

Noatak Fuel Haul Project Description:

Noatak is located on the west bank of the Noatak River, 55 miles north of Kotzebue and 70 miles north of the Arctic Circle. This is the only settlement on the 396 mile-long Noatak River, just west of the 66-million acre Noatak National Preserve.

The Native Village of Noatak is a federally recognized tribe. There is no municipal government in Noatak. Noatak is part of the Northwest Arctic Borough (NAB). The NAB provides some planning services. Maniilaq Association is the non-profit organization. Maniilaq Association has provided health, tribal, and social services to residents of rural Northwest Alaska for over 30 years. NANA is the regional Native Corporation. Nearby is the Red Dog zinc and lead mine which provides employment to many residents of Noatak. Red Dog is operated by Teck Alaska, Inc. Red Dog Operations is based upon a unique development and lease agreement whereby Teck is the mine operator and NANA is the land owner.

This fuel haul transfer project has one goal: to lower the cost of heating fuel for residents on

Red Dog provided \$921 million in benefits to the regional economy, including wages, payments in lieu of taxes and direct royalty payments to NANA from 1989 to 2009. In the last five years alone, the mine provided \$749 million in taxes to the local, state and federal governments.

With a payroll of approximately \$52 million, Red Dog provides 550 high-paying jobs, and in 2010, there will be over 200 summer construction jobs. Along with high paying jobs, Red Dog provides specialized equipment, maintenance and operations training. Many residents of Noatak are employed year-round at the mine. Many are trained operators on equipment similar to the CAT Forwarder.

Residents of Noatak rely on subsistence and, as a result, travel on snow machines in winter to hunt. They also travel to neighboring villages to visit family and friends and sometimes travel by snow machine to Kotzebue.

This rural, remote community has one of the highest cost of living in the nation. Noatak, populated by over 500, primarily Inupiaq residents sits on the west bank of the Noatak River. The transportation and import of goods, fuels and supplies drive the high cost of living. There are no roads that connect this community to any other. The only way to travel to/from Noatak is by boat, snowmobile, or aircraft. Our rural, remote region is challenged by a limited market base. Each of our isolated villages have challenges unique to their local, geography, and size. Noatak on the Noatak River have river channels that have diverted away from the village. This village no longer has annual barge services to bring in fuel supplies, heavy equipment, building materials and other necessary supplies at the most cost effective transportation rates, instead Noatak has to fly in supplies at a much higher cost. The closest possible landing for a barge on the river is 30 miles downriver at Nuvugraq.

Below is a comparison of energy costs between Kotzebue, the hub community, and Noatak. These costs could spike as high as \$14.00/gallon when the only way to get fuel in is by air.

	Gasoline/gal.	Stove Oil/gal.	Propane/23 gal.	kWh(1-500)	kWh (500-700)
Kotzebue	\$ 6.80	\$ 6.16	\$198.28	\$ 0.18	\$ 0.45
Noatak	\$ 9.99	\$ 9.99	N/A	\$ 0.22	\$ 0.77

Heating fuel is not subsidized by any local, regional or state programs. Electricity costs are lowered by a State of Alaska subsidy called the Power Cost Equalization program. This program has a 500 kWh/month limit for residents.

The Noatak IRA Council, the Northwest Arctic Borough, the State of Alaska and Teck Alaska have partnered to provide for a fuel and energy supply that would reduce the cost of heating fuel for residential homes in the community. Noatak IRA Council requests federal approval for the transportation of fuel across Cape Krusenstern National Monument through a 5 year right-of-way permit. A fifty two mile industrial road, Delong Mountain Transportation System (DMTS) connects the Red Dog Mine with the Red Dog Portsite. A gravel pit, referred to as Pit 6, that was mined for the construction and maintenance of the DMTS is situated 19.07 miles to the west of Noatak, within the Cape Krusenstern National Monument. This is the proposed fuel transfer site for the fuel procurement program. The existing winter snowmachine trail between Noatak and Kivalina is the proposed route to the fuel transfer site. Approximately seven miles of National Park lands would be traversed on the route from Noatak to Pit 6. The project needs National Park Service approval to traverse 7 miles of federal lands of the fuel transportation route.

The Northwest Arctic Borough worked with the Native Village of Noatak, and appropriate vendors for the purchase, design, fabrication, and transportation of fueling equipment for the Native Village of Noatak. A State of Alaska legislative grant provided for the purchase of equipment (**complete**), conversion of equipment and fabrication of fuel tank and pump assembly (**complete**), freight shipped to the Red Dog Mine (**complete**), for the purpose of developing a winter fuel haul program from a point along the DMTS to the community of Noatak 20 miles to the south. The intent is to move heating fuel during the first quarter of the calendar year overland as opposed to air freighting fuel as that is a very expensive method of providing the community's heating fuel supply.

The transfer of fuel from the mine Port Site along the DMTS road system will be done by Teck Alaska staff and equipment.

The transfer site at Pit 6 is the access road area, not the Pit itself, which reclamation and re-contouring has already commenced as requested by the NPS. This site is the current site for transfer of fuel for Noatak residents. Further details of this location will be provided by Teck Alaska in December 2015. Transfer from a fuel tank to the CAT Forwarder will commence outdoors and a site spill containment plan will be part of the SPCC (Exhibit 5).

The equipment purchased for this heating fuel transfer is a CAT Forwarder. This was specifically selected by Cruz Construction, who was consulted as experts in logistics in the state, to help with the design and purchase of the equipment. Currently, this piece of equipment is stored in at the Red Dog Mine Port Site. Please refer to Exhibit 6 for details on specifications of both the equipment and tank.

Operational specifics (transfer site, spill response, storage capacity, etc.):

Teck Alaska will continue to transfer fuel from the Red Dog Port site to Pit 6. Transfer of fuel at this site does not require additional buildings or maintenance. The SPCC (Exhibit 5) will cover the transfer of fuel staging area. A fuel truck will be operated by Teck Alaska employees. (More details will be provided by Teck Alaska by 12/2015)

Technical & Financial Capacity of Native Village of Noatak

Cost related to construct, operate, maintain, and terminate system:

Please refer to Exhibit 6 for detailed information.

Transportation Route and Logistics:

The Native Village of Noatak is allotted from Teck-Alaska 50,000 gallons of home heating fuel to provide for resale for Noatak residents. The proposed route will be over terrain that could be traversed by equipment hauling up to 3000 gallons of fuel per trip. The route that the Native Village of Noatak proposes is the current winter snowmachine trail that crosses the Cape Krusenstern National Monument, BLM lands and a small portion of NANA lands. This is the route normally used for travel between Noatak and the coast as shown in **Ex.1**. The National Park Service, community representatives of the Noatak tribe, the Northwest Arctic Borough, and Cruz Construction, the project contractor, have done reconnaissance winter travel over a number of routes during the winters of 2014 and 2015. This route provides for the safest route of all routes considered.

That equipment purchased is a Caterpillar Forwarder 564. Cruz Construction and a West-Mark Fabrication plant worked together so that a fuel tank and pump assembly would be designed and fabricated for this Arctic application. A 3000 gallon fuel tank was designed and built by West Mark, a tank fabrication company. **Ex. 2 and 3**. The fuel tank and pump assembly was trucked to Anchorage then flown out to the Red Dog Mine, where complete assembly took place. The additional wheels, tires and critical spares were also combined on that freight shipment.

There is an agreement with Cruz Construction to support in the transportation, upgrades, fuel tank installation, maintenance and operations scheduling and equipment training for the Noatak employees, shown in **Ex. 4**. A spill response containment and countermeasure plan (SPCC), which will be refined in coordination with Teck-Alaska before project implementation. **Ex. 5**.

Storage of fuel in the village of Noatak is readily available in the Northwest Arctic Borough School District's bulk fuel storage facility which has a maximum capacity of 75,000 gallons. The school and the Native Village of Noatak are in the process of signing a memorandum of agreement for this purpose.

Fuel Type and Quantity:

Teck Alaska committed to an annual commitment of selling to the Native Village of Noatak 50,000 gallons of an Ultra-Low Sulfur Diesel Fuel product that would be consumed as home heating fuel by Noatak residents. The fuel capacity of the fuel tank/equipment transferring the fuel is 3400 gallons. The plan calls for transferring 3000 gallons per trip. The equipment would carry the fuel one-way from DMTS-Noatak and return empty from Noatak-DMTS.

Currently, the bulk of fuel being transported into Noatak is airfreighted. The shipments are for, primarily four users groups. The electric utility, AVEC, is the largest consumer of diesel for local power generation. ANICA, the local retail store provides diesel-home heating and unleaded gasoline for local retail consumption. The school district and the tribally owned water and sewer public utilities also consume large supplies of diesel for water heating and space heating.

A smaller volume of fuel is brought in by snowmachine and freight sled during the winter and boat during the summer. Some of that volume is brought in currently by residents purchasing home heating fuel from Teck Alaska.

Economic Value for Residents:

The current retail price for Noatak households is \$9.99 per gallon. As one Tribal Council woman, Hilda Booth, explained, a household can consume over 3 fifty-three gallon (159 gal) drums in a month. The cost for three drums is \$1588.41. The Red Dog Mine procures between 19 and 20 million gallons of fuel annually. That fuel is landed at the Red Dog Portsite at the best prices in Northwest Alaska. Teck has sold diesel fuel to Noatak residents for \$5.41 per gallon based on previous year prices. That price is \$4.58 below the current retail price. This cost reduction allows for residents to lower their energy cost, thus allowing residual funds for a lower cost of living.

Frequency of Fuel trips-Start and End Dates:

The intent is to move fuel during the first quarter of the calendar year overland as opposed to air freighting fuel as that is a very expensive method of providing the community's fuel supply. It would take 17 trips with this equipment to move 50,000 gallons of fuel. The equipment would move at 8-10 miles per hour, on large tires as opposed to tracks. The planning has been to begin the new shipping based on the same criteria that oil companies and state and federal regulators use on the Alaska North Slope. A successful should result in a long term operation or until a more cost efficient fuel transportation is realized. Please refer to Exhibit 6 for more detailed information on trail preparation and operations.

Since climate change and seasonal snow coverage varies, each season will be unique for trail preparation and movement of fuel transfers.

Transportation Equipment: See attached equipment specifications and dimensions. Ex. 6

Natural Resource Protection: See current draft of SPCC. Operations plan will follow route development.

Exhibit 1: Route Map

Exhibit 2: Image of CAT Forwarder Equipment

Exhibit 3: West Mark Tank Specs

Exhibit 4: Service Contract between Native Village of Noatak and Cruz Construction

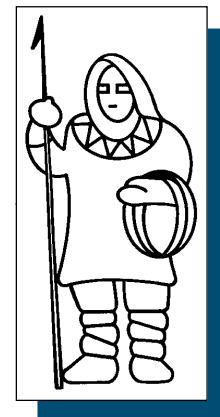
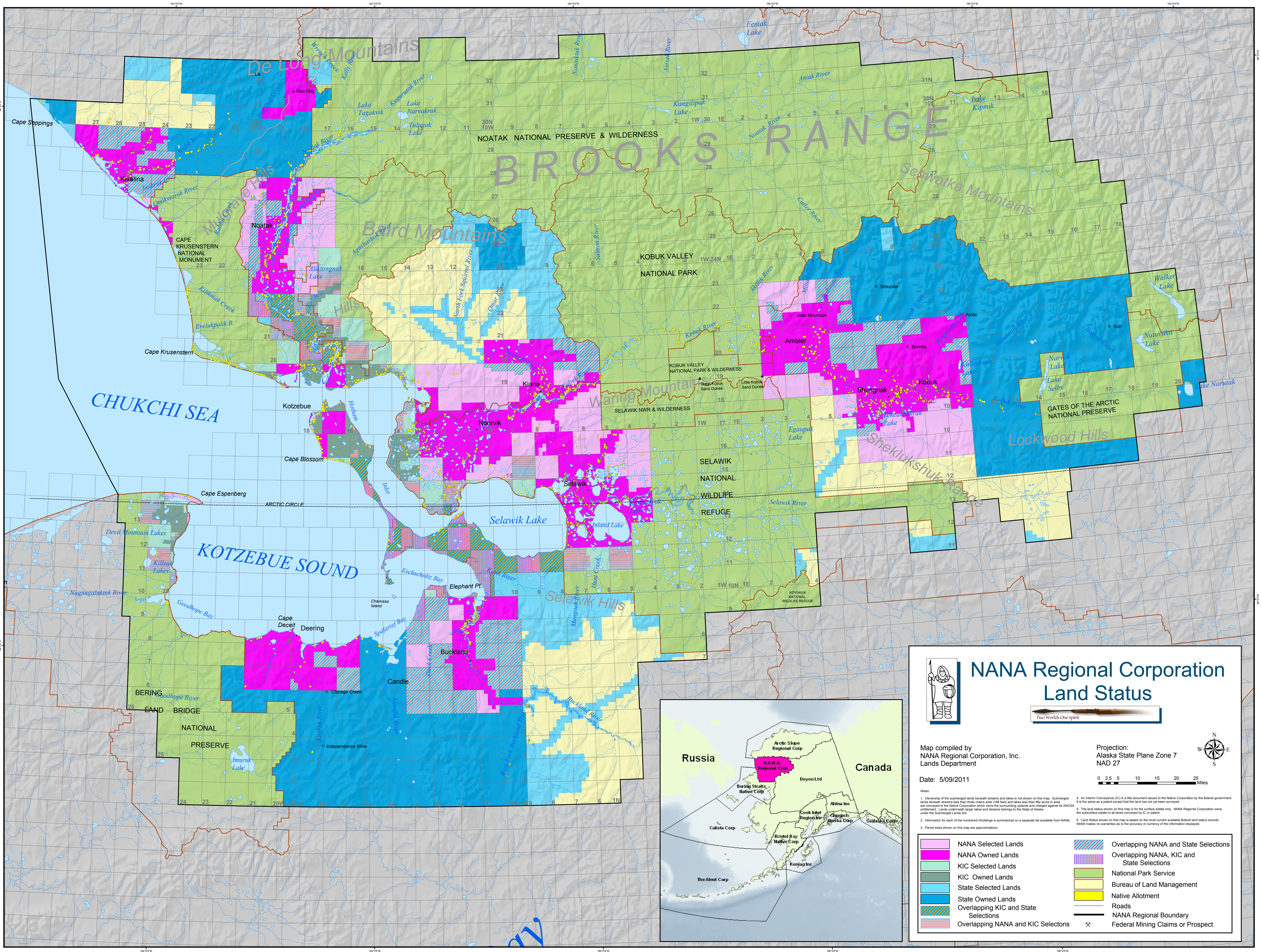
Exhibit 5: SPCC

Exhibit 6: Cruz Construction project document

Exhibit 7: Land Ownership document

Exhibit 8: Cost Comparison

Exhibit 9: NANA VED Funding Description (Financial)

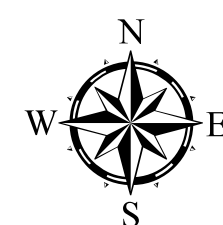


NANA Regional Corporation Land Status

Two Worlds One Spirit

Map compiled by
NANA Regional Corporation, Inc.
Lands Department

Projection:
Alaska State Plane Zone 7
NAD 27



0 2.5 5 10 15 20 25 Miles

Date: 5/09/2011

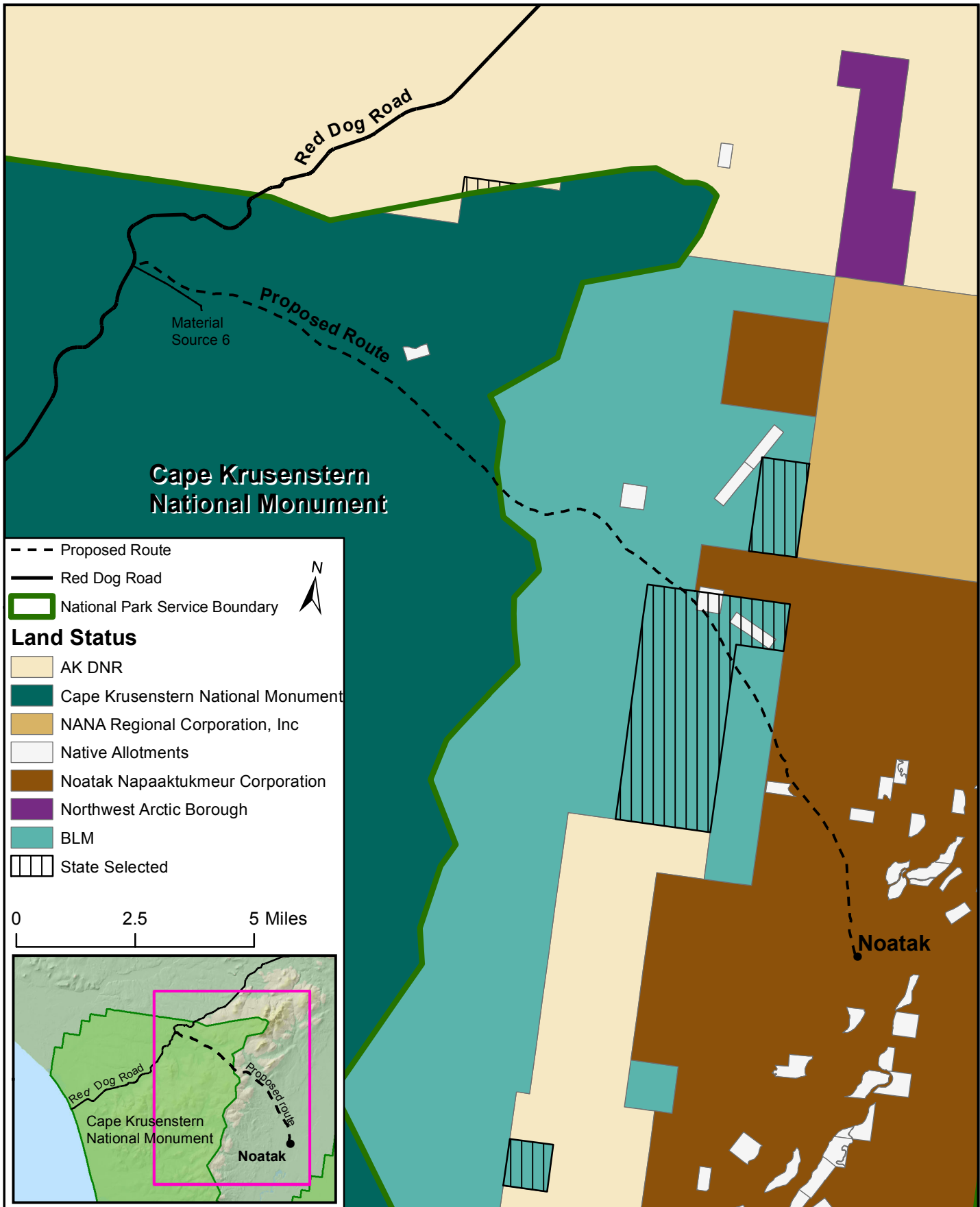
- Notes:
1. Ownership of the submerged lands beneath streams and lakes is not shown on this map. Submerged lands beneath streams less than three chains wide (198 feet) and lakes less than fifty acres in area are conveyed to the Native Corporation which owns the surrounding uplands and charged against its ANCSA entitlement. Lands underlying larger lakes and streams belongs to the State of Alaska.
 2. Information for each of the numbered intrusions is summarized on a separate list available from NANA.
 3. Parcel sizes shown on this map are approximations.
 4. An Interim Conveyance (IC) is a title document issued to the Native Corporation by the federal government. It is the same as a patent except that the land has not yet been surveyed.
 5. The land status shown on this map is for the surface estate only. NANA Regional Corporation owns the subsurface estate to all lands conveyed by IC or patent.
 6. Land status shown on this map is based on the most current available federal land status records. NANA makes no warranties as to the accuracy or currency of the information displayed.

