attached to the tank. The tank is filled by the mobile tank.	PTA does not have Engineered spill containment capability. The tank has a 4" over fill valve which is the wrong size for this use and would likely not work when filling from the mobile tank.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
5	Southwest of the Tank Farm	Gasoline AST (2273 L)	No	The tank is filled from drums using an electric pump. The fill end of the tank is level gravel. The tank has a spill box (cylindrical) which is accessed by a steel step and a platform.	PTA does not have Engineered spill containment capability. The tank has a 4" over fill valve which is the wrong size for this use and would likely not work since the tank is filled by drums.	Appendix C – Diagram #7	$2,000	Regular visual inspection of the portable containment prior to use
6	East of NDB building	NDB AST (9000 L)	Yes	The tank is elevated ~1m on a gravel mound. The tank has a spill box which is accessed by a steel ladder attached to the tank. The tank is filled by the mobile tank.	PTA does not have Engineered spill containment capability. The tank has a 4" over fill valve which is the wrong size for this use and would likely not work when filling from the mobile tank.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspections of the containment device are required prior to each use.

System I.D.	System Location	System Description	PTA Federally Regulated	Description of Product Transfer Area (PTA)	PTA Areas of Concern	Recommendations	Estimated Initial Cost of Recommendations	Expected Life Cycle Costs of Recommendations
7	North of airfield, near the west end	DND jet fuel ASTs (four 30,000 L)	Yes	PTA is a level gravel area beside the airfield. Dedicated fill hose is stored on rack beside the tanks which connects to the Hercules delivery aircraft. The tanks have mechanical shut-off devices to prevent overfill.	PTA does not have Engineered spill containment capability.	Appendix C – Diagram #2 and 3	$5,000	Regular visual inspections of the containment device is required prior to each use.
8	South of Fort Eureka Building	Fort Eureka heat AST (30,000 L)	Yes	PTA is a level gravel area next to the building. The tank is filled by the mobile tank. The fill port has no spill box and is accessed by a wooden stairs and platform.	PTA does not have Engineered spill containment capability. There is no overfill protection.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
9	Southeast corner of DND garage	DND garage heat at airfield AST (9000 L)	Yes	PTA is a level gravel area next to the garage. The tank is elevated ~1m on wooden cribbing. The tank is filled by the mobile tank. The tank has a spill box and is accessed by a wooden stairs and platform and a metal steel ladder attached to the tank.	PTA does not have Engineered spill containment capability. There is no overfill protection.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
10	Southwest of Fort Eureka, beside the incinerator	DND Incinerator AST (2,500 L)	Yes	PTA is a level gravel area next to the incinerator. The tank is filled by the mobile tank. The tank has a spill box which is accessed by steel stairs attached to the tank.	PTA does not have Engineered spill containment capability. There is a vent whistle overfill protection, however, it will likely not function due to the method of filling.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
11	West of the incinerator	DND waste oil AST (2,500 L)	Yes	PTA is a level gravel area next to the incinerator. The tank has a spill box which is accessed by metal stairs attached to the tank.	PTA does not have Engineered spill containment capability. There is no overfill protection.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
12	Next to building immediately northeast of Fort Eureka	heating oil ASTs (2 interconnected tanks, each 1,125 L)	No	PTA is a level gravel area next to the incinerator building. The tank system (2 tanks) is elevated ~1m on wooden cribbing. The tanks have spill boxes and are accessed by wooden stairs.	PTA does not have Engineered spill containment capability. There is vent whistle overfill protection, however, it will likely not function due to the method of filling.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
13	South of Fort Eureka	Waste glycol AST (2,250 L) and not in use AST (1125 L)	No	PTA is a level gravel area in front of the tank. The tank has a spill box.	PTA does not have Engineered spill containment capability. . There is no overfill protection.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
14	Southeast corner of DND HADCS Warehouse	DND heating oil AST (2,250 L)	No	PTA is a level gravel area in front of the tank. The tank is elevated ~1-2m on a gravel mound and further elevated by ~1m of wood cribbing. The tank is filled by the mobile tank. The tank has a spill box which is accessed by wooden stairs.	PTA does not have Engineered spill containment capability. There is vent whistle overfill protection, however, it will likely not function due to the method of filling.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use

System I.D.	System Location	System Description	PTA Federally Regulated	Description of Product Transfer Area (PTA)	PTA Areas of Concern	Recommendations	Estimated Initial Cost of Recommendations	Expected Life Cycle Costs of Recommendations
15	West of NRCan shed (Polar Continental Shelf Project)	NRCan ASTs (~900 L, heating oil, empty dispenser tank)	No	PTA is a level gravel area in front of the tanks. The heating oil tank supported on a wood frame and the dispenser tank is set on wood cribbing.	PTA does not have Engineered spill containment capability. There is no spillbox or overfill protection.	Appendix C – Diagram #5 or 6 (depending on refuelling truck used on site)	$1,000 (Estimate based on Diagram #6)	Regular visual inspection of the portable containment prior to use
16	Southwest of the Tank Farm	Mobile Refuelling Tank	N/A	N/A	N/A	The current mobile tank does not meet the Transportation of Dangerous Goods Act and must be replaced by January 1, 2010.	$125,000	Regular maintenance will be required.

Note:

1. The cost of the new mobile refuelling tank will depend on the tanker size and selected operational options. The maintenance requirement for the new mobile refuelling tank will depend on the tanker procured. A site and user analysis should be complete prior to selecting the mobile tank.

3 DESCRIPTION OF PRODUCT TRANSFER OPERATIONS

3.1 CCG Ship Fuel Offloading

Ship fuel offloading occurs annually and is performed by a Canadian Coast Guard (CCG) vessel using a 102mm pipeline which connects to the Main Diesel tank farm. Fuel offloading occurs in late summer under varying weather conditions and ice migration near the shoreline. Fuel transfer operation currently utilizes three (3) 122 metres (400 feet) lengths each of 102mm (4") flexible hose (Goodyear Marathon Transfer Chemigum) interconnected using camlock fittings. The hose is stored on a vertical hose reel in a small unheated storage building onsite and is pressure tested prior to each use. Once the hose is deployed and all connections have been made, the hose is hydrostatically tested. Water used for the pressure test is not contained once the test is completed, but drained on the ground near the hose connection location.

Photo 1: Beach Connection Point

Photo 2: Coast Guard Ship Fuel Offloading

The connection point of the hose is approximately 15m from the edge of the water and there is a metal dyke of approximately 0.69m^3 capacity used to collect fuel which may leak during the fuel transfer operation. The pipeline has a 4" check valve at the connection point and has a manual shut-off valve ~1m downgradient of the check valve. There is a small drain valve between the check valve and shut-off valve to drain the trapped fuel from this pipe section after offloading operations are completed. A "pig" is used to clear the flexible hose of fuel after the transfer operation is complete.

The ~475 m pipeline from the fill point to the tank farm is constructed of 102mm (4") welded steel with flanges at valves and multiple fittings. Flanged flexible hose sections are utilized intermittently to account for thermal expansion and contraction. The pipeline is painted, but shows signs of corrosion near the shoreline. Empty drums are used as pipe supports along the entire length of the pipeline.

There is a storage shed near the on-shore connection point which is filled with spill response gear and absorbent booms. Emergency phone numbers are posted inside the shed.

While the Federal Regulations define a Product Transfer Area as the area around the connection point between a delivery truck, railcar, or vessel and the storage tank system, the implication is that the primary concern is with transfer equipment (hose, pipe, valves, etc.) which is used for product transfer only and which cannot be determined to be leak-free through periodic inspections as these lines/devices are not normally under charged conditions. Consequently, the PTA for the Eureka refueling operation should include the pipeline up to the 206m mark upgradient from the flexible hose-to-pipeline connection point as this section is only charged with fuel during transfer operations. There is a check valve at this location (206m mark) and above which a branch line supplies fuel to the generator day tanks from the tank farm tanks. As the pipeline above the 206m mark is used to continuously supply fuel to the generators, it must comply with the Federal Regulations' requirements for inspection for leaks (existing single-walled piping), and therefore is not included as a part of the PTA assessment.

Due to scheduling difficulties, JWSL was unable to witness the 2009 ship fuel offloading operation at Eureka. Documentation provided by Environment Canada indicates that the fuel transfer operation relies on available guidelines including, but not limited to:

- The Canadian Shipping Act
- Arctic Water Oil Transfer Guidelines
- Canadian Coast Guard – Oil Transfer Guidelines
- Rubber Manufacturers Association - Hose Technical Bulletin
- Goodyear Technical bulletins

3.2 Product Transfer into Fixed Tanks using an Improvised Mobile Fuel System

The mobile trailer-mounted fuel storage tank is a 2,273 litre double wall tank constructed to ULC S601. The improvised system is not a TDG tank with baffles intended for portable/mobile use. The trailer-mounted tank is owned by DND and operated by various parties. The tank has a spillbox and is equipped with a 4" overfill valve (mechanical positive closing), which may not be suitable for the method of product transfer into the tank at the diesel dispensing area (not considered as a product transfer area by the Regulations, but rather a product dispensing area as defined by the NFC). The vacuum gauge for interstitial leak detection is missing from the tank. The tank is secured to the trailer bed with tie-down straps. There is a spool of ground cable with a clamp on the trailer deck.

An electric motor pump with an extension cord is mounted on the trailer for use as a transfer pump for refuling various tank systems around the site. Connected to the pump outlet is a 1 ½" fuel hose on a reel, which terminates with a valve and pipe used as a nozzle for refueling tanks (not capable of providing a liquid tight connection). The hose was in poor condition and is not of Arctic grade.

Photo 3: Improvised mobile/portable tank delivery system

3.3 Product Transfer of Jet Fuel from an Hercules Aircraft

There are four 30,000L double wall AST tanks at the runway, built to ULC S653 standard, which are used to store Jet fuel for DND operations. The tanks have level gauges and ports for manual dipping. Wooden stairs and a catwalk provide access to the top of the tanks. There is a common fill pipe manifold and each tank is equipped with an automatic float-type shutoff valve. The fill pipe manifold is piped to grade level and connected to a dedicated fill hose with a camlock fitting. There is an absorbent pad under the camlock connection. The fill hose is stored at the tanks on wooden posts and the end of the hose has terminates with a fitting which is compatible with the fuel tank on the Hercules aircraft (covered with plastic). A portable pump skid was observed in a shelter near the tanks which is used to refuel other aircraft, but is not used for product transfer operations from the Hercules aircraft.

Photo 4: DND Fuel Storage Tanks at Airfield

3.4 Product Transfer into Fixed Tanks using Drums

The gasoline AST (System 5) beside the tank farm is filled from drums using an electric pump which is kept on the platform on the fill end of the tank. The tank is a 2273L double wall tank with vacuum monitoring, built to ULC S601 standard, and has a cylindrical spill box with a 4" (mechanical positive closing) overfill valve. The drum pump is fitted with a drop tube and is connected to a ¾" hose and nozzle for refueling the tank. There were no drums at the product transfer area during our assessment. There was no observed means of containment for the drums in the vicinity of the PTA. It is assumed that the drums are brought to the tank by truck and gasoline is pumped from the drums near the fill end of the tank. Up to 20 drums would be required to fill the tank.

Photo 5: Gasoline Dispensing Tank PTA

4 PRODUCT TRANSFER AREA ASSESSMENT METHODOLOGY

In an effort to provide a consistent and due diligent approach to addressing the requirements of the Federal Regulations, JWSL has developed a standardized Risk Based Assessment Matrix that will provide a quantitative assessment of the inherent risks associated with product transfer activities at petroleum storage systems. This process is designed so that it can be readily applied to all types of petroleum storage systems. The process will identify a level of risk through the matrix providing direction with respect to mitigating the risks and meeting the intent of the regulations (environmental protection).

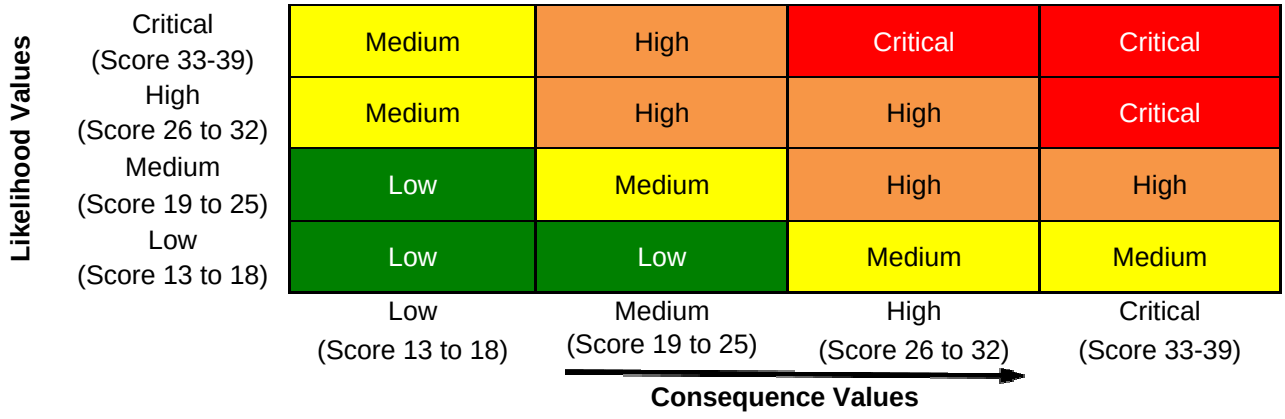
It should be noted that this process has not been officially adopted by the Environment Canada's Environmental Stewardship Branch for the Storage Tanks Systems Containing Petroleum and Allied Petroleum Products. The system is, however, based on a report prepared by Jacques Whitford Stantec Limited for Environment Canada titled *Spill Containment at Product Transfer Areas – Development of Generic Designs dated March 31, 2008,* made available by EC at a regional level on request. The risk levels are broken down into four categories with corresponding recommendations for mitigation. These categories are illustrated in the following Table:

Table 2: Risk Level Categories

Risk Level	Action
Critical	Corrective Action required to mitigate risk to Medium or Low
High	Corrective Action required to mitigate risk to Medium or Low
Medium	Optional Corrective Action required to mitigate risk to Low
Low	No further risk mitigation required

This risk-based approach uses a matrix that has ranges of consequence and likelihood as the axes. The combination of a likelihood and consequence range gives an estimate of risk or a risk level. A series of key screening issues associated with the potential likelihood of a spill or release have been developed with corresponding values for the resulting on site conditions. Conversely, a series of key screening issues associated with the potential consequences of a spill or release have also been developed with corresponding values for the resulting effect on site. These issues include personnel safety, public safety, environmental impact, property damage/business interruption, corporate image and legal implications. There are over 25 specific likelihood and consequential criteria to be scrutinized for each PTA in this process. This process is proprietary to JWSL and as such, the specific criteria are not shown. The result of the screening process is a quantitative risk value from both the likelihood and consequence criteria. These values are then applied to the axes of the following risk matrix shown in Figure 1.

Figure 4 RISK LEVEL = Likelihood x Consequence



A corresponding level of risk is correlated from the matrix using the values obtained from the screening criteria. The corresponding Risk levels are defined in Table 3 with recommendations for generic mitigation actions as required.

Table 3: Recommended Risk Mitigation Methods for Product Transfer Area

Level of Risk	Recommended Risk Mitigation Methods	Definition of Risk
Low	Standard Operating Procedures (SOPs)	1. Low Risk: minor reversible effects of spill, unlikely event, not within or in proximity to sensitive area/receptor, volume of spill less than 100L
	Training	
	Spill Kit	
	Regular Maintenance	
Medium	All Low Risk Mitigations Measures	2. Medium Risk: potential negative effect, volume of potential spill more than 100L but less than 2,500 L, no reliance on groundwater, effects of spill can be mitigated with immediate response by trained personnel.
	Level Gauge	
	Overfill Device	
High	All Medium Risk Mitigation Measures	3. High Risk: high likelihood of spill, sensitive area, reliance on nearby groundwater, high volume potential (> 2,500 L), traditional land use considerations, permanent/long term environmental effects.
	Overfill Alarm - Audible & Visible	
	Fuel Supplier Equipped with Spill Containment Equipment while Filling Tank	
Critical	All High Risk Mitigation Measures	4. Critical Risk: high likelihood of spills in very sensitive environments with no protective measures in place. Significant long term environmental effects and human health considerations.
	Engineered Fuel Transfer Area	

The key to risk management is to identify risks that are intolerable and to mitigate them to a tolerable level. The benefit of using a risk matrix is that it identifies those risks that need to be mitigated and therefore allows for prioritization of and for more cost-effective risk mitigation measures. This is becoming increasingly important as organizations have reduced their operating budgets and have limited resources to manage risk.

4.1 Summary of Risk Assessment Values for PTAs

The following table summarizes the level of risk that each Product Transfer Area presents.

Table 4: Level of Risk

System ID	Tank ID	Location	Consequence Score	Likelihood Score	Risk
1	Main Diesel Tank Farm	North section of Station Area, upgradient of Operations Complex	31	23	High
1	Generator Day Tanks	Inside the powerhouse building	27	24	High
2	Operation Complex heating oil AST	West of warehouse beside Operations Complex	24	24	Medium
3	Old garage heating oil AST	Northwest corner of old garage	26	24	High
4	Incinerator AST	South of incinerator, north of building 12	26	24	High
5	Gasoline AST	Southwest of the tank farm	28	23	High
6	NDB AST	East of NDB building	27	24	High
7	DND Jet fuel ASTs	North of airfield, near the west end	30	25	High
8	Fort Eureka heat AST	South of Fort Eureka building	25	25	Medium
9	DND Garage heat at airfield	Southeast corner of DND garage	27	24	High
10	DND Incinerator AST	Southwest of Fort Eureka, beside the incinerator	27	24	High
11	DND waste oil AST	West of the incinerator	27	24	High
12	Pair of heating oil ASTs	Next to building immediately northeast of Fort Eureka	27	24	High
13	Waste Glycol AST and not in use AST	South of Fort Eureka	27	24	High
14	DND heating oil AST	Southeast corner of DND HADCS Warehouse	27	24	High
15	NRCan ASTs (heating oil, empty dispenser tank)	Next to NRCan Building	27	25	High

5 RECOMMENDATIONS

JWSL has conducted a risk-based assessment of the Product Transfer Areas at selected petroleum storage systems at the Eureka Weather Station. The results of the assessment classify the risk levels of the PTAs in the order of ***Medium*** and ***High*** (Table 4). The assessment also highlights that there are a number of activities that can be put into action to further reduce product transfer spills through the implementation of various plans, policies and spill prevention equipment.

In our opinion, the implementation of the recommended corrective actions identified in this report would satisfy the requirements of Sections 15 of the Federal Regulations with respect to the requirement for containment at product transfer areas.

Further assessment of the systems using the risk-based assessment matrix revealed there is a limited amount of measures that can be implemented to reduce the risks associated at these PTAs. These measures include but are not limited to the following:

- Awareness training;
- Provision of spill kits at selected location;
- Provision of Standard Operating Procedures for the transfer of petroleum products;
- Retrofitting of spill containment at fill pipes;
- Regular compliance assessments;
- Storage tank Environmental Management Plans (STEMPs); and
- Environmental Emergency Response Plans (EERPs).

5.1 Ship Fuel Offloading

Due to the quantity of fuel delivered, and the product transfer across open water, the annual bulk transfer by ship offloading poses the greatest potential risk to the environment at the Eureka Weather Station. Two aspects of the Federal Regulations which are not adequately addressed with the current ship fuel offloading practices are:

- Spill Containment at Product Transfer Area; and
- Emergency Plan

5.1.1 Product Transfer Area

As with most refueling operations, the transfer hose at Eureka is the weakest component of the product transfer process and its selection, storage, handling and annual recertification are critical to maintaining its integrity. The Goodyear Marathon Transfer Chemigum (**see Appendix D**) hose has a pressure rating of 150 psig when properly stored and handled according to Goodyear recommendations. The current hose is stored in a small unheated storage building on a vertical reel when not in use. It is our understanding that Environment Canada is planning to procure new transfer hoses for the 2010 and 2011 refuelling season. These new hoses must be stored as per manufacturer's instructions such that it does not affect the integrity of the hose.

Annual pressure testing of ship-to-shore fuel transfer hose is a requirement of the *Canadian Shipping Act*, *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*. Certain federal fuel installations, such as Lightstations, require the hose to tested at an accredited test facility prior to each annual fuel transfer operation. The current practice of hydrostatically testing the hose at site may not be in accordance with the manufacturer's recommendations (i.e. test duration, test acceptance level, calibration of test gauges, etc.) and record keeping requirements. Also, any residual fuel in the hose from previous refueling operations would mix with the pressure test water and should be contained and disposed of properly (currently test water is discharged on the ground). Environment Canada may want to consider having the transfer hose tested and stored offsite. The Goodyear hose currently in use for fuel transfer is manufactured near Montreal and therefore the hose could be tested and stored in Montreal and delivered to

site by the CCG vessel. Additionally, it is also recommended that at least one spare section of hose be available on site during fuel transfer such that should a section of hose fail, there would be a replacement section for use.

After each annual fuel transfer operation it is important that the hose be thoroughly drained and flushed for proper storage. JWSL was not onsite to witness the actual fuel transfer and therefore is unaware if proper draining/flushing procedures are in place to prevent a spill of fuel or contaminated water. If water is used to flush the hose at the completion of fuel transfer operations then it is recommended that the contaminated water be collected and disposed of in a manner which will not adversely affect the environment.

The shoreline spill containment material should contain enough absorbent hydro-phobic boom material to encircle the entire length of the transfer hose on shore. Oil containment booms should be deployed, when feasible, around the CCG vessel and tied onto the shore. Shoreline oil containment booms allow for a portion of the boom on shore to remain collapsed while the section of the booms in the water to be engaged. Consideration should be given to deploy the boom prior to each annual product transfer operation (refer to **Appendix C** for customized generic options).

Although JWSL acknowledges that the deployment of hydro-phobic booms is not always feasible due to ice flow conditions, in review of photographs taken over the last few years of fuel transfers, it appears that the ice is cleared between the ship and the shore to allow for the fuel hose to run safely to the connection point. In all these photos, there is sufficient enough clearance to allow for hydro-phobic booms to be installed along the piping and allow for mitigation methods to be installed in the water in case of a spill.

Photo 6: 2004 Ship to Shore Fuel Transfer

Photo 7: 2006 Ship to Shore Fuel Transfer

Photo 8: 2007 Ship to Shore Fuel Transfer

Photo 9: 2008 Ship to Shore Fuel Transfer

Photo 10: 2009 Ship to Shore Drum Transfer

The improvised steel containment pan under the fill pipe fitting has an internal volume of ~0.9 cubic metres, however, the notches at each end to cradle the pipe/hose reduce the effective containment volume to 0.69 cubic metres. This may not be adequate to contain fuel if a substantial leak developed during a product transfer at the connection point. Also, a pressurized leak may not be contained by the steel containment pan, which is more effective at containing an unpressurized drip from a mechanical connection. Therefore an enclosed fill connection with spill containment (refer to **Appendix** C, Diagram 2)) should be considered to mitigate the risk of a spill at the shoreline hose connection point.

The portion of the transfer pipe which is only charged during product transfer operations (i.e. from the fill point at the beach up to the 206m mark) should be pressure tested annually. At a minimum, welds, flanges, and flexible pipe sections should be monitored by line walkers during the annual refueling operation.

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5.1.2 Emergency Plan

Section 30 of the Federal Regulation requires that the owner or operator of a fuel tank system must prepare an emergency plan. It is JWSL's understanding that the "Oil Pollution Emergency Plan for Land Spills" for the Eureka HAWS will be updated to include all the requirements of the Federal Regulation. Note that the current emergency plan states that it is for land spills only (although 6.5.2 & 6.5.3 refer to spills on water) and should be updated to include an action plan for spills occurring on water. The plan must be developed and implemented by June 12, 2010.