	NANA Selected Lands		Overlapping NANA and State Selections
	NANA Owned Lands		Overlapping NANA, KIC and State Selections
	KIC Selected Lands		National Park Service
	KIC Owned Lands		Bureau of Land Management
	State Selected Lands		Native Allotment
	State Owned Lands		Roads
	Overlapping KIC and State Selections		NANA Regional Boundary
	Overlapping NANA and KIC Selections		Federal Mining Claims or Prospect



Noatak Fuel Project Proposal with Land Status

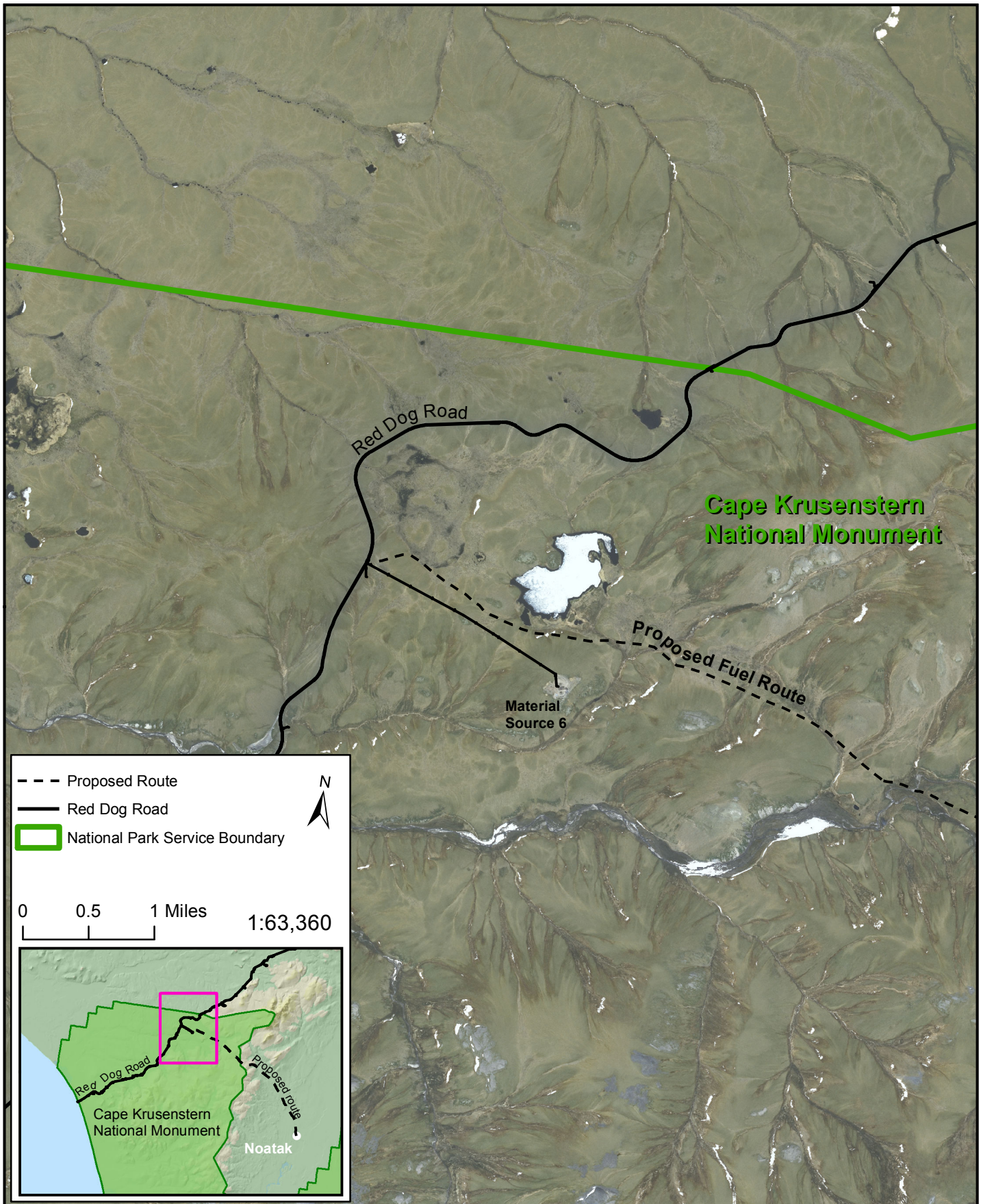
Alaska Region
National Park Service
U.S. Department of the Interior



Noatak Fuel Project Proposal with Imagery

Segment 1

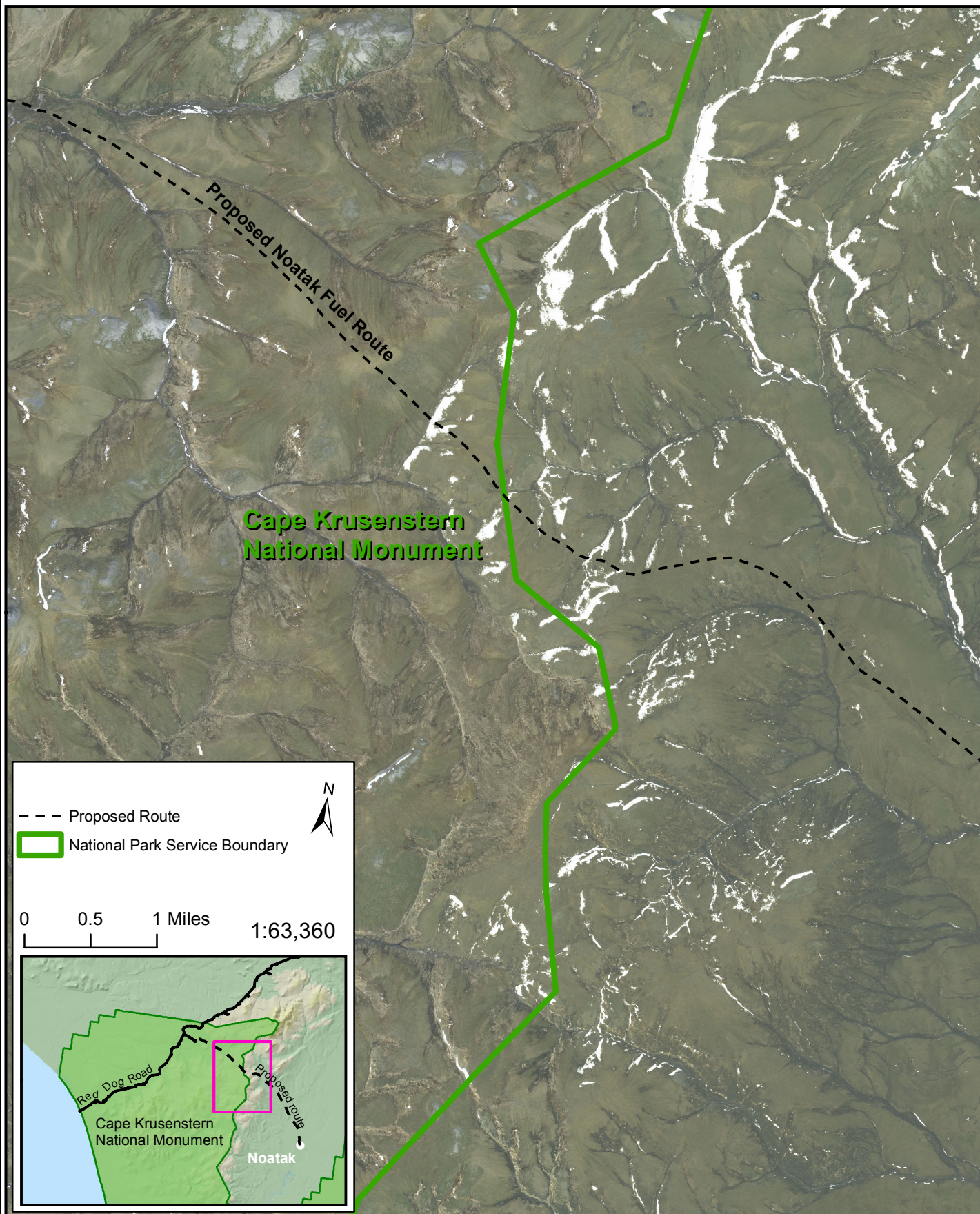
Alaska Region
National Park Service
U.S. Department of the Interior



Noatak Fuel Project Proposal with Imagery

Segment 2

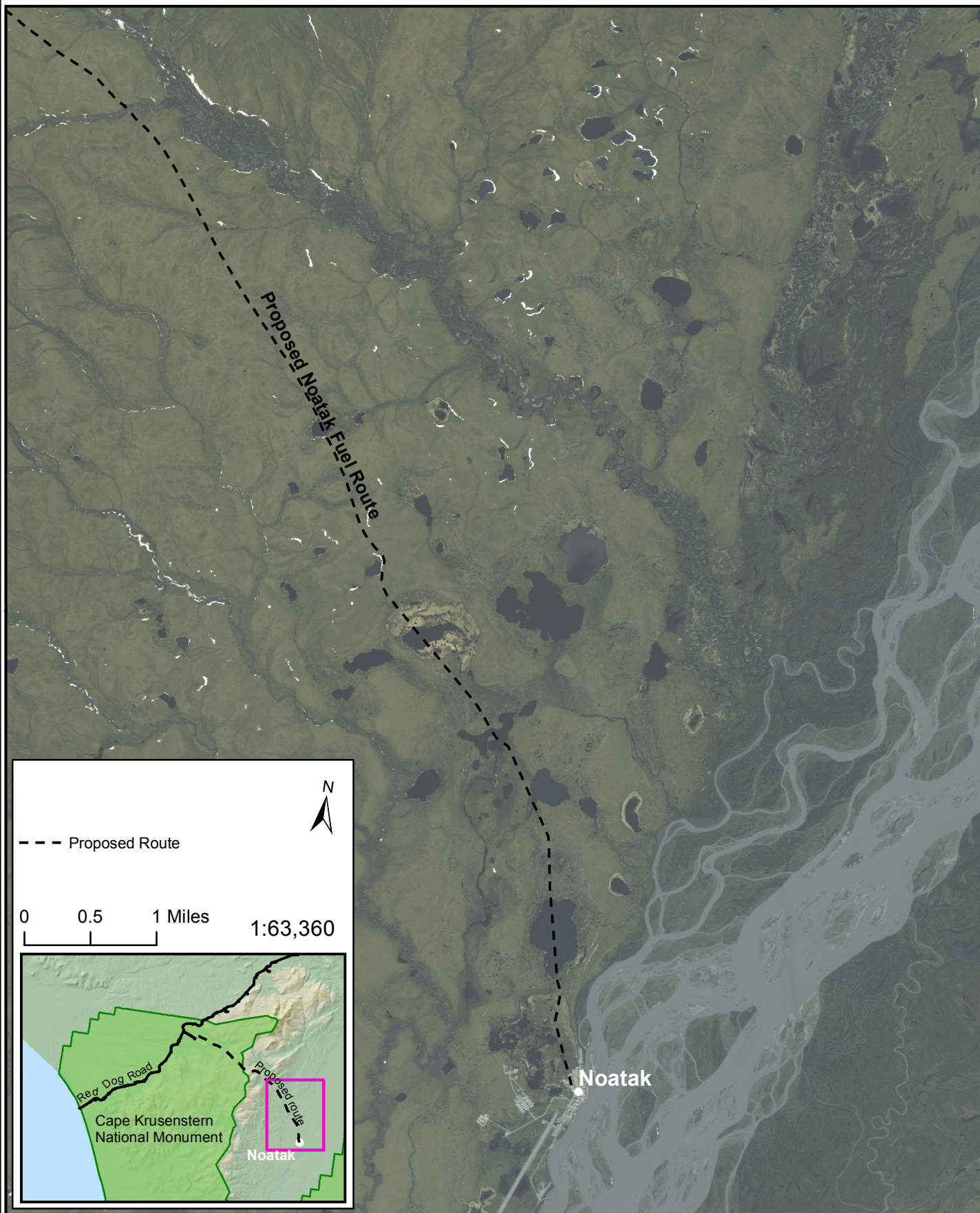
Alaska Region
National Park Service
U.S. Department of the Interior



Noatak Fuel Project Proposal with Imagery

Segment 3

Alaska Region
National Park Service
U.S. Department of the Interior

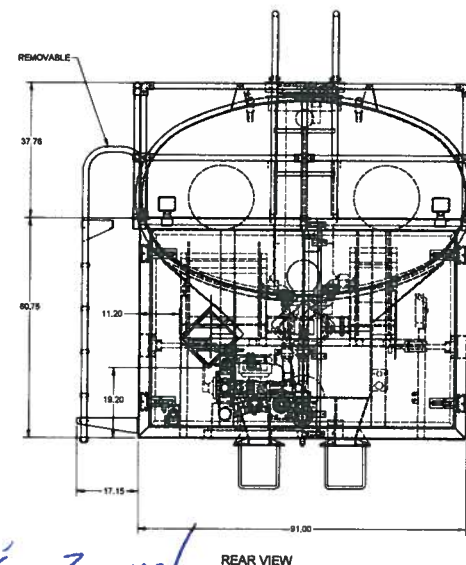
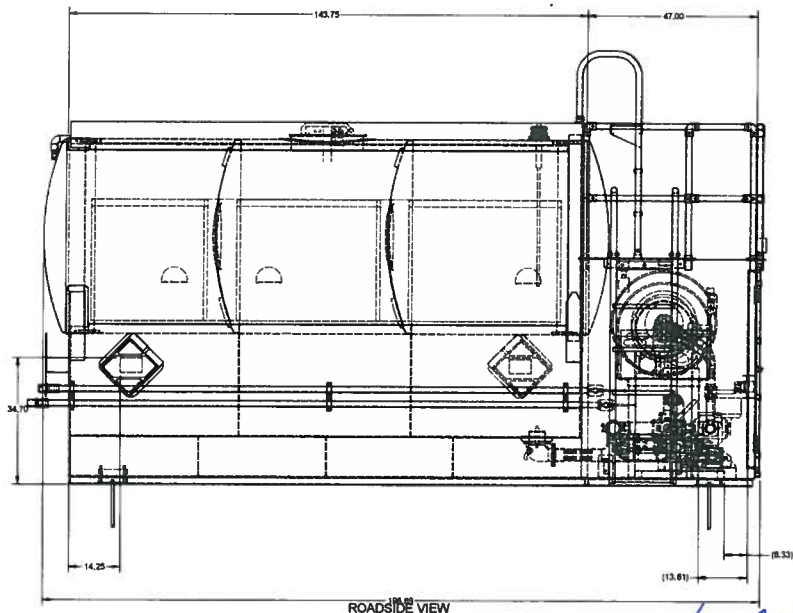
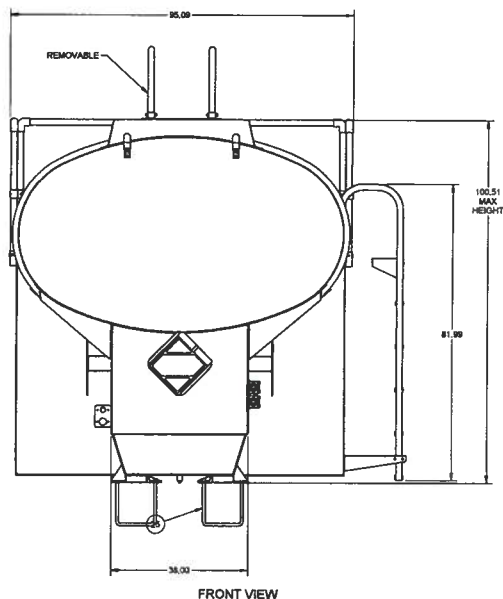
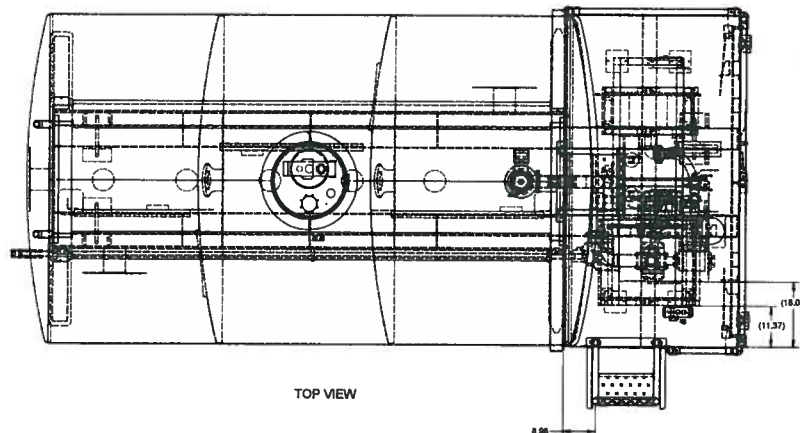




DISCLAIMER:
DIMENSIONS SHOWN ARE APPROXIMATE AND SUBJECT TO MINOR DEVIATIONS AS MAY OCCUR OR BE NECESSARY IN CONSTRUCTION. MINOR DETAILS NOT SHOWN WHERE THERE MAY BE INCONFORMITY BETWEEN THE ILLUSTRATION AND THE SALES ORDER, THE SALES ORDER AND ALL APPROVED SALES ORDER CHANGES SHALL PREVAIL.

- NON-CODE BUILT TO DOT-408 NOTES:
A. NON-CODE 3,300 GAL. 1-COMPT OVAL SKID TANK.
D. HYDRO-TEST FINISHED UNIT @ 3 P.S.I., MAX. W.P. = 3 P.S.I.
MAX. OPERATING TEMPERATURE 120° F.
E. UNIT WAS DESIGNED TO WAU, DIESEL.
MAX. G.P.L. = 17.21, GVWR = 24,000 LBS.
F. INSTALL DOT/VM PLATE ON SIDE FILLER (ROADSIDE).
G. RELIEF VENTING RECTO AT ALL TIMES, BUILT INTO PPV, MAN-HOLES.
H. WELD WIRE TO BE USED: 8FA 5.5 ER-316, 8F.

- MANUFACTURING NOTES:
1. INSTALL SLIDE IN TYPE PLACARDS TO SIDES, FRONT AND REAR OF UNIT.
2. ELECTRIC HOSE REEL CONTROLS TO BE CENTRALLY LOCATED IN REAR CABINET OFF HOSE REEL FRAME, ELECTRICAL TO BE RAN TO FRONT OF UNIT (SINGLE POLE).
3. WORK LIGHTS TO BE WIRED TO TOGGLE SWITCHES CENTRALLY LOCATED WITH HOSE REEL CONTROLS AND 4 WAY PLUG RAN TO FRONT OF UNIT.
4. MECHANICAL VENT TO BE PLUMBED TO MECHANICAL VALVE AT BOTTOM OF TANK.
5. POLYETHYLENE DRAIN HOSES TO BE CONNECTED AT FRONT OF UNIT.
6. ELECTRICAL HARNESS FOR STOP, TAIL, TURN AND BACK-UP LIGHTS TO BE RAN TO FRONT OF UNIT.
7. NON-SKID TAPE IN BRILLIANT AREA BETWEEN RAILS.
8. MECHANICAL OPERATOR LOCATED IN REAR CABINET, RIGHT SIDE OF UNLOAD LINE.



ITEM	QTY	CATALOG#	DESCRIPTION	MAT
1	1	CB30225	CABINET, ALUM. 91W X 82T X 48D 2-DOOR	-
2	1	E1-6100130	SOCKET, SINGLE POLE COLE HERSEEP 11041 1	-
3	1	E1-6100140	PLUG, SINGLE POLE/EM GRND COLE HERSEEP 1	General
4	1	EO-3802801	BRACKET, VALVE OPERATOR MTO.	T-304 2B
5	1	EOX11M01	1 COMPARTMENT EMERGENCY VALVE OPERATOR	-
6	1	HF3822501	HANDRAIL ASSY, 1-1/4" X 91 IN LONG X 42.00 IN TALL W/ MID SUPPORT	-
7	1	HF3822502	HANDRAIL ASSY, 1-1/4" X 48 IN LONG X 42.00 IN TALL W/ MID SUPPORT	-
8	1	HF3822503	HANDRAIL ASSY, 1-1/4" X 48 IN LONG X 42.00 IN TALL W/ MID SUPPORT	-
9	1	HS08225	HOSE REEL, MOUNTING FRAME ASSY.	-
10	1	HY38225	HYDRAULIC ASSY.	-
11	2	L1-0111200	MULTI-PURPOSE LADDER ASSY. W/ PERFORATED	-
12	1	L3-4000119	RECEPTACLE, T-RAY, FEMALE SAE J580 STYLE	-
13	1	LD-38225100	LADDER MOUNTING BRACKET	T-304 2B
14	1	LD-38225100M	LADDER MOUNTING BRACKET (OPPOSITE)	T-304 2B
15	2	LD-38225101	LADDER MOUNTING BRACKET BACKING PLATE	T-304 2B
16	2	LD-38225102	LADDER MOUNTING TAB	201LN
17	1	LW-38225002	7-WAY MOUNTING BRACKET	201LN
18	1	LW38225	CABINET LIGHTING, VISION X WORK LIGHT W/	-
19	1	PS-6110100	PLACARD HOLDER, ALUM W/ CLIP 81TPH	-
20	1	PL-38225200	HOSE, 2" DIESEL FUEL, RATED @ -40 F. 100	General
21	1	PL-38225201	HOSE, 2" DIESEL FUEL, RATED @ -40 F. 100	General
22	1	PL-38225202	HOSE, 3" DIESEL FUEL, RATED @ -40 F. 100	General
23	1	PL38225	PLUMBING ASSY, 2.5" BLACKHORN	-
24	3	PSX11M01	PLACARD, SEA, SLIDE IN 819 HEAD MOUNT	-
25	4	SA-38225300	LATCH, Y	M.B.
26	1	BA38225	SHELL ASSY, 3,300 GAL, T-304 819 OVAL	-

Fred Smith - Northwest Arctic Borough

WEST-MARK 811 INDUSTRY WAY ATWATER, CA 95001 (209) 837-4747	
N.W. ARTIC BOROUGH - 3,300 GAL. T-304 SKID TANK	SCALE: 3/8" = 1' SHEET: 1 OF 1
DATE: 10/20/04 DESIGNED BY: [Signature] CHECKED BY: [Signature]	DATE: 10/20/04 DESIGNED BY: [Signature] CHECKED BY: [Signature]

SERVICE AGREEMENT

Between the Village of Noatak and Cruz Construction

THIS AGREEMENT is effective as of the 23rd day of November, between the NATIVE VILLAGE OF NOATAK, whose address is PO Box 89, Noatak, Alaska 99761 ("Customer"), and Cruz Construction, Inc., whose address is 7000 East Palmer-Wasilla Hwy, Palmer, Alaska 99645 ("Cruz").

WHEREAS Cruz desires to enter into an agreement with Customer for the purposes of providing consulting services as hereinafter described, and Customer is willing to enter into such an agreement,

NOW THEREFORE, in consideration of the services to be provided by Cruz and the payments be made by Customer as hereinafter set forth, the parties hereto do mutually agree as follows:

1. SCOPE OF SERVICES

Cruz will provide transition coordination actions for Customer's Fuel Haul Program, as outlined in APPENDIX B. Cruz warrants that it is fully qualified and experienced to perform all such services.

2. PAYMENT

Customer shall pay Cruz compensation for the Services to be provided hereunder in accordance with terms and conditions herein and those outlined in APPENDIX B. Customer makes no representations or guarantees of any minimum payment which Cruz may receive under this Agreement. Payment for consulting services will be made within 30 days of receipt and approval by Customer of a proper invoice for services rendered. Cruz shall submit invoices no more than once every 30 days. Payment will be on a net 30, no retainage basis. Invoices shall be submitted with attachments to include time sheets, receipts and other documentation as required by Company to:

Vernon Adams Sr., President
Native Village of Noatak
PO Box 89
Noatak, Alaska 99761

3. SCHEDULE

Cruz shall provide Services in accordance with the Schedule as outlined in APPENDIX B. Customer may terminate this Agreement at any time upon written notice to Cruz. This schedule may be extended only by mutual agreement between the parties.

4. LOCATION OF SERVICES TO BE PERFORMED

Cruz shall perform the Services required hereunder in the Village of Noatak and along Customer's fuel haul route. Customer is interested in the results obtained through the use of Cruz's Services, rather than the manner in which the Cruz's services are performed. Cruz understands and agrees that, for any Services performed on the Premises it will comply with any and all rules and regulations pertaining to health, safety, environmental, or security.

5. CONTRACTUAL RELATIONSHIP

Cruz is and shall be an independent contractor and accordingly Cruz is not covered by Customer's insurance, including its worker's compensation insurance. Cruz acknowledges that he/she is not entitled, shall not receive, and hereby waives any claim to insurance benefits including, but not limited to, health and accident, or disability insurance, and that Cruz's sole compensation shall be as provided for in APPENDIX B.

6. PAYROLL TAXES AND INSURANCE

Cruz shall be fully responsible for payment of any and all taxes and insurance, including, but not limited to, federal, state, and local income taxes and FICA. Cruz shall make such statutory filings as may be required by law. At all times during performance of this agreement, Cruz shall maintain insurance coverage as provided in APPENDIX A.

7. WAIVER OF CLAIMS

Cruz hereby waives and releases any and all liens, claims, or other demands that it may have against Customer and its officers, directors, agents and employees, for any bodily or personal injury (including death) sustained in the performance of Services hereunder.

8. "AT WILL" TERMINATION/DAMAGES

In the event of termination for any reason whatsoever, Customer shall incur no liability to Cruz for any reasons whatsoever other than for the payment of all compensation as expressly provided in APPENDIX B, up to the date of such termination. Customer does not in any way guarantee any minimum duration of the services to be performed by Consultant hereunder. In no event shall Customer be liable for any incidental, consequential, or special damages, including loss of anticipated income or revenues, as a result of termination of Services hereunder.

9. CONSEQUENTIAL DAMAGES

Neither party shall be responsible to the other for indirect or special damages, including without limitation extra expense, loss of profits from delay or loss of use, whether resulting from negligence, breach of this agreement, or otherwise by Customer or Cruz, even if the possibility of damages were foreseeable by either party.

10. GOVERNING LAW

This Agreement shall be deemed to be executed in Alaska and shall be construed and enforced in accordance with the laws of the State of Alaska, but without consideration of its choice of law rules. The parties hereto agree that sole and exclusive jurisdiction for any disputes arising out

of or in any manner connected with this Agreement shall be determined by the courts of appropriate jurisdiction sitting in Anchorage, Alaska.

11. VALIDITY

In the event that any provision hereof is found to be invalid or unenforceable under applicable laws, such provision shall be ineffective only to the extent of such invalidity or unenforceability, without invalidating the remainder of such provision or this Agreement, which shall be construed as if such provision or offending part thereof had never been contained herein.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date first entered above.

CRUZ

Cruz Construction, Inc.

By:_____

Print Name:_____

Title:_____

Date Signed:_____

THE VILLAGE

Native Village of Noatak

By:_____

Print Name:_____

Title:_____

Date Signed:_____

APPENDIX A – INSURANCE REQUIREMENTS

I. Cruz shall procure and maintain the following minimum insurance coverage/limits:

A. Coverage

- i. General liability - coverage shall include but not be limited to premises and operations; blanket contractual; personal injury.
- ii. Commercial auto liability - coverage for any owned, non-owned or hired autos.
- iii. Workers' compensation and employers' liability

B. Minimum Limits

- i. General liability: Combined single limit for bodily injury and property damage per occurrence and in the aggregate. General aggregate shall apply per project.

☒ \$1,000,000
☐ \$3,000,000
☐ \$5,000,000
☐ \$_____

- ii. Commercial auto liability: Combined single limit for bodily injury and property damage

☒ \$1,000,000
☐ \$3,000,000
☐ \$5,000,000
☐ \$_____

- iii. Worker's compensation and employer's liability:

(a) Worker's compensation – statutory
(b) Employers' liability – ☒ \$1,000,000
☐ \$3,000,000
☐ \$5,000,000
☐ \$_____

C. Other provisions – Primary and Umbrella/Excess

- i. Customer shall be additional insured(s) on a primary/non contributory basis on A.i; A.ii;
- ii. All coverages shall be written with carriers with an A.M. Best rating of A VII or better, or acceptable to Customer at its sole discretion.
- iii. Certificates of insurance shall be provided to Customer evidencing all required coverages and limits. Copies of additional insured forms/provisions shall be attached. The AM Best's rating of each carrier so evidenced shall be noted on the certificate.

APPENDIX B - PROPOSAL

RE: Village of Noatak Fuel Haul Program

11/1/15

Cruz Construction would like to propose the following support to the Village of Noatak.

- 1. SCOPE OF SERVICES.** Cruz will perform services to assist the Village to operate and maintain its 2015 Caterpillar Forwarder 564 (the "Equipment") for use as a fuel hauler. The work which the Cruz is required to perform consists of the following:

- i. Operational management on site
- ii. Training on site (this will be done simultaneously with on site management)
- iii. Written operating procedures (tank/be change out, fuel tank operation)

- 2. RATES.**

Labor & Equipment	Price
labor/operator/ instructor	(\$75.00/hour)
Round trip ticket to Noatak + tools/equipment	(Cost plus 5%)
Consumables	(Cost plus 5%)
SPCC Plan written and filed	(Cost plus 5%)

Notes:

- Labor rates include straight and overtime wages and fringe benefits.
- Any materials, fuel or supplies that Cruz Construction purchases at customer's request will be cost plus 5%.

- 3. SCHEDULE.** The work that is to be performed under this agreement is contingent on the terms spelled out in the 5 year renewable R.O.W. Permit from the National Park Service.

Jeff Miller
Senior Executive V.P. of Operations
Cruz Companies
(907) 746-3144 (office)
Jeff.miller@cruzconstruct.com



3852 N. Clark-Wolverine Road • Palmer, Alaska 99645

Tel: (907) 746-3144

Fax: (907) 746-5557

www.cruzconstruct.com

Spill Prevention, Control and Countermeasure Plan

REFERENCE: P-157-2.3

PROJECT

Noatak Fuel Haul Program

Prepared by:
Cruz Construction, Inc.
7000 E Palmer-Wasilla Highway
Palmer, Alaska 99645

Index

Section I.	General Information/Plan Certification and Management Approval
Section II.	Facilities Description
Section III.	Spill Prevention Procedures
Section IV.	Spill Controls
Section V.	Spill Countermeasures
Section VI.	Revision History
Table I.	Facility Fuel Storage and Supply Summary
Figure 1	Location Map – Noatak, Alaska
Appendix A.	Spill History
Appendix B.	Fuel Storage and Distribution System Inspection Checklist
Appendix C.	SPCC Program Requirements
Appendix D.	SPCC Recommendations
Appendix E.	Mobile Fuel Storage and Distribution Facility Relocation Summary Sheet
Appendix F.	Spill Response Materials and Equipment
Appendix G.	Contact List
Appendix H.	Spill Report Form

SECTION I. GENERAL INFORMATION AND MANAGEMENT APPROVAL

Project Location: Pit 6 (Cape Krusenstern National Monument – 67.739402 and -163.554881
Noatak – 67.565924 and -162.993324
(See Figure 1. Location Map)



Figure 1. Location Map – Pit 6 (left pin) and Noatak (right pin)

Project Description: The project consists transporting 3000 gallons of diesel fuel from Pit 6 on Red Dog Mine Road to the village of Noatak.

Cruz Construction, Inc. has prepared this spill prevention, control, and countermeasure plan (SPCC) for the transportation of diesel approximately 20 miles from Pit 6 to Noatak using a 564 Cat Forwarder and a 3000 gallon Westmark tank.

The SPCC plan covers operations performed for the Noatak project that have the potential to release petroleum in locations that may allow it to reach tundra surfaces.

Cruz Construction has prepared this SPCC plan for the project to meet the general requirements of the U.S. Environmental Protection Agency Oil Pollution Prevention rules applicable to water programs. These rules stipulate that facilities regulated under Title 40, Code of Federal Regulations, Part 112 (40 CFR 112) are required to have an SPCC plan if (1) non transportation related; (2) underground storage capacity exceeds 42,000 gallons of oil or aggregated aboveground storage capacity exceeds 1,320 gallons of oil, including all containers of oil with a capacity of 55 gallons or greater counted; and (3) a potential to discharge oil to navigable waters of the United States of Adjoining shorelines exists.

The fuel storage and supply capacity is summarized in Table 1.

Table 1. Mobile Facility Storage and Supply Summary

The final Configuration of tanks comprising the facilities (Umiat Camp and 359 Pad) to be set up for the Linc Umiat Project:

Tank Type	Contents	Quantity (Gallons)	Location	Secondary Containment
3,000 gallon mobile tank	Diesel	3,000	Mobile	Facility will carry duck ponds and spill kit for mobile utilization

This SPCC plan documents engineering controls and measures for preventing oil spills from reaching navigable waters, including spill prevention, discovery, and emergency notification procedures. This plan was prepared to comply with the provisions of the Oil Pollution Prevention Regulations (40 CFR 112) as they pertain to non-transportation-related, nonproduction, mobile, onshore storage facilities.

A copy of this SPCC shall be maintained at the facility and shall be available to site personnel. Copies of this plan shall also be maintained at the Cruz Construction's Palmer office. In accordance with 40 CFR 112.5, this plan shall be amended with 6 months of a change in fuel storage and distribution design, construction, operation, or maintenance that materially affects the potential of the station for discharging oil.

This plan requires documentation of the following activities or events:

- Location and duration of facility operation
- Equipment inspections and test
- Equipment repairs
- Personnel training and briefing
- Reportable spills
- Corrective actions
- Mitigating measures to prevent spill recurrences
- Soil, surface water, and/or groundwater investigations, in the event of a reportable spill
- Notification of permanent closure

Sample forms are included as appendices. Copies of completed documentation forms shall be filed with this plan at the Cruz office in Palmer.

Plan Certification

I hereby certify that my agent has visited and examined the mobile facility, and being familiar with the provisions of 40 CFR 112, attest that this SPCC plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of this part, that procedures for required inspections and testing have been established, and is adequate for the facility.

Richard Todd Kasteler
Printed Name of Registered Professional Engineer

Richard Todd Kasteler
Signature of Registered Professional Engineer

Registration No. 12159 State: Alaska

Statement of Commitment of Resources

Cruz Construction Management extends full approval of this plan at a level with sufficient authority to commit the necessary resources to carry out the procedures and processes identified in this plan. The manpower, equipment, and materials required to enact this plan will be implemented.

Richard Todd Kasteler
Printed Name of Cruz Construction's Project Manager

Richard Todd Kasteler
Signature of Cruz Construction's Project Manager

1/14/2013
Date

Certification of the Applicability of Substantial Harm Criteria Periodic Review
(40 CFR 112, Appendix C)

	Yes	No
Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?		X
Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?		X
Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?		X
Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance such that a discharge from the facility would shut down a public drinking water intake?		X
Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?		X

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining information I believe that based on my inquiry of those individuals responsible for obtaining information I believe that the submitted information is true, accurate, and complete.

Todd Kasteler, Cruz Construction, Inc. Project Manager
Name

Signature

Date

SECTION II. FACILITY DESCRIPTION

In accordance with 40 CFR 112.7, an SPCC plan shall contain a description of the facility's physical plant and shall include a diagram of the site. Specific information to be included in the facility description is listed below:

- **Type and quantity of oil stored,**
- **Unit-by-unit storage capacity,**
- **Spill history**

The following sections describe the site and detail the facility's fuel storage and supply features.

The fuel tank will travel from Pit 6 off the Red Dog Mine Road to the village of Noatak (See Figure 1: Location Map).

Spill History and Potential Future Spill Documentation

This facility has not experienced a reportable spill in the 12 months before preparation of this SPCC plan. A spill history form to document potential future spills is included in Appendix A. Procedures for maintaining this form and other methods of documentation are presented in the next section of this plan.

SECTION III. SPILL PREVENTION PROCEDURES

According to 40 CFR 112.7, An SPCC plan shall include a discussion of spill prevention procedures. This discussion shall address procedures for the following specific items:

- **Routine fuel handling**
- **Conducting inspections and tests**
- **Maintaining records of inspections and tests**
- **Training facility personnel in operation and maintenance of the facility and in the applicable pollution control guidance**
- **Conducting spill prevention briefings**
- **Securing the site**

These spill prevention procedures are discussed below.

Routine Fuel Handling

Cruz Construction does not anticipate the need to fuel any equipment during the mobilization. If fueling is required the fuel transfer operator shall do the following:

1. Understand fuel storage and distribution system operating procedures, site spill prevention, controls, countermeasures, and reporting requirements
2. Verify that the volume of fuel transfer does not exceed the available capacity
3. Properly ground the fuel delivery vehicle
4. Place drip pads or other containment underneath the generator and all hose connections
5. Have personnel present to monitor all fuel transfer operations in their entirety. Personnel shall be present to (1) monitor the entire fuel transfer operation, (2) be prepared to respond to equipment malfunctions or failures, and (3) monitor the fuel delivery to anticipate when the tank is 90 percent full. The tanks shall not be filled above a level that will result in overflow resulting from thermal expansion. Personnel monitoring the fuel transfer will be in visual and verbal communication with each other at all times. The pump operator will be in continuous radio contact with personnel on top of the tanks providing real time fill level measurements.
6. Following the completion of fuel transfer, close all valves, lock fuel delivery nozzle in the closed position, and place the nozzle within the secondary containment provided for the pump/filter. Rewire dry cam-lock fitting levers in the locked/closed position.

Equipment Inspection, Tests, and Record Keeping

The fuel storage and distribution system shall be inspected daily when in use. An inspection checklist is presented in Appendix B. A record of each inspection shall be recorded in the facility logbook. Records (including inspections and associated documentation) shall be maintained at Cruz Construction's Palmer office for at least 3 years from date of the inspection.

Requirements for the facility to be in compliance with 40 CFR 112 are presented in Appendix C. Recommendations for facility improvements based on prudent engineering practices are presented in Appendix D.

Placing of Facility in Standby Status

Before placing the facility in standby status, Cruz Construction personnel will inspect the facility to confirm that the fuel storage and distribution system is sealed and fuels are not present within the liner system. The system will be inspected before operations resume.

Personnel Training

Cruz Construction employees working on this project shall be familiar with this SPCC plan and the operation and maintenance of the fuel storage facility and distribution system.

New employees arriving onsite shall receive supervised on-the-job training to become familiar with the equipment and operating procedures at the facility. A thorough instructional program shall be implemented and maintained to promote proper operating and maintenance practices. Names of the attendees and the topics covered during personnel training shall be recorded in the facility logbook.

All Employees shall become familiar with applicable pollution control guidance and spill reporting requirements as outlined in Section V and 18 AAC 75, Article 3, Discharge Reporting, Cleanup and disposal of Oil and Other Hazardous Substances. Cruz Construction employees receive Hazard Communication and Hazard Identification (including Site Safety Plans, Inspections, and Site Reviews) at hire and annually.

Spill Prevention Briefing Program

Spill prevention briefing shall be conducted before the start of work to verify that facility personnel adequately understand the SPCC plan and the location and use of spill response materials. Briefings shall describe known spill events, possible equipment failures and malfunctions, and newly developed precautionary measures, where applicable. Hypothetical questions will be raised to test employee knowledge in handling emergency situations and preventing spills. Names of the attendees and topics covered shall be recorded on the a safety record sheet and filed with the plan documentation in the Cruz Palmer office.

Security Measures

Fences with locking gates are not considered prudent because of the remote location. The hose connections, manifolds and pump will be mobile and monitored during transportation.

SECTION IV. SPILL CONTROLS

In accordance with 40 CFR 112.1, spill control measures shall be implemented, where applicable, by installing structures or equipment to prevent the discharge of oil into or upon navigable water, as defined by the Federal Waters Pollution Control Act. The following section describes spill control measures at the facility.

Monitoring Systems

While in active status, the facility shall be monitored at all times. All monitoring of the facility will be visual. Fuel delivery meters may be observed during fuel transfers to and from the tanks.

Containment Systems

Facility will carry duck ponds and spill kit for mobile utilization.

Spill Response Materials and Equipment

Federal regulations require that spill response materials and equipment be present to prevent discharge oil from reaching a navigable watercourse. A summary of spill response materials and equipment to be maintained at the facility is present in Appendix F.

Potential Spills – Prediction and Control

If a catastrophic fuel release occurs at the facility, fuel will migrate laterally in all directions, away from the tanks, regardless of seasonal conditions. Fuel will also migrate vertically, saturating the snow and frozen and unfrozen soils. Released fuel would likely affect nearby surface-water bodies and migrate through the surrounding areas, possibly reaching nearby streams. If a fuel release does occur, procedures in this plan shall be followed and potential impacts to the surrounding area should be assessed.

SECTION V. SPILL COUNTERMEASURES

A description of spill countermeasures shall include procedures for the following items:

- **Spill Discovery**
- **Spill Response**
- **Spill Cleanup**
- **Recovered Material Disposal**

The follow sections describe procedures for spill countermeasures at the facility.

Spill Discovery

Visual observation is the only method for detection of fuel released from facility. While the tank is being transported, the operator will monitor the distribution facility.

Spill Response and Cleanup Procedures

Releases of Petroleum hydrocarbons shall be reported to the Alaska Department of Environmental Conservation (ADEC) by Cruz Construction's project manager as required under the Oil and Hazardous Substances Pollution Control Regulations (18 AAC 75). This section presents the procedures for responding to and reporting a release (leak, overfill, or spill). Persons who have not received 24-hour hazardous waste operations training should avoid exposure to released fuel and associated vapors. The telephone numbers of the appropriate organizational contacts in case of a spill are presented in Appendix G. A sample spill report form is presented in Appendix H.

In case of a release, initiate the following spill response measures:

- Stop or contain the spill without endangering human life. The actions may include the following:
 - Identify source of the spill.
 - Provide first aid to any injured personnel; call for medical assistance if required.
 - Evacuate if necessary and/or make the spill scene off limits to unauthorized personnel.
 - Shut off electrical power/generators if disconnect spark is not a hazard.
 - Eliminate ignition sources.
 - Restrict and contain the flow or migration of the released substance by closing valves and using appropriate spill controls and/or cleanup materials. Spill response materials and equipment are stored at the facility (Appendix F).
 - Immediately report the spill to the supervisor or person in charge.
 - Supervisor or person in charge reports the spill to the emergency response crews or Palmer, Alaska
 - Start cleanup operations. If the spill exceeds cleanup capability, immediately dispatch necessary equipment and personnel.
- Report the spill. Site personnel who discover a spill must report the spill to their supervisor, who in turn will notify Cruz Construction's project manager. Cruz Construction shall notify the ADEC and provide the ADEC with a written report documenting the nature of the spill and cleanup activities.
- Continue cleanup of the spill in accordance with 18 AAC 75, Article 3. Cleanup activities shall be coordinated with the ADEC. Coordination may include requesting assistance and additional resources for the containment, cleanup, and disposal of materials, when necessary.
- Inform the Cruz Construction project manager at least daily of the status of the cleanup efforts until the spill has been cleaned up.

When reporting a spill, the following information shall be provided:

- Name and telephone number of the person reporting the spill
- Date, time, and location of the spill
- Estimated quantity of the spill
- Type of material spilled

- Cause and source of spill
- Potential damage and impacts to environmentally sensitive areas, such as surface water, or wildlife
- Corrective action conducted
- Initial response actions taken

In accordance with 18 AAC 75, releases exceeding 55 gallons, or any discharge of oil into water, shall be reported immediately upon discovery. Any discharge of oil into water shall be reported to the U.S. Environmental Protection Agency's National Response Center immediately upon discovery. Releases that exceed 10 gallons but are 55 gallons or less, or releases that exceed 55 gallons within a secondary containment, shall be reported to the ADEC within 48 hours of discovery. An individual release of less than 10 gallons shall be reported to the ADEC in a monthly report if the cumulative release within a month is between 1 and 10 gallons. A record of all releases shall be maintained in the SPCC plan in accordance with 40 CFR 112.2 and 18 AAC 75 (see Appendix A, Spill History Form).

Disposal of Recovered Material

The disposal of recovered contaminated material by the facility shall be coordinated with an ADEC representative, the Cruz Construction project manager, and a cleanup contractor. The disposal method will depend on the type and amount of material spilled. Temporary onsite storage of fuel-affected material shall be handled in accordance with 18 AAC 75, Article 3.

SECTION VI. REVISION HISTORY

Date	Version	Revised by	Update Notes
3/27/2014	1.0	Nowers	Initial



Execution Plan:

Cruz has constructed thousands of miles of snow trails, ice roads, ice runways, civil runways, ice pads, and drill sites; all while safely transporting millions of gallons of fuel, hazardous material, waste mud, and drill cuttings. Over our many years of working in remote arctic locations we have created very sound and innovative processes.

The following depicts our plan to haul fuel to Noatak.

Methodology (overview)

a) Mobilization

Currently the Forwarder and necessary snowmachines for developing the trail are in the project area. It is the project team's hope that after conducting an initial seasonal reconnaissance survey we could make a one-time trip with the Forwarder in order to move it from Red Dog to Noatak. This would help the training process and initiate test runs on land outside of the Park.

It may be necessary to mobilize a groomer via airplane depending on the trail conditions.

Furthermore, it may be necessary to mobilize a Pisten Bully via airplane if the trail conditions do not permit the use of the Forwarder.

b) Route Prep Process

Upon approval the project team will conduct initial route survey and trail grooming efforts with snowmachines.

A ground measuring device will be necessary in future years if the village chooses to try and mobilize fuel before January 1st.

During the trail preparation time it will be critical to identify problematic areas where grade, snow depth, or water crossings pose risks. Delineation and rerouting will have to be handled on a year by year basis.

c) Haul Fuel

Once the trail has been prepped which should be completed by the middle March the project team will make a test run with an empty Forwarder. If there are not any issues then a load of fuel will be hauled.

It will be critical to evaluate the integrity of the trail after each trip. If there are any risks realized then the hauling operation will be suspended until the trail can be appropriately maintained. The team will continue to use groomers as the trail is being utilized for fuel hauling operations.



Noatak Fuel Haul Applicable Experience Summary

It will be important to monitor the weather and not perform a trip during a storm. The short length of the haul route makes this a manageable risk.

It is the goal of the project team to eventually have a Piston Bully with a sled trailer to add to its operation so that the village will have multiple options to navigate the trail for a longer seasonal duration. Additionally, the Piston Bully would be helpful during deep snow years.

If the Forwarder was unable to complete the trip because it was stuck or unable to be repaired on the trail, the fuel would be transferred to drums and hauled with snowmachines. A LGP Dozer from the village would tow it back to the village.



PREPARED BY:
CRUZ CONSTRUCTION, INC.
7000 E. PALMER-WASILLA HIGHWAY
PALMER, ALASKA 99645



Founded in 1979, Cruz Construction, Inc. (Cruz) specializes in heavy civil construction and resource development projects in Alaska's remote and difficult terrain. Cruz is an innovative

leader in performing remote logistics, ice roads, ice pads, tundra transport services, civil and structural construction, oil field services, as well as offering camps and support facilities at remote sites. Cruz has constructed thousands of miles of snow trails, ice roads, civil roads, ice runways, civil runways, ice pads, civil pads, and drill sites; all while safely transporting millions of gallons of fuel, waste mud, and drill cuttings from isolated locations.





Noatak Fuel Haul Applicable Experience Summary

Organizational Experience

Familiarity and Experience of Cruz Construction Working Specifically in the NPRA:

Cruz has extensive experience constructing ice roads and pads, and providing rig support in the NPRA. Over the last 15 years we have created many of the Arctic construction practices that are currently being used. While we have an excellent project/health safety and environmental record, we continually review and modify the practices to adapt to changes in environmental regulations and quality standards. The following projects are representative of our familiarity and experience working in the NPRA:



Customer:	FEX
Project Name:	FEX Exploratory Drilling
Project Location:	Cape Simpson – North Slope
Contract Type:	Negotiated
Construction Period:	2005 through 2007
Project Contact:	See References at the end of section 2.1.2
Project Description:	

Cruz Constructed a snow trail over 280 miles. The FEX exploratory drilling Project included ATV trail development, several rig moves, rig service, and barging support. The ATV trails traversed over tussocks, grasslands, rivers, lakes, ocean beaches, and sea ice.



Noatak Fuel Haul Applicable Experience Summary



Customer: Jacobs Field Services / Army Core of Engineers
Project Name: Kogru – Reclamation/Remediation
Project Location: North Slope, Alaska – Arctic Coast
Contract Type: Proposal/Negotiated
Construction Period: January 1st, 2009 to April 20th 2009
Project Contact: See References at the end of section 2.1.2
Project Description:

Cruz constructed 50 miles of snow trail across the Beaufort Sea ice, provided camp services, and excavated and transported 1400 cubic yards of contaminated material. To get to the site, Cruz cleared 50 Miles of snow across the Beaufort Sea Ice. The project team had to mobilize over 100 miles from Deadhorse across the sea ice in order to clean-up and closeout an existing Air Force landfill. The contaminated material had to be hauled across a snow trail and then trucked and barged to Oregon. Cruz Construction handled all of the logistics, field work, and support tasks (i.e. camps and fuel). This project was behind schedule upon contract award, but Cruz was able to increase the project resources and add some value engineering which caused the project to finish a couple weeks ahead of schedule and under the ACOE's budget.