Although this scope of work did not include a formal review of the spill plan, JWSL recommends that the following items be discussed in future revisions of the plan:

- Procedures to mitigate and contain any offshore spills;
- Complete routine API 653 inspections of the tank farm tanks to help prevent a tank failure from occurring;
- The possible spill scenarios do not include any piping leak from any site tank piping (heating, incinerator, generator, etc.);
- The possible spill scenarios in the filling and dispensing of the portable tank;
- The accessibility of spill kit #2 in the winter months;
- The lack of spill kits at each tank being refueled by the portable tank;
- The location of the personal protective equipment (PPE) on site;
- The location of fire extinguishers and other fire suppressant equipment (if available);
- If there are any confined space risks with a fuel spill and the appropriate air monitoring equipment needed;
- Description of equipment and material (spill kit inventory) available to control and contain free product at site; and
- Personnel who use the portable tank and those who do maintenance on storage tanks and piping should be listed as those with spill training;

5.2 Product Transfers into Fixed Storage Tanks using a Mobile Fuel Tank

5.2.1 Mobile Fuel Tank – Transportation of Dangerous Goods Regulation

In August 2002, the *Transportation of Dangerous Goods* (TDG) *Regulation* was amended such that containers greater than 450L used to transport fuel shall meet safety standards outlined in Part 5 of the regulations. Some portable containers, such as slip tanks, were grandfather until December 31, 2009 if they passed certain testing and certification requirements. As of January 1, 2010, all portable tanks shall meet the standard set in Section 5.14 of the TDG regulations which states:

*"**(1)** A person must not handle, offer for transport or transport dangerous goods included in Class 3, 4, 5, 6.1, 8 or 9 in a large means of containment unless it is manufactured, selected and used in accordance with*

> ***(a)** for transport by road vehicle,*
>
> > ***(i)** if the means of containment is a UN standardized means of containment, the requirements of sections 2, 3, 12 and 13 of CGSB-43.146,**SOR/2002-306***
> >
> > ***(ii)** CSA B621 and, despite any indication to the contrary in CSA B620, Appendices A and B of CSA B620, **SOR/2008-34***
> >
> > ***(iii)** if the means of containment is a type 1 or type 2 portable tank, the requirements of Section 13 of Volume I, General Introduction, of the IMDG Code, 29th Amendment, or **SOR/2002-306** (A type 1 and a type 2 portable tank are described in the IMDG Code, 29th Amendment.**SOR/2002-306)***
> >
> > ***(iv)** if the means of containment is an IM 101 or IM 102 portable tank, the requirements of Subpart B of Part 172 and section 173.32 of 49 CFR;*
> > ***SOR/2008-34** (An IM 101 and an IM 102 portable tank are described in 49 CFR.)"*

Based on our assessment of the improvised mobile/portable tank (ULC S601, double wall, shown in Photo 11 below) at the Eureka site, it did not have any indication that it met the CSA B620 standard. Thus on January 1, 2010, this tank shall not be used to transfer fuel in accordance with the TDG Regulation. Refer to **Appendix E** for additional information regarding the TDG Regulation.

Photo 11: Improvised mobile/portable tank delivery system

5.2.2 Mobile Fuel Tank – Product Transfer Area Concerns

None of the fixed tanks that are refueled by the improvised mobile tank appear to have specific PTAs. The area where the mobile tank would be positioned during product transfer can generally be described as flat or slightly sloped gravel, with adequate space for access. Although there were no sensitive ecological receptors noticed in the immediate vicinity of tanks, their placement on coarse granular material with no ability for secondary containment or temporary retention of accidentally spilled product would allow for quick subsurface migration of the product to the water table (as appropriate) with a potential for resurfacing at the nearest surface body of water, generally in close proximity for the entire site.

For the larger tanks or frequently refueled tanks it is recommended that a geotechnical liner (**Appendix D**) and bermed area be installed to contain leaks which may occur during product transfers. For smaller tanks or infrequently filled tanks a small temporary berm should be deployed during product transfers. Temporary berms are very easy to set-up and dismantle and could be kept either at the tank system location in a storage shed/container or onboard a TDG-approved refueling truck.

5.2.3 Mobile Fuel Tank – Product Transfer Hose

The existing hose on the portable tank is in poor condition and is not of Arctic grade. It is recommended that the hose be replaced and inspected on a regular basis until such a time as the refueling truck is replaced.

The improvised mobile tank system is equipped with an electric pump and a hose reel which terminates with a valve and pipe to act as a nozzle. The pipe nozzle is not a proper liquid-tight fill “fitting” and is not compatible with the type of overfill protection noticed on many of the tanks. Vent whistles will not function and fuel can escape on tanks equipped with mechanical shut-off valves as there are no liquid tight fittings between the nozzle and the fill pipe. Therefore it is recommended the fill connection type for each tank be reviewed with respect to the method of overfill protection. If properly sized mechanical overfill valves are used on ASTs, it is recommended that the vent whistles be installed to alert the operator to cease filling the tank (typically 90-95% full) before the overfill valves stop the filling operation.

Note: for tank systems less than 5000 L, the code allows for product transfers to be performed by a delivery hose that does not have a liquid tight connection as long as the product transfer operation can be continuously monitored (visual gauge) to ensure no overfill occurs (may use constant visual monitoring and gauging during filling operation CCME 3.4.1(2)).

5.3 Product Transfer of Jet Fuel from the Hercules Aircraft

The current transfer point (fill pipe manifold) offers no potential containment during a product transfer. Due to the nature of the soils and fill type, JWSL recommends that the fill manifold piping be extended to a prefabricated remote fill enclosure to house the fill connection and designed with an integral reservoir to contain residual fuel from the hose after product transfer. An example of remote fill enclosure is shown in Diagram #2 at **Appendix C**.

The current practice of storing the fill hose at the tank exposes the hose to UV degradation which is not recommended for rubber products. The hose should also be of “Arctic-grade” to prevent cracking and to ensure flexibility at low temperatures. Therefore, it is recommended that the hose be kept on a suitable hose real and stored in an enclosure or nearby shelter. Also, there is also no apparent method to drain the hose and capture residual fuel remaining in the hose after fuel delivery. With a properly designed product transfer point, the residual fuel could be drained to the secondary containment for immediate transfer to a drum for disposal as waste fuel or for transfer to a system storing the same type of fuel (although not of aviation grade).

Photo 12: DND Fuel Tanks Delivery Hose

5.4 Gasoline Transfer into System #5 using Drums

The volume of the single gasoline storage tank (System #5) is less than 2,500 L, and therefore it does not need to comply with Section 15 of the Regulations for PTA designs. Regardless of this, JWSL recommends the following mitigation measures to reduce the risks posed by the method of transfer. The hose used for product transfer of gasoline to the AST is equipped with a dispensing nozzle. The AST is equipped with an overfill valve designed to operate with a liquid tight connection (4” camlock fitting with mechanical positive closing overfill device in the fill pipe). In the current transfer procedure, this device would stop flow into the tank when full, but it would not prevent a fuel spill as the dispensing nozzle on the hose does not provide a liquid tight fitting between the nozzle and the fill pipe. It is recommended that a 2” camlok fill fitting be installed on the tank and on the end of the dispensing hose (used to transfer product to the tank) and that a vent whistle or visual level gauge be used to alert the operator when the tank is full.

JWSL further recommends that drum containment pallets be used to set the drums on while refueling the tank.

6 RECOMMENDATIONS FOR SECONDARY CONTAINMENT FOR DRUM STORAGE

Various products are delivered to Eureka in standard 205L drums, such as gasoline, jet fuel, various lubricants, ethylene glycol, and other petroleum distillates. Also “salvage drums” were also observed which are used to contain and store waste products. There are four main areas at Eureka where a significant quantity of drums are stored as followes:

- Environment Canada Drum Cache (Station Area)
- DND Drum Cache (West Airstrip)
- Polar Continental Shelf Project Drum Cache (West Airstrip)
- DND Garage Drum Cache (West Airstrip)

The DND Garage Drum Cache is the only one which has permanent secondary containment, which is a sturdy welded steel metal dyke with metal grating upon which the drums are set. While this secondary containment structure appears adequate for its intended purpose, it may have exceeded its capacity to hold 110% of the intended storage volume (one drum was resting on the inclined gravel outside the dyke) and must also be maintained regularly in order to manage the water that collects under the raised metal grating floor (just like any other dyke). .

The Environment Canada Drum Cache had limited secondary containment in the form of two containment pallets ; however, these were not being used at the time of our assessment. The pallets were approximately 2m x 2m in size and constructed of reinforced plastic.

The recommended options for secondary containment of drum storage areas would depend on the quantity of drums to be stored and the need for separate areas of storage (for operational reasons). The following sections propose options that are seen as viable mitigation measures that are appropriate for Eureka.

6.1 Geotechnical Liner

For the large drum caches, the best option for contained storage is to install a subsurface geotechnical synthetic liner within a graded bermed perimeter (the liner would be covered by the gravel in order to protect it from UV degradation and heavy equipment traffic bringing drum pallets in and out of the area). A geotechnical liner would provide a durable long lasting solution for the environmentally safe storage of large quantities of drums. Handling of the drums would not be affected, as most drums in the large drum cache arrive in Eureka on wooden pallets for handling with a forklift. The abundance of gravel at the site would assist in keeping the installation cost down.

Installation cost will vary by size of the liner, but for a 30m x 30m liner (seamless 30 mil Linear Low Density Polyethylene (LLDPE)) the cost is approximately $75,000 FOB Yellowknife. Installation of the liner should be completed by a qualified contractor (International Association of Geosynthetic Installers), therefore the installed cost of a 30m x 30m liner would be in the order of $150,000 to $225,000 range. Water that would collect at the low end of the lined area should be managed so that it can be removed through a sump. For an estimated cost breakdown, please refer to **Appendix D**.

There are commercially available ready-to-use bermed containment devices which vehicles (tanker trucks) can drive over; however, due to the rough terrain and temperature extremes, this type of containment is not recommended as a long lasting, durable solution.

6.2 Plastic and Steel Drum Containment Pallets

While every effort should be made to consolidate drum storage at two or three cashes with geotechnical liners, it is evident that there is a site requirement for smaller quantities of drum storage or dispensing at individual buildings at the Station Area or the Airstrip. For these storage needs, it is recommended that pallets with built-in containment capacity be used.

Containment pallets can be made from plastic or steel. Plastic would not be as durable as steel, particularly in cold weather. Plastic pallets have a lower load capacity and are typically not stackable. Plastic containment pallets are less expensive to purchase (~$400) and because they are lighter they would be less expensive to ship to site.

Steel pallets are stronger and more durable, particularly at colder temperatures. The added strength of steel pallets increases the load capacity and the ability to stack pallets. However, steel pallets are more expensive than plastic pallets (~$800), and being heavier than plastic, the cost to ship steel pallets to Eureka would also be greater.

Due to the greater durability of steel spill containment pallets, it is recommended that small quantities of drums, outside of drum caches with geotechnical liners, be stored on steel containment pallets vs plastic. The life cycle cost of steel containment pallets should also be lower due to their durability. Included in **Appendix D** is a list of different plastic and steel pallet configurations available for use. EC should review with each user to determine which pallet configuration would best suit their needs.

7 CLOSURE

This report has been prepared for the sole benefit of Environment Canada. The report may not be used by any other person or entity without the express written consent of Jacques Whitford Stantec Limited and Environment Canada.

Any use which a third party makes of this report, or any reliance on decisions made based on it, are the responsibility of such third parties. Jacques Whitford Stantec Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. Conclusions presented in this report should not be construed as legal advice.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

If you have any questions regarding this report, please contact the undersigned.

Yours very truly,

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IF/FJL/jg

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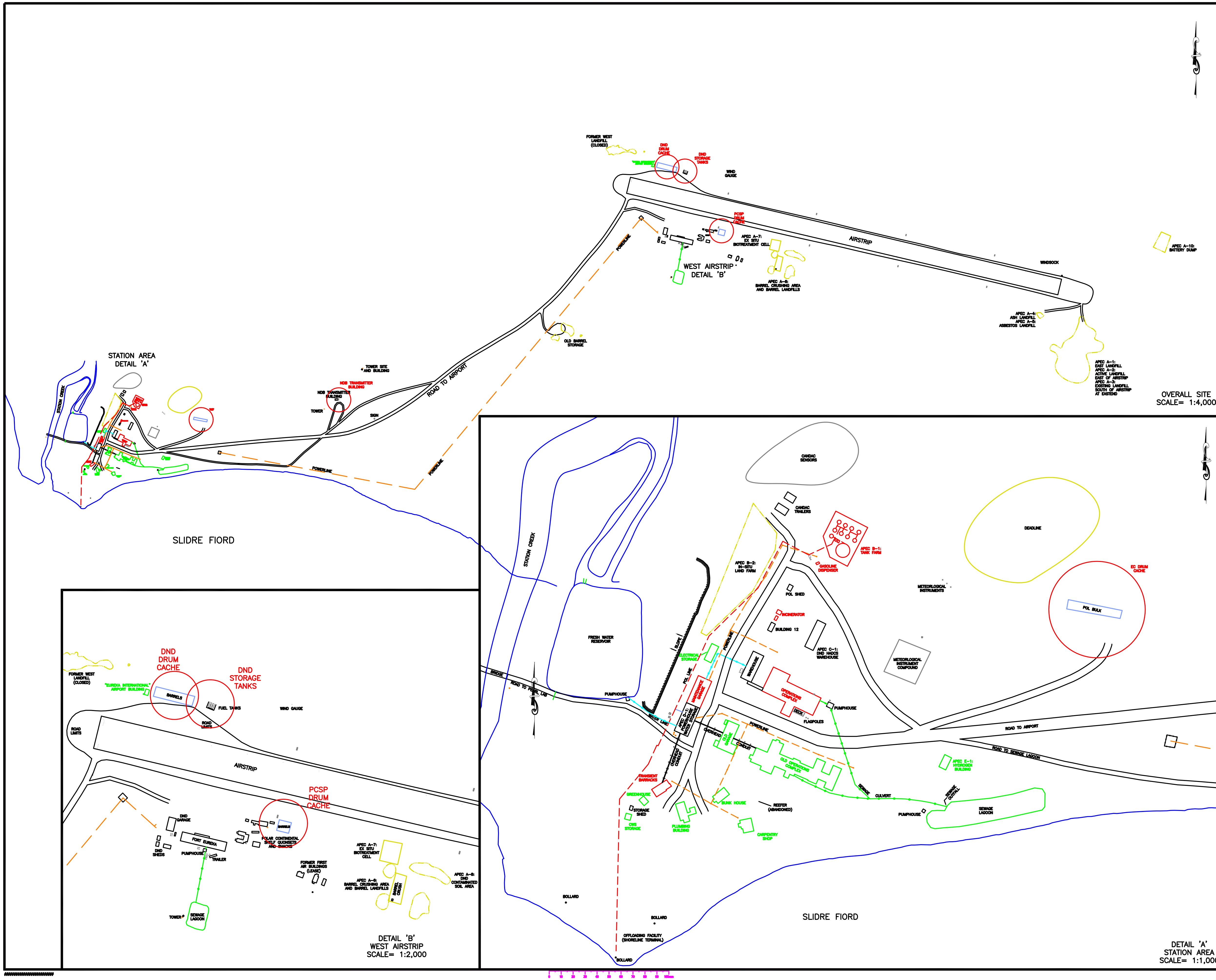
8 APPENDICES

Appendix A Site Plan
Appendix B Risk Evaluation Matrix
Appendix C Product Transfer Area Design Options
Appendix D Product Data Sheets
Appendix E TDG Regulation Governing Mobile Tanks

APPENDIX A

Site Plan



Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Western Region
SERVICES IMMOBILIERS
Région de l'ouest

PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND:

POL LINES SHOWN THUS:
SEWAGE LINES SHOWN THUS:
ENVIRONMENTAL SITES SHOWN THUS:
POWERLINES SHOWN THUS:
FUEL TANKS SHOWN THUS:
WATER LINES SHOWN THUS:
POWERPOLES SHOWN THUS:

DND – DEPARTMENT OF NATIONAL DEFENCE
POL – PETROLEUM, OIL & LUBRICANTS
APEC – AREA OF POTENTIAL ENVIRONMENTAL CONCERN
CANDAC – CANADIAN NETWORK FOR THE DETECTION OF ATMOSPHERIC CHANGE
PEARL – POLAR ENVIRONMENTAL ATMOSPHERIC RESEARCH LABROTORY

DO NOT SCALE DRAWINGS

Revision/Révision	Description/Description	Date/Date

Client/client
ENVIRONMENT CANADA

Project title/Titre du projet
EUREKA SITE PLAN

Approved by/Approuvé par
Ed Domijan

Designed by/Concept par

Drawn by/Dessiné par
JAM

PWGSC Project Manager/Administrateur de Projets TPSGC

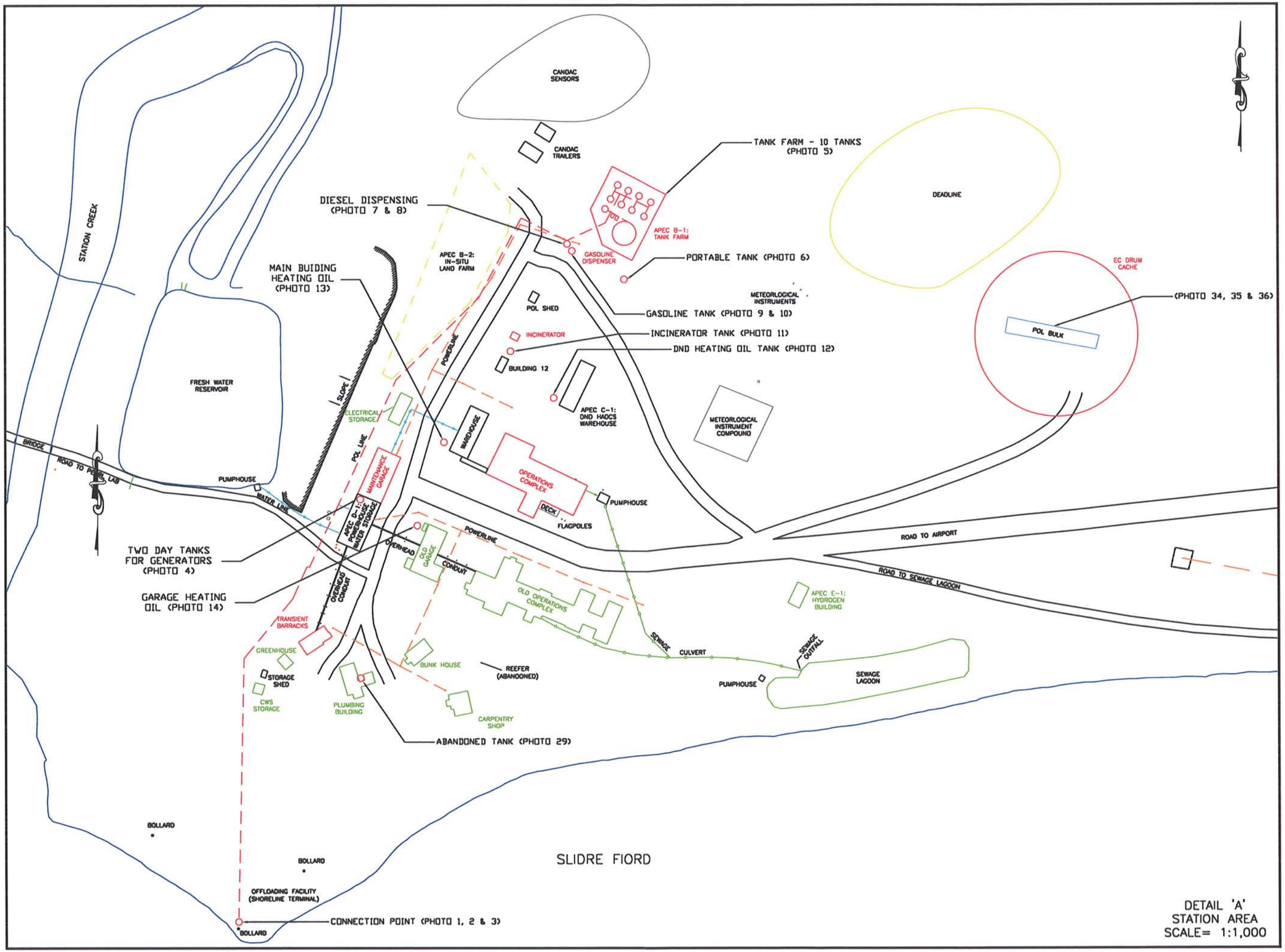
PWGSC, Architectural and Engineering Resources Manager/ Ressources Architecturales et de Directeur d'ingénierie, TPSGC

Client/client
Environment Canada

Drawing title/Titre du dessin
Eureka Site Plan

Project No./No. du projet	Sheet/Feuille	Revision no./La Révision no.
422007	1 OF 1	

Eureka Location of Tanks


CANDAC SENSORS
CANDAC TRAILERS
TANK FARM - 10 TANKS (PHOTO 5)
DIESEL DISPENSING (PHOTO 7 & 8)
APEC B-1: TANK FARM
GASOLINE DISPENSER
PORTABLE TANK (PHOTO 6)
DEADLINE
STATION CREEK
APEC B-2: IN-SITU LAND FARM
MAIN BUIDING HEATING OIL (PHOTO 13)
METEORLOGICAL INSTRUMENTS
EC DRUM CACHE
(PHOTO 34, 35 & 36)
POL SHED
GASOLINE TANK (PHOTO 9 & 10)
INCINERATOR
INCINERATOR TANK (PHOTO 11)
POWERLINE
POL BULK
DND HEATING OIL TANK (PHOTO 12)
BUILDING 12
FRESH WATER RESERVOIR
SLOPE
APEC C-1: DND HADCS WAREHOUSE
METEORLOGICAL INSTRUMENT COMPOUND
ELECTRICAL STORAGE
POL LINE
WAREHOUSE
MAINTENANCE GARAGE
OPERATIONS COMPLEX
DECK
FLAGPOLES
PUMPHOUSE
BRIDGE
ROAD TO PEARL LAB
WATER LINE
APEC D-1: POWERHOUSE WATER STORAGE
ROAD TO AIRPORT
ROAD TO SEWAGE LAGOON
TWO DAY TANKS FOR GENERATORS (PHOTO 4)
OVERHEAD
OLD GARAGE
CONDUIT
POWERLINE
OVERHEAD CONDUIT
GARAGE HEATING OIL (PHOTO 14)
OLD OPERATIONS COMPLEX
APEC E-1: HYDROGEN BUILDING
TRANSIENT BARRACKS
SEWAGE
CULVERT
SEWAGE OUTFALL
GREENHOUSE
BUNK HOUSE
REEFER (ABANDONED)
PUMPHOUSE
SEWAGE LAGOON
STORAGE SHED
CWS STORAGE
PLUMBING BUILDING
CARPENTRY SHOP
ABANDONED TANK (PHOTO 29)
BOLLARD
SLIDRE FIORD
BOLLARD
OFFLOADING FACILITY (SHORELINE TERMINAL)
CONNECTION POINT (PHOTO 1, 2 & 3)
BOLLARD
DETAIL 'A'
STATION AREA
SCALE= 1:1,000