Noatak Fuel Haul Applicable Experience Summary



Customer: Linc Energy
Project Name: Umiat Exploration Project
Project Location: Umiat, Alaska
Contract Type: Negotiated
Construction Period: 2011 through 2014
Project Contact: See References at the end of section 2.1.2

Project Description:

Over two winter seasons, the Umiat Exploration project included the construction of 202 miles of snow trail, 20 miles of Ice Road, Five 500'x 500' ice pads, 18 significant ice crossings, operation of three camps with approximate peak capacity of 120 people, 729 round trip all-terrain vehicle loads for a total of 147,500 miles of travel including transport and support of Kuukpik Drill Rig 5. Post project tundra inspections received excellent reviews from ASRC, the State of Alaska Department of Natural Resources, and the Bureau of Land Management.



Noatak Fuel Haul Applicable Experience Summary



Customer: Nordaq Energy, Inc.
Project Name: Tulimaniq Exploration
Project Location: Smith Bay, Alaska
Contract Type: Negotiated
Construction Period: Winter of 2014-2015
Project Contact: See References at the end of section 2.1.2

Project Description:

During the 2014-2015 winter exploration season, Cruz Construction was contracted by Nordaq Energy to manage the logistics program associated with their Tulimaniq Exploration program in Smith Bay, Alaska.

Logistics Program Management:

- Develop scope of work, budget and schedule to execute a remote single well exploration program
- Procurement of regulatory permits and authorizations
- Coordination with stakeholders and interested parties

Note: Cruz transported seventeen (17) loads via C-130 Hercules to Point Lonely

Constructed 154 miles of snow trail:

- 127 miles between DS-2P and Smith Bay and 27 miles between Point Lonely and Smith Bay



Noatak Fuel Haul Applicable Experience Summary

- Thermistor installation

Ice infrastructure construction included:

- 750' x 500' infield ice staging/camp pad at Smith Bay
- 400' x 400' staging ice pad adjacent to DS-2P
- 7 miles of infield ice roads
- Approx. 2 miles on tundra
- Approx. 5 miles within Smith Bay
- 5,000' x 150' ice airstrip on an infield lake
- Ice bridge across the Ikpikpuk River Channel within the Ikpikpuk Delta

Proposed ice infrastructure construction included:

- 500' diameter ice island in 4' at the southern extent of Smith Bay

Note: The project was suspended prior to the above-noted ice infrastructure being completed.

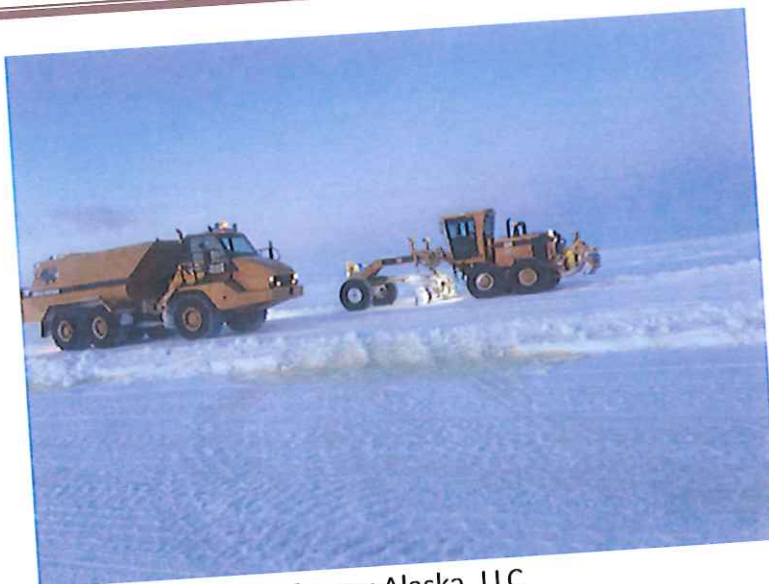
Project Logistics Management:

- Overland transportation of approx. 650 loads of equipment and materials
- Transportation of Doyon Drilling's Arctic Fox drill rig
- Assembly/Disassembly of the Arctic Fox drill rig
- General rig support
- Cuttings management, transportation and disposal
- Procurement, transportation, assembly and management of two camps (120 beds total)
- Procurement, transportation and distribution of 1.1M gals or fuel
- Management of personnel transportation and billeting
- Catering and Housekeeping
- Construction of secondary containment

Note: The project was suspended prior to the above-noted logistics functions being completed.



Noatak Fuel Haul Applicable Experience Summary



Customer:

Caelus Energy Alaska, LLC

Project Name:

Tulimaniq Exploration

Project Location:

Smith Bay, Alaska

Contract Type:

Negotiated

Construction Period:

Winter 2015-2016 (Ongoing)

Project Contact:

See References at the end of section 2.1.2

Project Description:

Cruz Construction is currently contracted with Caelus Energy to manage the logistics program for the 2015-2016 Tulimaniq Exploration program in Smith Bay, Alaska.

Logistics Program Management:

- Develop scope of work, budget and schedule to execute a two (2) well exploration program
- Mobilize "spud-critical" loads via barge to Point Lonely:
- Procurement, management and coordination of five (5) vessels
- Execute thirty (30) barge loadings/landings
- Transport approx. 350 trailer loads of "spud-critical" equipment



Noatak Fuel Haul Applicable Experience Summary

- Construct 154 miles of snow trail:
- 127 miles between DS-2P and Smith Bay
- 27 miles between Point Lonely and Smith Bay
- Thermistor installation

Ice infrastructure construction includes:

- 750' x 500' infield ice staging/camp pad at Smith Bay
- 400' x 400' staging ice pad adjacent to DS-2P
- 12 miles of infield ice roads
- Approx. 2 miles on tundra
- Approx. 10 miles within Smith Bay
- 5,000' x 150' ice airstrip on an infield lake
- Construction of two (2) ice bridges
- Ice bridge across the Ikpikpuk River Channel within the Ikpikpuk Delta
- Ice bridge construction across the Colville River at Ocean Point
- 500' diameter ice island in 2' at the southern extent of Smith Bay
- 500' diameter ice island in 5' at the southwestern extent of Smith Bay

Program Logistics Management:

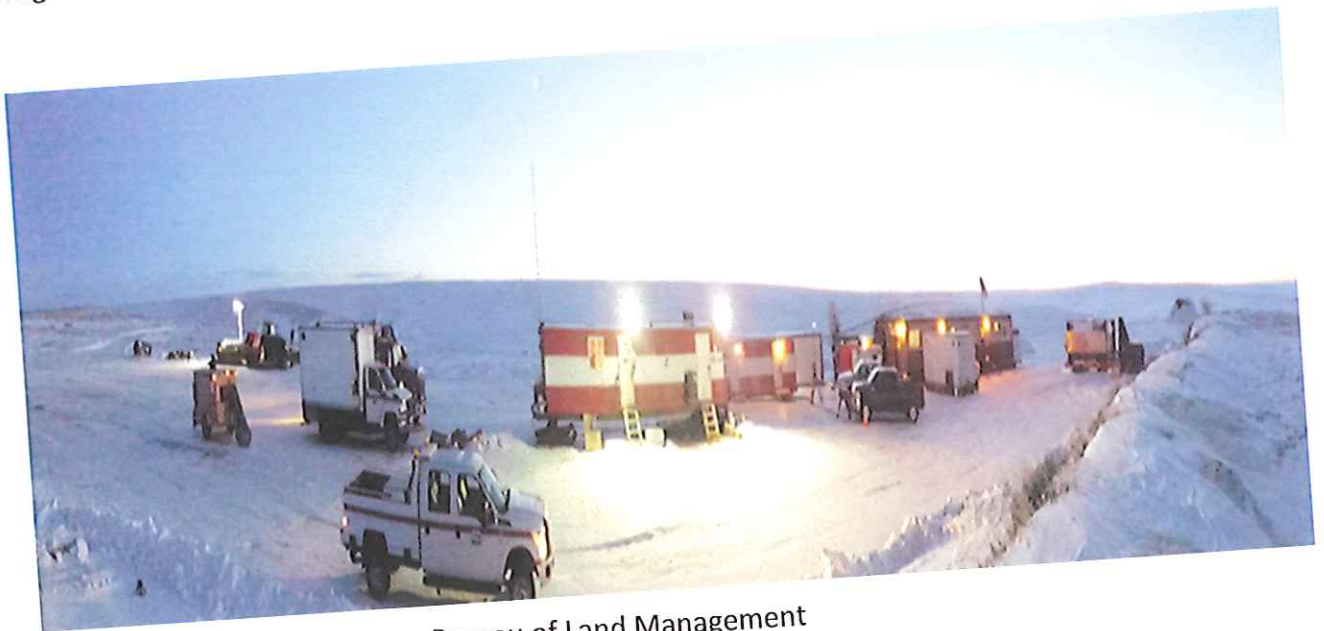
- Overland transportation of approx. 800 loads of equipment and materials
- Transportation of Doyon Drilling's Arctic Fox drill rig
- Assembly/Disassembly of the Arctic Fox drill rig
- General rig support
- Cuttings management, transportation and disposal
- Procurement, transportation, assembly and management of five (5) remote camps (225 beds total)
- Catering and Housekeeping
- Procurement, transportation and distribution of 1.4M gals of fuel
- Construction of secondary containment



Noatak Fuel Haul Applicable Experience Summary

Familiarity and Experience of Cruz Working Specifically Under Federal Regulations:

Cruz has extensive experience constructing ice roads and pads, and providing rig support under State and Federal regulations. Cruz has routinely received excellent post project reviews from regulatory agencies. Cruz is confident that our sound management program and field experience will lead to another excellent post project review by the BLM on the Ice Road Construction and Rig Support Services 2015-2016 Willow Exploration Program project. The following projects are representative of our familiarity and experience working under BLM regulations:



Customer:	Bureau of Land Management
Project Name:	Oil Well Plugging and Abandonment in Alaska
Project Location:	Deadhorse, Umiat, and Cape Simpson, AK
Contract Type:	Negotiated – Fixed Price
Construction Period:	March to April of 2006
Project Contact:	See References at the end of section 2.1.2
Project Description:	

On this project Cruz mobilized and setup a 20 man Sleigh Camp that housed 15 crew members. Cruz also provided support services and utility supply. Support services for the camp included catering services, housekeeping, camp mechanics, water, transportation, waste disposal, and fueling. As with any camp, we were required to obtain and maintain a DEC Food Service Permit.



Noatak Fuel Haul Applicable Experience Summary

The scope of work required that, in 30 days, we transport the BLM representative and his USGS Drill Crew 750 miles (Deadhorse to Umiat to 2P to Cape Simpson to 2P to Deadhorse). We plugged and abandoned 5 wells in this time. Cruz provided all the logistical support for this operation. The BLM only had to worry about the activity of plugging and abandoning the wells.

Cruz has received numerous performance reports with "excellent" ratings particularly when it comes to remote and or unique circumstances. On this project, Cruz received an outstanding review from the Bureau of Land Management (BLM). BLM's project manager stated Cruz's personnel "had a go get 'em attitude...especially in remote and/or unique locations.....and their experience and know how were critical to the overall success of the project".

Note: The FEX project, Linc Energy project, Kogru project, and Nordaq project also qualify as familiarity and experience of Cruz working specifically under BLM regulations.



Familiarity and Experience Successfully Meeting Deadlines in Remote Arctic Environments:

Cruz Construction's familiarity and experience successfully meeting deadlines in remote arctic environments is extensive. Cruz has been working on remote arctic environments on the North Slope of Alaska for over a decade. Cruz has provided primary support of multiple drilling programs. The following projects are further testimony of Cruz Construction's familiarity and experience successfully meeting deadlines in remote arctic environments:



Customer:	Pioneer Natural Resources
Project Name:	PNR - Exploration & Drilling Project, 2005
Project Location:	Hailstorm & Cronus Drill Sites – North Slope
Contract Type:	Negotiated
Construction Period:	December, 2004 through March, 2005
Project Contact:	Project contacts are available upon request.

Project Description:

Cruz Construction built 6 miles of ice road from X pad to Hailstorm drill site, constructed a 500' x 500' drill site pad, and provided rig maintenance and support for the 2005 drilling season. Additionally, Cruz constructed a 9 mile ice road from 2P to Cronus drill site, a 500' by 500' drill pad, and provided rig maintenance and support for the 2005 drilling season. Cruz Construction completed the project safely, on time and under budget.



Noatak Fuel Haul Applicable Experience Summary



Customer: Chevron
Project Name: Chevron White Hills Project
Project Location: 56.5 Miles West of MP 359 of Dalton Hwy
Contract Type: Negotiated
Construction Period: 2007 to 2009
Project Contact: Project contacts to be supplied upon request.

Project Description:

During the first season, Cruz constructed 56.5 miles of onshore ice roads, constructed three ice pads for exploratory drilling (more than 100,000 CY of fill), and two infield rig moves. In 95,000 hours worked, there were no recordable accidents. Terrain difficulties included thick tussocks, mountains, valleys, and several river crossings. Construction included building six drill site pads, four staging pads, and five ramps.

During the second year of the Chevron White Hills Project Cruz constructed 52 miles of ice road, 3 ice pads, and 2 infield rig moves. In 149,893 hours worked, there were no recordable accidents. The second year of this project followed a similar route, covered similar difficult terrain, and included six drill site pads, four staging pads, several river crossings, and five ramps. We moved over 2 million gallons of fuel without a spill.



Noatak Fuel Haul Applicable Experience Summary



Customer: Savant Alaska, LLC

Project Name: Badami Unit Redevelopment

Project Location: Badami, Alaska

Contract Type: Negotiated – Lump Sum

Construction Period: 2009 and 2010

Project Contact: Project contacts to be supplied upon request.

Project Description:

The 2009-2010 Tundra Winter Road included construction of 26 miles of ice road, two ice pads, and four major river crossings. Project start was located at the Endicott Pipeline CX-4 Caribou Crossing and continued to the Badami CFF Pad. Doyon's rig #15 (2 million pounds) was mobilized on Cruz constructed ice roads and over four major river crossings without incident or roadway failure.



Noatak Fuel Haul Applicable Experience Summary



Customer: Savant Alaska, LLC

Project Name: Badami Unit Redevelopment

Project Location: Badami, Alaska

Contract Type: T&M

Construction Period: 2010 through 2013

Project Contact: Project contacts to be supplied upon request.

Project Description:

The Badami Unit Redevelopment Project was performed yearly for three years and consisted of building an ice road from the Endicott Pipeline CX-4 Caribou Crossing to the Badami CFF Pad, approximately 26.7 miles for a total of 80.1 miles. The road specifications included a minimum of 35' wide, ice thickness of six inches, delineated at 50' intervals, and capable of supporting rig module mobilization of 2.5 million pounds without failure. The project included four major river crossings, ramps, and was an onshore ice road.



Customer: Kiska Metals Corporation

Project Name: Whistler Mine Project

Project Location: Alaska Range

Contract Type: Negotiated – Lump Sum

Construction Period: February, 2011 – April, 2011

Project Contact: Project contacts are available upon request.

Project Description:

Cruz Construction built and maintained a 113 mile snow trail from Oilwell Road in Trapper Creek to the Whistler Mine located 5 miles upstream of Portage Creek on the Skwentna River. The project included approximately 50 river and creek crossings. Cruz successfully hauled approximately 12 loads of fuel, equipment, fuel and supplies to the project. The project was completed safely, on time, under budget and with great appreciation from the owner.



Noatak Fuel Haul Applicable Experience Summary



Customer: Jacobs Field Services / Air Force

Project Name: F22 Recovery Project

Project Location: Near Cantwell, Alaska

Contract Type: Negotiated

Construction Period: March 1, 2011 – February 15, 2012

Project Contact: Project contacts are available upon request.

Project Description:

Cruz Construction was contracted to mobilize a camp and equipment 50 miles along the closed Denali Highway and 20 miles into the wilderness in order to recover a crashed F22 for the Air Force. The scope of work on this project incorporated snow trail construction, camp services and environmental cleanup activities in an extremely remote location. The Air Force has been very pleased with our performance and would not hesitate to contract with us again. Our contact with the Air Force is Dr. Mark Prieksat (907-384-2716). Though we are not at liberty to discuss specific details due to project security demands, Cruz Construction successfully completed this logistically challenging project ahead of schedule and without any recordable injuries.



Noatak Fuel Haul Applicable Experience Summary



Customer:	Cook Inlet Energy
Project Name:	Big Bend Project
Project Location:	Willow, Alaska
Contract Type:	Negotiated
Construction Period:	January, 2012 – April, 2012
Project Contact:	Project contacts are available upon request.

Project Description:

Cruz Construction built and maintained 22.5 miles of snow trail from the Willow Campground to the Yetna River. An additional 3.5 miles of snow trail were constructed northward from the trail to the Kroto drill pad. The project included approximately twenty ice crossings including the Susitna River system and Kroto Creek. Two 500' x 500' drill site pads were constructed at the Kroto Drill Site and the Moose Drill site. The project was completed safely, on time and under budget.



Noatak Fuel Haul Applicable Experience Summary



Customer: AIC/Conoco Phillips Alaska, Inc.

Project Name: DS2S Ice Road

Project Location: Near Kuparuk, Alaska

Contract Type: Negotiated – Lump Sum

Construction Period: 2013-2014

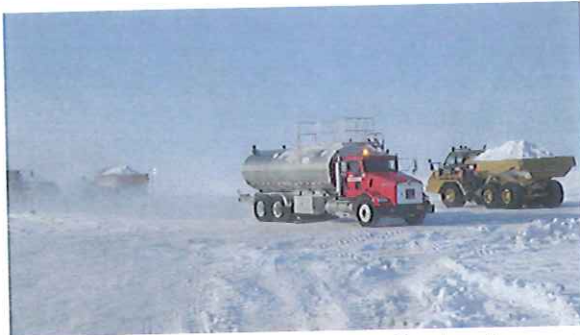
Project Contact: Project contacts are available on request.

Project Description:

The AIC/Conoco DS2S Ice Roads project included the construction of 17 miles of 50' wide Ice Road, 3.5 miles water source access road, and a 250'x 150' ice pad in support of AIC's Gravel Mining & Hauling project. Cruz Construction received a letter from ConocoPhillips commending our excellent safety record on the project.



Noatak Fuel Haul Applicable Experience Summary



Customer: Caelus Energy Alaska, LLC

Project Name: Nuna Ice Road

Project Location: Near Kuparuk, Alaska

Contract Type: Negotiated – Lump Sum

Construction Period: 2014-2015

Project Contact: Project contacts are available on request.

Project Description:

During the 2014-2015 winter season, Cruz was hired by Caelus to construct 12 miles of 50 foot wide ice road in the Kuparuk River Unit. The project also consisted of 8 miles of water source access roads, 3.5 miles of 25 foot wide ice road, and 15 acres of ice pads. The approximate 9 mile stretch designed for construction along the shoreline faced difficulty as suspected polar bear dens forced portions of the route 1 mile offshore into water depths of 3-5 feet. This route was required to be grounded while maintaining the project schedule. Cruz was able to modify the construction sequence and ground the sea ice route while leaving enough schedule time for Alaska Interstate Construction to haul 100% of the gravel to complete the permanent pad construction. To accelerate construction across the sea ice, Cruz used a combination of sea water flooding coupled with conventional ice road construction. Cruz completed the total 23.5 miles of road (including grounding 9 miles of sea ice) and associated pads in 45 calendar days. There were zero injuries reported on this project.



Noatak Fuel Haul Applicable Experience Summary



Customer: Price Gregory

Project Name: 3HAMI Ice Road

Project Location: Near Kuparuk, Alaska

Contract Type: Negotiated-Lump Sum

Construction Period: February 2015

Project Contact: Project contacts are available upon request.

Project Description:

Cruz Construction was contracted through Price Gregory to construct approximately a half mile of ice road and equipment staging pad. The project was in close proximity to Conoco Phillip's pipeline so extra precaution was essential for the project's success. The project finished ahead of schedule which allowed Price Gregory to mobilize equipment for their scope of work. There were zero incidents on this project.



Customer: Repsol

Project Name: Repsol Exploration Drilling Camps

Project Location: Kuparuk

Contract Type: Negotiated

Construction Period: Winter of 2014-2015

Project Contact: See References at the end of section 2.1.2

Project Description:

Cruz was in charge of all cuttings management duties on this project. Cruz had a loader connected to the drill rigs cuttings tub, in order to receive drill cuttings from the rig. The loader then transferred the cuttings tub to the Cruz shale bins. A secondary drill rig cuttings tub was in place during the material transfer in order to ensure continuous containment of the drill cuttings material. As the drill cuttings started to freeze a Cruz excavator would manipulate the drill cuttings in order to promote thermal transfer to the environment and prevent the cuttings from freezing into a large solid mass. Once a sufficient volume of material was in Cruz's shale bins, a Cruz side dump would be dispatched to the drill site location. Once on site the drill cuttings were transferred to the side dump and transported to BP's Grind and Inject facility for disposal.



References

FEX Exploratory Drilling

F.E.X./ASRC

Walter Quay – Drilling Manger

Phone: (907) 230-3961 - Mobile

Kogru – Reclamation/Remediation

Jacobs Field Services/Kasteler Consulting (Currently)

Todd Kasteler – Project Engineer

5720 Denali Street

Anchorage, AK 99518

Phone: (907) 301-0342

Umiat Exploration Project

Linc Energy Operations, Inc.

Marty Lemon – Project Manager

3000 C Street, Suite 103

Anchorage, AK 99503

Tulimaniq Exploration

Nordaq Energy, Inc.

Mike Miller - Chief Operating Officer

3000 A Street, Ste. 200

Anchorage, AK 99503

Phone (907) 375-1810 – Office

Cell (907) 240-7850 – Office

Tulimaniq Exploration



Noatak Fuel Haul Applicable Experience Summary

Caelus Energy Alaska, LLC

David Moles - Senior Vice President of Development

8401 N. Central Expressway, Suite 400

Dallas, TX 75225

Phone: (214) 368-6050 – Work

Phone: (214) 730-5363 – Work

Phone (832) 512-4532 - Mobile

Oil Well Plugging and Abandonment in Alaska

Bureau of Land Management

Stan Porhola – Project Manager

222 West Seventh Avenue

Anchorage, AK 99513,

Phone: (907)267-1469

Note: References for all the other projects listed are available upon request.



March 3, 2014

1201 Pacific Avenue
Suite 1001
Tacoma WA 98402-4121
253-759-2269

Re: Cruz Construction, Inc.

Dear _____:

As the surety broker for Cruz Construction, Inc. we are pleased to provide information concerning their capabilities and bonding. During the time that we have been associated with Cruz Construction, they have consistently demonstrated an excellent performance record based on sound planning, tight project controls, superior knowledge of construction requirements, and tireless efforts. Cruz Construction has a well-established reputation for delivering cost effective and high quality projects to their many satisfied clients. In short, we hold Cruz Construction in the highest regard and highly recommend them for your project.

Liberty Mutual Insurance Company is the current bonding company for Cruz Construction, Inc. Liberty is one of the largest bonding companies in the nation, and the largest in the state of Alaska. Liberty maintains updated files on Cruz Construction, and is well versed in their management, financials and operating capabilities.

Historically, Liberty has supported Cruz Construction on contracts in the \$50,000,000 size range. It is however important to note that projects are underwritten on an individual basis and subject to the surety company's review and approval. As such, additional capacity, considerations and options will be considered at the time an individual request is made.