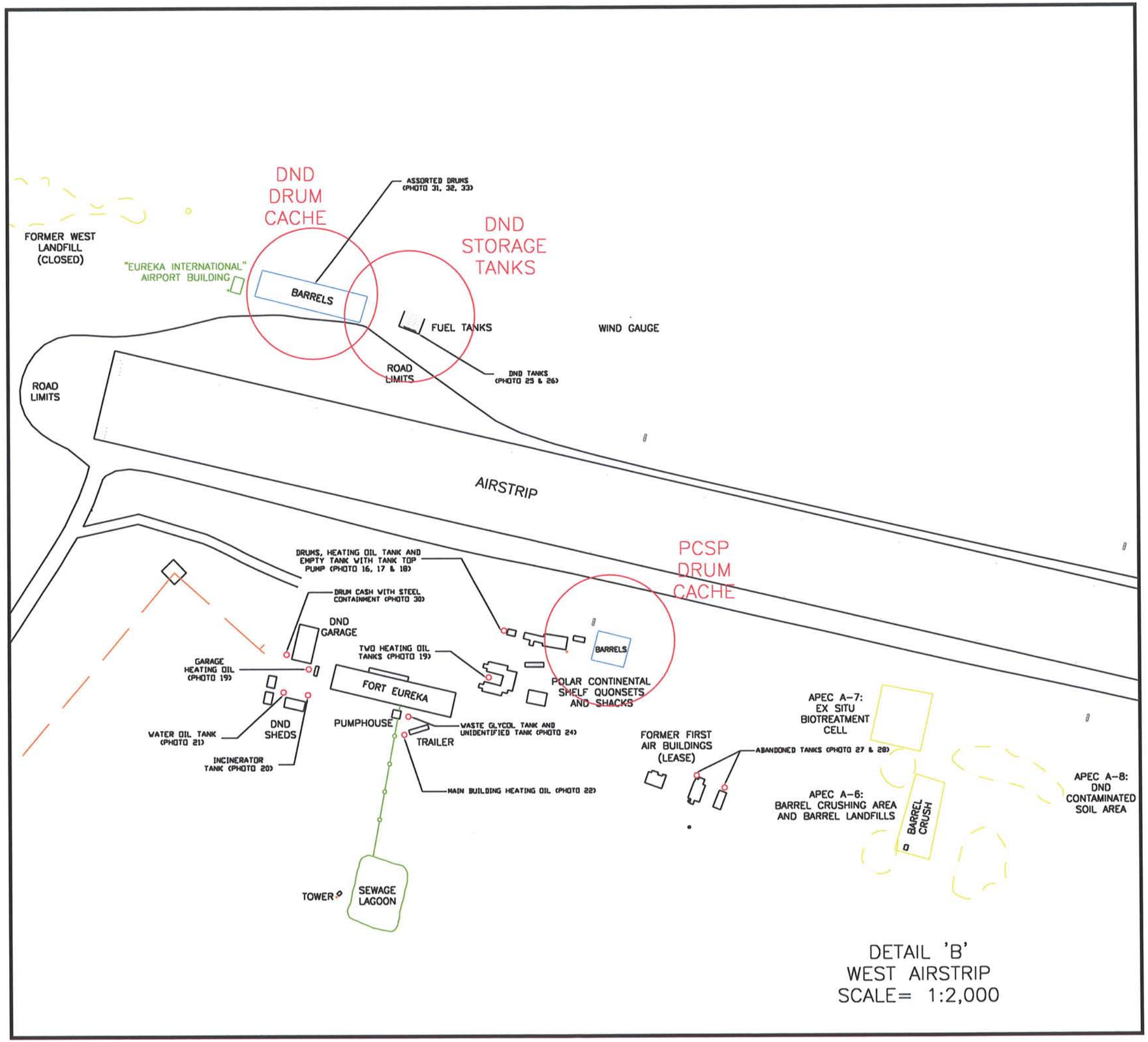

DND
DRUM
CACHE
ASSORTED DRUMS
(PHOTO 31, 32, 33)
DND
STORAGE
TANKS
FORMER WEST
LANDFILL
(CLOSED)
"EUREKA INTERNATIONAL"
AIRPORT BUILDING
BARRELS
FUEL TANKS
WIND GAUGE
ROAD
LIMITS
ROAD
LIMITS
DND TANKS
(PHOTO 25 & 26)
AIRSTRIP
PCSP
DRUM
CACHE
DRUMS, HEATING OIL TANK AND
EMPTY TANK WITH TANK TOP
PUMP (PHOTO 16, 17 & 18)
DRUM CASH WITH STEEL
CONTAINMENT (PHOTO 30)
DND
GARAGE
TWO HEATING OIL
TANKS (PHOTO 19)
BARRELS
GARAGE
HEATING OIL
(PHOTO 19)
FORT EUREKA
POLAR CONTINENTAL
SHELF QUONSETS
AND SHACKS
APEC A-7:
EX SITU
BIOTREATMENT
CELL
DND
SHEDS
PUMPHOUSE
WASTE GLYCOL TANK AND
UNIDENTIFIED TANK (PHOTO 24)
WATER OIL TANK
(PHOTO 21)
TRAILER
FORMER FIRST
AIR BUILDINGS
(LEASE)
ABANDONED TANKS (PHOTO 27 & 28)
INCINERATOR
TANK (PHOTO 20)
MAIN BUILDING HEATING OIL (PHOTO 22)
APEC A-8:
DND
CONTAMINATED
SOIL AREA
APEC A-6:
BARREL CRUSHING AREA
AND BARREL LANDFILLS
BARREL
CRUSH
TOWER
SEWAGE
LAGOON
DETAIL 'B'
WEST AIRSTRIP
SCALE= 1:2,000

Photo 1: Beach Connection Point

Photo 2: Coast Guard Ship Fuel Offloading

Photo 3: Ice in the Bay

Photo 4: Generator Day Tanks

Photo 5: Tank Farm

Photo 6: Portable Refuelling Tank

Photo 7: Diesel Dispensing System

Photo 8: Diesel Dispensing Nozzle

Photo 9: Gasoline Dispensing Tank

Photo 10: Gasoline Dispensing Tank Product Transfer Area

Photo 11: Incinerator Tank

Photo 12: DND Heating Oil Tank

Photo 13: Main Building Heating Oil Tank

Photo 14: Garage Heating Oil Tank

Photo 15: NDB Transmitter Building Tank

Photo 16: Polar Continental Shelf Fuel Storage (Heating Oil Tank, Drums and Empty Dispensing Tank)

Photo 17: Polar Continental Shelf Dispensing Tank

Photo 18: Heating Supply Drum for the Polar Continental Shelf Project Building

Photo 19: DND Heating Tank for Garage at Runway

Photo 20: DND Incinerator Tank at Runway

Photo 21: DND Waste Oil Tank at Runway

Photo 22: Fort Eureka Heating Tank

Photo 23: DND Pair of Heating Tank at Runway

Photo 24: DND Waste Glycol Tank and Unidentified Tank at Runway

Photo 25: DND Fuel Storage Tanks at Runway

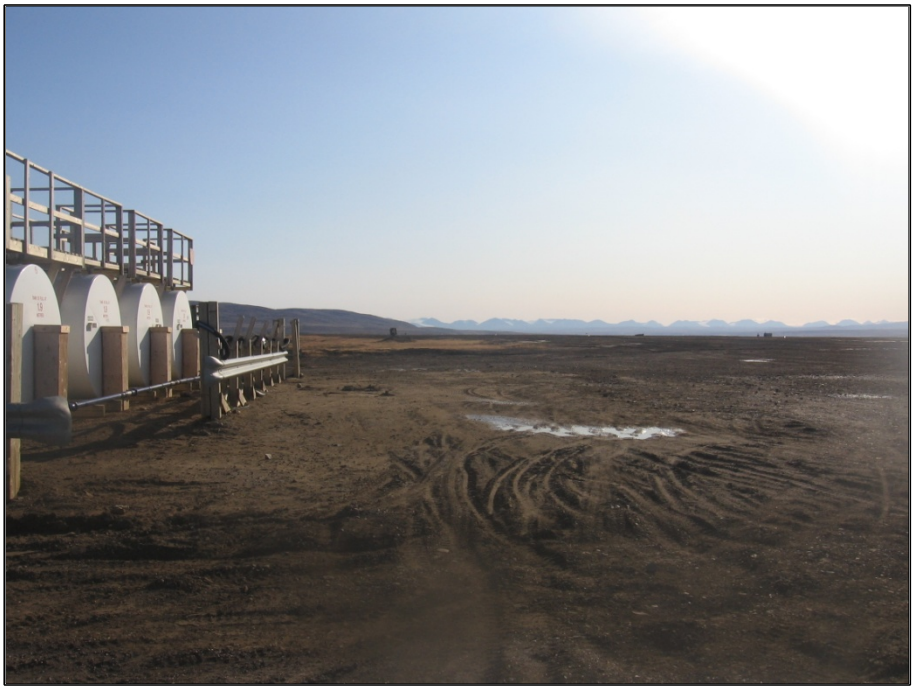


Photo 26: DND Fuel Storage Tank Product Transfer Area at Runway

Photo 27: First Air Heating Tank #1 (Abandoned)

Photo 28: First Air Heating Tank #2 (Abandoned)

Photo 29: Plumbing Building Tank (Abandoned)

Photo 30: DND Drum Storage next to Garage at Runway

Photo 31: Runway Drum Cache

Photo 32: Runway Drum Cache

Photo 33: Runway Drum Cache

Photo 34: EC Drum Storage

Photo 35: EC Drum Storage

Photo 36: EC Drum Storage

APPENDIX B

Risk Evaluation Matrix

PRODUCT TRANSFER AREA RISK ASSESSMENT MARIX - DATA ENTRY FORM V.0.0

Number	Tank ID	Location	Distance to nearest downgradient surface water body	Characteristic of soil at the fuel facility	Slope of terrain surrounding the fuel facility	Depth to Potable groundwater aquifer	Location of Site	Species at Risk	Distance between Tank and Building (with Foundations)	Site designation or description	Maximum Volume of product transfered
1	Main diesel Tank Farm	North section of Station Area, upgradient behind Station Complex	<30m	Porous or unknown	<2% slope	<10m or unknown	Remote	<100m	>10 m	Residential/ Commercial area	> 5,000L
1	Generator Day Tanks	Inside the powerhouse building, west of old Operations Complex	30m - 100m	Non-porous, clay/bedrock or asphalt/concrete	<2% slope	<10m or unknown	Remote	<100m	<2m	Residential/ Commercial area	5,000L-1,500L
2	Operations Complex heating oil AST	West of warehouse beside Operations Complex	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	>10 m	Residential/ Commercial area	<1,500L
3	Old Garage heating oil AST	Northwest corner of old garage	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	<1,500L
4	Incinerator AST	South of incinerator, north of Building 12	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	<1,500L
5	Gasoline AST	Southwest of the Tank Farm	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	<100m	>10 m	Residential/ Commercial area	5,000L-1,500L
6	NDB AST	East of NDB building	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
7	DND Jet fuel ASTs	North of airfield, near the west end	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	>10 m	Residential/ Commercial area	> 5,000L
8	Fort Erueka Heat AST	South of Fort Eureka building	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	>10 m	Residential/ Commercial area	5,000L-1,500L
9	DND Garage heat at airfield AST	Next to garage	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
10	DND Incinerator AST	Southwest of Fort Eureka, beside the incinerator	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
11	DND waste oil AST	West of the incinerator	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
12	Pair of heating oil ASTs	Next to building immediately northeast of Fort Eureka	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
13	Waste Glycol and not in use AST	South of Fort Eureka building	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L
14	DND heating oil AST	Southeast corner of DND HADCS Warehouse	>100m	Porous or unknown	<2% slope	<10m or unknown	Remote	100m-1km	<2m	Residential/ Commercial area	5,000L-1,500L

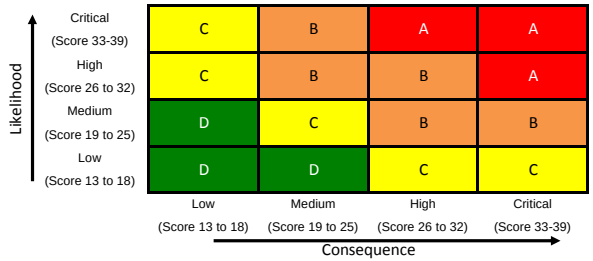
PRODUCT TRANSFER AREA RISK ASSESSMENT MARIX - DATA ENTRY FORM V.0.0

Number	Maximum Volume Capacity of Truck/Ship/Rail	Type of Product	Impact on Operational Downtime	Impact of a spill	Number of times the fuel system is filled	Levels of protection/Spill Control (i.e., SOP, secondary containment, overfill protection, diked area, curbs and drains, etc.)	Containment Capacity	Type of delivery	Age of Fuel System	Code compliance
1	<15,000L	all other products	> 7 days	If a spill occurs, mitigation methods are in place to reduce impact on human health and safety	<3 times per year	1-2 levels of protection	110% or less of the tank volume	aircraft, ship	5-15 years	meets some Best Management practices
1	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	> 12 times per year	3+ levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
2	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
3	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
4	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
5	<15,000L	all other products	> 7 days	If a spill occurs, mitigation methods are in place to reduce impact on human health and safety	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
6	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
7	> 50,000L	all other products	> 7 days	If a spill occurs, mitigation methods are in place to reduce impact on human health and safety	<3 times per year	1-2 levels of protection	no containment	aircraft, ship	5-15 years	meets some Best Management practices
8	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	no containment	truck	5-15 years	meets some Best Management practices
9	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
10	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
11	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
12	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
13	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices
14	<15,000L	all other products	> 7 days	If a spill occurs, it can adversely affect the health and Safety of those working on the site	3-12 times per year	1-2 levels of protection	110% or less of the tank volume	truck	5-15 years	meets some Best Management practices

PRODUCT TRANSFER AREA RISK ASSESSMENT MARIX - DATA ENTRY FORM V.0.0

Number	Maintenance Frequency	Availability of Spill Kit	Availability of standard operating procedures	Distance between Operator and Emergency Stop (during Offloading)	Are there DFO personnel available during transfer	Distance to additional spill response support	Last spill response training session for everyone handling fuel	Consequence Score	Likelihood Score	Risk	Score Override Justification
1	Maintenance is performed irregularly (only when part/components fail)	Complete Spill kit	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	31	23	High	
1	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	This PTA is the same as the one for the tank Farm therefore only one PTA should be addressed.
2	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	24	24	Medium	
3	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	26	24	High	
4	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	26	24	High	
5	Maintenance is performed irregularly (only when part/components fail)	Partial Spill Kit	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	28	23	High	
6	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
7	Maintenance is performed irregularly (only when part/components fail)	Partial Spill Kit	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	30	25	High	
8	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	25	25	Medium	
9	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
10	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
11	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
12	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
13	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	
14	Maintenance is performed irregularly (only when part/components fail)	None available	SOPs are available in HQ but not on site	<5m	Yes - site is permanently staffed	<15 minutes	Operator not trained in >2 years or unknown	27	24	High	

RISK = Likelihood x Consequence



A:Critical
B: High
C: Medium
D: Low

Spills at product Transfer Areas Occur mainly for 2 Reasons:
1. Human Error (overfill)
2. Equipment Failure or Absence of overfill Equipment

Recommended Risk Mitigation Methods

Numerical Value (Likelihood score X Consequence score)	Level of Risk	Recommended Risk Mitigation Methods	Definition of Risk
D	**Low**	SOPs Training Spill Kit Regular Maintenace	1. Low Risk: minor reversible effects of spill, unlikely event, not within or in proximity to sensitive area/receptor (more than 0.5 Km), volume of spill less than 100L.
C	**Medium**	SOPs Training Spill Kit Regular Maintenace Level Gauge Overfill Device	2. Medium Risk: potential negative effect, volume of potential spill more than 100L but less than 2,500 L, no reliance on GW, effects of spill can be mitigated with immediate response by trained personnel.
B	**High**	SOPs Training Spill Kit Regular Maintenace Level Gauge Overfill Device Overfill Alarm - Audible & Visible Fuel Supplier Equipped with Spill Containment Equipment while Filling Tank	3. High Risk: high likelyhood of spill, sensitive area, reliance on nearby GW, high volume potential (> 2,500 L), traditional land use considerations, permanent/long term environmental effects.
A	Critical	SOPs Training Spill Kit Regular Maintenace Level Gauge Overfill Device Overfill Alarm - Audible & Visible Fuel Supplier Equipped with Spill Containment Equipment while Filling Tank Engineered Fuel Transfer Area	4. Critical Risk: high likelyhood of spills in very sensitive environments with no protective measures in place. Significant long term environmental effects and human health considerations.

APPENDIX C

Product Transfer Area Design Options

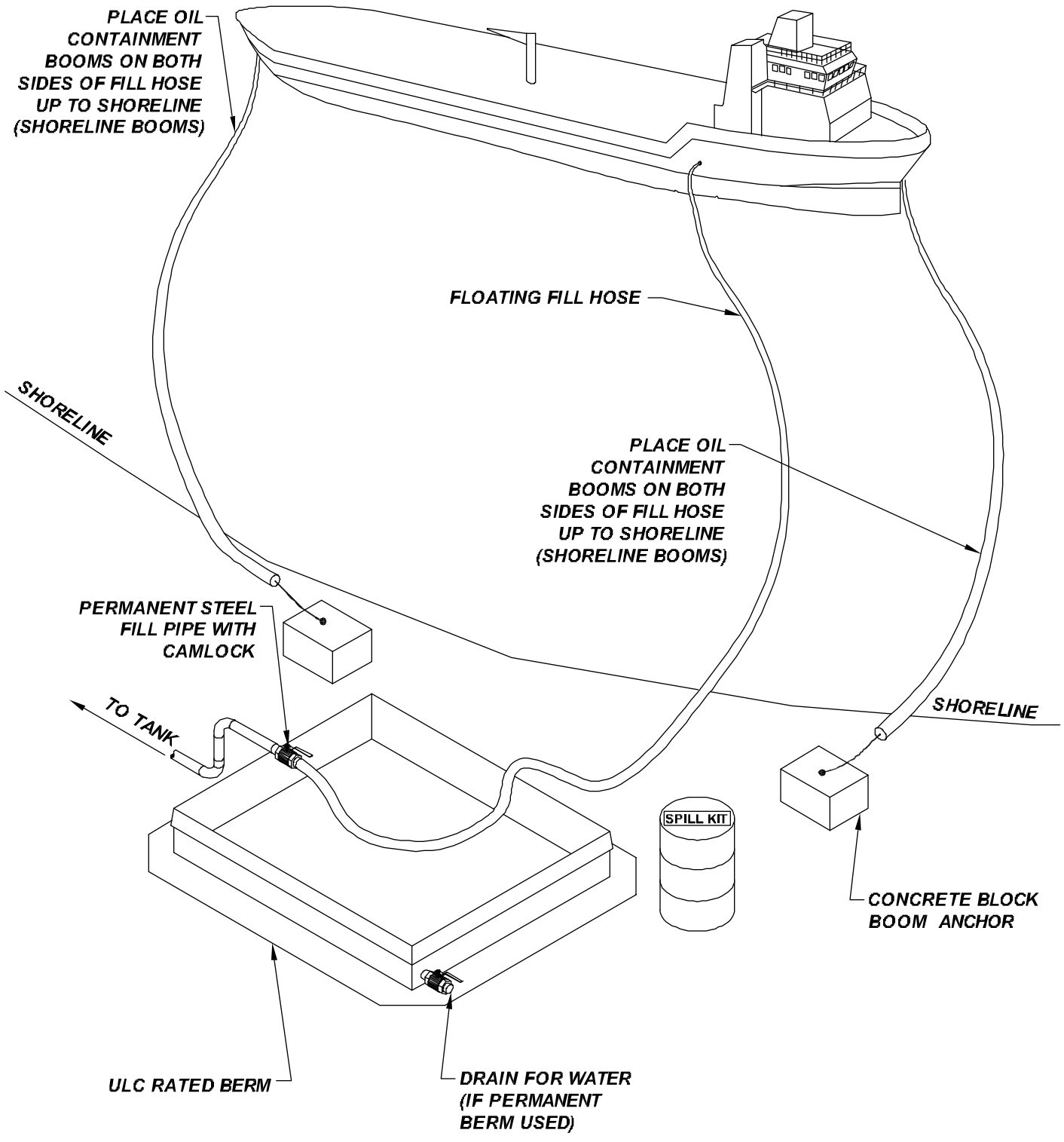
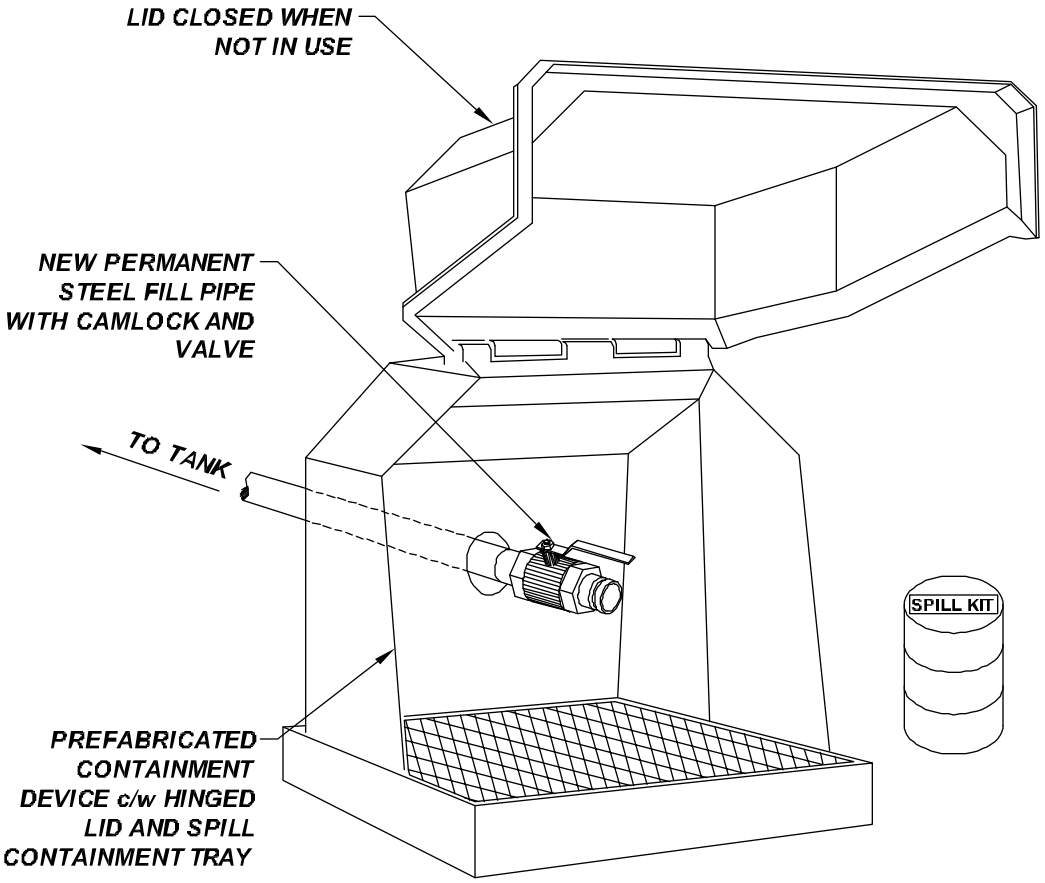


DIAGRAM #1

CONTAINMENT BOOMS AND ULC-RATED BERM IN USE WHILE SHIP UNLOADS FUEL (TO BE USED WHEN ICE IS NOT PRESENT)

Stantec

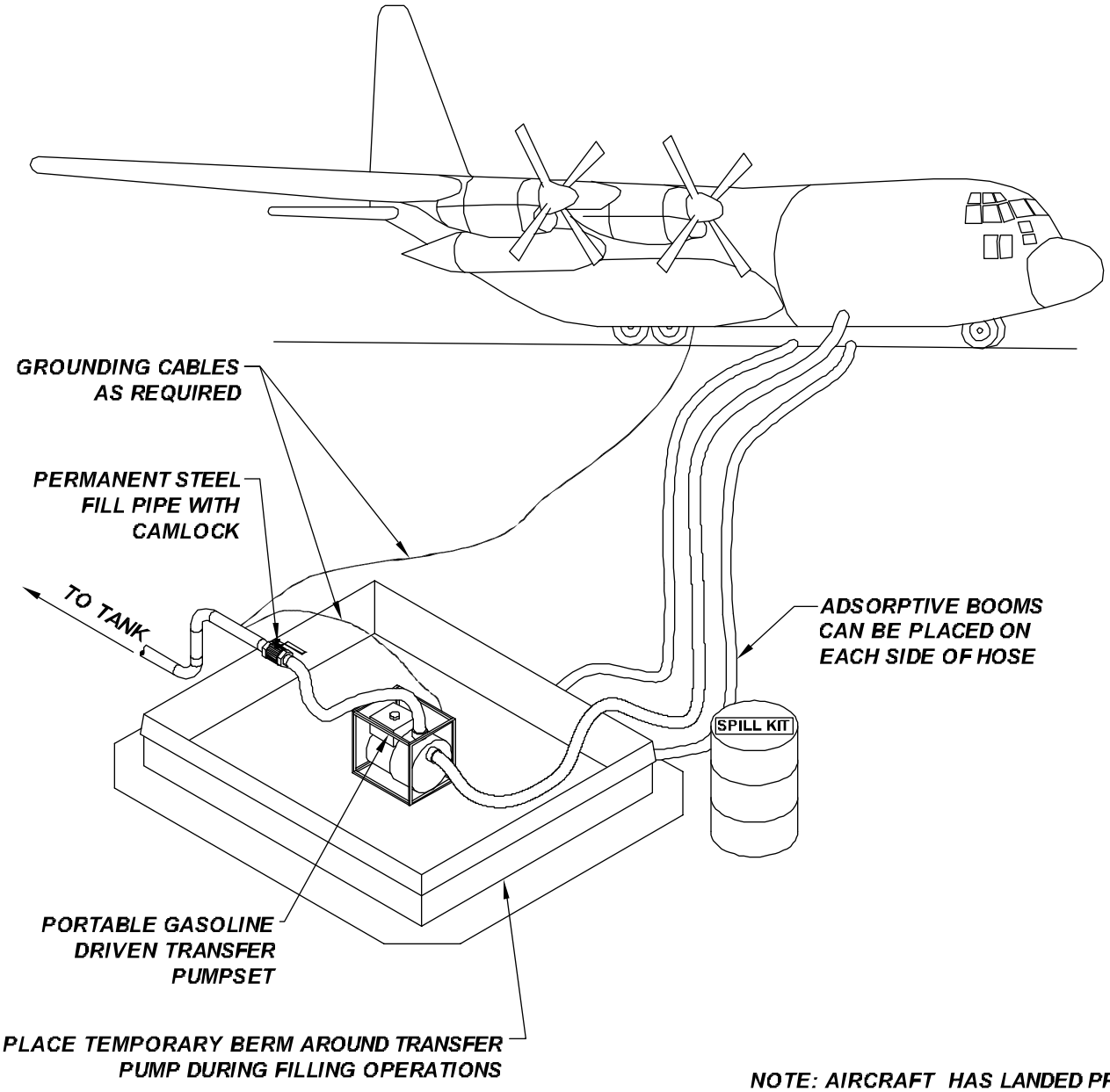


With a hole cut in the back of the containment device, the product transfer point is now enclosed from the elements and has integrated containment.