In closing, we feel extremely honored and privileged to have Cruz Construction as a client. Should you have any questions or require any additional information on this fine company, please do not hesitate to call me at 253-310-4016.

Respectfully,

Brent E. Heilesen
Account Executive

Cruz Character the key to success

A collection of talented individuals without personal discipline will ultimately and inevitably fail. Character triumphs over talent.

All Blacks Player and Coach, Wayne Smith, summarizes the key to character best:

"We used matrices to back intuition because there are certain statistics in rugby that determine the player's character and that's what we are after. So we picked high work rate, strong body movers, and guys that were unselfish and had a sacrificial mindset. The challenge is to always improve, to always get better, even when you are the best. Especially when you are the best"

This focus help rebuild a team that has been the most successful athletic team in the last 110 years.

At Cruz Companies we have been successful because of a similar mindset through the majority of our personnel. Never assume you have acquired all the knowledge you need to hold your company's place in the market. Understand the individual tasks that encompass the company or project you are responsible for managing. When sound understanding of the majority of the tasks is achieved, it is even more critical for a leader to remain humble and communicate his/her knowledge in order to sustain and/or improve the company and themselves.

The three main points of corporate character we must assess within our projects or companies are:

1. Recognize the value and indicators of our H.S.E. system
2. Inherently know our assets (people and equipment)
3. Constantly monitor and evaluate your project or company costs and productivity

Last but not least, none of this works unless you hold yourself and those you lead accountable.

Jeff D. Miller



Cruz Companies



MOGUL *Master* **MULTI-BLADE PLANERS**



Simply the finest trail groomer you can buy
www.mogulmaster.ca

A snowmobile trail groomer must do three things to effectively groom a snowmobile trail: cut the moguls; process the snow; and finally, compact the snow. And no trail groomer does this better than a Mogul Master Multi-Blade Planer. Just ask one thousand four hundred and seventy five Mogul Master owners across North America!

Cut the Moguls: To simply take the top half of a Mogul and drop it into the valley of the next mogul is asking for a re-grooming job to happen ... very soon, and at a big cost. The Mogul Master's multiple, angled cutting blades are designed to easily remove moguls, right down to the bottom of the mogul, removing all "memory" of the moguls from the trail so your groomed trail stays groomed far longer.



The heat treated cutting blades are adjustable and have a unique adjustment stop that keeps the blade in place when set. Spring tripping cutting blades are a must for early season grooming.

Compact the snow: Once the moguls have been eliminated and the snow is processed, the trail groomer must compact the snow to a hard, quick setting finish. Regardless of the model of Mogul Master, the packing pan is designed with high compaction in mind.



The standard serrated cutting blades are very effective in those hard icy trail conditions. Blade support struts have been rotated 45 degrees to promote the free flow of snow through the drag.

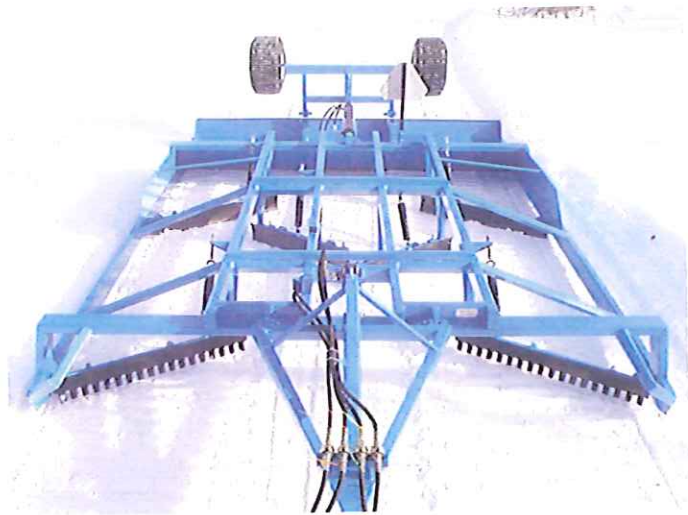
Process the Snow: Snow must be effectively "processed" by the trail groomer to ensure a smooth, flat, durable trail. To complete this processing, the snow that the groomer is working must: (a) be thoroughly mixed or blended, (b) have the sharp edges of the individual snow flakes broken down, (c) be de-aerated and (d) have its temperature raised ever so slightly due to the friction created by the groomer. The Mogul Master's multiple blade design processes snow like no other trail groomer can.



Multiple, adjustable and replaceable skags in the pan reduce side hill slippage on uneven terrain. The high, radiused lip on the rear of the pan "ramps" the drag up onto the snow when backing up. The hydraulic rear wheel assembly with high flotation tires provides plenty of height when needed.

Deep Snow Multi-Blade Planer:

The Mogul Master DS MBP is designed to allow very high quantities of snow to flow through the drag freely. Incorporating fewer blades than a standard Mogul Master MBP, yet very aggressive at cutting hard packed moguls when conditions demand, the DS is a must for those areas that experience high snow accumulations. And the DS will groom in wet snow at above freezing temperatures like no other trail groomer can.



Extremely rugged in design, all Mogul Masters are manufactured to exacting standards to provide years of trouble free service. Choose from a pintle hitch, extended reinforced pintle hitch, goose neck hitch or a hydraulic ramsteer hitch to maximize track vehicle performance.



Front "nose cones" are reinforced to cut through hard packed snow. Tree guards and shear pin hitches eliminate the "oops" when cornering.



All Mogul Masters incorporate a unique floating device on the hitch to reduce scalping when cresting a hill. The chain hooks on the hitch make the connection to the track vehicle a simple, one man job that takes only minutes.

Mogul Masters are available for all snow grooming vehicles from utility type snowmobiles to high horsepower industrial track vehicles.

This photo details the 7 blade XLMBP 16 series drag, a lighter yet aggressive Mogul Master, used with track vehicles such as the Tucker 1000 and the Prinoth Trooper.

MOGUL *Master* MULTI-BLADE PLANERS

MODEL	WEIGHT (with standard hitch)	LENGTH (nose cone to pan)	WIDTH	NO. of BLADES
MBP 18-08	3,260 lbs	17' 6"	8' 4"	11
MBP 18-09	3,400 lbs	17' 6"	9' 4"	11
MBP 18-10	3,600 lbs	17' 6"	10' 4"	11
MBP 18-12	3,850 lbs	18'	12'	11
DS MBP 18-08	2,710 lbs	17' 6"	8' 4"	6
DS MBP 18-09	3,060 lbs	17' 6"	9' 4"	6
DS MBP 18-10	3,260 lbs	17' 6"	10' 4"	6
DS MBP 18-12	3,460 lbs	18'	12'	6
MBP 08-08	2,100 lbs	10' 6"	8' 4"	4
MBP 08-09	2,400 lbs	10' 6"	9' 4"	4
MBP 08-10	2,600 lbs	10' 6"	10' 4"	4
MBP 08-12	2,950 lbs	10' 6"	12'	4
XLMBP 16-07	2,330 lbs	15' 3"	7' 4"	7
XLMBP 16-08	2,460 lbs	15' 3"	8' 4"	7
XLMBP 16-09	2,580 lbs	15' 3"	9' 4"	7
XLMBP 16-10	2,710 lbs	15' 3"	10' 4"	7
XLMBP 16-07 HD	2,674 lbs	15' 3"	7' 4"	7
XLMBP 16-08 HD	2,804 lbs	15' 3"	8' 4"	7
XLMBP 16-09 HD	2,924 lbs	15' 3"	9' 4"	7
XLMBP 16-10 HD	3,054 lbs	15' 3"	10' 4"	7
ULMBP 14-06	1,450 lbs	12' 3"	6' 4"	4
ULMBP 14-07	1,575 lbs	12' 3"	7' 4"	4
ULMBP 14-08	1,700 lbs	12' 3"	8' 4"	4
ULMBP 9-06	940 lbs	9'	6' 3"	7
ULMBP 9-07	1020 lbs	9'	7' 3"	7
ULMBP 9-08	1100 lbs	9'	8' 3"	7
ULMBP 8-04	360 lbs	8'	4' 3"	4
ULMBP 8-04 ST	419 lbs	8'	4' 3"	4
ULMBP 8-06	575 lbs	8'	6' 3"	4

THE SHOP INDUSTRIAL INC.

112 Fielding Road
Lively ON P3Y 1L5
705 682-1522
800 663-3724
705 682-1221 fax
tsi@theshopindustrial.com

*"Industrial/Recreational Over-Snow and
All-Terrain Vehicle & Equipment Specialists"*
Sales • Parts • Service
www.theshopindustrial.com

BRP Products

- [Ski-Doo Snowmobiles](#)
- [Can-Am Roadster](#)
- [Sea-Doo Watercraft](#)
- [Lynx Snowmobiles](#)
- [Can-Am SIDE-BY-SIDE](#)
- [Evinrude Outboard Engines](#)
- [Rotax Engines](#)
- [Can-Am ATV](#)



Move the bar to see different angles.

Close
Sport-Utility

Skandic SWT

Engine: ROTAX 600 H.O. E-TEC / ROTAX 900 ACE

Starting at: \$12,699 US (MSRP)

[Estimate Payments](#)

[Insure your sled](#)

[View 360°](#)

[Build & Price](#)

[Get a Quote](#)



- [Skandic WT](#)
- [Skandic SWT](#)



The ultimate utility sled with the comfortable and maneuverable REV-XU platform and massive 24 x 154 in. (61 x 391 cm) wide track for going nearly anywhere and pulling nearly anything.

- **Compare Models**



[Compare now](#)

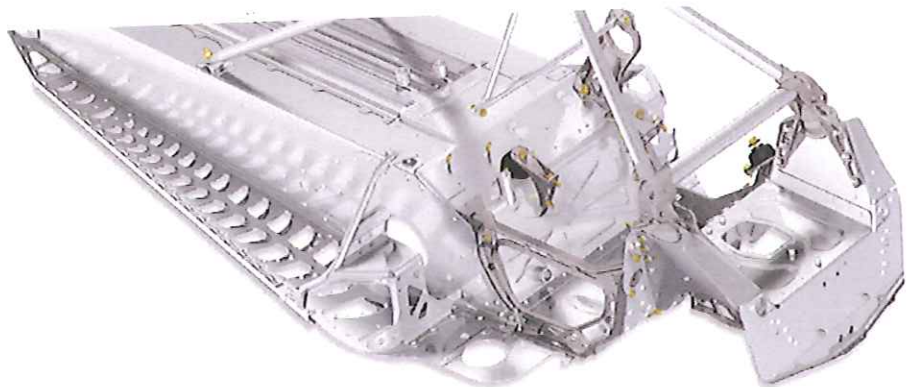
- **Find a Dealer**



[Find Yours Now](#)

- [Play video](#)

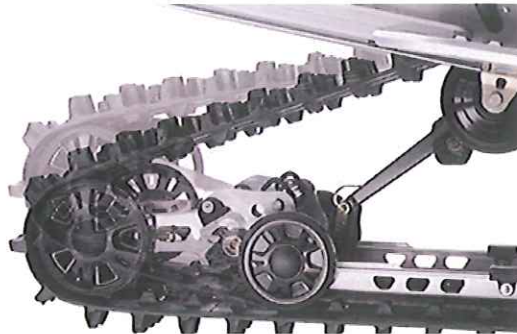
Key Features



Platform:	REV-XU
Engine:	ROTAX 600 H.O. E-TEC ROTAX 900 ACE
Color	Tactical Grey/Black
Front Suspension:	LTS
Front Shocks:	Motion Control
Center Shock:	Motion Control
Rear Suspension:	SC-5U
Rear Shock:	HPG
Skis:	Pilot DS 2 with 10-inch liner

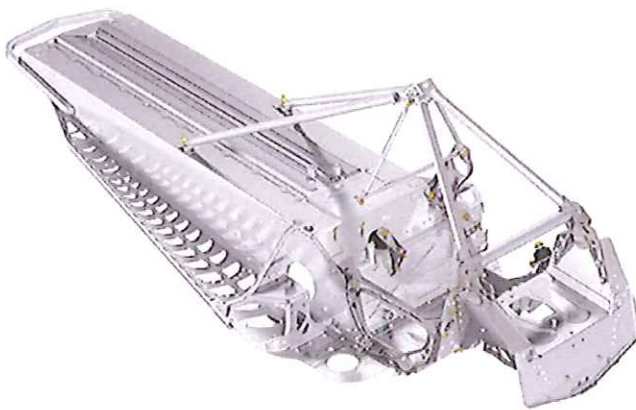
- [Download the Skandic SWT printable version of the Spec Sheet \(PDF\)](#)
-
-
- [Download the Lineup Brochure \(PDF\)](#)

Package Highlights



SC-5U Rear Suspension

Our sport-utility suspension. Refined ride both on trail and on top of powder. Articulated rail to maximize deep snow traction in reverse or locked out when towing.



REV-XU Platform

A revolutionary platform that's a modern combination of ruggedness and sportiness. Its light, yet strong, aluminum frame delivers exceptional handling and less rider fatigue. And its ergonomically advanced design provides more flexibility and comfort for any riding style.



LTS Front Suspension

Telescopic front suspension with a large, flat belly pan for exceptional deep snow flotation.



ROTAX 600 H.O. E-TEC Engine

This groundbreaking, direct-injected two-stroke delivers unsurpassed oil and fuel economy, an easy start and virtually no smoke or smell – especially at start and idle. No wonder it's the best-selling 600cc engine in snowmobiling.*

- Up to 21 mpg (11.3 L/100 km) trail fuel economy**
- 120 horsepower

*Based on retail sale results as of December 31, 2014.

**Data based on internal engineering trail testing on a MXZ



Rotax 900 ACE Engine with iTC

This inline triple four-stroke uses Rotax Advanced Combustion Technology to deliver 90 hp with excellent fuel economy (up to 21.8 mpg, 10.8 L/ 100 km)* and ultra low maintenance. The industry's only Intelligent Throttle Control (iTC) throttle-by-wire technology opens up a new world of customization and drivability options. Includes three shift-on-the-fly driving modes (Sport, Standard, ECO), Learning Key feature and optional finger throttle operation.

*Data based on internal engineering trail testing on a MXZ TNT in its ECO mode.



Finger Throttle (ACE engines)

The throttle block can be rotated forward for use as a finger throttle, if preferred. Great for changing hand positions on a long ride and for more control in bumps.



24 x 156 x 1.25 in. Track

The industry's largest footprint (24 x 156 in./ 61 x 396 cm) provides unmatched traction and makes the Skandic SWT the lowest ground pressure on the market.



Synchromesh Transmission

Take off from a stop smoothly, even with a heavy load, thanks to two forward and one reverse gears. Inline 2-1-N-R pattern on right side and can be safely shifted from High to Low while on the fly.



Pilot DS 2 Skis

Single-keel with excellent sidehilling bite, thanks to thin outer edges. Narrow and thin, yet stiff. Shorter behind its complementary spindle with flat tail for easier counter-steering and sidehilling.

PHOTOS & VIDEOS



[Pictures](#) [Videos](#)

Specifications

Engine

Engine

ROTAX 600 H.O. E-TEC

ROTAX 900 ACE

Dimensions

Vehicle overall width	1076 mm / 42.4 in	1076 mm / 42.4 in
Official dry weight	303 kg / 669 lb	316 kg / 696 lb
Ski stance	900 mm / 35.4 in	900 mm / 35.4 in
Track nominal width	600 mm / 24 in	600 mm / 24 in
Track nominal length	3968 mm / 156 in	3968 mm / 156 in
Track profile height	31.8 mm / 1.25 in	31.8 mm / 1.25 in

Powertrain

Drive clutch type	TRA III	eDrive 2
Driven clutch type	QRS	QRS
Brake system	Hydraulic with braided stainless-steel brake line	

Suspension

Front Suspension	LTS	LTS
Front Shocks	Motion Control	Motion Control
Center Shock	Motion Control	Motion Control
Rear Suspension	SC-5U	SC-5U
Rear Shock	HPG	HPG

Features

Platform	REV-XU	REV-XU
Skis	Pilot DS 2 with 10-inch liner	Pilot DS 2 with 10-inch liner
Optional Adjustment Package		

bigice.ca

Flood Pumps for Serious Ice Road Builders
Call Us Toll Free: 1-888-249-8886

- [Products](#)
- [Gallery](#)
- [Safety](#)
- [Contact](#)

-- B-55 Flood Pump ▾

B-55 Flood Pump

B-55 Flood Pump Operating Features



- Purpose built for ice flooding operations over streams, rivers, and lakes.
- High volume output 120,000 litres per hour. 26,000 gallons per hr.
- Powered with a Honda 4 cycle 5.5 HP easy start engine.
- Pump self primes as it is placed into pre-drilled bore hole.
- Removal of the pump allows the impeller case to self drain avoiding costly freeze ups.
- Discharge tube may be removed for transport or storage.



Alaska Model with longer intake tube for working on slab ice in the ocean (special order only)

- 4 Stroke
- Recoil Start
- 163 C.C. Displacement

Download the B-55 brochure in PDF format:

- [English](#)
- [French](#)

© 2014 bigice.ca. All Rights Reserved.

[Back to Top](#)



B-55 Flood Pump

Pump Specifications:

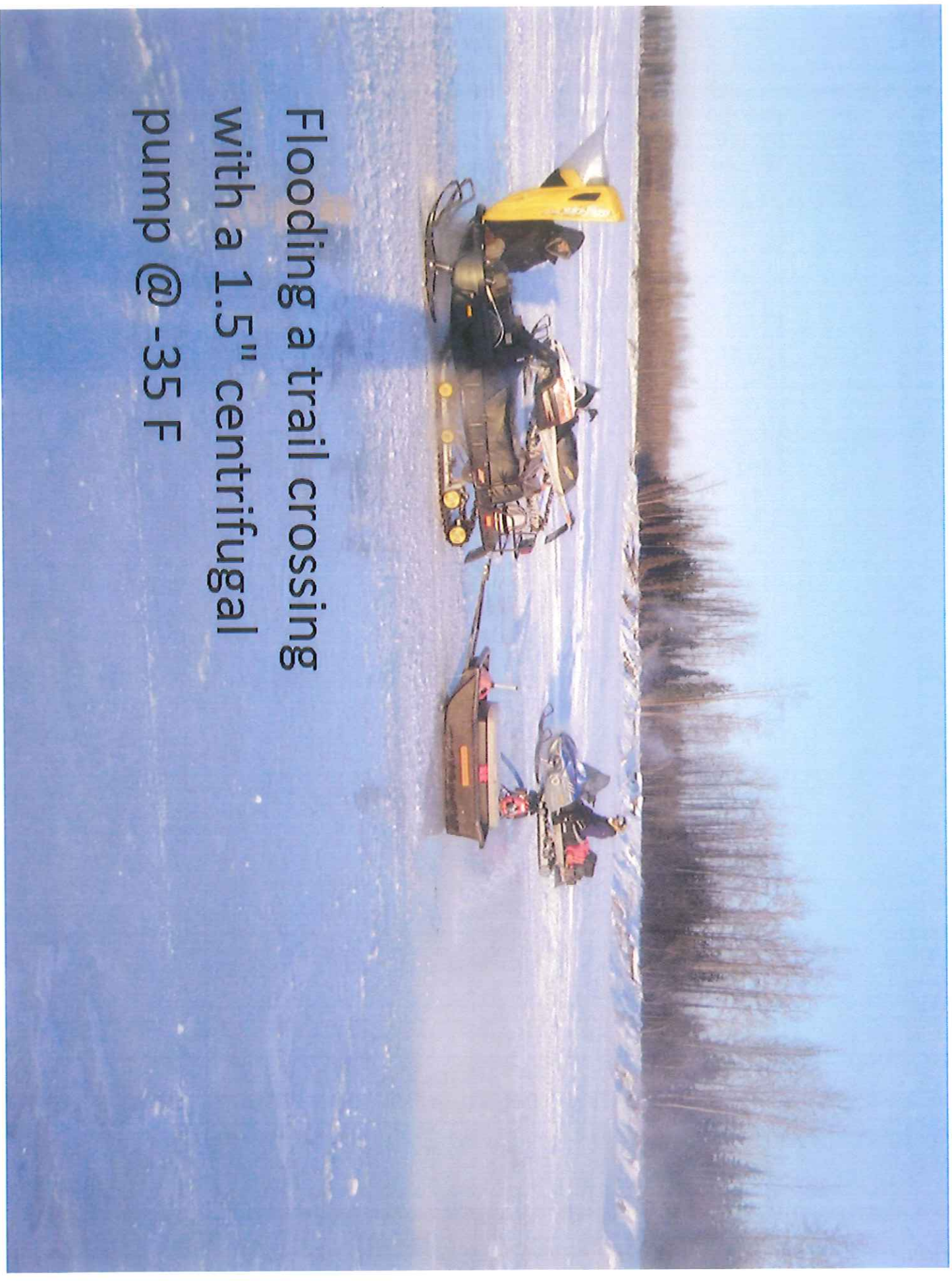
- Aluminum and stainless construction
- Grease bearings
- Cold weather seals
- Stainless fasteners
- Height: 33"
- Length: 20"
- Weight: 68 pounds

Engine Specifications:

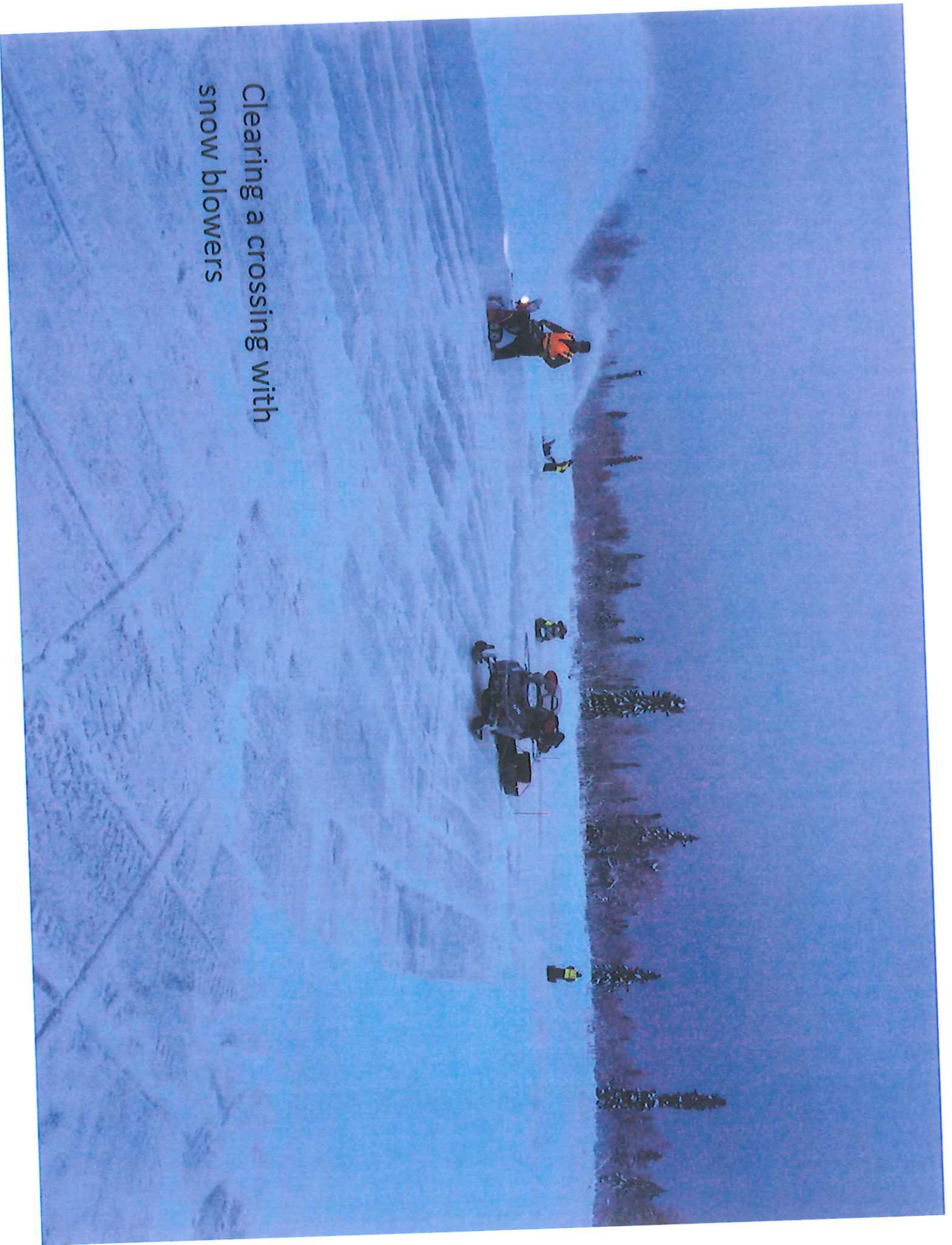
- Honda Commercial Engine
- GxV 160 Engine
- 5.5 HP

A B-55 Flood Pump flooding an ice crossing.