DIAGRAM #2

ENCLOSE FILL CONNECTION WITH SPILL CONTAINMENT FOR HERCULES AIRCRAFT OFFLOAD

Stantec

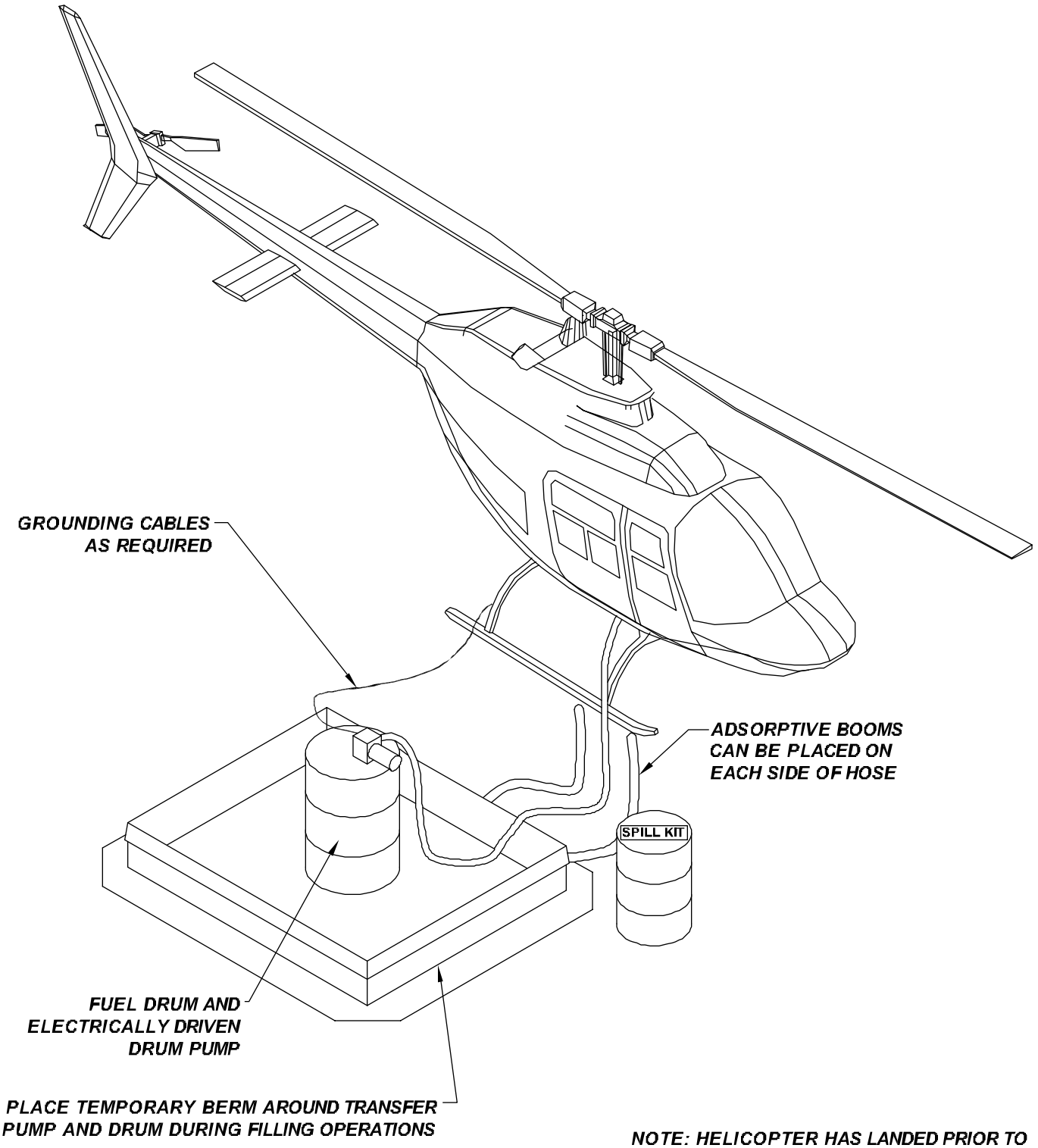


NOTE: AIRCRAFT HAS LANDED PRIOR TO PRODUCT TRANSFER.

DIAGRAM #3

HERCULES FUEL TRANSFER USING ON-BOARD TANK AND PORTABLE PUMP SYSTEM

Stantec



NOTE: HELICOPTER HAS LANDED PRIOR TO PRODUCT TRANSFER.

DIAGRAM #4

HELICOPTER REFUELLING USING PORTABLE PUMP SYSTEM AND DRUMS

Stantec

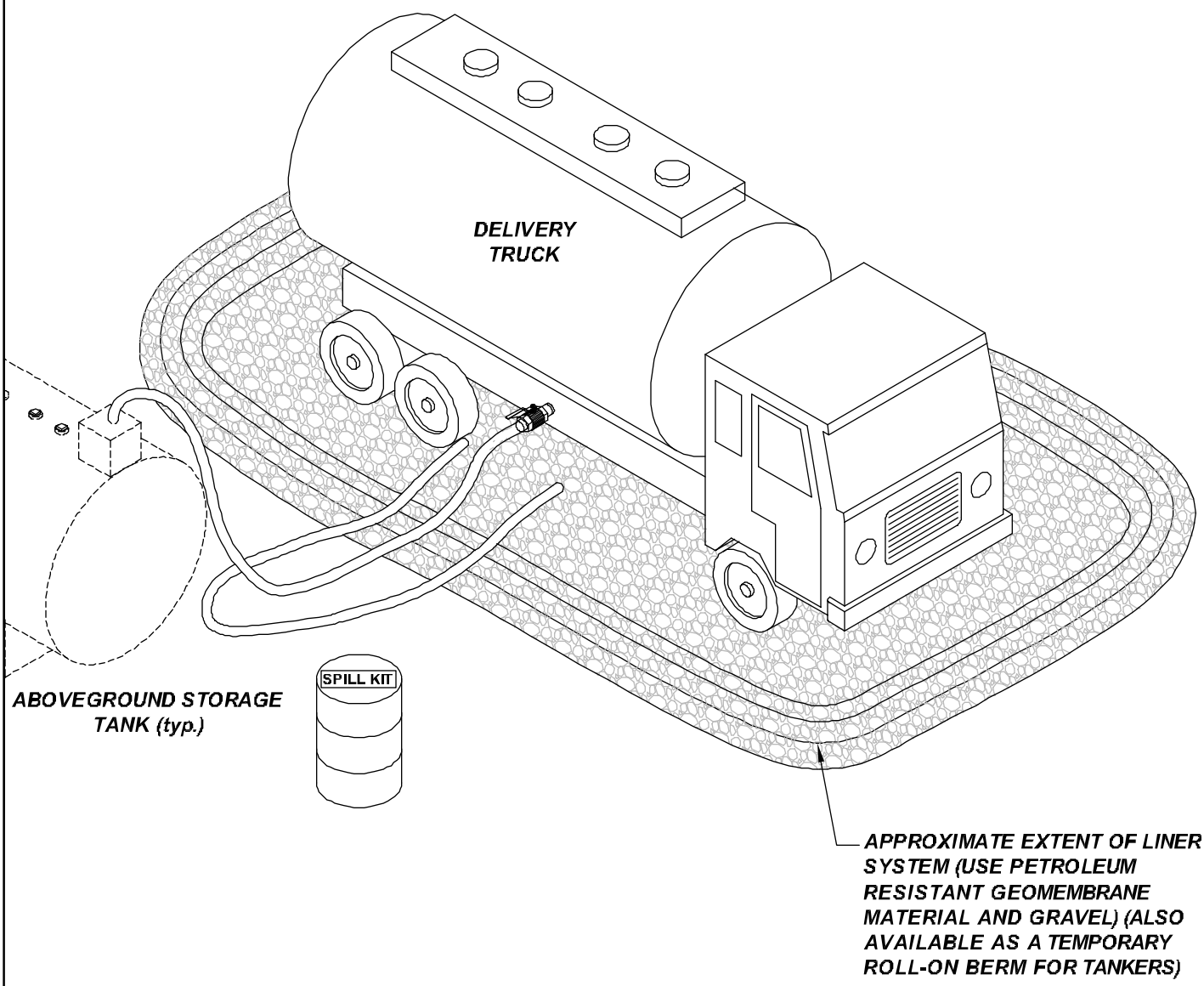


DIAGRAM #5

GRAVEL FILLED IMPERMIABLE LINER SYSTEM INSTALLED AT FUEL TRUCK OFFLOADING AREA

Stantec

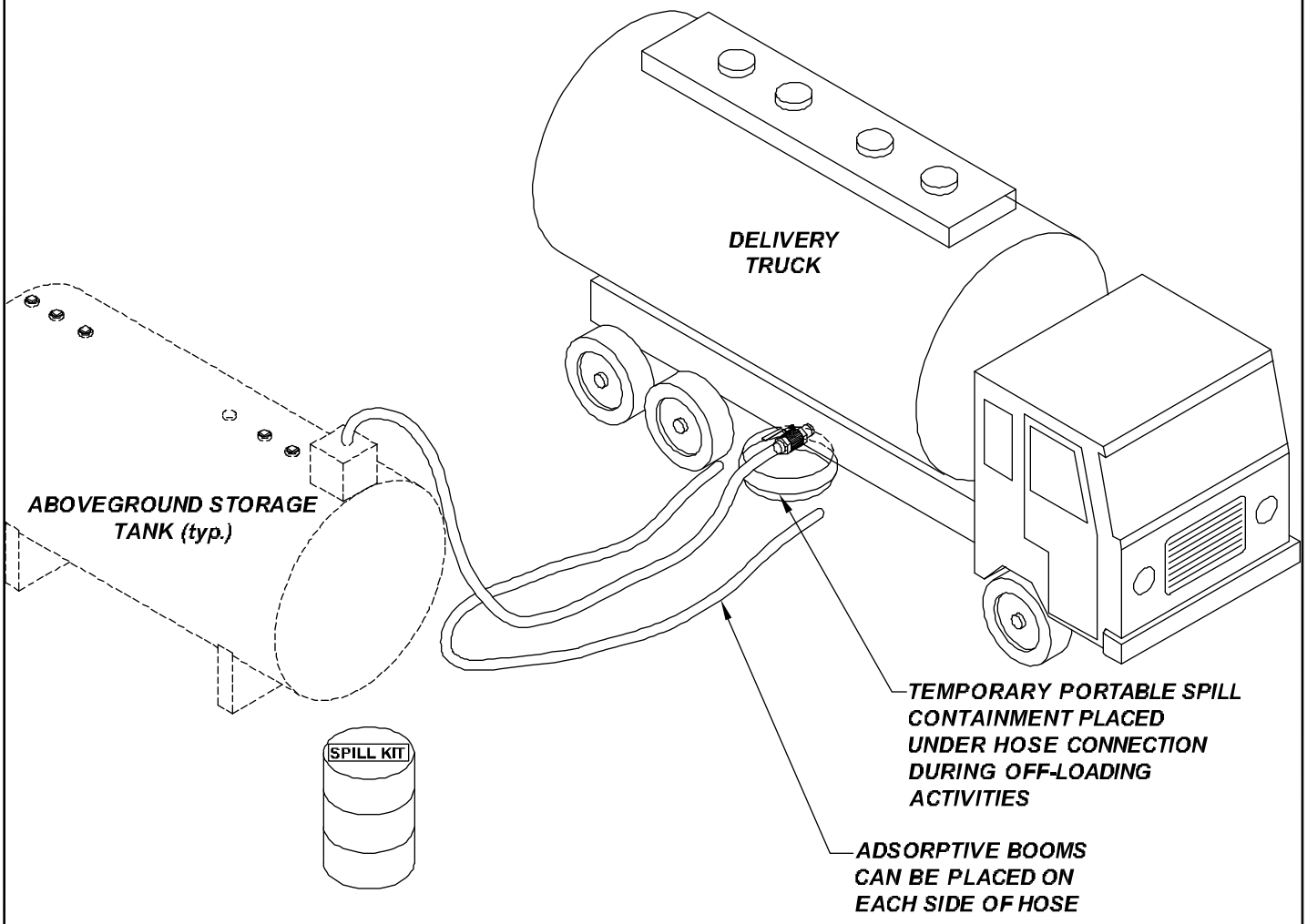
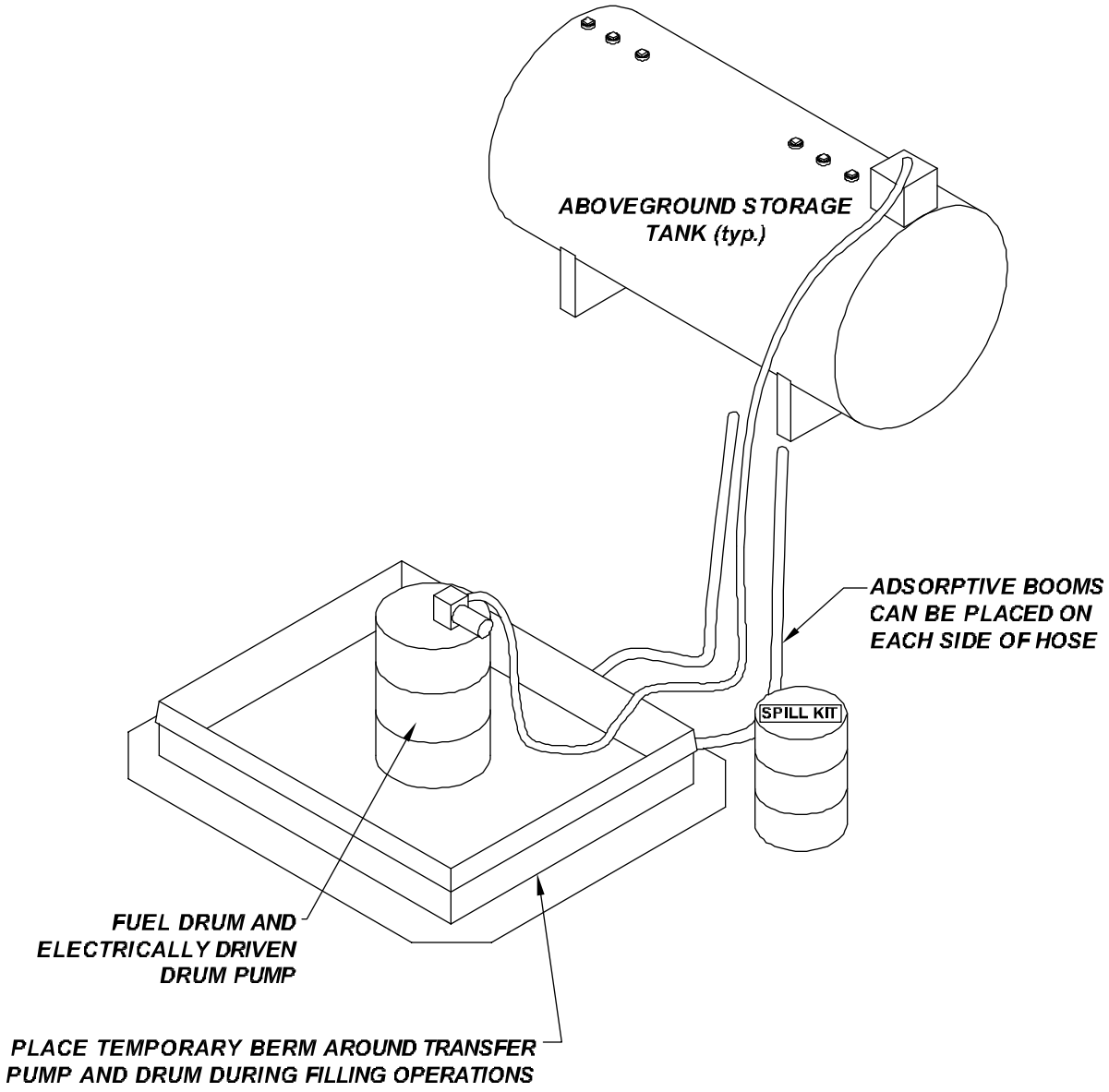


DIAGRAM #6

PORTABLE CONTAINMENT DEVICES UNDER HOSE CONNECTIONS

Stantec



OPTION #7

GASOLINE TANK PRODUCT TRANSFER FROM DRUMS

Stantec

APPENDIX D

Product Data Sheets

Plicord® Arctic Flexwing®

APPLICATION:

Plicord Arctic Flexwing is for use in low-temperature operations for transferring gasoline, oil, and other petroleum products.

CONSTRUCTION:

TUBE: Ultra-low temperature oil resistant synthetic rubber RMA Class A (High Oil Resistance)

COVER: Blue ultra-low temperature synthetic rubber RMA Class A (High Oil Resistance) with red spiral stripe. Smooth cover, wrapped finish

REINFORCEMENT: Spiral-plied synthetic fabric with wire helix

TEMPERATURE: -65°F to 180°F (-54°C to 82°C)

PACKAGING: 100' lengths, coiled and polywrapped

BRANDING: Continuous spiral brand example “Goodyear™ Arctic Flexwing 150 psi WP.”

COUPLINGS: Use Goodyear’s Insta-Lock Cam & Groove Fittings with this product. See page 221 for available Insta-Lock products.

NON-STOCK/SIZES: Refer to page 300 for special production run minimum requirements.

ORDER CODES: 543-650

NOM. ID		NOM. OD		MAX. WP		BEND RADIUS		VACUUM HG		WEIGHT	
in.	mm.	in.	mm.	psi	Mpa	in.	mm.	in.	mm.	lb./ft.	kg./m.
1 1/4	31.8	1.73	43.9	150	1.03	3	80	29	737	0.66	0.98
1 1/2	38.1	1.98	50.3	150	1.03	4	102	29	737	0.82	1.22
2	50.8	2.50	63.5	150	1.03	5	127	29	737	1.07	1.59
2 1/2	63.5	3.09	78.5	150	1.03	6	152	29	737	1.64	2.44
3	76.2	3.58	90.9	150	1.03	7	178	29	737	1.92	2.86
4	101.6	4.70	119.4	150	1.03	10	254	29	737	2.88	4.29

LW Arctic Tank Truck

APPLICATION:

For transfer of petroleum-based products under suction, low-pressure discharge or gravity flow. Flexibility maintained down to -65°F (-54°C).

CONSTRUCTION:

TUBE: Black Nitrile RMA Class A (High Oil Resistance)

COVER: Blue Wingprene® (corrugated)

REINFORCEMENT: Spiral-plied synthetic fabric with double wire helix

TEMPERATURE: -65°F to 180°F (-54°C to 82°C)

PACKAGING: 100' lengths, coiled and polywrapped

BRANDING: Spiral brand example “Goodyear LW Arctic Tank Truck 150 psi/10 Bar.”

COUPLINGS: Contact fitting manufacturer for proper fitting recommendation and coupling procedure.

NON-STOCK/SIZES: Refer to page 300 for special production run minimum requirements.

ORDER CODES: 543-365

NOM. ID		NOM. OD		MAX. WP		BEND RADIUS		VACUUM HG		WEIGHT	
in.	mm.	in.	mm.	psi	Mpa	in.	mm.	in.	mm.	lb./ft.	kg./m.
1 1/2	38.1	1.95	49.5	250	1.72	4	100	29	737	0.81	1.21
2	50.8	2.53	64.3	200	1.38	4	100	29	737	1.11	1.64
2 1/2	63.5	3.02	76.7	150	1.03	5	125	29	737	1.42	2.11
3	76.2	3.55	90.2	150	1.03	6	150	29	737	1.83	2.72
4	101.6	4.61	117.1	150	1.03	9	225	29	737	2.62	3.90

INDUSTRIAL HOSE GOODYEAR

INDUSTRIAL PRODUCTS DIVISION

Aug 07

PLICORD
MARATHON TRANSFER
NITRILE TUBE 150 psi

ID x OD Inches	Max WP psi	Weight lbs/ft.	Product Code
2" x 2-39/64"	150	1.28	543-485-064
2-1/2" x 3-7/64"	150	1.55	543-485-080
3" x 3-19/32"	150	1.83	543-485-107
4" x 4-21/32"	150	2.51	543-485-123
6" x 6-11/16"	150	3.88	543-485-155
8" x 8-13/16	150	5.77	541-485-187

PRODUCT INFORMATION

1. Service: Designed for the transfer of petroleum based product & oil service with up to 50% Aromatic content
Temperature range -25˚F to 180˚F.

2. Construction: Tube – High Quality Black nitrile
Reinforcement -- 4 plies of synthetic fabric and two embedded static wires.
Cover -- Black Chemivic (wrapped finish).

3. Recommended Fittings: Permanent or re-attachable, contact Goodyear.

4. Branding: Goodyear logo with spiral lay line.

5. Packaging: Coiled and polywrapped

6. Cut Lengths: Built to length.
- Up to 400 ft in 6 inches diameter
- Up to 100 ft in 8 inches dia

7. Testing: All hose tested to Coast Guard requirements specified in the code of Federal Regulations, title 33, Chapter 1, Subpart C clause 154.500, dated 03/2006.

From: Steve Di Florio [diflorio@hitechpiping.ca]
Sent: Tuesday, September 08, 2009 4:30 PM
To: richard.binns@stantec.com
Subject: marathon hose

Hi Richard,
Sorry for the delay, I finally have some prices.
3 lens – 4'' X 400 feet Marathon hose complete with Part C and E stainless steel instalok cam and groove fittings.
Price : $ 7400.00 per length net
Delivery – 4 to 5 weeks.