Flooding a trail crossing
with a 1.5" centrifugal
pump @ -35 F



Clearing a crossing with
snow blowers

Profiling to measure the thickness of ice and/or making a hole for our small flood pumps.





Pisten Bully pulling a groomer



Tucker pulling a groomer

**564
574
Forwarders**

CAT®



	564	574
CAT® Engine	C6.6 ACERT	C6.6 ACERT
Gross Power	129 kW (173 HP)	129 kW (173 HP)
Standard Wood Bunk Length	4.88m (16')	4.88m (16')
- Optional	5.64m (18.5')	5.64m (18.5')
Operating Weight	16,330 kg (36,000 lb)	17,237 kg (38,000 lb)

Cat® Forwarders

Power Train

- Field proven Cat ACERT diesel engines
- Torque converter power shift transmission
- 4-speed electronic shift
- Wet disc axle and parking brakes

Control System

- IQAN computer control system
- Closed center proportional control valves
- Hydraulic oil cooler with thermal bypass

Operator Station

- Scratch resistant 12.7 mm (1/2 in) tinted polycarbonate windows
- Side windows double as escape routes
- Heater/air conditioner
- Fire extinguisher
- 360° lighting package
- Hydraulic tilt cab
- Isolation mounted cab



Structures

- Large engine side covers
- Heavy-duty engine and radiator house
- Purpose-built blade with wear resistant front cutting edge
- Optional brush sweeps
- Heavy frame articulation points
- Full 40° articulation with frame lock
- Adjustable log bunks with floating cam stakes

Loader Features

- Rear mounted loader with durable rack and pinion swing system
- Wrapped hoses
- Full load high reach boom
- 250° rotation
- European style butt-bypass grapple with high strength steel dampener



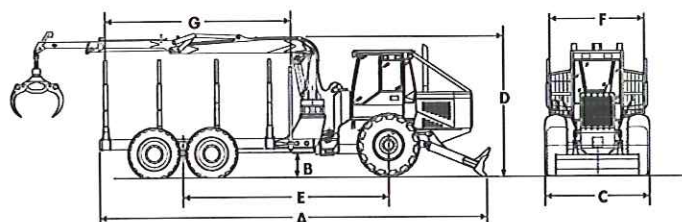
Cat forwarders have proven, over-sized components including heavy-duty axles and torque converter power shift transmission. The spacious, comfortable operator station is designed for exceptional visibility.

Forwarder General Specifications

Axle Front
Axle Rear
Front Axle Bogie lift
Engine
Standard Engine kw
Standard Engine hp
Fuel
Standard Tire Front
Standard Tire Rear
Optional Tire Front (other sizes available on request)
Optional Tire Rear (other sizes available on request)
Transmission
Gears
Maximum Forward Speed
Variable displacement load sensing piston pump
Flow @ 2200 rpm
Reservoir Capacity
Loader with Telescopic Boom - 6.93m (22 ft, 9 in) Reach
8.53 m (28 Sq ft) Clam Bunk
Bogie Tracks
Standard Operating Weight
Load Capacity
Load Capacity with Clam Bunk Attachment

564, 6-Wheel	574, 8-Wheel
Funk 1200	NAF Bogie (HD)
NAF Bogie (HD)	NAF Bogie (HD)
	Optional
Cat C6.6 ACERT	Cat C6.6 ACERT
129	129
173	173
178 L (47 gal)	178 L (47 gal)
28 L x 26	700/50 x 26.5
700/50 x 26.5	700/50 x 26.5
30.5 x 32	800/50 x 26.5
800/50 x 26.5	800/50 x 26.5
Electric Power Shift	Electric Power Shift
4/4	4/4
23.33 km/h (14.5 mph)	23.33 km/h (14.5 mph)
PVG 100 cc	PVG 100 cc
250 l/m (66 gpm)	250 l/m (66 gpm)
121 L (32 gal)	121 L (32 gal)
Standard	Standard
Optional	Optional
Optional	Optional
16,330 kg (36,000 lbs)	17,237 kg (38,000 lbs)
13,608 kg (30,000 lbs)	14,525 kg (32,000 lbs)
11,793 kg (26,000 lbs)	11,793 kg (26,000 lbs)

Forwarder Basic Dimensions



A. Length (With Blade Raised)
4.88 m (16 ft) Bunk
5.64 m (18.5 ft) Bunk
B. Ground Clearance
C. Width with Standard Tires
D. Transport Height
E. Wheel Base
4.88 m (16 ft) Bunk
5.64 m (18.5 ft) Bunk
F. Load Stake Width (Inside)
G. Length of Wood Bunk
Optional Length

564, 6-Wheel	574, 8-Wheel
10.21 m (402 in)	10.21 m (402 in)
10.97 m (432 in)	10.97 m (432 in)
579 mm (22.8 in)	579 mm (22.8 in)
2997 mm (118 in)	3048 mm (120 in)
3581 mm (141 in)	3581 mm (141 in)
5334 mm (210 in)	5334 mm (210 in)
5715 mm (225 in)	5715 mm (225 in)
2591 mm (102 in)	2591 mm (102 in)
4.88 m (16 ft)	4.88 m (16 ft)
5.64 m (18.5 ft)	5.64 m (18.5 ft)

For more complete information on Cat® products, dealer services, and industry solutions, visit us on the web at www.cat.com/forestry

© 2012 Caterpillar Inc.
All rights reserved

Materials and specifications are subject to change without notice. Featured machines may include additional equipment. See your Cat dealer for available options.

CAT, CATERPILLAR, SAFETY.CAT.COM, their respective logos, "Caterpillar Yellow" and the POWER EDGE trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

AEHQ6299
CATFWD-2(04-12)



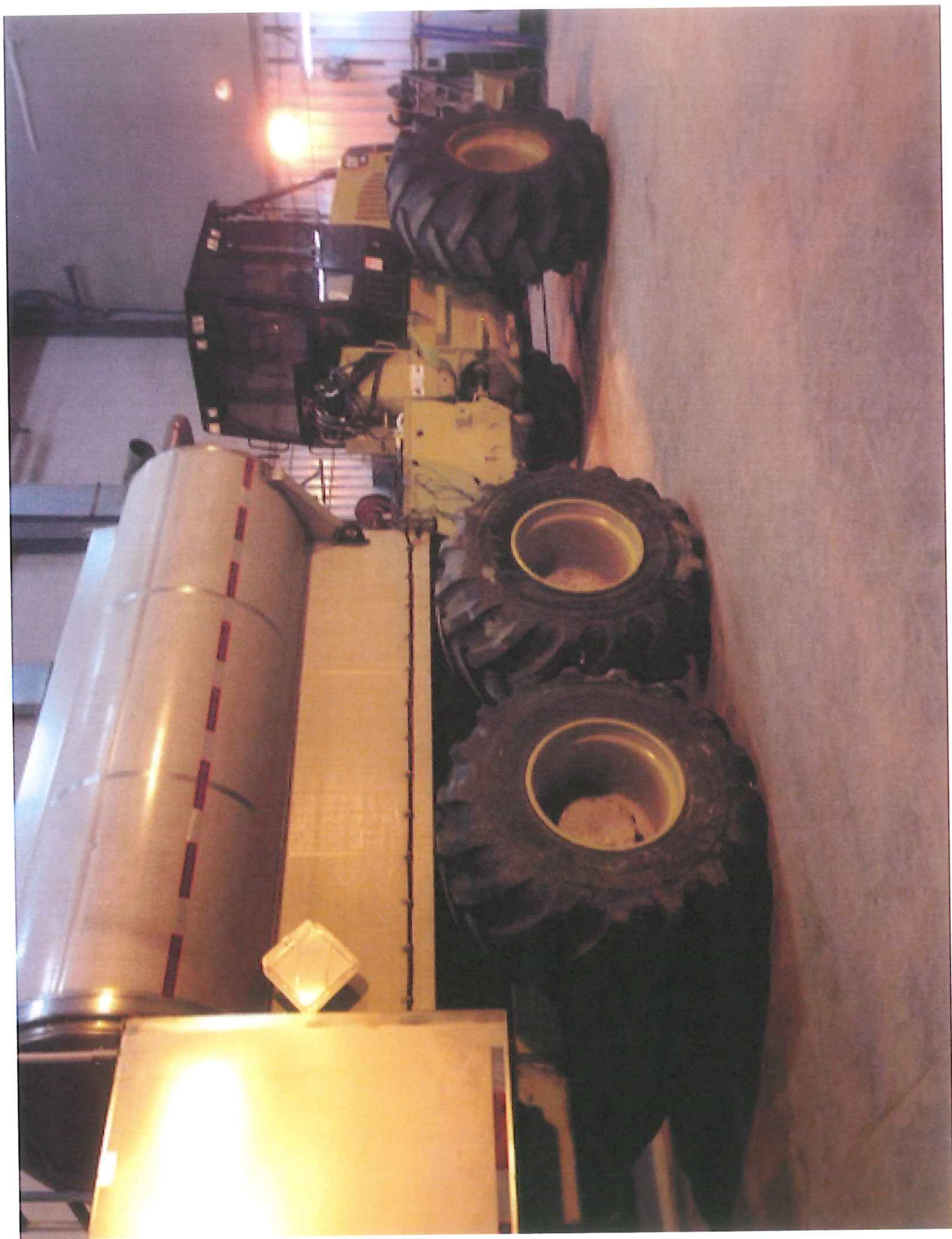


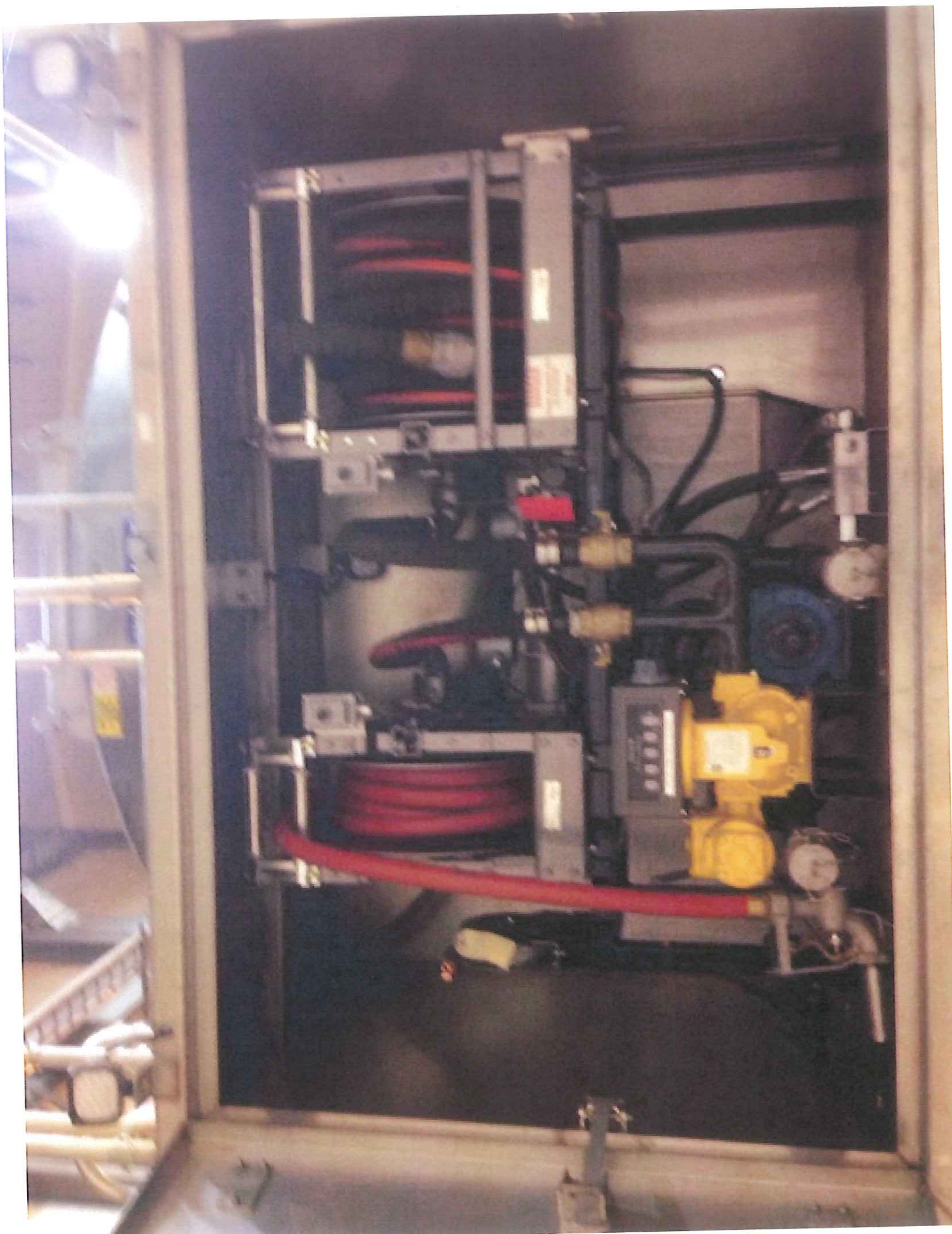
The following is a more in depth link to the CAT forwarder:

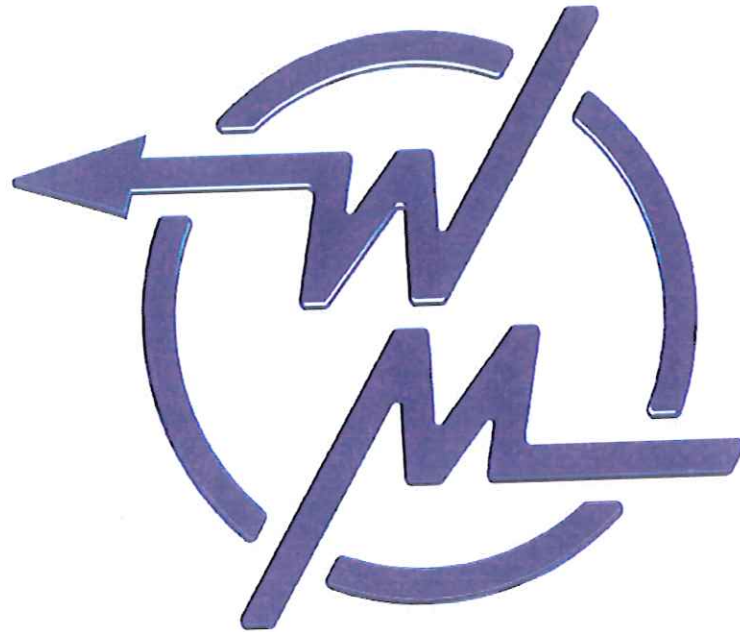
http://www.cat.com/en_US/products/new/equipment/forwarders/forwarder/14134103.html











←WEST-MARK

**OPERATOR AND MAINTENANCE
MANUAL 2015**

TRUCK TANKS

TO OUR VALUED CUSTOMERS

West-Mark stainless steel tanks are fabricated with high quality stainless steel and to our exact standards. However, while stainless steel is resistant to corrosion in many applications, corrosion still can occur. Chloride, sulfides, bromine iodine and salt compounds as well as stagnant water can cause pitting and corrosion cracking. For this reason, we recommend that you care for and maintain your stainless steel tanks in accordance with instructions contained in this manual. If you have questions, please call us at (800) 692-5844.

**For Sales or general information please contact us at
Toll free: 800-692-5844 fax (209) 603-9817
or visit our website at www.west-mark.com**

**West-Mark Manufacturing
581 Industry Way
Atwater, CA 95209**

**West-Mark Corporate Offices
2704 Railroad Ave.
P.O. Box 100
Ceres, CA 95307**

**West-Mark Service Center
303B Mt. Vernon Ave.
P.O. Box 70186
Bakersfield, CA 93387**

**West-Mark Service Center
3050 Van Horn Road
Fairbanks, AK 99709**

**West-Mark Service Center
2704 Railroad Ave.
Ceres, CA 95307**

INTRODUCTION

West-Mark has provided you with one of the finest liquid bulk transport vehicles available today. Materials and components have been carefully chosen to give long periods of trouble free service.

Your new vehicle has been specifically designed to haul certain cargos within reasonable weight and temperature range restrictions. West-Mark equipment is built in full compliance with latest *U. S. Department of Transportation* regulations.

This Owners Manual has been printed as a general reference for the standard specifications and may not cover all the options that are on your vehicle. For more information on components not covered herein, refer to the manufacturers and/or chassis maintenance and service instructions supplied by West-Mark. Additional information may be obtained through the *Truck Trailer Manufacturing Association (TTMA) Recommended Practices (RP) and Technical Bulletins (TB)*:

**Truck Trailer Manufacturing Association
1020 Princess Street
Alexandria, Virginia 22314
(703) 549-3010 Fax (703) 549-3014**

Proper operation of your West-Mark tanker vehicles includes skilled, professional driving habits and knowledge of the products being transported. Many commodities are regulated by federal and state codes. Safe, legal and profitable operation requires the operator and driver to know the properties of the commodities being transported, including safe procedures for loading, unloading and handling of accidents and spills. If you are not certain about the requirements for commodities to be transported, contact the shipper.

Maintenance should begin with the purchase and subsequent usage of the vehicle. Regular service and preventive maintenance will prolong the useful life of the equipment. West-Mark and it's authorized repair facilities know your equipment and stand ready to serve. Return to authorized West-Mark facilities for maintenance service and other assistance you may require. For information and/or the name and address of the nearest authorized dealer or West-Mark Service Center, call (800) 692-5844 or (209) 537-4747. Visit our Website at www.west-mark.com.

IMPORTANT SAFETY INSTRUCTIONS

READ ALL INSTRUCTIONS AND WARNINGS BEFORE USING THIS PRODUCT.

COMMON SENSE AND CAUTION ARE FACTORS WHICH CANNOT BE BUILT INTO ANY PRODUCT. THESE FACTORS MUST BE SUPPLIED BY THE OPERATOR. PLEASE REMEMBER:

- DO NOT go underneath vehicle while engine is running.
- DO NOT work near rotating driveshaft or components and prevent getting caught or entangled.
- DO NOT attempt to operate the controls of the power take-off or other driven equipment from beneath the vehicle with the engine running.
- DO NOT attempt to operate the controls of the power take-off or other driven equipment in any position that could result in getting caught in the moving machinery.

It is the responsibility of the owner / operator of this equipment to comply with all Federal, State and Local regulations including your Confined Space Program, before entering a tank. As a minimum, establish requirements for maintenance, training, operating, and testing of the equipment. All operating personnel must be thoroughly knowledgeable with the regulations and the data supplied with the unit when handling the many and varied hazardous materials encountered.

WARNING: Transportation Tanks may be subject to Confined Space hazards. Work inside the cargo tank must be performed in accordance with the regulations of the Occupational Safety and Health Administration (OSHA) found in 29 CFR 1910.146.

TABLE OF CONTENTS

INTRODUCTION	1
SAFETY GUIDELINES.....	3
PRE-TRIP SAFETY INSPECTION	3
OVER-THE-ROAD SAFE HANDLING	3
LOADING AND UNLOADING SAFETY	4
RECOMMENDED PREVENTATIVE MAINTENANCE	7
COMPONENTS & ACCESSORIES	8
LADDERS & WALKWAYS.....	8
MANHOLE.....	8
VENTING & CLEANOUTS	10
MAINTENANCE OF TANKS AND VESSELS.....	11
CORROSION PREVENTION FOR STAINLESS STEEL TANKS	11
CORROSION PREVENTION FOR ALUMINUM TANKS.....	13
IDENTIFICATION OF VENTS, DRAINS, VOIDS AND VAPOR RETURN SYSTEMS (TTMA TB#96)	14
INSPECTION AND MAINTENANCE OF CARGO TANK BARRELS (TTMA TB#80)	16
CARGO TANK VEHICLE OPERATING INSTRUCTIONS.....	18
GENERAL OPERATING INSTRUCTIONS.....	18
SANITARY / NON-SANITARY TRANSPORT UNITS - NON-CODE	19
SPECIFICATION CARGO TANK UNITS (TTMA #80).....	22
DOT 407 & DOT 412 UNITS TYPICAL VAPOR RECOVERY LINES (TTMA TB#122)	25
VACUUM / PRESSURE TRANSPORT UNITS.....	26
HOT PRODUCTS TRANSPORT UNITS (TTMA TB#75 Apr. 2006)	29
ORDERING SERVICE & REPLACEMENT PARTS.....	33
REPORTING SAFETY DEFECTS.....	33

SAFETY GUIDELINES

PRE-TRIP SAFETY INSPECTION

Before each trip, for your safety and the safety of the motoring public, your vehicle should be inspected for deficiencies and proper corrective action taken in the following areas. Read and follow all safety and operation manuals from the chassis manufacturer before operating any equipment.