3 lens – 4'' X 400 feet Marathon low temperature- (-65 F.) complete with Part C and E stainless steel instalok cam and groove fittings.
Price -- $ 8600.00 per length net.
Del. 4 to 5 weeks
Taxes – extra
FOB—Gatineau, Quebec.
Thank You
Steve

QUOTATION

American Marine, Inc.
401 Shearer Blvd - Cocoa, FL 32922
Phone: +1 321-636-5783
Fax: +1 321-636-5787
Email: elastec@elastec.com

ELASTEC INC.
AmericanMarine INC.
For Innovative Environmental Products

Date	Quote Valid Until	Quote #
10/01/09	10/31/2009	ELAQ2599

Sold To: Stantec
Iole Faragalli
200-2781 Lancaster Road
Ottawa, ON K1B 1A7
Canada

Phone: (613)738-6092
Fax: (613)738-0721

Ship To:

Phone:
Fax:

Questions? Please Call: Shon Mosier

Terms	Customer RFQ	Ship Via
Prepayment		Ex-works

Ln #	Qty	Part #	Description	Unit Price	Ext. Price
1	24	0060100	MAXIMAX - 36" x 100ft (30 m) Section The MaxiMax range of booms are ideal for rapid deployment and oil containment. It has low storage volume and can be stored on pallets or wound on reels. MaxiMax boom mounted on a reel (optional) is especially useful for ports and harbors where a quick response is required. The boom features closed cell foam buoyancy panels, vertical stiffeners, galvanized chain ballast, stainless steel top tension cable. It is also fitted with handles and anchor points, Height: 36" / 910mm Freeboard : 11" / 280mm Draft: 25" / 630mm Fabric: LTA Fabric Top cable: 1/4" / 6mm stainless steel Ballast: 3/8" / 10 mm galvanized ballast chain Boom weight: 2.8 lbs/ft / 4.2 kg/m Connector: Universeal slide with zinc anodes Shipping information: 200ft / 60m pallet as follows: 65 x 42 x 48" / 1.65 x 1.07 x 1.22m 610 lbs / 277kg. Optional: Reel, repair kit, anchors, lights, repair kits, towing sets, reflectors	$1,638.75	$39,330.00
2	2	0563000	ACCESSORIES KIT 2- MAXIMAX Kit includes 2 each - tow bridles with 30 meters of tow line each. Two additional spare tow bridles. Eight each spare S.S. toggle pinss with lanyard assemblies, and eight each spare shackles. Boom maintenance manual and a water proof plastic tool box.	$745.75	$1,491.50
3	2	0REELBO144D	BOOM REEL / TYPE E - HOLDS UP TO 1250' OF MAXIMAX 36" Elastec / American Marine boom reels are built for safe and controlled deployment and recovery of a range of	$17,996.80	$35,993.60

*3% charge will apply on credit card transactions over $6,000

Ln #	Qty	Part #	Description	Unit Price	Ext. Price
			boom types. We produce a range of boom reels according to the capacity or model of boom to be stored. Elastec / American Marine products are designed to provide safe and dependable service when operated according to instructions. The boom reel is hydraulically controlled to assist in the deployment and retrieval of the boom. Paint; Steel base - shot blasted, primed and painted Lifting; Fork lift pockets and lifting points Securing: Dedicated Tie down points . Spool; Reinforced Aluminum. Closed sides for operator protection Drive; Heavy-duty direct drive hydraulic motor and gearbox, all hydraulic fittings are stainless steel. Heavy Duty Steel Base with Marine Grade aluminum spool with solid side flanges. Included manaul disc brake. Speed Control - Forward, Reverse and Free Wheel Shipping Dimensions: 186" X 89" X 101" / 4.73 x 2.26 x 2.57m		
4	2	0341010	COVER FOR BOOM REEL - LARGE - 72" & Up Boom reel cover capable of protecting boom from the environment. Cover will fit complete over the reel.	$660.73	$1,321.46
5	1	0POWEYA509	POWER PAC 9HP - BOOM REEL The D9 is a compact and portable diesel driven hydraulic power unit for operating a boom reel fitted with controls. It features a hand and electric start diesel engine mounted in a steel cage frame. The open style allows excellent access for maintenance. A hydraulic tank is mounted above the hydraulic pump and fitted with level / temperature gauge, filter and filler/strainer. Drive: 9hp / 6.7kW air cooled Yanmar diesel engine with 12 Volt Electric and Recoil Hand start Max Hydraulic output ; 4.2 gpm / 16 lpm Max Pressure: 2500 psi / 172 bar. Single Hydraulic Circuit Frame; Skid mount with lifting Bracket. Hydraulic tank; 8 gallons / 30 litres. Fuel tank; 1.25 gallons / 4.7 litres Hydraulic Quick Couplings; Stainless steel Lifting; Central lift point 1 - 3/4" X 25' Hydraulic Return Hose 1 - 1/2" X 25' Hydraulic Pressure Hose Dimensions: 32" X 28" X 38" / 0.81 x 0.71 x 0.97m Weight: 280 lbs / 127 kg Fabric cover; Included . Shipping Dimensions: 33"x29"x39" / 0.84 x 0.74 x 0.99m 298 lbs./ 135 kg Note: No air blower included	$5,834.90	$5,834.90
6	1	0KIT-SP409	SPARES KIT D9 BOOM REEL POWER PAC Boom Reel Power Unit w/Yanmar Engine 6 Hydraulic Oil Filters 2 Air Filters 2 Oil Filters 4 Fuel Filters	$284.30	$284.30

Ln #	Qty	Part #	Description	Unit Price	Ext. Price

Terms: Prepayment unless otherwise specified

Visa, MasterCard and American Express accepted*

Shipping Terms: Ex-works unless otherwise specified

Shipping Weights & Dims are Estimates Only - Final Packaging May Vary

*3% charge will apply on credit card transactions over $6,000

1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

Aluminum Boom Reel Description

Elastec / American Marine boom reels are built for safe and controlled deployment and recovery of a range of boom types. We produce a range of boom reels according to the capacity or model of boom to be stored, please contact us for sizing.

Elastec / American Marine products are designed to provide safe and dependable service when operated according to instructions.

The boom reel is hydraulically controlled to assist in the deployment and retrieval of the boom. The controls also allow the reel to freewheel for rapid deployment of foam filled booms (note reel should be fitted with brake for this option).

Boom reels come in a variety of different sizes and configurations. We recommend reels are supplied with a brake to slow or stop the reel from turning (optional depending on model). This key feature is vital for the safety of operators along with dedicated tie down points.

1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

We manufacture reels with steel and aluminum spools (for weight saving), this aluminum spool reel is typically used for our AirMax and MaxiMax booms.

Specifications

Weight and dimensions:	According to capacity, contact us for details
Paint:	Steel base shot blasted, primed and epoxy painted
Lifting:	Fork lift pockets* and lifting points are provided
Securing:	Dedicated tie down points are provided
Weather/corrosion protection:	All hydraulic fittings are stainless steel
Spool:	Reinforced closed sides for operator protection
Drive:	Heavy-duty hydraulic motor and gearbox
Materials:	Steel base and aluminum spool (for weight reduction)
Optional:	Certified lifting sling, fabric cover, heavy-duty brake (capable of 10,000 lbs of clamp force)

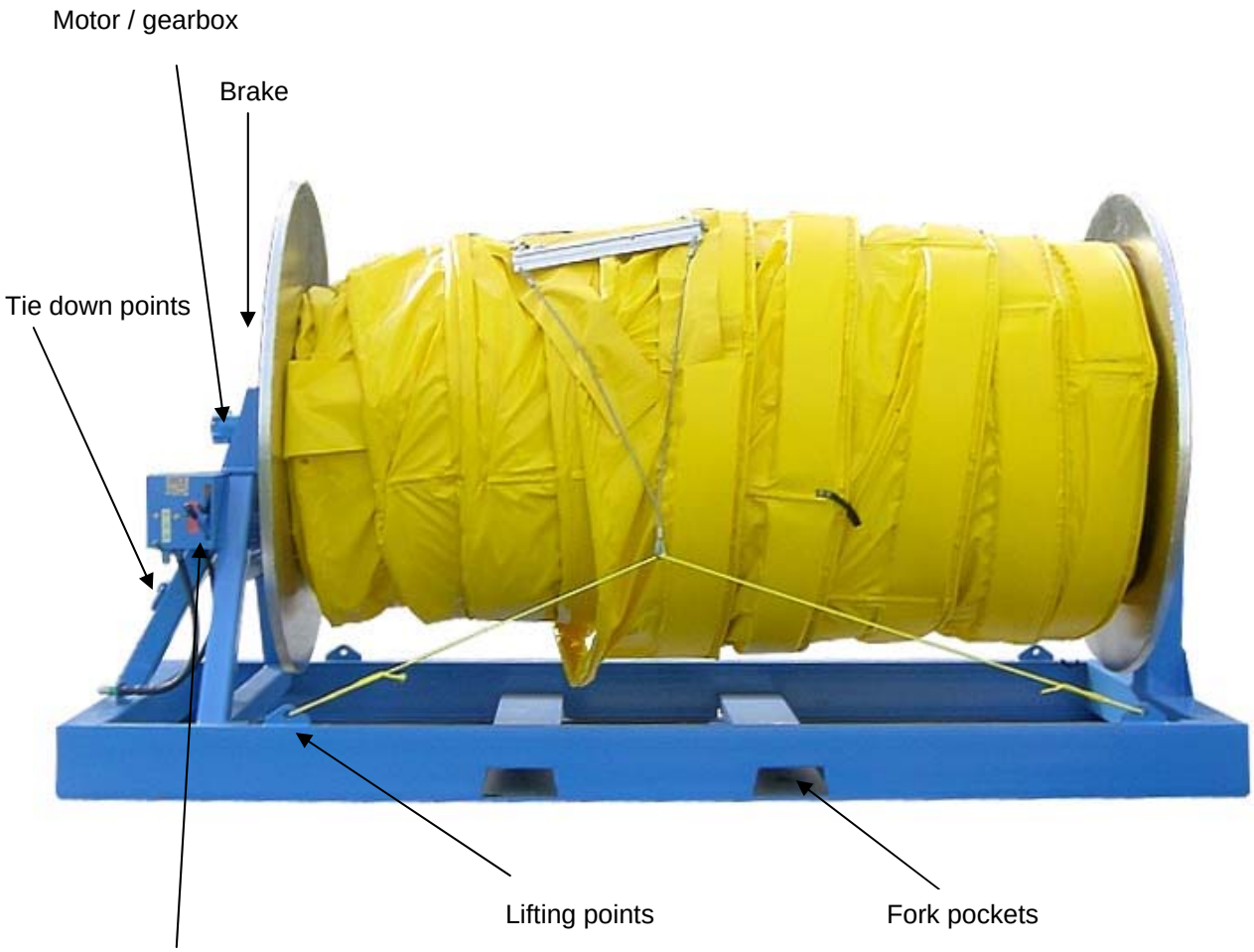
Elastec / American Marine boom reels comply with US Navy specifications**,** all data is based on the latest product information and subject to change without notice**.** Elastec / American Marine reserves the right to make changes at any time without notice and without incurring any obligations. If a problem is encountered, or if you have any questions about your Elastec / American Marine equipment, please call one of our consultants at +1 (618) 382-2525.

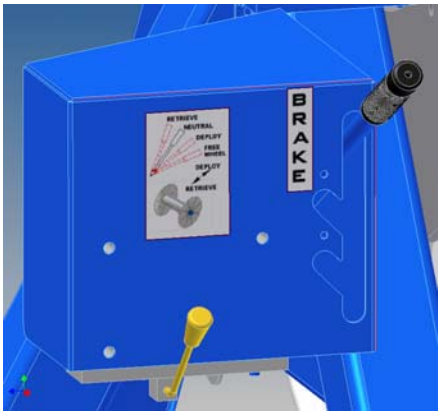
Elastec / American Marine warrants the boom reel against defects in material and workmanship under normal use and service for a period of 1 year.

* Trailer mounted reels excepted.

1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

Boom Reel Illustration





Ergonomic controls

1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

BOOM REEL PHOTO ALBUM

Elastec American Marine manufactures boom reel systems in-house at our facility in Illinois according to ISO 9000 quality standard. These reels can be either manually operated or hydraulic powered, supplied with aluminum or steel spool, with and without controls

Reels with aluminum spools are lighter and can hold a lot more boom.

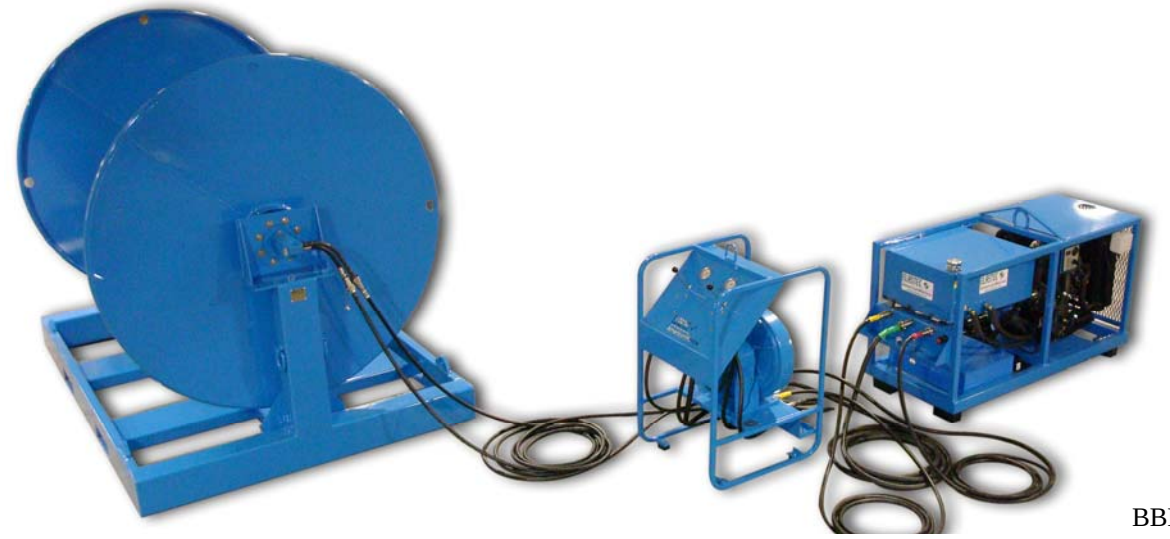
1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

Reels may be fitted with guide rollers to help distribute the boom on the spool. Trailers provide added mobility. Reels are fabricated according to US Navy specifications.

Manually operated reels for smaller booms or quantities;

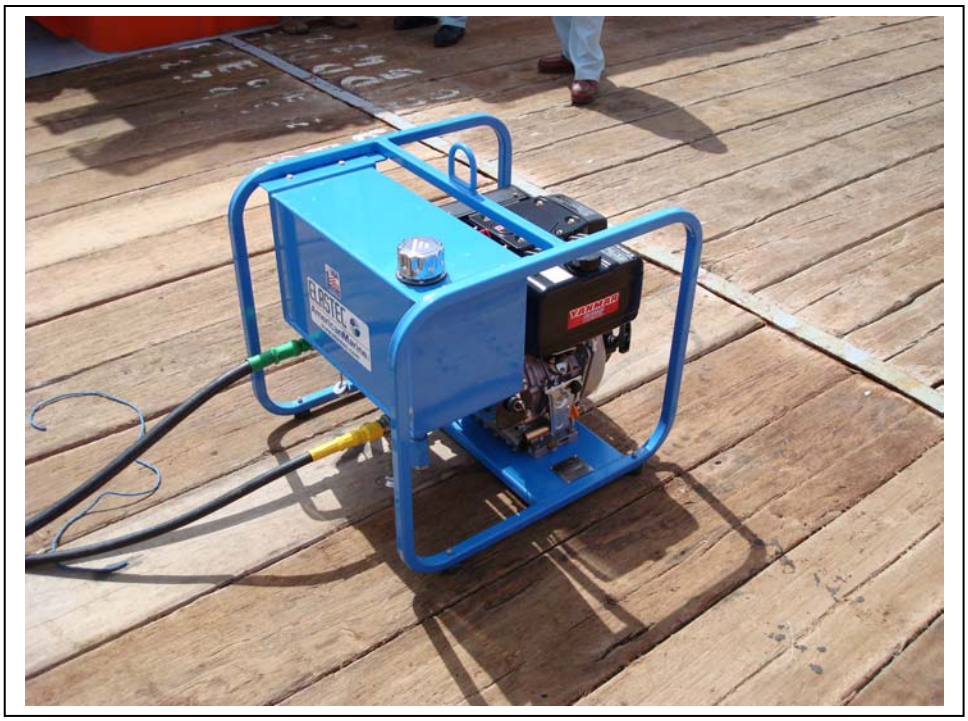
1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

Steel reels are used for heavier inflatable boom or where compact size is required, a choice of hydraulic power units and controls are offered;



1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

D9 Boom Reel PowerPak Description



The D9 is a compact and portable diesel driven hydraulic power unit for operating a boom reel fitted with controls.

It features a hand and electric start diesel engine mounted in a steel cage frame. The open style allows excellent access for maintenance.

A hydraulic tank is mounted above the hydraulic pump and fitted with level / temperature gauge, filter and filler/strainer.

1309 West Main, Carmi, IL 62821, USA
Tel: (618) 382 2525 Fax: (618) 382 3610
E-mail: elastec@elastec.com
Web Page: www.elastec.com

Specifications;

Drive:	Air cooled Yanmar diesel engine with 12 Volt Electric and Recoil Hand start
Max Hydraulic output ;	4.2 gpm / 16 lpm
Max Pressure:	2500 psi / 172 bar
	Single Hydraulic Circuit
Frame;	Skid mount with lifting Bracket.
Hydraulic tank;	8 gallons / 30 litres. Spin on return filter, fluid level and temp gauges, tank top filler/strainer.
Fuel tank;	1.25 gallons / 4.7 litres
Hydraulic Quick Couplings;	Stainless steel
Lifting:	Central lift point
Dimensions:	32" X 28" X 38" / 0.81 x 0.71 x 0.97m
Weight:	280 lbs / 127 kg
Fabric cover:	Included

.

Shipping Dimensions: 33"x29"x39" / 0.84 x 0.74 x 0.99m 298 lbs./ 135 kg

Optional; Spares kit

Note: Specifications subject to change without notice

BPP-003
8/18/08

ATLANTIC POLY LINERS INC.

103 Park Rd, Elmsdale, N.S. B2S 2L3
Phone: (902) 883-0085 Fax: (902) 883-8050

Quotation 090709

To: Iole Faragalli/ Stantech

From: Dale Haverstock

Date: September 7, 2009

Re: Containment Membrane to Eureka

Iole,

We are pleased to provide you with the following quotation to supply 5 panels of 36mil RLLDPE with dimensions of 30m x 30m. Our lump sum quote of **$73,450.00** (applicable taxes extra) includes the material and shipping to Yellowknife from our facility in Elmsdale, NS. We have also included for all of the Quality Assurance and Control for the material and fabrication seams. This price is only valid for the next 30 days due to uncertainty related to transport costs.

Our firm is recognized as an Approved Contractor by the International Association of Geosynthetic Installers (IAGI), also our crews have International Association of Geosynthetic Installer (IAGI) accreditation and we are a member in Good Standing with the NSCSA. All of our projects are completed in an expedient manner however this is done with strict compliance to our safety program. Payment is to be 30 days after invoiced.

Do not hesitate to contact us if you have any questions or need further information.

Regards,

DaleHaverstock
General Superintendent
Atlantic Poly Liners Inc.

Cost Estimate for Installation of Geotechnical Liners

Description of Cost	Unit Cost	Quantity	Cost
30m x 30m, 36 mil Geotechnical Synthetic Liners FOB Yellowknife	$14,690	5	$ 73,450
Contractor 30% Markup on Material	$ 4,407	5	$ 22,035
Charter Aircraft Yellowknife-Eureka	$ 30,000	2	$ 60,000
4 labourers/heavy equipment operators	$ 450/day	14 days x 4 labourers	$ 25,200
1 foreman	$ 550/day	14 days	$ 7,700
2 licensed installers	$ 550/day	14 days x 2 labourers	$ 15,400
		Total	**$ 203,785**

Cost Assumptions:

- No costs have been included to crush gravel.
- It is assumed that all heavy equipment is available on site to install a subsurface geotechnical synthetic liner within a graded bermed perimeter.
- No cost has been included for site support, accommodations or fuel usage.
- This cost breakdown is an estimate only and should be used for general budgeting purposes only.

Special Note:

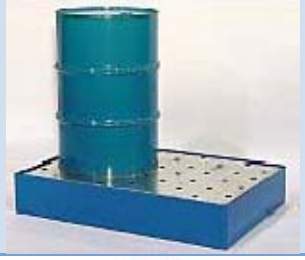
Prior to procurement and installation, an engineered design should be developed to confirm the quantities of geotechnical synthetic liners required.