- ✓ **TIRES** – Check tires for cuts, bruises, bulges, tread wear, improper air pressure.
- ✓ **RIMS** – Check rims for cracks and deformation.
- ✓ **WHEELS** – Check wheels for cracks in spokes, discs, rim clamps or hubs. Check for leaking of bearing lubricant at seals or hub caps.
- ✓ **BRAKE SYSTEM** – Check brake systems for air leakage with and without service brakes applied. Air reservoirs should be completely drained of moisture daily in order to maintain air supply volume provided and to minimize cold weather freeze-up. Antifreeze solutions if used should only be introduced in the system through the tractor mounted evaporator and be an approved type. *Additionally, if your brake system is equipped with ABS; a visual inspection is required to assure the system is operating properly. See your ABS manual for instructions.*
- ✓ **SUPPORTS** – Check trailer supports for proper operation and brakes intact in the event they are needed due to breakdown in route. **CAUTION:** Never set a loaded trailer down on supports that are not intended for this purpose, or if a multiple compartment tank, do not set on supports if front compartment is loaded. If an air operated suspension is used, never set a loaded trailer on supports unless the suspension has been purged of air pressure.
- ✓ **EQUIPMENT SECURITY** - Spare tire, hoses, tools, fittings and emergency equipment properly secured in respective carriers with chains, latches, etc. in good restraining condition.
- ✓ **LIGHTING SYSTEM** - All lights must perform their proper function when activated and be clearly visible.
- ✓ **TRUCK MOUNTED TANKS** - Check tie-down fastener assemblies to be sure they are intact and secured.
- ✓ **PULL TRAILER TANKS** - Check draw bar, safety chains or cables, hinges, hitch, towing hitch, towing eye (or corresponding device) for abnormal wear, fastener tightness, weld cracks or cracks in components. Check electrical connector for good electrical contact and mechanical security. Electrical cable and air hoses should be free of cuts and abrasions.
- ✓ **Do Not Load Damaged Tanks.**
- ✓ **LADDERS/ WALKWAYS** - ladder(s) and walkway(s) must be inspected thoroughly before they are used by the operator. If ladder(s) or walkway(s) is damaged or not properly secured, they should not be used. Any damaged ladder(s) or walkway(s) must be properly repaired before any use. Ladders are for tank maintenance only.
- ✓ **SAFETY DEVICES** - a visual inspection is required on all safety devices before operating this equipment. Devices such as Bumpers, Underride bumpers, Overturns, Shear sections, Manholes, Plumbing, Valves, Vents, and Shutdown devices must be free of damage before operating this equipment.
- ✓ **CODE TANKS** - Do not load a cargo tank in which test and inspection markings of 49 CFR 180.415 have expired.

OVER-THE-ROAD SAFE HANDLING

YOUR AND OUR SAFETY

Frequently tanks are used to carry products that are hazardous, flammable, or at high temperature. When operating a tank trailer loaded with a hazardous material, you have a double obligation to yourself and the public to drive safely. Traffic accidents that cause a spill can turn into disasters. **YOU - THE OPERATOR** - have control of the most important factors that affect vehicle stability. Tank vehicles are important tools in our transportation industry -- and, like any tool are safe in the hands of a properly qualified operator.

FACTORS WHICH PROMOTE OPERATIONAL SAFETY

The fifth wheel should be securely mounted to the tractor frame.

The drivers should be familiar with the characteristics of the particular tank trailer and the load being transported.

The driver should be familiar with the nature of the roads and traffic which may be encountered during the trip.

STABILITY

WARNING: Like any other vehicle, cargo tank motor vehicles can tip or slide out of control if turns are negotiated at too high a speed or when making violent maneuvers such as abrupt lane changes or other evasive actions to avoid obstacles.

Within the relatively narrow confines of road laws limiting vehicle size and weight, together with the characteristics of available tires, suspensions, and other components, there is little that a cargo tank manufacturer can do to affect the inherent stability of a trailer other than keeping the bottom of the tank as low as practicable considering the requirements of mounting structures and other appurtenances. This means that the major factor affecting operational stability is the knowledge and skill of the driver. Based upon accident reports (which happen infrequently considering the volume of traffic involved) are:

- Excessive Speed.
- Violent swerving or turning.
- Application of brakes or tractor power while turning.
- Entering curves at too high a speed which is probably caused by one of the following factors: Traveling at freeway speeds for long periods of time and failing to recognize the high speed of travel and reducing it before entering freeway interchanges and other curves requiring a reduced and controlled speed; or lack of familiarity with the vehicle characteristics to recognize its safe speed with relation to posted speed limits on curves which are usually determined with automobile traffic in mind. Failure to reduce speed sufficiently when approaching congested traffic such as might be found at traffic signals on highways. With the advent of today's more powerful and higher torque engines, the original practice of maintaining momentum to avoid acceleration in traffic is outmoded.

TIRE CHARACTERISTICS

High-pressure truck tires have different characteristics under high speed cornering conditions than do passenger car tires. As an example, it is fairly common knowledge that a skilled race car driver can consistently "drift" his racer around tight turns where very high lateral "g" forces are encountered. However, truck/trailer tires which are designed for carrying high loads over long distances have substantially different characteristics, and their lateral stability becomes unpredictable when lateral forces approach 0.4g. This means that trailer tanks, truck tanks, or other commercial vehicles must be operated in a conservative manner when cornering.

BRAKING AND ACCELERATION

Either braking or accelerating while cornering can significantly reduce the stability of the vehicle and should be avoided. The best driving practice is to decelerate to a safe conservative speed before entering a corner or approaching congested traffic, and then to apply only very moderate power until an essential straight path has been reestablished. **CAUTION: If your trailer is equipped with ABS braking please review all of the brake manufacturers literature accompanied with this manual. Only trained personnel should operate this system.**

HANDLING PARTIALLY LOADED TANKS

It is an accepted fact that liquid cargo tanks filled to their normal capacity (with 5% outage or less) handle essentially the same as a similar vehicle with a solid load. However, as the tanks are partially loaded due to product density or legal requirements in the case of compressed gases, the mobility of the load or "sloshing" can be detected and must be taken into account in establishing safe driving practices. In general, a downloaded tank will be less stable under cornering and braking conditions than an ordinary liquid tank loaded to its normal capacity. This factor must be given full consideration when determining the handling characteristics of the vehicle and establishing knowledge required for safe driving of the vehicle. A specific suggestion is that the driver of a downloaded tank should learn the characteristics of the load and handle his braking efforts accordingly for smoothest stopping. It is also good practice to keep the brakes on full for a few moments after coming to a stop to avoid vehicle movement in the event that the braking sequence has developed a wave action in the tank.

LOADING AND UNLOADING SAFETY

WARNING: Only qualified and trained personnel should operate, load, or unload tank trailers. Trailers should not be loaded or unloaded while supported by landing gear.

AT TERMINALS, LOADING AND UNLOADING SITES

The shipper and/or carrier should establish safe operating procedures and instructions for each application for loading and unloading of cargo tanks. Since each of these involve not only the cargo tank being used but also varied types of valving,

storage, safety equipment at each location, it is not possible to establish a single procedure for all applications. As a minimum, the instructions should include but not be limited to the following items:

1. Description of the product and its hazardous characteristics.
2. Check for proper shipping papers, marking, and placards.
3. Protective clothing and equipment to be used by the operator.
4. Knowledge of the location and use of safety equipment in the area including safety showers and eye wash fountains.
5. Knowledge of location and use of First Aid equipment and location of dispensary or medical facility at each location.
6. Instructions to check all equipment on cargo tank for proper operation before loading (i.e. vents, gaskets, pressure gauges, connections, etc.)
7. Detailed loading procedure.
8. Detailed unloading procedure.
9. Detailed procedure for removing pressure from cargo tank (if pressure unloaded) after unloading and securing empty cargo tank for return trip.
10. Washing or cleaning instructions if required (many acids react violently upon the addition of water to the acid).
11. Procedure to be used in case of spills or leaks.
12. Understanding of what happens if the cargo tank is over-pressurized and a relief valve or rupture disc blows; especially the sudden noise that occurs and the discharge of air, gas, vapor, or liquid and vapor which ensues.
13. Understanding of how easily a cargo tank can be collapsed due to vacuum if it is pumped off without an operable vacuum vent, top valve, fill cover, or manhole cover being open to allow air to replace the material being pumped out.

VACUUM DAMAGE

A vacuum can occur in the following manners. After a tank has been used, it often times is cleaned by steaming. This is usually done by dropping a steam hose into the manhole or especially adapted spray balls are dropped into the cleanouts. Steam is then introduced into the vessel for a period of time. This steam displaces the normal atmosphere in the tank. If this vessel is then allowed to cool with manholes and discharge valves closed, the almost certain result is a "sucked in" tank. Vacuum damage occurs as follows. When this steam cools and condenses back to water, it leaves a vacuum. Partial vacuums can be created other ways also. The same amount of cool air takes up less volume than hot air. If hot air is allowed to cool in a tank without proper venting, the possibility of vacuum damage exists.

If the contents of a tank are discharged without a manhole or valve being opened at the top of the tank, there will be a heavy vacuum pulled in the tank with certain severe damage. Most tanks have vents to protect them from vacuum. These vents are usually small and will not give enough venting for the severe use of the above cases. Nevertheless, these vents should be kept clean and in operational condition. These vents are necessary for the slow changes in temperature that a tank undergoes.

When tank temperatures are changed:

1. If the temperature of a tank has to be changed, make the change as evenly and as slowly as possible.
2. When an empty tank is hot, make certain a valve or manhole is left open to prevent vacuum damage. Never depend on a vacuum vent to accomplish this.
3. As part of a repair maintenance program, inspect the inside of a tank frequently; if buckles are present, have them repaired promptly before more damage is done.

HEAT

Your heat pad is designed to withstand certain operating temperatures and pressures. Exceeding the design pressure/heat is unsafe and could severely damage your tank!

PREHEATING

Heating of an unloaded tank through a heat pad/pan or internal coils is not recommended and highly discouraged. Application of heat on an empty tank through the pad, especially high-pressure steam, cause rapid heating of some shell areas before the heat is able to evenly warm other areas. This irregular heating can cause belly sections to buckle. Heats beyond designed ranges will void any warranties.

NOTE: If preheating is necessary, steam or hot air should be introduced through the manhole. Leave the manhole open and drain condensate out through the piping.

CAUTION: Avoid closing a heated or preheated tank empty of product. Rapid cooling could cause severe vacuum damage to the tank shell.

MAINTENANCE

Pressure relief valves, steam traps, and related fittings for your heat pad require little maintenance. Prior to application of heat to any tank, check the relief valve to insure its operability. (Operate the handle to insure movement of spring and depressor.) In extreme cold weather insure that valves, traps, and pad do not retain water after use. Moisture contained internally in these parts when freezing could expand enough to rupture fittings and lines and cause failure of the system.

Prior to any heating operation insure that relief valves and traps are not rendered inoperable. Especially check during freezing weather to insure that the relief vents are not frozen. During such weather, preheating the vent should be the accepted practice.

RECOMMENDED PREVENTATIVE MAINTENANCE

In addition to the pre-trip daily inspection, the services listed below are suggested maintenance service interval guide for keeping your equipment in peak operating conditions. These suggested service intervals will add thousands of operating miles and many years of trouble-free service to the life of your tank trailer.

Note: All maintenance periods are recommendations based on average operating conditions. Vehicles operated principally on gravel or dusty roads, through unusual amounts of water or a corrosive environment may require maintenance more frequently and should be serviced as required.

Please read and follow the schedule maintenance requirements of the chassis manufacturer.

DOT regulations require that MC and DOT specification cargo tanks be inspected periodically per 49 CFR 180.407. Any repair or alteration to a non-ASME MC or DOT specification cargo tank shall be done by a shop possessing an ASME "U" or a National Board "R" stamp. Any repair or alteration to a MC or DOT specification cargo tank built to the ASME Code shall be done by a shop possessing a National Board "R" Stamp.

The cargo tank barrel of a cargo tank trailer serves the dual purpose of product retention and carrying the weight of the product in addition to the weight of the barrel itself. The tank barrel is strongest when it is in its originally manufactured condition. A substantial amount of its load bearing capability is lost if buckling or distortion occurs in the tank shell due to an accident, overloading or any of the following:

- Fast filling of hot product in a cold cargo tank that has not been prewarmed by other means that are not detrimental to the cargo tank, lading and/or safety of the loader or operator. Slow initial filling should be considered.
- Loading with product that is hotter than the maximum temperature rating of the cargo tank.
- Vacuum created by the unloading process (or by cargo tank cooling after unloading) with manhole closed and vents plugged with solidified materials or otherwise rendered inoperative.
- Repeated travel over rough roadways at speeds that are not reasonable for longevity of any type of vehicle.
- Operating a cargo tank at a continuous speed at which the resonant frequency (vibration) is at its peak. Every trailer has such a frequency and a change in speed of two or three miles per hour either faster or slower reduces the vibration out of the peak range.

The structural integrity of the cargo tank vehicle must be maintained. It is recommended that the cargo tank barrel and all internal members be checked regularly at intervals as follows. Corrective repairs should be made as soon as possible.

Observe the day-to-day care recommendations. Watch for the symptoms described under Nonscheduled Maintenance above and have any needed adjustments made promptly at your local West-Mark Service Center. Use only the recommended lubricants and parts conforming to West-Mark specifications. Chassis lubricant requirements must be followed.

West-Mark parts are designed and built for best performance and reliability in your tank. Using these parts for replacements is your assurance the West-Mark quality stays in your equipment.

WARNING: Transportation Tanks may be subject to Confined Space hazards. Work inside the cargo tank must be performed in accordance with the regulations of the Occupational Safety and Health Administration (OSHA) found in 29 CFR 1910.146.

COMPONENTS & ACCESSORIES

LADDERS & WALKWAYS

Ladders and walkways must be inspected thoroughly before they are used by the operator. If ladder(s) or walkway(s) is damaged or not properly secured, they should not be used. Any damaged ladders or walkways must be properly repaired before any use. Ladders are for tank maintenance only.

MANHOLE

The gasket should be checked to see that it is seating properly. See that there are no nicks, cuts, or abrasions. With age, a woven gasket will get frayed and porous and lose some of its Teflon dispersion and a hypalon may crack from brittleness or have nicks and cuts. These gaskets should be replaced.

The hinge assembly should be checked for wear, corrosion, and binding. If lock pins and keys show wear, they should be replaced. If swing bolts are bent or twisted or if the threads are galling, the swing bolt and wing nut should be replaced.

Check overall manhole to see that all welds are intact. Be sure that there is no distortion in manhole collar or cover. Should there be distortion, the situation should be remedied. Also, the rest of the unit should be checked because this indicative of over pressurization.

CAUTION: Care should be taken when opening manhole. Be sure tank has been depressurized. There may be a slight amount of pressure or vacuum remaining in the tank. Be prepared for a rush of air or fumes in or out of manhole opening.

MAINTENANCE OF MC306 & DOT 406 MANHOLE ASSEMBLIES AND/OR FILL ASSEMBLIES (TTMA TB#92, Apr. 2006)

Manhole assemblies, fill assemblies, and venting devices shall be inspected with sufficient frequency, but no less than once a month, and with due regard to the products carried to insure a liquid and vapor tight seal and proper operation of venting devices. Contact the manhole assembly manufacturer for more detailed maintenance instructions.

Inspect the entire manhole and/or fill assembly for damage, corroded areas or other conditions that could impair their function or product retention capability. Pay particular attention to any closure assembly, gaskets, clamping ring, fusible plugs and venting devices.

Closure Assembly: Inspect the manhole cover for damage and hinges, latches and pins for wear or corrosion that could impair the product retention integrity of the closure assembly. If the product retention capability of the cover assembly is impaired, it should be repaired or replaced. Failure to do so can result in vapor or product leakage.

Gaskets: Check the condition of all manhole assembly gaskets and replace if their effectiveness as a seal is impaired in any way. Worn, torn, or deteriorated gaskets may result in product or vapor leakage. Seal surfaces must be free of nicks, rust, product deposit or other foreign material. Replacement gaskets must be compatible with products carried. Failure to follow the above procedures can result in vapor or product leakage.

Clamping Ring: Check the tightness of the bolt securing the clamping ring. Tighten if necessary. When tightening the bolt or reassembling the ring, tap the clamping ring at various points to insure equal clamping around the periphery of the manhole. Also, open the pressure relief valve/fill cover prior to tightening the ring, if it is so equipped. Failure to follow the above procedures can result in liquid or vapor leakage.

Fuse Plugs: Check for damage to the fuse metal and the plug itself. When reinstalling, follow the manufacturer's recommendation.

Venting Devices: Inspect pressure relief valves and normal pressure/vacuum valves with sufficient frequency, but no less than once a month, to insure they are operational. Corroded parts must be replaced. Valves that are filled with residue must be cleaned. If venting devices are not operational, do not operate the cargo tank until the venting devices are repaired or replaced. Failure to follow this procedure can result in liquid or vapor leakage and tank damages.

WARNING: Transportation Tanks may be subject to Confined Space hazards. Work inside the cargo tank must be performed in accordance with the regulations of the Occupational Safety and Health Administration (OSHA) found in 29 CFR 1910.146.

INCOMPLETE VEHICLE DOCUMENT FOR TRUCK MOUNTS (New Equipment Only)

MANUFACTURED BY: _____

DATE OF MANUFACTURE _____ no. _____ yr

INCOMPLETE VEHICLE MANUFACTURED BY: _____

DATE INC. VEH. MFD. _____ no. _____ yr

GVMR _____

GAINR FRONT _____ with _____

_____ ems, 0 _____ psi acid _____

GAINR INTERMEDIATE (1) _____ with _____

_____ ems, 0 _____ psi acid _____

GAINR INTERMEDIATE (2) _____ with _____

_____ ems, 0 _____ psi acid _____

GAINR REAR _____ with _____

_____ ems, 0 _____ psi acid _____

CONFORMITY OF THE CHASSIS-CAB TO FEDERAL MOTOR VEHICLE SAFETY STANDARDS, WHICH HAVE BEEN PREVIOUSLY FULLY CERTIFIED BY THE INCOMPLETE VEHICLE MANUFACTURER OR BY THE INTERMEDIATE VEHICLE MANUFACTURER, HAS NOT BEEN AFFECTED BY FINAL STAGE MANUFACTURE. THE VEHICLE HAS BEEN COMPLETED IN ACCORDANCE WITH PRIOR MANUFACTURER'S INSTRUCTIONS, WHERE APPLICABLE. THIS VEHICLE CONFORMS TO ALL OTHER APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT IN _____ (MONTH, YEAR)

VEHICLE IDENTIFICATION NO: _____

VEHICLE TYPE: _____

DANGER, CAUTION DECALS

The use of a tank trailer often requires the handling of liquid materials, which are potentially hazardous. For the safety of the operator and the public, as well as to avoid damage to expensive equipment, it is important to acquaint yourself with the warnings listed. These warning decals are posted at appropriate places along the tank and should be explicitly followed.

It should be noted that these decals are not exhaustive and cannot cover all of the possibilities that could occur while hauling cargo. Therefore, the user must satisfy himself that his safety, the safety of the public, the integrity of the trailer and lading are not jeopardized.

During the course of time these decals may become illegible or wear off of the area they were attached to. In this case, please feel free to contact the Service Parts Department of West-Mark for replacements as required.

Part No.	Decal Description
P3-0910300	WEST-MARK (BLUE & SILVER STICKER)
P3-0920080	CAUTION: OPEN MANHOLE BEFORE UNLOADING.
P3-0920500	DANGER: DO NOT EXCEED WORKING PRESSURE (SEE MANUFACTURING DATA PLATE FOR WORKING PRESSURE).
P3-0920900	DANGER: PRESSURE RELIEF DEVICE MAY OPEN WITHOUT WARNING. STAY CLEAR TO AVOID INJURY.
P3-0920600	DANGER: RELIEVE PRESSURE BEFORE OPENING MANHOLE, PURGE TANK VOIDS-VAPOR COLLECTOR BEFORE ENTERING OR REPAIRING.
P3-0930000	DANGER: CLEAN TANK BEFORE ENTERING OR REPAIRING. AFTER CLEANING, KEEP MANHOLE OPEN UNTIL COOL
P3-0930100	DANGER: WATCH YOUR STEP. USE HANDRAIL AT ALL TIMES.
P3-0930200	DANGER: HOT STEAM UNDER EXTREME PRESSURE
P3-0930250	DANGER: PRODUCT DISCHARGE VALVE USE WITH CAUTION.
P3-0930300	DANGER: PRODUCT DISCHARGE VALVE (USE WITH CAUTION). DISCHARGE HOSE MUST BE CONNECTED BEFORE OPENING DISCHARGE VALVE. RELIEVE PRESSURE IN HOSE BEFORE DISCONNECTING.
P3-0930400	DANGER: SPRING BREAK CHAMBERS ARE UNDER EXTREME PRESSURE. RELEASE OF COVER WITHOUT PROPER CAGING COULD RESULT IN EXTREME INJURY OR DEATH. CAGING OF SPRING BRAKES RENDERS TRAILER EMERGENCY BREAK-AWAY SYSTEM INOPERATIVE.
P3-0930500	DANGER: THIS TANK MAY CONTAIN HOT PRODUCTS.
P3-0930600	DANGER: DO NOT EXCEED INDICATED MAXIMUM PRESSURE OF HEATING SYSTEM.
P3-0920700	DANGER: THIS UNIT IS EQUIPPED FOR TRANSIT HEAT ONLY, DO NOT USE STEAM OR INJURY COULD OCCUR.
P3-0920150	EMERGENCY SHUT OFF (LEFT)
P3-0920100	EMERGENCY SHUT OFF (RIGHT)
P3-0930650	WARNING: YOUR TANK HAS BEEN DESIGNED AND BUILT TO TRANSPORT A SPECIFIC PRODUCT OR PRODUCTS. IT HAS NOT BEEN DESIGNED TO STORE PRODUCTS. STORING EVEN SEEMINGLY NON-CORROSIVE PRODUCTS FOR EVEN SHORT PERIODS OF TIME CAN DAMAGE YOUR TANK. MOST IMPORTANTLY, ALWAYS CHECK TO MAKE SURE YOUR PRODUCT IS COMPATIBLE WITH THE TANK MATERIAL. IF YOU EVER HAVE ANY QUESTIONS, CONTACT WEST-MARK.
P3-0930800	CAUTION: AFTER FIRST TRIP, TIGHTEN WHEEL NUTS TO RECOMMENDED TORQUE TO AVOID LOOSE OR MALFUNCTIONING WHEEL.
P3-0930900	CAUTION: RELIEF VALVE MUST BE OPERATIONAL, CLEAN AND CHECK BEFORE EACH LOAD.

P3-0940000	CAUTION: CLOSE VALVE DURING TRANSIT
P3-0940200	CAUTION: NOT A WORKING PLATFORM, FOR ACCESS ONLY.
P3-0940250	CAUTION: THIS IS NOT A STEP.
P3-0940300	CAUTION: MAXIMUM STEAM PRESSURE 150 LBS.
P3-0940400	CAUTION: MAXIMUM STEAM PRESSURE 225 LBS.
P3-0940500	CAUTION: DO NOT CIRCULATE STEAM OR OTHER HOT FLUIDS THROUGH THE HEATING PANEL UNLESS THERE IS PRODUCT IN THE TANK.
P3-0940510	CAUTION: AFTER STEAM CLEANING KEEP MANHOLE OPEN UNTIL TANK HAS COOLED.
P3-0940550	SUSPENSION DECALS (TORQUE/MAINT. REQUIRED)
P3-0900050	VI-UC-T-P-L-K
P3-0940600	IMPORTANT: TIGHTEN ALL BOLTS EVERY 5,000-MILES.
P3-0940700	IMPORTANT: DISENGAGE CLUTCH BEFORE STARTING ENGINE.
P3-0940800	IMPORTANT: 4-WAY VALVE, PUSH HANDLE FOR VACUUM, PULL HANDLE FOR PRESSURE

For decals not listed, please call our customer service representative. They can assist you in providing additional decals not listed in this manual.