Drum Pallet	Description	Unit Cost
	Poly Drum Cradle In Yellow It is 100% polyethylene for durable chemical resistance. Units are designed to interlock into spill pallet grating for stable drum storage. Dimensions are 29"l x 26.5" w x 22.5" h. Load Capacity: 2000 lbs.	$329.50
	Single Drum Poly Stacker In Yellow It doubles the storage capacity of Eagle's horizontal drum cradle with a Single Stacker. Weight is 50 Lbs. The Dimensions are 27"W x 26.5"L x 29"H. Load Capacity is 1000 Lbs.	$359.90
	Double Drum Poly Stacker 50 Lbs. Yellow It is 100% polyethylene for durable chemical resistance. Dimensions are 48"l x 26.5" w x 13" h. Load Capacity: 2000 lbs	$425.50
	Poly Shelf For Stacker Units In Yellow It is 100% polyethylene for durable chemical resistance. Units are designed to interlock into spill pallet grating for stable drum storage. Shelf attaches easily and allows for filling more than one container at a time. Dimensions are 19" l x 23" w x 19" h. Load Capacity: 100 lbs	$149.90
	Yellow Poly Racker It is one-piece polyethylene rack that holds two 55 Gallon drums security in place. Dimensions are 49" L x 53" W x 22.88" H. Weight: 120 lbs. Load Bearing Sump Capacity: 3000 lbs.	$1,109.90
	Poly Stacker for the Drum Poly Rack System Yellow Combine a single Poly Stacker with the Poly Rackers to stack up to four drums. Add another Poly Stacker and you have a storage system. Dimensions are 49" L x 41" W x 13" H. Weight: 56 lbs. Load Bearing Capacity UDL: 2400 lbs.	$500.95
	2 Drum Pallet Unit Two drum containment is ideal for use as a spill containment unit, mobile pumping station or a waste collection station. The Dimension is 51.00" in Length, 26.25" in Width and 15.00"in Height. 48 Lbs is the Weight. The Load Capacity is 2000 Lbs. THIS PRODUCT IS COMPLIANT TO: EPA 40 CFR 264.175) and EPA E 19, s.91.1	$404.80
	4 Drum Pallet Unit Spill containment pallets provide flexible and comprehensive spill protection. It has grating with 1¾" square opening that removes easily for cleaning. The Forklift able design is with 3/4" drain plug. The Dimension is 51.50"in Width, 51.50" in Length and 18.50" in Height. 88 Lbs is the	$575.75

	4 Drum Pallet Unit-Low Profile 66 Gallon spill capacity is with a 3/4" drain plug. The Dimension is 51.50" in Width, 51.50" in Length and 10.00" in Height. 65 Lbs is the Weight. The Load Capacity is 8000 Lbs. THIS PRODUCT IS COMPLIANT TO: EPA (40 CFR 264.175) and EPA E 19, s.91.1	$505.50
	Drum Nestable Pallet (Low Profile) 66 Gallon spill capacity is with a ¾" drain plug. TThe Dimension is 58.50" in Width, 58.50" in Length and 7.75" in Height. 65 Lbs is the Weight. The Load Capacity is 6000 Lbs.	$534.80
	Poly Pallet 2000, 2 Drums In Yellow This secondary containment system is engineered to meet the rigors of today's regulatory environment. The Dimension is 29.00" in Width, 53.50" in Length and 17.00" in Height. 58 Gallon is the Sump Capacity. Yellow is the color.	$518.69
	Spill Containment Pallets Yellow This secondary containment system is engineered to meet the rigors of today's regulatory environment. The Dimension is 29.00" in Width, 53.50" in Length and 17.00" in Height. 58 Gallon is the Sump Capacity. Yellow is the color.	$575.59
	Poly Spill Pallet 6000, 4 Drums Yellow It is designed to hold-The Heavy Load. The Dimension is 50.00" in Width, 50.00" in Length and 17.00" in Height. 83 Gallon is the Sump Capacity.Yellow is the color.	$697.95
	Poly Spill Pallet 6000, W/Drain 4 Drums In Yellow It is designed to hold-The Heavy Load. Rated at The Dimension is 50.00" in Width, 50.00" in Length and 17.00" in Height. 83 Gallon is the Sump Capacity. Yellow is the color.	$779.70
	4 Drum In-Line Pallet Yellow It is designed to hold 55 Gallon Drums. Storing drums in-line near the wall, between columns, and in all those spaces you thought were unusable. The Dimension is 25.25" in Width, 98.00" in Length and 12.00" in Height. 66 Gallon is the Sump Capacity. Yellow is the color.	$624.90

	4 Drum In-Line Pallet W/Drain Yellow It is designed to hold 55 Gallon Drums. Storing drums in-line near the wall, between columns, and in all those spaces you thought were unusable. The Dimension is 25.25" in Width, 98.00" in Length and 12.00" in Height. 66 Gallon is the Sump Capacity. Yellow is the color.	$659.90
	Poly Shelf For Drum Poly Rack System Yellow Easily attaches to a Poly Stacker and allows simultaneous dispensing from all drums. Dimensions are 17" L x 22" W x 18" H. Weight: 10 lbs. Load Bearing Capacity UDL: 60 lbs.	$193.90
	Poly Safety Pack Yellow Safe, secure two-drum storage! This tough, indoor or outdoor performer protects two 55-gallon drums while containing leaks with a 135-gallon sump capacity. Dimensions 60"1 x 36.25"w x 45.75"h Weight is 115 lbs. Load Bearing Capacity UDL: 1200 lbs. Sump Capacity: 135 gal.	$1,599.90
	Poly Safety Pack with Drain In Yellow Safe, secure two-drum storage! This tough, indoor or outdoor performer protects two 55-gallon drums while containing leaks with a 135-gallon sump capacity. It comes with Drain. Exterior Dimensions 60"1 x 36.25"w x 45.75"h. Weight: 109 lbs. Load Bearing Capacity UDL: 1200 lbs.	$1,645.90
	Yellow Hazard Hut Outdoor hazardous materials storage for up to for 55 gallon drums. One piece moulded-100% polyethylene means there are no joints or seams to leak. Door Opening 41.5" W x 48.5" H. Exterior Dimensions 68" L x 67" W x 71" H. Weight: 255 lbs. Load Bearing Capacity UDL: 4000lbs. Sump Capacity: 72 gal.	$4,249.90
	2 Drum Workstation (Low) It is low profile for the storage of two drums. Forklift able allows for easier movement on worksite. Dimensions are 60"Wx34"Lx46"H. Weight is 100Lbs.	$1,264.80
	2 Drum Workstation W/Cover Forklift able allows for easier movement on worksite. Dimensions are 60"Lx34"H. Weight 64" 120Lbs.	$1,467.70

	Rotary Top Containment Unit Protect up to four 55-gallon drums from the elements with this rotary style hard cover pallet that features easy-lift pivot-point-axis design. Dimensions are 59 ½"Wx73 ½"Lx68"H. Weight is 200Lbs.	$2,030.60
	4 Drum Poly Storage Building Securely store up to four 55 gallon drums, up to 8,000 pound load capacity. Dimensions are 57 ½"Wx57 ½"Lx72"H 285 Lbs. Weight is 285 lbs.	$2,933.70
	Stinger Yellow Jacket -Portable Spill Containment Lightweight, portable container can be used anywhere and prevent spills from occurring. Dimensions are 4' L x 4' W x 8" H. Weight is 13 lbs. Sump Capacity is 80 gal.Yellow in color.	$784.80
	Portable Spill Containment-Stinger Yellow Jacket Lightweight, portable container can be used anywhere and prevent spills from occurring. Dimensions are 4' L x 6" W x 8" H. Weight is 13 lbs. Sump Capacity: 120 gal.	$1,049.90
	**1-Drum Steel Pallet** 1 pallet 600 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 195 lbs. 34" L x 34" W x 18" H	$359.00
	**2 Drum Blue Steel Spill Containment Pallet** 1 pallet 1,200 lb Load Bearing Capacity, Sump Capacity - 72 gal., 165 lbs. 47.25"W x 31.5”D x 16.313”H	$544.00
	**2 Drum Galvanized Steel Spill Containment Pallet** 1 pallet 1,200 lb Load Bearing Capacity, Sump Capacity - 72 gal., 165 lbs. 47.25"W x 31.5”D x 16.313”H	$564.00

	**2-Drum Steel Pallet** 1 pallet 1,200 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 205 lbs. 54" L x 34" W x 14" H	$579.00
	**2-Drum Steel Sump** 1 sump 1,200 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 212 lbs. 50" L x 34" W x 9" H	$414.00
	**4 Drum Blue Steel Spill Containment Pallet** 1 pallet 2,400 lb Load Bearing Capacity, Sump Capacity - 77 gal., 215 lbs. 47.25”W x 47.25”D x 13.0625”H	$659.00
	**4 Drum Galvanized Steel Spill Containment Pallet** 1 pallet 2,400 lb Load Bearing Capacity, Sump Capacity - 77 gal., 215 lbs. 47.25”W x 47.25”D x 13.0625”H	$679.00
	**Drum Inline Blue Steel Spill Containment Pallet** 1 pallet 2,400 lb Load Bearing Capacity, Sump Capacity - 102 gal., 305 lbs. 94.125”W x 31.5”D x 13.0625”H	$735.00
	**4 Drum Inline Galvanized Steel Spill Containment Pallet** 1 pallet 2,400 lb Load Bearing Capacity, Sump Capacity - 102 gal., 305 lbs. 94.125”W x 31.5”D x 13.0625”H	$755.00

	**4-Drum Inline Steel Pallet** 1 pallet 2,400 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 380 lbs. 107" L x 34" W x 10" H	$745.00
	**4-Drum Inline Steel Sump** 1 sump 2,400 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 350 lbs. 102" L x 34" W x 5" H	$719.00
	**4-Drum Steel Pallet** 1 pallet 2,400 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 270 lbs. 54" L x 50" W x 10" H	$661.00
	**4-Drum Steel Sump** 1 sump 2,400 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 265 lbs. 50" L x 50" W x 7" H	$582.00
	**8-Drum Steel Pallet** 1 pallet 4,800 lbs. Load Bearing Capacity, 66 gal. Sump Capacity - 525 lbs. 107" L x 50" W x 10" H	$1,179.00

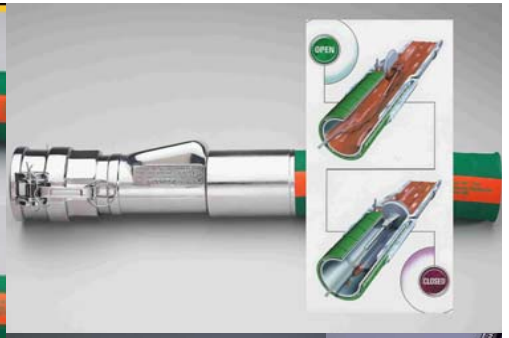
We've Taken the Luck out of Safety

Accidents do happen! In the case of hose failure a few seconds can mean the difference between a minor mishap and a major catastrophe.

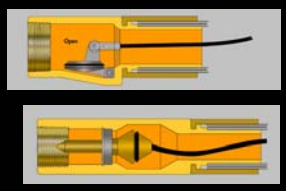
With Smart-Hose™ technology, spills are minimized or eliminated and your employees as well as the environment are safe. Furthermore, the technology requires no training and lowers maintenance costs.

Smart-Hose™
TECHNOLOGIES

Why use Smart-Hose?
Innovation, Cost and Safety



Smart-Hose™ TECHNOLOGIES



"The World's Safest Hose Assemblies"

Eliminate the consequence resulting from the uncontrolled release of Toxic & Hazardous chemicals due to hose accidents. Smart-Hose shuts off the flow of product in both directions upon hose & coupling separation, catastrophic hose rupture and hose stretching.

Any Hose – Any Application!

Metal Hose

Rubber Hose

Teflon® Hose

Any Liquid or Gas Transfer Application!

Any Connection!

Male Camlock

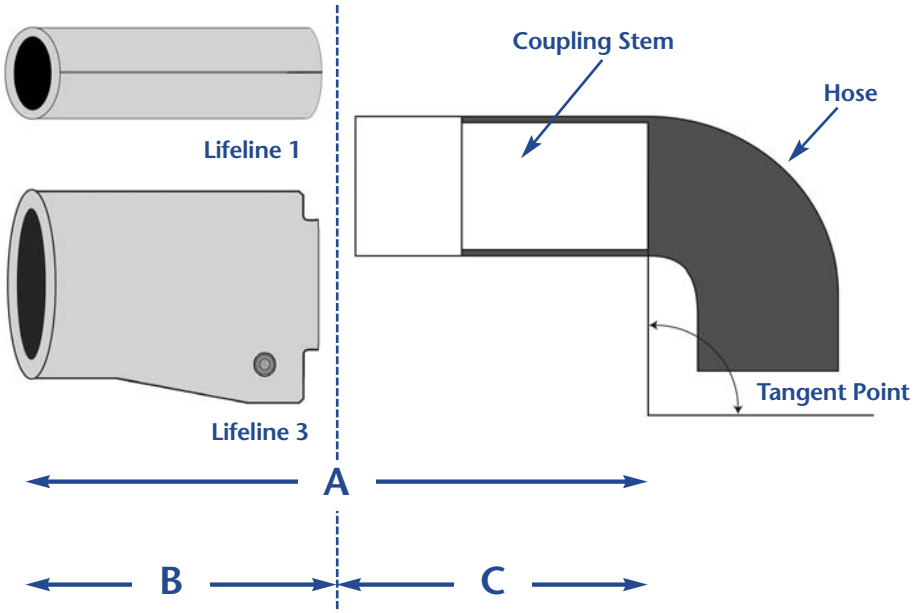
Female Camlock

NPT Threads
Female Male Weld

Smart-Hose Technologies, A Zena Associates LLC Company
2536 South 59th St., Phila., PA 19143
tel: 215-730-9000 Fax: 215-730-0558

Smart-Hose™
FLUID SYSTEMS

Coupling Data



Coupling ID	Type	A"	B"	C"	Coupling Weight	Standard End Styles
1/4"	LL1	2.26	1.60	.665	0.40	NPT Female
3/8"	LL1	3.50	2.20	1.30	0.60	NPT Female
1/2"	LL1	4.08	2.40	1.68	0.80	NPT Female
3/4"	LL1	5.72	3.60	2.12	1.60	NPT Female
1"	LL1	6.68	4.40	2.28	2.50	NPT Female
	LL1 BA	7.94	5.39	2.55	4.50	NPT Female
1 1/4"	LL1	8.50	5.42	3.08	2.90	NPT Female
	LL1 BA	9.08	6.26	2.82	6.20	NPT Female
1 1/2"	LL3	7.82	4.74	3.08	3.40	NPT Male
2"	LL3	9.28	5.36	3.92	4.70	NPT M or F
3"	LL3	12.87	8.21	4.66	12.10	NPT M or F
4"	LL3	14.35	9.10	5.35	20.75	NPT M or F
6"	LL3	25.30	13.30	12.10	45.43	Flange
8"	LL3	w/a	w/a	w/a	w/a	Flange
10"	LL3	w/a	w/a	w/a	w/a	Flange
12"	LL3	w/a	w/a	w/a	w/a	Flange

Data subject to change

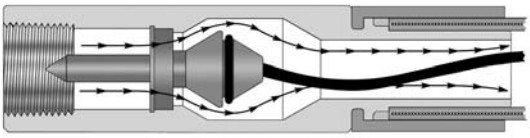
LL1 BA = Breakaway
w/a = will advise

Smart-Hose™ FLUID SYSTEMS

ENGINEERING DATA

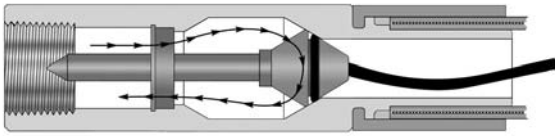
Lifeline® 1

Flow



OPEN

No Flow



CLOSED

Lifeline 1 incorporates an internally coated cable connected to normally unseated "Valve Plungers" located on each end of the cable. In the event of a hose separation, coupling ejection or catastrophic hose failure, the "Valve Plungers" are released and instantly seat, stopping the flow of product in both directions.

- Reduce or eliminate personal injury
- Reduce or eliminate property damage
- Reduce or eliminate cost associated with hazardous spills

Open Flow (Valves Open)

Coupling Ejection (Valves Seated)

Coupling Data

Lifeline 1 is recommended for gaseous flow and liquids applications.

Chemical Version	All metal parts are 316 stainless steel
High Pressure/ Compressed Gas	Parts are 304 stainless steel
Monel Version	All parts are Monel with Hastelloy Snap Ring
Flammable Gas Version	All parts are 316 stainless steel with brass plug valve
Brass Version	All parts are brass with 316 stainless steel snap ring
O-ring	All couplings use PTFE Teflon unless other material is required

Size	Alloys Offered	End Configurations	Wt. Lbs.*	Length	WP
1/4"	Stainless 304 & 316, Brass	Male & Female NPT, Flanges, Cam Lock	.4 ea.	1.6"	6000 psi
3/8"	Stainless 304 & 316, Brass	Male & Female NPT, Flanges, Cam Lock	.6 ea.	2.2"	6000 psi
1/2"	Monel, Stainless 316, Brass	Male & Female NPT, Flanges, Cam Lock	.8 ea.	2.4"	6000 psi
3/4"	Stainless 316, Brass	Male & Female NPT, Flanges, Cam Lock	1.6 ea.	3.6"	5000 psi
1"	Monel, Stainless 316, Brass	Male & Female NPT, Flanges, Cam Lock	2.5 ea.	4.4"	5000 psi
1 1/4"	Stainless 316	Male & Female NPT, Flanges, Cam Lock	2.9 ea.	5.42"	2000 psi

*approximate

All completed hose assemblies are tested with dried air under water to the test pressure of the hose assembly prior to shipment. Each hose assembly comes boxed with test certificate and instruction booklet on Care, Use and Maintenance for Lifeline products.

Rev 01/02

2536 South 59th Street • Philadelphia, PA 19143

Phone Fax Toll-Free

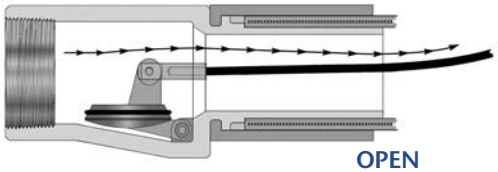
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

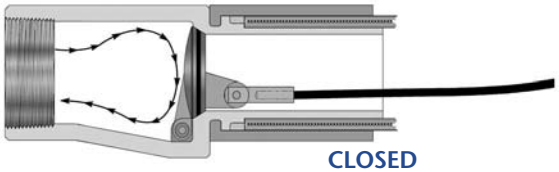
Lifeline® 3

Flow



OPEN

No Flow



CLOSED

Lifeline 3 incorporates an internally coated cable connected to normally unseated "Valve Flapper" located on each end of the cable. In the event of a hose separation, coupling ejection or catastrophic hose failure, the "Valve Flappers" are released and instantly seat, stopping the flow of product in both directions.

- Reduce or eliminate personal injury
- Reduce or eliminate property damage
- Reduce or eliminate cost associated with hazardous spills

Open Flow (Valves Open)

Coupling Ejection (Valves Seated)

Coupling Data

Lifeline 3 is recommended for gaseous flow and liquids applications

Chemical Version	All metal parts are 316 stainless steel
HCL Version	Hastelloy metal parts
Flammable Gas Version	All metal parts are 316 stainless steel
Brass Version	All metal parts are brass
O-ring	All couplings use PTFE Teflon unless other material is required

Size	Alloys Offered	End Configurations	Wt. Lbs.*	Length	WP
1 1/2"	Monel, Stainless 316	Male & Female NPT, Flanges, Cam Lock	3.4 ea.	4.74"	1000 psi
2"	Stainless 316, Hastelloy	Male & Female NPT, Flanges, Cam Lock	4.7 ea.	5.36"	1000 psi
3"	Stainless 316	Male & Female NPT, Flanges, Cam Lock	12.1 ea.	8.21"	800 psi
4"	Stainless 316	Male & Female NPT, Flanges, Cam Lock	20.7 ea.	9.1"	800 psi
6"	Stainless 316	Male & Female NPT, Flanges, Cam Lock	61.5 ea.	12.25"	500 psi

*subject to change

All completed hose assemblies are tested with dried air under water to the test pressure of the hose assembly prior to shipment. Each hose assembly comes boxed with test certificate and instruction booklet on Care, Use and Maintenance for Lifeline products.

Rev 01/02

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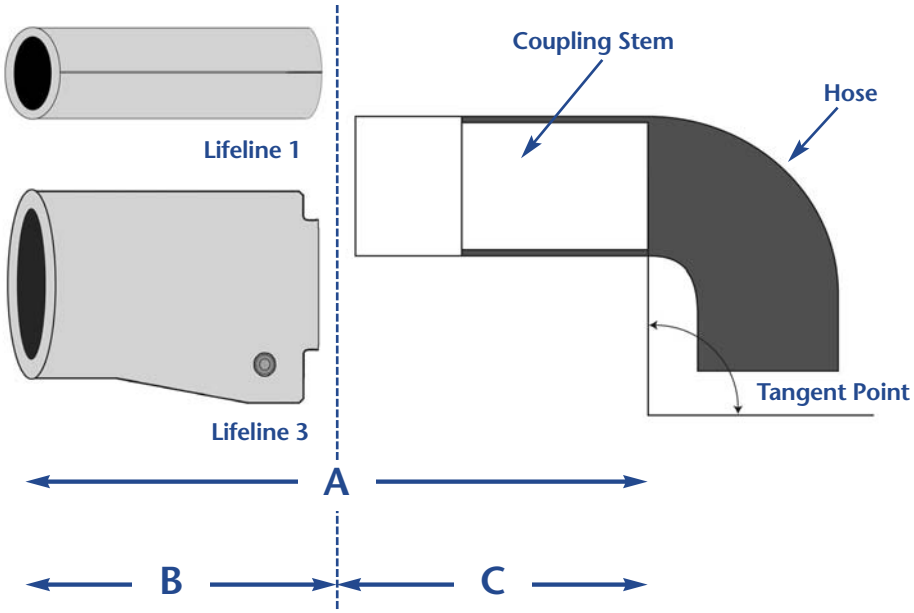
Smart-Hose™
FLUID SYSTEMS

Coupling Data



Coupling ID	Type	A"	B"	C"	Coupling Weight	Standard End Styles
1/4"	LL1	2.26	1.60	.665	0.40	NPT Female
3/8"	LL1	3.50	2.20	1.30	0.60	NPT Female
1/2"	LL1	4.08	2.40	1.68	0.80	NPT Female
3/4"	LL1	5.72	3.60	2.12	1.60	NPT Female
1"	LL1	6.68	4.40	2.28	2.50	NPT Female
	LL1 BA	7.94	5.39	2.55	4.50	NPT Female
1 1/4"	LL1	8.50	5.42	3.08	2.90	NPT Female
	LL1 BA	9.08	6.26	2.82	6.20	NPT Female
1 1/2"	LL3	7.82	4.74	3.08	3.40	NPT Male
2"	LL3	9.28	5.36	3.92	4.70	NPT M or F
3"	LL3	12.87	8.21	4.66	12.10	NPT M or F
4"	LL3	14.35	9.10	5.35	20.75	NPT M or F
6"	LL3	25.30	13.30	12.10	45.43	Flange
8"	LL3	w/a	w/a	w/a	w/a	Flange
10"	LL3	w/a	w/a	w/a	w/a	Flange
12"	LL3	w/a	w/a	w/a	w/a	Flange

Data subject to change

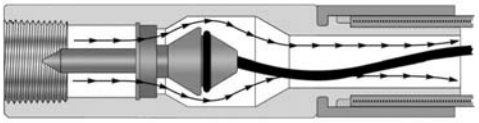
LL1 BA = Breakaway
w/a = will advise

Smart-Hose™

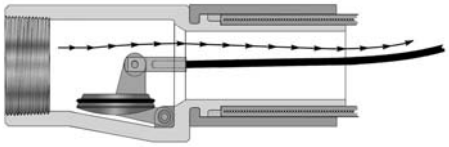
FLUID SYSTEMS

ENGINEERING DATA

Goodyear® SmartChem UHMWPe Chemical Hose



Lifeline 1



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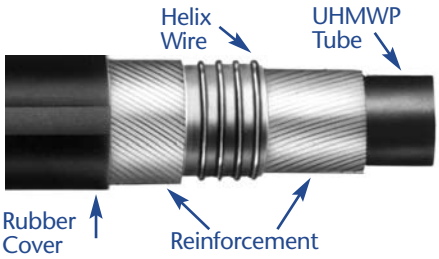

SmartChem chemical transfer hose is a significant improvement to Goodyear's chemical hose line. It handles the majority of common industrial chemicals in pressure, gravity flow and suction service. SmartChem combined with the Smart-Hose Safety System is your safe alternative to regular hose.

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the use of the Smart-Hose Safety System. **SmartChem UHMWP cannot be used with chemicals that have a phase change below 122˚F (50˚C).**

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Green Versigard® synthetic rubber with bright orange longitudinal stripe
Reinforcement	Multi layers of polyester with double helix (Vacuum 29 in. HG)
Tube	Pliosyn™ (ultra-high molecular weight polyethylene)
Branding	Continuous spiral brand Goodyear® Chemical Transfer Hose, 200 psi WP Caution: Hose and couplings should be inspected prior to each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +150˚F (-40˚C to +66˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care, and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Weight 316 S/S Lifeline 1	Lifeline 3	Part #
3/4"	200	0.5	6"	1.60 lbs		R2000614000
1"	200	0.75	8"	2.50 lbs		R2000814000
1 1/4"	200	0.9	10"	2.70 lbs		R2001014000
1 1/2"	200	1.05	10"		3.40 lbs	R2001232000
2"	200	1.42	12"		4.70 lbs	R2001632000
3"	200	2.36	20"		12.10 lbs	R2002432000

Weights & dimensions are subject to change

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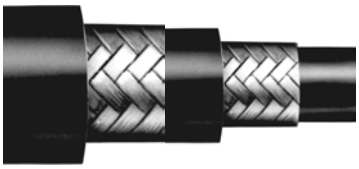
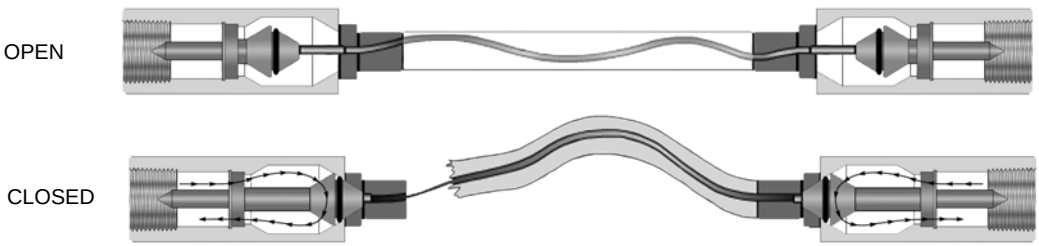
Smart-Hose™
FLUID SYSTEMS
ENGINEERING DATA

Smart-Hose Steam





The Smart-Hose safety system is built into a 250 psi Steam Hose that is suitable for use in steam applications to 450 degrees F. Smart-Hose Steam is ideal for refinery service and other industrial steam applications.

Hose Data

Cover Red Abrasion & Oil Resistant Co-Polymer
Reinforcement 2 wire braids
Tube Black EPDM
Branding Steam Service 250 psi, 406/450 ° F
Temperature -20 to 406/450 ° F
Maintenance See Smart-Hose “Proper Use, Care & Maintenance” Booklet Form# 1999-1

	WP	Hose	Coupling		
ID	psi	Wt/Ft	Weight LL1	Weight LL3	Part #
1/2"	300	.55 lb	.8 lb		R90004160000
3/4"	300	.8 lb	1.6 lb		R90006140000
1"	300	.95 lb	2.5 lb		R90008140000

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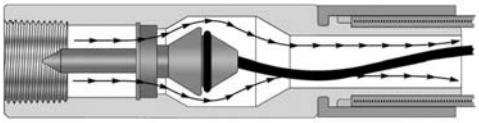
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

UHMWP *Phase Change* Chemical Transfer Hose



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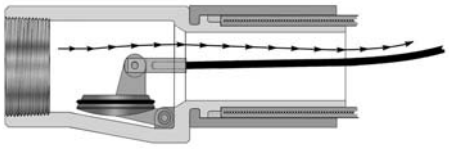

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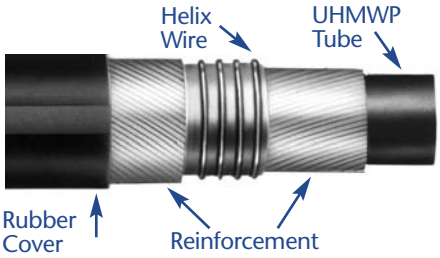

The Smart-Hose Safety System is combined with a UHMWP tube chemical transfer hose designed to meet the bulk hauling and chemical industries' most demanding requirements. It is light weight, flexible but also rugged. **Chemical UHMWP will handle chemicals with a phase change to gas down to 60˚F.**

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the use of the Smart-Hose Safety System.

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Green EPDM chemical & weather resistant
Reinforcement	Multi layers of polyester with double helix (vacuum 29 in. HG)
Tube	UHMWP polyethylene – chemical resistant
Branding	UHMWP Chemical Transfer Hose, 200 psi WP maximum temperature. Caution: Hose and couplings should be inspected before each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +180˚F (-40˚C to +82˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care and Maintenance Booklet form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Weight 316 S/S Lifeline 1	Lifeline 3	Part #
3/4"	200	0.46	6"	1.60 lbs		R2400614000
1"	200	0.60	8"	2.50 lbs		R2400814000
1 1/2"	200	0.84	10"		3.40 lbs	R2401232000
2"	200	1.20	12"		4.70 lbs	R2401632000
3"	200	2.20	20"		12.10 lbs	R2402432000

Weights & dimensions are subject to change

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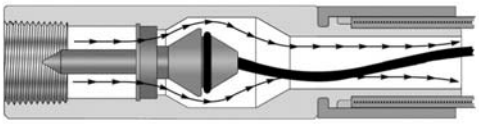
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

Goodyear® SmartChem Teflon® Chemical Hose



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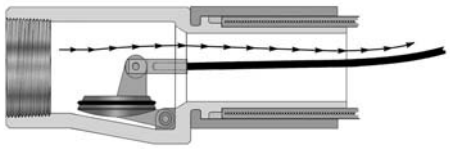

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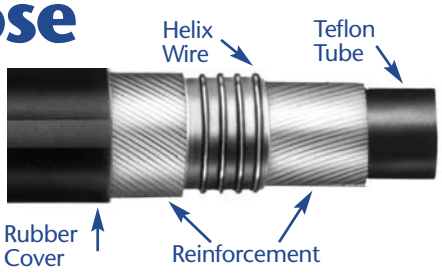

SmartChem Teflon® is Goodyear's premium hose which is Teflon lined to handle a broad spectrum of fluids and materials in a wide variety of applications. Combined with the Smart-Hose Safety System, SmartChem Teflon is your safe alternative to regular hose.

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the Smart-Hose Safety System.

- Each hose is tested with dry air to test pressure
- Each hose is serial numbered and has test certificate and operating booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load and unloading).

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type. **SmartChem Teflon cannot be used with chemicals that have a phase change below 122˚F (50˚C)**

Hose Data

Cover	Blue Versigard® EPDM chemical & weather resistant
Reinforcement	Multi layers of synthetic fabric with double helix (vacuum 29 in. HG)
Tube	Teflon (FEP)
Branding	Continuous spiral brand Goodyear® SmartChem Teflon Hose FEP Tube. Caution: Hose and couplings should be inspected prior to each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +200˚F (-40˚C to +92˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care, and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Coupling Weight Lifeline 1	Lifeline 3	Part #
1/2"	350	.51	6"	0.80 lb		R2100414000
3/4"	350	.71	10"	1.60 lb		R2100614000
1"	350	.85	13"	2.50 lb		R2100814000
1 1/4"	350	1.03	15"	2.90 lb		R2101014000
1 1/2"	350	1.25	20"		3.40 lb	R2101232000
2"	300	1.72	20"		4.70 lb	R2101632000
3"	200	2.67	40"		12.10 lb	R2102432000

Weights & dimensions are subject to change

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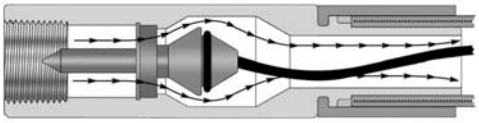
Smart-Hose™ FLUID SYSTEMS

ENGINEERING DATA

Metal Hose – 316

STAINLESS STEEL



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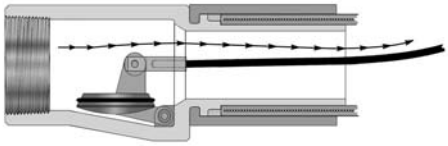

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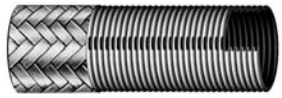

Single Braid

Double Braid

The Smart-Hose Safety System is built into a stainless steel metal hose to prevent or eliminate the catastrophic consequences of a hose separation resulting from a pull away or major hose rupture. In the event of such an occurrence, the Smart-Hose Safety System will shut off the flow of product in both directions instantly upon hose separation.

This type hose is an excellent choice for liquid and gaseous chemicals, along with compressed air, petroleum and other products requiring the chemical resistance of 312 stainless steel.

Each hose is welded by the manufacturer in accordance with their specifications and 100% pressure tested with dried air under water to insure assembly safety. Each serial numbered assembly has a test certification and instruction booklet attached. Mass-spectrometer testing is supplied on request for all hazardous material transfer service hoses. (2" ID and larger hose can have a Flex Guard installed to guard against over bending at the coupling.)

- Each hose is tested with dry air or nitrogen to test pressure
- Each hose is serial numbered and has test certificate and Operating Booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load and unloading).
- Hose can be made to meet DOT HM225/49CFR173.315

Hose Data

Tube 316 Stainless Steel
Braid 321 & 304 Stainless Steel (1 or 2 braids)
Welds Performed by the manufacturer with ANSI code 9 welders
Testing Proof testing by manufacturer, second pressure test by Smart-Hose to a minimum of 1.5 working pressure based on specification
Temperature Cryogenic to +450˚F (Cryogenic to +230˚C)

ID	1 Braid WP psi	2 Braid WP psi	1 Braid Hose Wt./Ft.	2 Braid Hose Wt./Ft.	1 Braid Static Bend Radius	2 Braid Static Bend Radius	1 Braid Intermittent Bend Radius	2 Braid Intermittent Bend Radius	Cplg. Lgth.	Cplg. Type	Cplg. Wt. Ea.
1/2"	1050	1575	0.41	0.54	1.5"	1.5"	6.5"	6.5"	3"	LL1	12.7 oz
3/4"	880	1410	0.67	0.85	2"	2"	8"	8"	3.5"	LL1	1.62 lb
1"	605	970	0.97	1.19	2.75"	2.75"	8"	8"	4"	LL1	2.50 lb
1 1/2"	525	790	1.96	2.36	3.75"	3.75"	10"	10"	4.25"	LL3	3.4 lb
2"	455	730	2.21	2.82	5"	5"	14"	14"	5"	LL3	4.7 lb
3"	290	405	2.63	3.46	7"	7"	18"	18"	6.9"	LL3	7.1 lb
4"	285	350	3.3	4.5	11"	11"	22"	33"	6.9"	LL3	12.1 lb
6"	240	299	6.2	8.0	16.5"	16.5"	33"	41"	6.9"	LL3	44.5 lb

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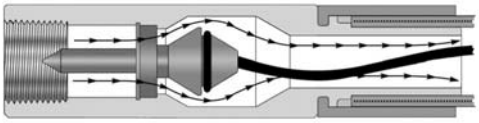
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

Metal Hose – 321

STAINLESS STEEL



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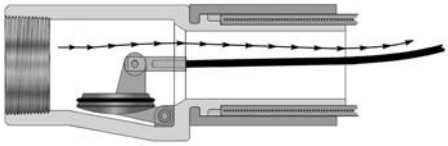

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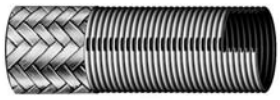

Single Braid

Double Braid

The Smart-Hose Safety System is built into a stainless steel metal hose to prevent or eliminate the catastrophic consequences of a hose separation resulting from a pull away or major hose rupture. In the event of such an occurrence, the Smart-Hose Safety System will shut off the flow of product in both directions instantly upon hose separation.

This type hose is an excellent choice for liquid and gaseous chemicals, along with compressed air, petroleum and other products requiring the chemical resistance of 321 stainless steel.

Each hose is welded by the manufacturer in accordance with their specifications and 100% pressure tested with dried air under water to insure assembly safety. Each serial numbered assembly has a test certification and instruction booklet attached. Mass-spectrometer testing is supplied on request for all hazardous material transfer service hoses. (2" ID and larger hose can have a Flex Guard installed to guard against over bending at the coupling.)

- Each hose is tested with dry air or nitrogen to test pressure
- Each hose is serial numbered and has test certificate and Operating Booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load and unloading).
- Hose can be made to meet DOT HM225/49CFR173.315

Hose Data

Tube 321 Stainless Steel
Braid 321 & 304 Stainless Steel (1 or 2 braids)
Welds Performed by the manufacturer with ANSI code 9 welders
Testing Proof testing by manufacturer, second pressure test by Smart-Hose to a minimum of 1.5 working pressure based on specification
Temperature Cryogenic to +450˚F (Cryogenic to +230˚C)

ID	1 Braid WP psi	2 Braid WP psi	1 Braid Hose Wt./Ft.	2 Braid Hose Wt./Ft.	1 Braid Static Bend Radius	2 Braid Static Bend Radius	1 Braid Intermittent Bend Radius	2 Braid Intermittent Bend Radius	Cplg. Lgth.	Cplg. Type	Cplg. Wt. Ea.
1/2"	1050	1575	0.41	0.54	1.5"	1.5"	6.5"	6.5"	3"	LL1	12.7 oz
3/4"	880	1410	0.67	0.85	2"	2"	8"	8"	3.5"	LL1	1.61 lb
1"	605	970	0.97	1.19	2.75"	2.75"	8"	8"	4"	LL1	2.50 lb
1 1/2"	525	790	1.96	2.36	3.75"	3.75"	10"	10"	4.25"	LL3	3.4 lb
2"	455	730	2.21	2.82	5"	5"	14"	14"	5"	LL3	4.7 lb
3"	290	405	2.63	3.46	7"	7"	18"	18"	6.9"	LL3	7.1 lb
4"	285	350	3.3	4.5	11"	11"	22"	33"	6.9"	LL3	12.1 lb
6"	240	299	6.2	8.0	16.5"	16.5"	33"	41"	6.9"	LL3	44.5 lb

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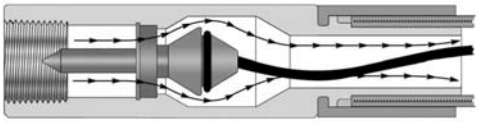
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

Teflon® – RC *Phase Change* Chemical Transfer Hose



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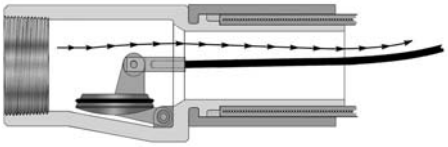

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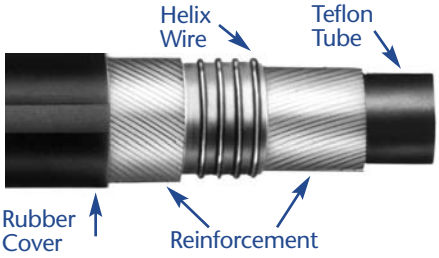

The Smart-Hose Safety System is combined with a Teflon® tubed chemical transfer hose designed to meet the chemical industry's most demanding requirements. It is light weight, flexible but also rugged. **Teflon-RC will handle chemicals with a phase change to gas down to 60˚F.**

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the Smart-Hose Safety System.

- Each hose is tested with dry air to test pressure
- Each hose is serial numbered and has test certificate and operating booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load & unloading).

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Blue EPDM chemical & weather resistant
Reinforcement	Multi layers of synthetic fabric with double helix (vacuum 29 in. HG)
Tube	Teflon (FEP) conforms to FDA standards
Branding	Continuous "Smart-Hose" Teflon Tube Suction & Discharge Hose WP
Temperature	-40˚F to 200˚F (-40˚C to 92˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Coupling Weight Lifeline 1	Coupling Weight Lifeline 3	Part #
1/2"	500	0.38	6"	0.80 lb		R2300414000
3/4"	500	0.57	10"	1.60 lb		R2300614000
1"	450	0.72	13"	2.50 lb		R2300814000
1 1/2"	350	1.25	20"		3.40 lb	R2301232000
2"	300	1.70	24"		4.70 lb	R2301632000
3"	175	2.60	40"		12.10 lb	R2302432000

Weights & dimensions are subject to change

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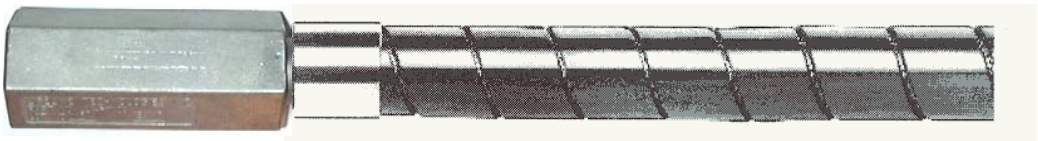
March 2002

Smart-Hose™ TECHNOLOGIES

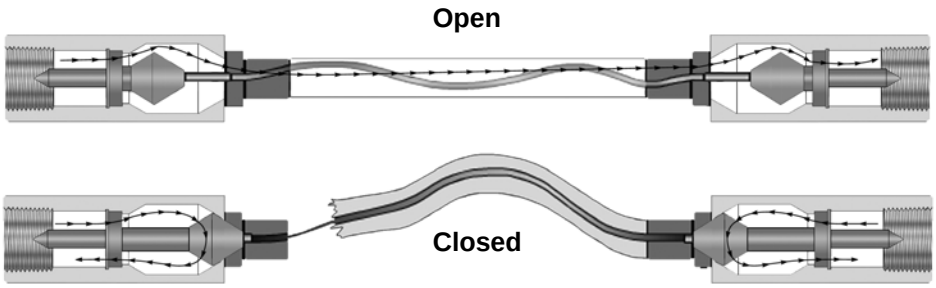
Engineering Data

Teflon Chlorine Transfer Hose



The Smart-Hose Safety System is combined with a convoluted Teflon tube hose assembly designed to meet the demanding requirements of the Chlorine industry.

The performance specifications meet or exceed the **guidelines of the Chlorine Institute (pamphlet 6).**



Hose Data

Cover	High Density Polyethylene spiral wrap
Reinforcement	Hastalloy C276 wire braid
Tube	Convoluted PTFE Teflon
Couplings	Schedule 80 Monel NPT female
Maintenance	See Smart-Hose Proper Hose Use and Maintenance Booklet form # 1999-3

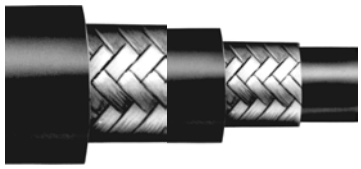
ID	Max Operaturing psi	Hose Wt/Ft	Min. Bend Radius	Part #
1/2"	1500	0.31	1"	T4900413000
1"	1250	0.61	3"	T4900813000
1 1/2"	750	0.91	7.5"	T4901230000

The Chlorine Institute guidelines for operation pressure are 500 psi for ½", 375 PSI for 1"and 1 ½" sizes with a 5:1 burst to operation pressure for all sizes.

Smart-Hose Fluid Systems. 7821 Bartram Ave. Philadelphia, PA 19153
Ph- (215) 492-5300 Fax- (215) 492-1186 Toll Free (877) 356-6278
www.smarthose.com

Smart-Hose™
FLUID SYSTEMS
ENGINEERING DATA

S02 Transfer Hose



LL1 open

LL3 open

The Smart-Hose safety system is built into a special rubber Sulfur Dioxide discharge hose. Common uses include in-plant processing, truck and rail car loading. This low temperature hose has been uniquely developed to meet the rugged requirements of this application.

Hose Data

Cover	Black, Special low temperature abrasions resistant co-polymer
Reinforcement	2 layers of stainless steel wire braid
Tube	Black, Special low temperature co-polymer resistant to S02 permeation
Branding	Yellow Mylar brand – S02 Discharge
Temperature	-5° to 185° F (-20° to 83° C)
Maintenance	See Smart-Hose “Proper Use, Care & Maintenance” Booklet Form# 1999-1

	WP	Hose		Coupling	
ID	**psi**	**Wt/Ft**	**Weight LL**	**Weight LL3**	**Part #**
1"	250	.8 lb	2.5 lb		R34008140000
2"	250	1.5 lb		4.7 lb	R34016330000

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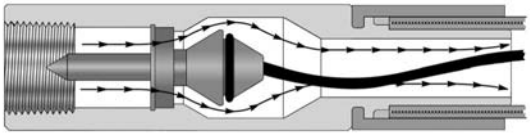
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

LPG Transfer Hose – UL® 21



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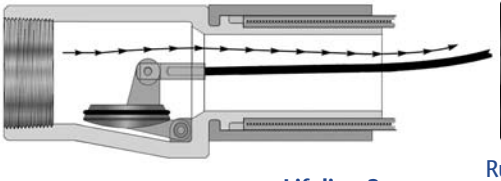

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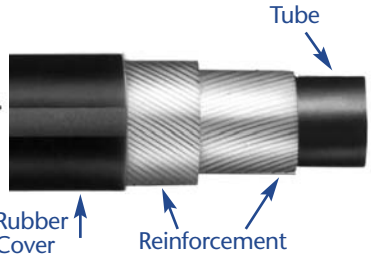

The Smart-Hose Safety System is combined with a heavy duty LPG transfer hose designed to meet the most rugged applications found in the LPG industry. All hose through 3" ID meets UL 21, 4" & 6" are built to BS 4089:1989. To achieve lower operating cost, return used Smart-Hose couplings for attachment to new hose!

- Each hose is tested under water with dry air or nitrogen to Test Pressure.
- Each hose is serial numbered.
- Each hose comes with Test Certificate & Operating Booklet.
- 316 Stainless Steel couplings are designed for reuse on new hose.
- Hose can be made to meet DOT HM225/46CFR173.315
- Each hose meets NFPA 59
- Hose can be made to meet DOT - E 12325 – (Special rail car unloading exemption eliminates requirement for human monitoring during unloading procedure).

Hose Data

Cover Black CR with Blue Longitudinal Stripe – abrasion & weather resistant
Reinforcement Multiple layers of Polyester – min. burst 1750 psi
Tube Oil resistant – resistant to permeation of Butane/Propane
Branding LPG Hose MH12585 350 Max. WP, Quarterly/Year, Made in USA.
Temperature -40˚F to 180˚F
Maintenance See Smart-Hose Proper Use, Care, and Maintenance, Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Coupling Weight Lifeline 1	Lifeline 2	Lifeline 3	Coupling Length	Part #
1/2"	350	0.3 lb	.80 lb	na	na	2.40"	R0100415000
3/4"	350	0.43 lb	1.60 lb	na	na	3.60"	R0100615000
1"	350	0.58 lb	2.50 lb	na	na	4.40"	R0100815000
1 1/4"	350	0.92 lb	2.90 lb	na	na	5.42"	R0101015000
1 1/2"	350	1.03 lb	na	na	3.40 lb	4.47"	R0101232000
2"	350	1.67 lb	na	12.1 lb	na	5.50"	R0101621000
			na	na	4.70 lb	5.36"	R0101632000
3"	350	2.34 lb	na	na	12.10 lb	8.21"	R0102432000
4"	350	3.35 lb	na	na	20.7 lb	13.25"	R0103232000
6"	350	8.23 lb	na	na	61.5 lb	26.3"	R0104832000

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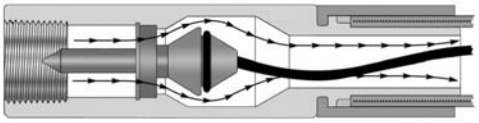
Smart-Hose™

FLUID SYSTEMS

ENGINEERING DATA

Goodyear® SmartChem UHMWPe Chemical Hose



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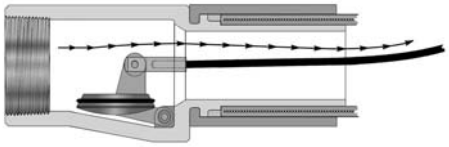

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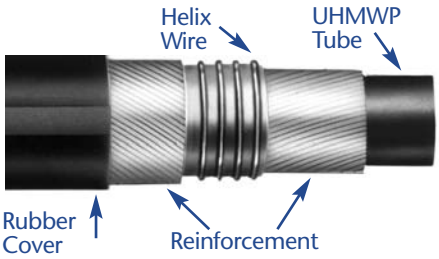

SmartChem chemical transfer hose is a significant improvement to Goodyear's chemical hose line. It handles the majority of common industrial chemicals in pressure, gravity flow and suction service. SmartChem combined with the Smart-Hose Safety System is your safe alternative to regular hose.

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the use of the Smart-Hose Safety System. **SmartChem UHMWP cannot be used with chemicals that have a phase change below 122˚F (50˚C).**

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Green Versigard® synthetic rubber with bright orange longitudinal stripe
Reinforcement	Multi layers of polyester with double helix (Vacuum 29 in. HG)
Tube	Pliosyn™ (ultra-high molecular weight polyethylene)
Branding	Continuous spiral brand Goodyear® Chemical Transfer Hose, 200 psi WP Caution: Hose and couplings should be inspected prior to each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +150˚F (-40˚C to +66˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care, and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Weight 316 S/S Lifeline 1	Lifeline 3	Part #
3/4"	200	0.5	6"	1.60 lbs		R2000614000
1"	200	0.75	8"	2.50 lbs		R2000814000
1 1/4"	200	0.9	10"	2.70 lbs		R2001014000
1 1/2"	200	1.05	10"		3.40 lbs	R2001232000
2"	200	1.42	12"		4.70 lbs	R2001632000
3"	200	2.36	20"		12.10 lbs	R2002432000

Weights & dimensions are subject to change

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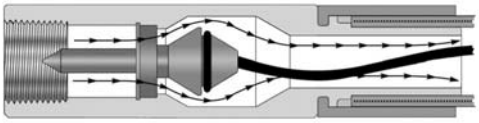
FLUID SYSTEMS

ENGINEERING DATA

UHMWP *Phase Change* Chemical Transfer Hose



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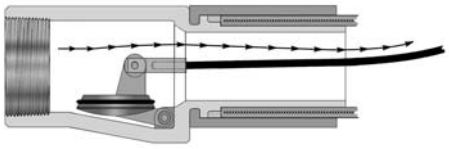

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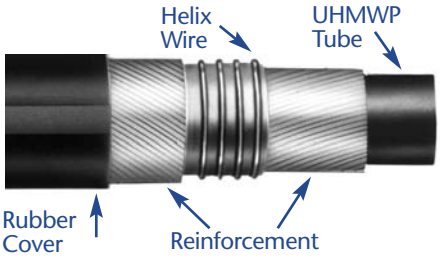

The Smart-Hose Safety System is combined with a UHMWP tube chemical transfer hose designed to meet the bulk hauling and chemical industries' most demanding requirements. It is light weight, flexible but also rugged. **Chemical UHMWP will handle chemicals with a phase change to gas down to 60˚F.**

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the use of the Smart-Hose Safety System.

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Green EPDM chemical & weather resistant
Reinforcement	Multi layers of polyester with double helix (vacuum 29 in. HG)
Tube	UHMWP polyethylene – chemical resistant
Branding	UHMWP Chemical Transfer Hose, 200 psi WP maximum temperature. Caution: Hose and couplings should be inspected before each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +180˚F (-40˚C to +82˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care and Maintenance Booklet form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Weight 316 S/S Lifeline 1	Lifeline 3	Part #
3/4"	200	0.46	6"	1.60 lbs		R2400614000
1"	200	0.60	8"	2.50 lbs		R2400814000
1 1/2"	200	0.84	10"		3.40 lbs	R2401232000
2"	200	1.20	12"		4.70 lbs	R2401632000
3"	200	2.20	20"		12.10 lbs	R2402432000

Weights & dimensions are subject to change

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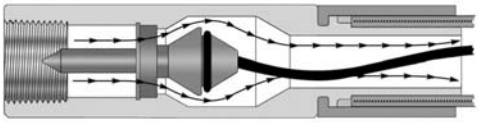
FLUID SYSTEMS

ENGINEERING DATA

Teflon® – RC *Phase Change* Chemical Transfer Hose



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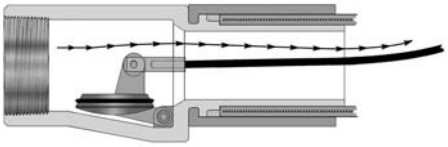

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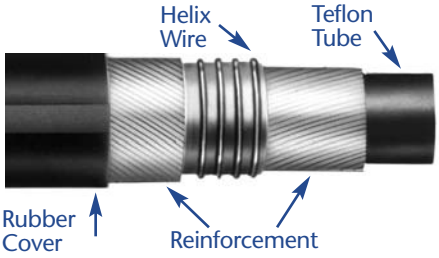

The Smart-Hose Safety System is combined with a Teflon® tubed chemical transfer hose designed to meet the chemical industry's most demanding requirements. It is light weight, flexible but also rugged. **Teflon-RC will handle chemicals with a phase change to gas down to 60˚F.**

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the Smart-Hose Safety System.

- Each hose is tested with dry air to test pressure
- Each hose is serial numbered and has test certificate and operating booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load & unloading).

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type.

Hose Data

Cover	Blue EPDM chemical & weather resistant
Reinforcement	Multi layers of synthetic fabric with double helix (vacuum 29 in. HG)
Tube	Teflon (FEP) conforms to FDA standards
Branding	Continuous "Smart-Hose" Teflon Tube Suction & Discharge Hose WP
Temperature	-40˚F to 200˚F (-40˚C to 92˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Coupling Weight Lifeline 1	Coupling Weight Lifeline 3	Part #
1/2"	500	0.38	6"	0.80 lb		R2300414000
3/4"	500	0.57	10"	1.60 lb		R2300614000
1"	450	0.72	13"	2.50 lb		R2300814000
1 1/2"	350	1.25	20"		3.40 lb	R2301232000
2"	300	1.70	24"		4.70 lb	R2301632000
3"	175	2.60	40"		12.10 lb	R2302432000

Weights & dimensions are subject to change

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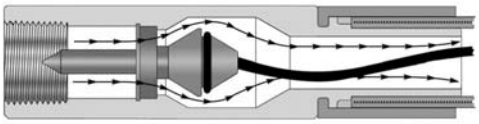
FLUID SYSTEMS

ENGINEERING DATA

Goodyear® SmartChem Teflon® Chemical Hose



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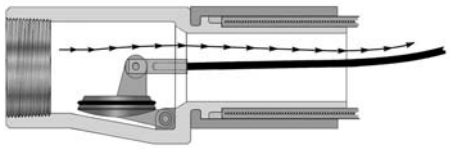

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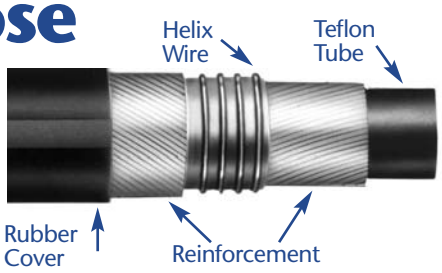

SmartChem Teflon® is Goodyear's premium hose which is Teflon lined to handle a broad spectrum of fluids and materials in a wide variety of applications. Combined with the Smart-Hose Safety System, SmartChem Teflon is your safe alternative to regular hose.

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the Smart-Hose Safety System.

- Each hose is tested with dry air to test pressure
- Each hose is serial numbered and has test certificate and operating booklet
- Hose can be made to meet DOT - E 12325 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during load and unloading).

Before use, always consult the chemical resistance chart for the compatibility of the chemical to be transferred with the tube type. **SmartChem Teflon cannot be used with chemicals that have a phase change below 122˚F (50˚C)**

Hose Data

Cover	Blue Versigard® EPDM chemical & weather resistant
Reinforcement	Multi layers of synthetic fabric with double helix (vacuum 29 in. HG)
Tube	Teflon (FEP)
Branding	Continuous spiral brand Goodyear® SmartChem Teflon Hose FEP Tube. Caution: Hose and couplings should be inspected prior to each use. Use of damaged assembly could be hazardous.
Temperature	-40˚F to +200˚F (-40˚C to +92˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care, and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Coupling Weight Lifeline 1	Lifeline 3	Part #
1/2"	350	.51	6"	0.80 lb		R2100414000
3/4"	350	.71	10"	1.60 lb		R2100614000
1"	350	.85	13"	2.50 lb		R2100814000
1 1/4"	350	1.03	15"	2.90 lb		R2101014000
1 1/2"	350	1.25	20"		3.40 lb	R2101232000
2"	300	1.72	20"		4.70 lb	R2101632000
3"	200	2.67	40"		12.10 lb	R2102432000

Weights & dimensions are subject to change

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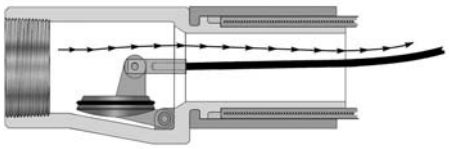
FLUID SYSTEMS

ENGINEERING DATA

Goodyear® Smart Petro 200



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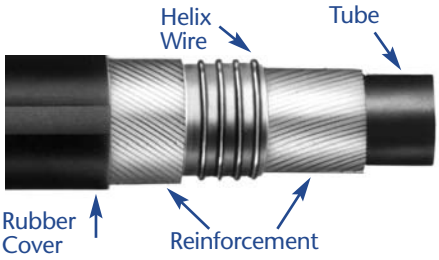

The Smart-Hose Safety System is combined with a high quality petroleum transfer hose designed to meet in-plant and the Tank Truck industry's most demanding requirements.

The environmental and human catastrophic consequences of spills resulting from hose separation and coupling ejection can be eliminated or greatly reduced with the Smart-Hose Safety System.

- Each hose is tested with dry air to test pressure
- Each hose is serial numbered & has test certificate & operating booklet
- Each hose meets DOT HM212 (special rail car unloading exemption eliminates the requirement for continuous human monitoring during loading & unloading) DOT exemption E-12325N

Hose Data

Cover	Black oil & abrasion resistant Nitrile PVC blend
Reinforcement	Multi layers of polyester with helix
Tube	Highest quality oil resistant Nitrile
Branding	200 psi WP
Temperature	-35˚F to 200˚F (-37˚C to 93˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care, and Maintenance Booklet Form #1999-1

ID	WP psi	Hose Wt/Ft	Bend Radius	Weight Lifeline 3	Part #
1 1/2"	200	0.95	8"	3.90 lbs	R5101232000
2"	200	1.10	12"	4.70 lbs	R5101632000
3"	200	1.80	14"	12.10 lbs	R5102432000
4"	200	2.60	18"	20.75 lbs	R5103232000

Weights & dimensions are subject to change

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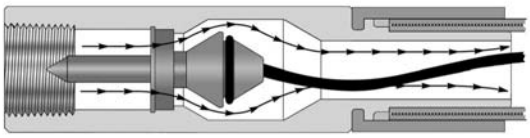
FLUID SYSTEMS

ENGINEERING DATA

Anhydrous Ammonia Transfer Hose

TEXTILE REINFORCED



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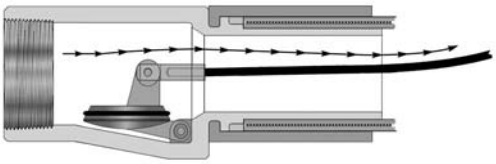

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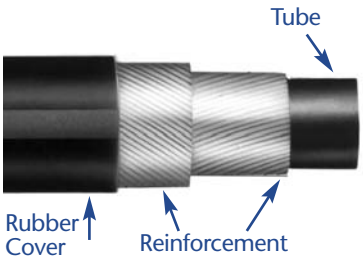

Lifeline Smart-Hose Safety System is combined with a heavy duty NH3 textile reinforced transfer hose designed to meet the most rugged applications found in the fertilizer industry. The hose assembly meets the requirements of DOT HM 225. The "Smart-Hose" end connections provide excellent performance with all the extra safety your employees and customers deserve.

These assemblies are excellent for all industrial ammonia applications including Riser & Nurse Tank applications found in the agricultural market place.

- Each hose is tested under water with dry air or nitrogen to Test Pressure.
- Each hose is serial numbered.
- Each hose comes with Test Certificate & Operating Booklet.
- 316 Stainless Steel couplings are designed for reuse on new hose.
- Hose can be made to meet DOT HM225/46CFR173.315
- Each hose meets NFPA 59
- Hose can be made to meet DOT - E-12325 – (Special rail car unloading exemption eliminates requirement for human monitoring during unloading procedure).

Liquid/Gas Hose Data

Cover	Black EPDM with Green stripe – abrasion & weather resistant
Reinforcement	Multi layers of nylon – min. burst 1750 psi
Tube	High grade permeation resistant EPDM rubber
Branding	Anhydrous Ammonia Hose Max. WP 350
Temperature	-40˚F to +180˚F (-40˚C to +82˚C)
Maintenance	See Smart-Hose Proper Hose Use, Care and Maintenance Booklet Form # 1999-1

ID	WP psi	Hose Wt/Ft	Coupling Weight Lifeline 1	Coupling Weight Lifeline 3	Coupling Length	Part #
3/4"	350	0.44 lb	1.60 lb	na	3.60"	R3000614000
1"	350	0.58 lb	2.50 lb	na	4.40"	R3000814000
1 1/4"	350	0.68 lb	2.90 lb	na	5.42"	R3001014000
1 1/2"	350	1.05 lb	na	3.40 lb	4.47"	R3001232000
2"	350	1.38 lb	na	4.70 lb	5.36"	R3001632000

Weights & dimensions are subject to change

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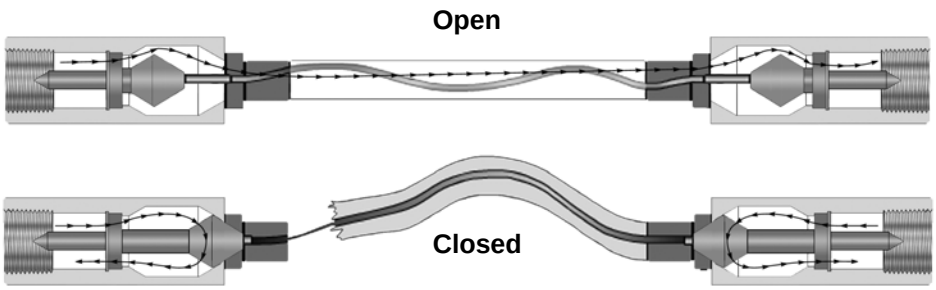
Smart-Hose™ TECHNOLOGIES

Engineering Data

Monel Chlorine Transfer Hose

The Smart-Hose Safety System is combined with a convoluted Monel 400 tube hose assembly designed to meet the demanding requirements of the Chlorine industry.

The performance specifications meet or exceed the **guidelines of the Chlorine Institute (pamphlet 6).**



Hose Data

Armor	300 Series Stainless Steel
Reinforcement	2 braids of Monel wire
Tube	Convoluted Monel 400
Couplings	Schedule 80 Monel NPT female
Maintenance	See Smart-Hose Proper Hose Use and Maintenance Booklet form # 1999-3

ID	Max Operaturing psi	Hose Wt/Ft	Min. Bend Radius	Part #
1/2"	1500	0.31	1"	M3000413000
1"	755	0.61	3"	M3000813000
1 1/2"	755	0.91	7.5"	M3001230000

The Chlorine Institute guidelines for operation pressure are 500 psi for ½", 375 PSI for 1"and 1 ½" sizes with a 5:1 burst to operation pressure for all sizes.

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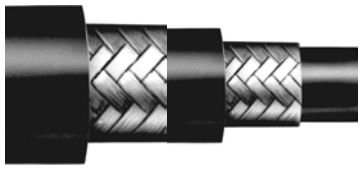
FLUID SYSTEMS
ENGINEERING DATA

C02 Transfer Hose



LL1 open

LL3 open

The Smart-Hose safety system is built into a special rubber Carbon Dioxide discharge hose. Common uses include in-plant, truck and rail car loading. This low temperature hose has been uniquely developed to meet the rugged requirements of this application.

Hose Data

Cover	Black, Special low temperature abrasions resistant co-polymer
Reinforcement	2 layers of stainless steel wire braid
Tube	Black, Special low temperature co-polymer resistant to C02 permeation
Branding	Orange Mylar brand – C02 Discharge
Temperature	-65° to 180° F (-55° to 83° C)
Maintenance	See Smart-Hose “Proper Use, Care & Maintenance” Booklet Form# 1999-1

	WP	Hose		Coupling	
ID	**psi**	**Wt/Ft**	**Weight LL**	**Weight LL3**	**Part #**
1"	450	.8 lb	2.5 lb		R33008140000
1.5"	450	1.2 lb		3.4 lb	R33012140000
2"	450	1.5 lb		4.7 lb	R33016330000

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APPENDIX E

TDG Regulation Governing Mobile Tanks

ALERT

Diesel Fuel in Non-Specification Slip Tanks—Permit Expiring

by Zenon Lewycky

The Permit for Equivalent Level of Safety that granted an extension allowing use of non-specification tanks for transporting diesel, heating oil and Jet A fuel,[1] by road is expiring on January 1, 2005. Most tanks affected are the so-called 'slip tanks', mounted on pickup trucks or small trailers.

After January 1, 2005, all tanks of over 450L capacity, in use for transportation of these substances by road, must be in conformity with the *Transportation of Dangerous Goods Regulations.* Non-specification tanks may still be used until 2010, but only if they are qualified to Specific Requirement 5(b) of Standard CAN/CSA-B621-98.

To qualify under SR 5(b), the tank must be brought for inspection to a facility registered by Transport Canada for inspecting TC306 or TC406 tanks. The facility will perform a visual inspection as well as a leak and pressure test at 21 kPa (3psi).[2] If the results are satisfactory, the facility will attach a "non-specification flammable liquids tank" nameplate for identification. Non-specification tanks under SR 5(b) must also be periodically inspected following application of the non-specification nameplate. The periodic inspection includes an annual visual inspection and leak test at a Transport Canada registered facility. Tanks that are beyond their due date for inspection may not be refilled.

Slip tanks complying with ULC/ORD C142.13, manufactured before 2003, may be used until 2010 and they do not need the non-specification nameplate described above. They are, however, required to undergo the periodic inspections and tests for "mobile IBC's" as prescribed under standard CAN/CGSB 43.146-2002. This includes internal and external visual inspection every 60 months. The 60-month period is counted from the date of manufacture or subsequent inspection.

Any slip tank built after January 1, 2003 must be a UN Standard Mobile IBC, as prescribed by the CAN/CGSB 43.146-2002 standard, if it is to be used for transport of flammable liquids.

Refer to the summary table on the next page for details on the various containers that are permitted for use in transport of gasoline and diesel fuel. For information on the registered tank inspection facilities in your area, please visit the TDG Web site at: *http://www.tc.gc.ca/tdg/containers/menu.htm*.

Change to CSA B340-02

The TDG Directorate intends to limit the size of container to which clause 5.5.3 in National Standard of Canada CAN/CSA-B340-02 can apply through an amendment to the Transportation of Dangerous Goods Regulations. The intention is to insert a qualifier limiting the application of that clause to containers of no more than 50 L capacity. Interested parties are advised of the Department's intention to insert this qualifier into Part II of the *Canada Gazette* when CSA B340-02 is adopted, and are invited to comment. Comments should be sent to Mrs. Linda Hume-Sastre at: humel@tc.gc.ca.

- 1 *and other flammable liquids in Packing Group III, no subsidiary classification, and with a flash point of 37.8°C or higher.*

- 2 *the leak and pressure tests will be performed as if the tank is a TC306 under CAN/CSA B620-98, as authorized under Permit SH6216.*

Summary Table

Product and capacity of container	Prescribed container	Alternate container	Sunset date on alternate container
DIESEL FUEL UN 1202 450L or less	Non-Specification	N/A	N/A
GASOLINE UN 1203 30L or less	Non-Specification, when the conditions for "Ltd. Qty." are met	N/A	N/A
GASOLINE UN 1203 Between 30L and 450L	Jerrican or drum to CGSB 43.150 or UN Standard IBC to CGSB 43.146	ULC/ORD C142.13, built before 2003	2010
DIESEL FUEL UN 1202 Between 450L and 3000L	UN Standard IBC to CGSB 43.146 or TC 306/406 to CSA B620	Code 31A and 31B IBC, TC 57 and ULC/ORD C142.13 built before 2003	2010 for ULC C142.13 and N/A for the rest
		Non-spec tank built before 2003 tested and marked to CSA B621 Specific Requirement 5(b)	2010
		Non-spec tank under Permit SH 6216	**2005**
DIESEL FUEL UN 1202 more than 3000L	TC 306/406 to CSA B620	ULC/ORD C142.13 built before 2003	2010
		Non-spec tank built before 2003 tested and marked to CSA B621 Specific Requirement 5(b)	2010
		Non-spec tank under Permit SH 6216. (5000L maximum)	**2005**
GASOLINE UN 1203 Between 450L and 3000L	UN Standard IBC to CGSB 43.146 or TC 306/406 to CSA B620	Code 31A and 31B IBC, TC 57 and ULC/ORD C142.13, all built before 2003	2010 for ULC C142.13 and N/A for the rest
		Non-spec tank built before July 1995 tested and marked to CSA B621 Specific Req.17	**2005**
GASOLINE UN 1203 more than 3000L	TC 306/406 to CSA B620	ULC/ORD C142.13 (5000L maximum) built before 2003 and TC 57	2010 for ULC C142.13 and N/A for the rest
		Non-spec tank built before July 1995 tested and marked to CSA B621 Specific Req. 17	**2005**

ALERT

Diesel Fuel, Heating Oil and Jet A Fuel Oil Non-Spec Tank Grandfather Clause Expiring

Diesel fuel (UN 1202)[1] is a dangerous goods within the scope of the *Transportation of Dangerous Goods Act, 1992*, and the *Transportation of Dangerous Goods Regulations*.

Since the August 2002 amendment, the *Regulations* require that when diesel fuel is transported in a container of greater than 450L capacity (a "large" container), that container must meet one of the safety standards prescribed in Part 5 of the *Regulations*. This requirement continues to apply even if a large container of over 450L capacity is underfilled.

Along with implementation of this new requirement for diesel fuel to be transported in standardized large containers, existing non-standardized tanks manufactured before 2003 were grandfathered for continued use for transport of diesel fuel by road until the end of 2009, under the conditions in specific requirement 5(b) of the CAN/CSA B621 standard.

The grandfather provision for non-standardized diesel transport tanks expires at the end of 2009. As a result, starting January 1, 2010 all diesel fuel transport tanks of over 450L capacity will be required to meet one of the standards prescribed in Part 5 of the *Transportation of Dangerous Goods Regulations*. Non-standardized (non-spec) large containers will no longer be allowed for transport of diesel fuel after January 1, 2010.

The following standardized large container types are and will remain acceptable for diesel fuel transport beyond January 1, 2010:

- Railroad tank cars in accordance with the CAN/CGSB 43.147 standard;
- TC 406 and TC 306 tank trucks and trailers in accordance with the CAN/CSA B621 standard;
- UN code 31A and 31B standardized intermediate bulk containers; including UN standardized 'mobile' intermediate bulk containers slip tanks, in accordance with the CAN/CGSB 43.146 standard. Intermediate bulk containers are limited to 3000L capacity but some of up to 5000L capacity have been approved by exception; and
- TC or DOT 57 portable tanks used in accordance with the CAN/CGSB 43.146 standard.

In addition, the Canadian Standards Association has recently published standards for two new large container types suitable for diesel fuel transport:

- TC 44 portable tanks are specified in the CSA B626-09 standard. TC 44 portable tanks may be rectangular or may be of round or oval cross section; and
- UN standardized portable tanks are specified in the CSA B625-08 standard. UN portable tanks are internationally accepted and may or may not be enclosed in an ISO tank container frame.

Both the CSA B625 and CSA B626 are now available from CSA[2] in English. Once the French editions are published, we will propose these new standards for adoption in the Regulations. Until that time, persons wishing

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[1] *The container requirements described in this article also apply to similar dangerous goods like heating oil and Jet A-1 fuel that are flammable liquids in Packing Group III, with no subsidiary classification and having a flash point of 37.8°C or higher.*

[2] *http://www.shopcsa.ca/onlinestore/*.

to manufacture or use UN portable tanks or TC 44 tanks in Canada must do so under the authority of a Permit for Equivalent Level of Safety issued under Chapter 14 of the *Transportation of Dangerous Goods Regulations*.

Diesel fuel may still continue to be transported in non-standardized small containers having a capacity of 450L or less. Please also note that none of the Transport Canada transportation of dangerous goods safety standards requires the use of double-walled tanks for diesel fuel transport. The transportation of dangerous goods safety standards detail design, manufacturing, periodic retesting, approval and use requirements for dangerous goods transport containers, but they do not require nor recommend the use of double-walled tanks. For more on double-walled tanks please refer to the summer 2008 edition of the *Transport Dangerous Goods Newsletter. http://www.tc.gc.ca/tdg/newsletter/summer2008.pdf.*

Should you wish to contact one of our regional Dangerous Goods offices for further information, the numbers are:

Atlantic:
- Moncton, NB: Toll free: 866-814-1477, Fax: 506-851-7042;
- Dartmouth, NS: Toll free: 866-814-1477, Fax: 902- 426-6921;
- St. John's, NL: Toll free: 866-814-1477, Fax: 709-772-3072.

Quebec: 514-283-5722, Fax: 514-283-8234,

Ontario: 416-973-1868, Fax: 416-973-9907,

Prairie and Northern (Alberta, Saskatchewan, Manitoba, Yukon, NWT, and Nunavut):
- Toll Free: 888-463-0521 or 204-983-3152
- Winnipeg, MB: Fax: 204-983-8992;
- Saskatoon, SK: Fax: 306-975-4555

Pacific:
- New Westminster 604-666-2955, Fax: 604-666-7747

Or visit the TDG website at: *www.tc.gc.ca/tdg/safety/menu.htm*

Canada