VEHICLE WEIGHT RATINGS

West-Mark tanks are designed to be operated within legal highway speeds on reasonable road surfaces in the service for which they are intended and to carry cargo within the limitations of the GAWR and GVWR as indicated on the Vehicle Identification Plate located on chassis door jam.

- Gross Axle Weight Rating (GAWR)* is the structural capability of the lowest rated member of the running gear components (i.e.: suspension and spring system, wheels, hubs, drums, rims, bearings, brakes, axles, or tires).
- Gross Vehicle Weight Rating (GVWR)* is the structural capability of the vehicle as supported by the axles. This is not to be interpreted to mean that the magnitude of loads appearing on the label can be carried legally on a highway.

Operation of the vehicle outside these limitations is against the manufacture's design criteria, and therefore, will void any responsibility on the part of the manufacturer. Never exceed chassis manufacturer's specifications.

THEORETICAL CALIBRATION CHARTS

The calibration chart provided is based on a theoretical level unit as measured from the bottom of the tank surface. Due to tank slope, built into each unit an adjustment must be made to level the tank, before gauging. If this step is not taken an inaccurate gallonage reading will occur. Due to outage built into tank, an extra capacity condition can occur if unit is filled to shell full condition.

VENTING & CLEANOUTS

Your unit is equipped with the proper number of venting devices for your particular code. These are attached to the nipples at the top of the tank. These fusible, frangible or solid caps can be removed for easy cleaning. Do not, however, replace or render inoperable the venting devices. They are a very important part of your tank's safety system. Periodically, inspect the caps and gaskets for evidence of leakage and replace defective parts. If your tank was built to DOT-406, DOT-407, or DOT-412 standards, periodically inspect the pressure relief and vacuum combination vents. Vents used on tanks are spring-loaded relief valves, fusible vents, rupture discs, positive actuated vents, open vents, and breather vents.

OPERATORS MUST HAVE PROPER VENTS IN PLACE AT ALL TIMES - Check DOT requirements and make certain conversion information indicated on Certification plates is complied with when tank used in multi speck service.

OPERATORS MUST KEEP VENTS IN A CLEAN OPERATING CONDITION AND SET PROPERLY - Vents clogged with viscous materials will not operate at design pressures.

When pressure unloading is used, equip pressure line with separate regulator or relief valve set to relieve at a pressure slightly below tank valve pressure to protect vessel and relieve air pressure before tank valve pops, which would discharge vapors.

During gravity unloading or pumping off on tanks not equipped with a vapor recovery system, prop manhole open as a safety factor to prevent vacuum collapse or buckle deformation.

After steam cleaning or hot solution cleaning, prop manholes open to prevent vacuum collapse of vessel during cooling.

CAUTION: Failure to keep vents in operating condition could result in over pressurization and/or serious vacuum damage.

If your tank is equipped with an air pressure line, close ball valve in line with relief valve to prevent product from corroding relief valve.

MAINTENANCE OF TANKS AND VESSELS

West-Mark manufactures many different styles and types of tanks for a large range of products to be hauled. Various types of materials are used. The tolerance level or resistance to corrosion can be affected by such things as temperature, contaminants, switch loading, condition of tank, chemical concentration and others. Because West-Mark has no control over these conditions, nor having the awareness of the actual chemical analysis of the commodities, we can only advise as to the compatibility of any particular tank material with various products. We cannot accept responsibility for corrosion of the tank beyond furnishing the specified material and reliable workmanship. It is up to the carrier, along with the shipper to determine if a particular tank material suits their needs. We warrant only that the materials are of the type specified and that the tank is manufactured of reliable workmanship.

Never exceed the design criteria on the tank manufacturing data plate, located on front side filler, driver side. The following data may include code, capacity, temperature, mawp, maximum product load, weight limits, etc.

WARNING: Your tank has been designed and built to TRANSPORT a specific product or products. It has NOT been designed to store products. Storing even seemingly non-corrosive products for even short periods of time can damage your tank. Most importantly, always check to make sure your product is compatible with the tank material. If you ever have any questions, contact West-Mark.

CORROSION PREVENTION FOR STAINLESS STEEL TANKS

West-Mark stainless steel tanks are fabricated with high quality stainless steel and to our exacting standards. However, while stainless steel is resistant to corrosion in many applications, corrosion still can occur. Chloride, sulfides, bromine iodine and salt compounds as well as stagnant water can cause pitting and corrosion cracking. For this reason, we recommend that you care for and maintain your stainless steel tanks in accordance with the attached bulletin entitled "Corrosion in General Purpose Stainless Steel Tanks." If you have any questions, please call us at (209) 537-4747.

EXTERIOR CLEANING OF STAINLESS STEEL

To keep your stainless steel trailer or components, bright and in "like-new" appearance, the following methods of cleaning stainless steel are recommended. This information on cleaning stainless steel has been supplied by the *American Iron & Steel Institute (AISI)*.

NOTE: Use of proprietary names for cleaners is only to indicate type of cleaner, it does not constitute any endorsement, nor is the omission of any proprietary cleaner imply its inadequacy. It is emphasized that all products should be used in strict accordance with instructions on package. In all applications a stainless steel wool or sponge, fibrous brush or pad is recommended. Avoid use of ordinary steel wool or steel brushes for scouring stainless steel.

1. Use the mildest cleaning procedure that will do the job effectively.
2. Rub in the direction of polish lines for maximum effectiveness and to avoid marring the surface.
3. Rinse thoroughly with fresh water after every cleaning operation.
4. Wipe dry to avoid watermarks.

ROUTINE CLEANING	Soap, ammonia, or detergent and water. Rub with cloth, rinse with clear water and wipe dry. Satisfactory to use on all finishes.
SMEARS AND FINGERPRINTS	Arcal 20; Lac-O-Nu; Lumin Wash; O'Cedar Cream Polish; Stainless Shine. Rub with cloth as directed on package. Satisfactory to use on all finishes.
STAINS AND LIGHT DISCOLORATIONS	Allchem Concentrated Cleaner; Samac, Twinkle; Cameo Copper Cleaner. Apply and rub with damp sponge or cloth. Satisfactory for all finishes if rubbing is light.
INDUSTRIAL ATMOSPHERIC STAINS	Oakite No. 33; Dilac; Texo 12; Caddy Cleaner; Permab 57; Flash-Klenz. Swab and soak with clean cloth, let stand 15 minutes or according to directions, then rinse and dry. Satisfactory for use on all finishes if rubbing is light.
GREASE AND OIL	Organic solvents such as kerosene; alcohol; acetone; carbon tetrachloride; benzene. Rub with cloth. Organic solvents may be flammable and/or toxic. OBSERVE ALL PRECAUTIONS AGAINST FIRE. Do NOT smoke while vapors are present. Be sure area is WELL VENTILATED. Rinse and dry. Satisfactory use on all surfaces.

Warning: Follow all requirements on material safety data sheet (MSDS). Wear breathing protection when using these products.

SANITARY (3-A) AND FOOD GRADE

When hot products are hauled, rinse and cool tank immediately after use. Your trailer is made of the finest known material for use in contact with dairy products, however, even stainless steel will deteriorate if correct cleaning procedures are not followed.

When hand brush method is used:

1. Rinse with cold water immediately after emptying. Before washing, rinse with water (100-115°F).
2. In a bucket of warm water, dissolve alkaline dairy cleaner in amounts of recommended by manufacturer of cleaner and brush all product contact surfaces.
3. Rinse with water below 115°F. Leave tank open and allow to drain dry.
4. Brush rinse with 100-ppm or spray with 200-ppm chlorine or other bactericide of proper strength. If a chemical bactericide is corrosive, apply just before filling tank.

IMPORTANT - Stainless steel surfaces which will not be completely covered by milk or dairy products within 20 minutes after application, must be rinsed free of any chemical bactericide to prevent continuing contact with and possible corrosion of stainless steel surface.

CAUTION: If this tank is refrigerated by direct expansion, **DO NOT** use water at temperatures higher than 115°F because of danger of developing high refrigerant pressures. Refer to tank precautions pertaining to the refrigeration system.

CARE AND MAINTENANCE OF STAINLESS STEEL TANKS AND PUMP SYSTEMS

West-Mark stainless steel tanks are fabricated with high quality stainless steel. Stainless steel resistant to corrosion in many applications but cannot be considered a cure for corrosion problems. Many chemicals and or solutions can cause pitting and stress corrosion cracking. Chlorine, sulfides, bromine iodine and salt compounds as well as stagnant water are all common offenders.

Any Chemical mixture or compound containing chlorine, (chlorides, chlorites, etc.), either as an ingredient or as a contaminant, can cause pitting or corrosion under certain conditions. Some can be hauled if the tank is thoroughly cleaned and dried after such service. Corrosion rates increase drastically as the temperature is increased, so minimum operating temperatures should be used and use of heating systems should be avoided. Also avoid leaving stagnant product or residue in a parked tank (over a weekend for example) as this will greatly accelerate attack.

Some unexpected sources of chloride pitting can be chlorinated solvents, sanitizing solutions, sugars, corn syrups, and animal or vegetable oil products containing salt. Tanks should be immediately flushed clean and dried after containing chlorinated solvents or the sanitizing solutions which are commonly found around dairy establishments.

The most important factor in promoting corrosion resistance (passivity) of 400 series stainless steel is to allow a chrome oxide layer to form on the surface of the metal. Therefore, when washing tanks, be certain to remove all small deposits of product or foreign material which will become starting points for pits (sometimes called deposit corrosion) and thoroughly air dry the tank allowing oxygen in the air to rebuild the chrome oxide layer.

We recommend that you undertake the following maintenance procedures:

- Open all pump drains and flush out sediment (weekly).
- Check and clean intake strainers (weekly or after each use).
- Check pump gearbox for proper oil level and traces of water.
- Operate pump primer with all pump valves closed.
- Operate changeover valve while pumping from booster tank (weekly).
- Check packing glands for excessive leaks.
- Operate all valves, including relief valve (weekly).
- Check all gauges for proper operation.
- Recalibrate flow meter according to manufacturer's instructions.
- Refer to manufacturer's recommendations for additional instructions.

As stated in the *International Service Training Association Manual*, we recommend the following:

- Drain the water tank completely once every week. The manhole should be kept open, all drains kept open and all valves and or "dumps" kept open to allow proper air "drying" of the tank! We recommend a visual internal and external inspection at this time.
- Circulate the tank water twice weekly.
- If anodes are installed, inspect them quarterly. Service and replace them per the manufacturers recommendations.
- As part of your annual inspection, all internal compartments should be visually inspected. After the inspection, the tank should be passivated before it is put back into service.
- As recommended by the International Service Training Association each fire department should keep records of fire apparatus maintenance. Each fire department should find a system that best meets its needs.

"Corrosion Protection in Stainless Steel Tanks – Precautions" (TTMA TB#101)

Stainless steel trailer tanks should not be used for storage. When it is used in normal service for transportation, the tank needs to be immediately cleaned and dried. Surface areas that are denied oxygen due to poor cleaning procedures that leave deposits or residue lack corrosion resistance because the characteristic passive film does not protect them. This often leads to localized corrosion such as pitting and crevice corrosion.

Stainless steels are susceptible to corrosion with products containing chlorides. Even in concentrations so low as to be expressed in parts per million, chloride containing products can cause corrosion problems, especially at slightly elevated temperatures. Stress corrosion cracking and under some conditions, weld decay, a form of intergranular stress cracking, will result due to exposure with chloride containing products.

If after cleaning, a tank is fogged with a sanitizing agent (chlorine, bromine, fluorine, etc.) to kill bacteria harmful to food grade products, the tank should either be immediately washed or loaded to prevent a corrosion attack on the tank within a few hours under certain conditions.

Other forms of corrosion possible for stainless steels include hydrogen-induced cracking, microbiologically influenced corrosion, galvanic corrosion and knifeline attack. The nature of the environment including the service conditions and the specific grade of alloy will ultimately influence the form and degree of attack.

With the multitude of corrosive media and conditions of exposure that may be encountered in service, it is not possible to list all the products that can cause corrosion problems. Products not listed as corrosive by the Hazardous Materials Tables in 49 CFR 172.101 may cause corrosion. Some products that are known to be issues are detergents in wash rack solutions, corn syrup, chlorinated solvents, fertilizers, animal fats, and any product that contains chlorides as part of its formulation or as a contaminant.

Proper test should be performed to evaluate the suitability of a specific grade of stainless steel for a specific application. A number of ASTM standards and NACE recommended practices exist for this purpose.

CORROSION PREVENTION FOR ALUMINUM TANKS

Most widely used aluminum is corrosion resistant to ordinary atmospheric exposure, most fuels, and solvent and other petroleum based products. Precautions, However, must be taken to avoid any exposure to caustic materials such as those found in cleaning or washing compounds. Aluminum will deteriorate very rapidly under constant exposure to these products.

Extreme care must be exercised when selecting aluminum tanks for many solvents or fertilizer solutions. While the tank itself may be suitable for such service, unless especially ordered for that use, vents, valves, and other fittings normally contain brass and steel and are likely to fail in a short time.

Most often retrofitting a tank with stainless steel trimmed valves and fittings, and corrosion resistant gaskets prior to those parts becoming inoperable will be least expensive and hazardous.

Aluminum alloys used in trailer tanks are resistant to corrosion by ordinary atmospheric exposure and most fuels, solvents, and dry bulk products.

Tank fabricators can only assure that the tank is fabricated of the materials specified and cannot be responsible for a corrosive attack or other interaction by any product.

"Corrosion Prevention for Aluminum Tanks – Precautions" (TTMA TB#60 Apr. 2006)

1. Precaution shall be taken to avoid any exposure to caustic (sodium hydroxide, et al) materials which are often present in cleaning or washing compounds as aluminum is not resistant to attack by caustic compounds of any kind.
2. Precaution should be taken to prevent acids and other chemicals that are mixed with the product from coming in contact with the bare aluminum. An example of this would be the chemicals that are used in acidizing wells being pumped back up with the crude oil.
3. Mercury and its compounds, even in extremely low concentrations, will also rapidly destroy aluminum tanks.
4. Care must be exercised when selecting aluminum tanks for hauling many solvents or fertilizer solutions. While the tank itself may be satisfactory, valves and fittings containing steel, brass, or zinc parts may be installed and these parts can cause trouble due to corrosion. Also special gaskets and composition valve discs may be required. A "clean oil" or solvent tank is usually equipped with only aluminum, stainless steel, and teflon fittings, discs, and gaskets.
5. Precaution should be taken when attaching or mounting dissimilar metals to aluminum mounting surfaces. A protective barrier should be installed between the dissimilar metals, such as barrier tape, paint or other protective coatings to prevent galvanic corrosion.

6. In addition, aluminum is subject to corrosion by a number of acids and bases, such as Ammonium Hydroxide, Sodium Carbonate, Acetic Acid, Nitric Acid, Hot Alcohol Solutions, and Phenol to name a few. Therefore, it is recommended that the Hazardous Materials Tables, in 49 CFR 172.101, are reviewed to ensure that the cargo tank specification is suitable to transport the product in question, and that other corrosion data resources, such as NACE International are reviewed to ensure that the product is not corrosive to the aluminum. The address, phone number and Web-site for NACE are: 1440 South Creek Drive, Houston, TX 77084, (281) 228-6200, <http://www.nace.org>.
7. Tanks or tank compartments used to carry water or a water based product should have sacrificial anodes installed to reduce the possibility of galvanic corrosion. This type of corrosion is the acceleration of corrosion of one metal as a result of its combination in electrical contact with a dissimilar metal in a corrosive environment capable of passing an electric current by ionic conduction. Tanks used to hold water for extended periods may be subject to galvanic corrosion because of relatively small amounts of salts or other substances in solution. Magnesium anodes are commercially available and are recommended for this application.

IDENTIFICATION OF VENTS, DRAINS, VOIDS AND VAPOR RETURN SYSTEMS (TTMA TB#96)

HAZARDS & PRECAUTIONS

CAUTION: FIND OUT WHAT PRODUCTS HAVE BEEN TRANSPORTED IN THE TANK AND THEIR PRODUCTS. IF THIS IS NOT POSSIBLE, ASSUME THE PRODUCT(S) WERE FLAMMABLE AND PROCEED WITH CAUTION.

Tank compartments are confined spaces and can be dangerous due to flammable or ignitable vapors, insufficient oxygen, or inhalation hazards. Flammable and combustible vapors may ignite and explode or displace air inside a cargo tank making such an atmosphere unsuitable for life. All precautions for entrance and working in flammable confined spaces must be followed. This includes, but is not limited to, monitoring procedures for the conditions. Tanks that have been in service are defined by OSHA in 29 CFR 1910.146 as "permit required confined spaces." All work inside tanks must be in compliance with 29 CFR 1910 and additional State and local regulations.

Flammable and combustible liquids should be properly disposed of and vapors of fumes should be exhausted outside away from potential ignition sources, compressor, heating, venting, air conditioning or other fresh air intakes. Any liquid or solid product in the tank must be properly disposed.

DO NOT weld or cut with a torch and keep all potential ignition sources away from any tank vehicle until absolutely certain that all compartments, void spaces and piping, vapor boots, vapor lines and components containing solids, liquids or vapors have been drained and purged, or removed, as necessary, to prevent the accumulation of flammable or combustible solids or liquids or recharging of potentially explosive vapors. If cutting or welding is to be performed on or near a void section the void is to be purged with forced air during such work. See Cleaning of Voids section for cautions and procedures.

On insulated trailers, leaks in compartments, voids, piping, or components may allow solids, liquids or vapors to accumulate in the insulation. Make certain the insulation is not retaining solids, liquids or vapors. If so, remove jacketing and insulation to remove solid, liquid or vapor accumulation. Structural pads within the insulated area may retain solids, liquids or vapors and should be cleaned or purged as necessary.

Liquids transported at elevated temperatures are often solids at ambient temperatures. When these products are trapped in a void area and are in solid form, a vapor tester (LEL) will not show the presence of the product. This product could vaporize when heat from cutting, or welding is applied. **VERIFY THAT SOLIDIFIED PRODUCT IS NOT PRESENT BEFORE PERFORMING ANY HOT WORK.**

IDENTIFICATION OF TYPICAL VOIDS AND VAPOR SYSTEMS, MC 306, MC 307, DOT 406, DOT 407 TANK VEHICLES

MC 306 and DOT 406 tanks may be equipped with double heads and/or vapor return systems, either of which may be difficult to identify and which may contain flammable or combustible vapor or liquid.

Refer to Figure 1 for sketches of typical head configurations. Note most double heads have a vent and drain between them at the top and bottom of the shell. Make sure the vent and drain are both open. When gas freeing between heads, be sure not to build up pressure in a void, otherwise a head will likely be reversed. Further confirmation of the presence of double heads can be made by observing the exterior of the tank shell. Normally the shell will be distorted where the head is welded to it. If the tank is entered to confirm the presence of double heads, make sure it is gas free and use proper breathing apparatus or fresh air system as required.

Note that all double heads look different when viewed from different sides except that a double nested flangeless head looks like a single flangeless head welded on both sides.

Many MC 306 and DOT 406 tanks have vapor recovery systems. These are easily identified by looking for vapor collection hoods at the top of each compartment. These hoods are normally connected to one or both of the inverted "V" flashing rails or they may be connected to a separate manifold. Make sure all vapor vent valves are open and all vapor recovery outlets are

open when gas freeing the tank. Vapor is conveyed to the ground level by several means (Refer to Figure 2) usually by an external line, sometimes by an internal line where the top connection is through the top shell under the flashing, and sometimes through the void between two heads. In the latter case there would be an opening (concealed) through the shell between the two heads under the flashing. There would also be a line connected to the bottom shell between the heads. If this is the case, make sure that any other vents or outlets in the bottom of the tank between the two heads are open.

Tank pads and lap seams are a possible retainer of flammable or combustible liquid or vapor. Check all tank pads and lap seams for weep holes (See Figure 3) to make sure no liquid is retained between them and the tank.

Drain all pipe lines, product valves and bottom loading valves as they may retain flammable or combustible liquids or vapors.

Some tanks may be equipped with "balanced" emergency valves where the balancing liquid is the same as the product being transported. Such valves almost always contain flammable or combustible liquid. Remove them before purging or gas freeing is complete so as to prevent accumulation of flammable or combustible liquids or recharging of the tank with flammable or combustible vapors.

Some tanks may be equipped with air or hydraulic emergency valves. The valves may have cylinders or air chambers integral with the valve or they may have internal cylinders or chambers. Such cylinders or air chambers may contain flammable or combustible liquid if valves are faulty. Remove them before gas freeing is complete so as to prevent accumulation of flammable or combustible liquids or recharging of the tank with flammable or combustible vapors.

Some meters may have vapor release lines which are piped into the tank. Remove these lines prior to purging the tank to prevent these lines from recharging the tank with flammable or combustible vapors.

Accessory equipment such as pumps, strainers, filters, meters, air eliminator and refuse tanks, reels, hoses and related piping, hose tubes and cabinets may contain flammable or combustible liquids or vapors. These and similar items shall be rendered safe by draining, flushing, purging or removal.

IDENTIFICATION OF TYPICAL VOIDS IN INSULATED TANK VEHICLES

BE SURE TANK IS VAPOR FREE BEFORE ENTERING. The type of void in an insulated tank trailer can only be identified by entering the tank. A Lower Explosive Limit "LEL" vapor detection test should be performed to verify the tank is safe for entry and adequate fresh air circulation or personal fresh air equipment must be provided. Unless great care is taken in identifying voids, vent and drain nipples may be mistaken for tank nozzles or steam panel outlets.

Opposed double bulkhead, multi-compartment tank. (See Figure 4D) In order to identify a double bulkhead it will be necessary to first check one compartment, then the adjacent compartment(s). A double bulkhead will have the concave side of the heads showing in both compartments. Note the approximate distance from the manhole to the head and locate vent openings at the top and bottom of tank, or in some cases both openings in bottom.

Single bulkhead with back-up angle or double, reversed-dished bulkheads, multi-compartment tanks (see Figure 4B). In order to identify a single bulkhead with a back-up angle or double, reversed-dished bulkheads, it will be necessary to first check one compartment, then the adjacent compartment(s). The convex side of a single bulkhead with back-up angle will show the angle welded to the bulkhead and shell, closing the crevice formed by the knuckle radius. Double reversed bulkheads will have the convex side of the head dished towards the flange of the head and will close off the crevice formed by the knuckle radius of the head in the adjacent compartment. Note the approximate distance from the manhole to the head and locate vent openings at top and bottom of tank, or in some cases both openings in bottom.

Some sanitary tanks may have flangeless double bulkheads. In this case it will be necessary to note the distance from the manhole to each side of the bulkhead(s) and the distance between the manholes to determine if the tank has a single or double bulkhead and the location of the vent and drain openings if it has a double bulkhead.

Multi-compartment or single compartment tanks with baffles braced with back-up angle. (See Figure 4A) In order to identify a baffle with back-up angle, check the convex side of the baffle. An angle will be welded to the shell and baffle closing the crevice formed by the knuckle radius of the baffle. Note the approximate distance from the manhole to the baffle(s) and locate the two (2) drains at the bottom of the tank.

CLEANING OF VOIDS

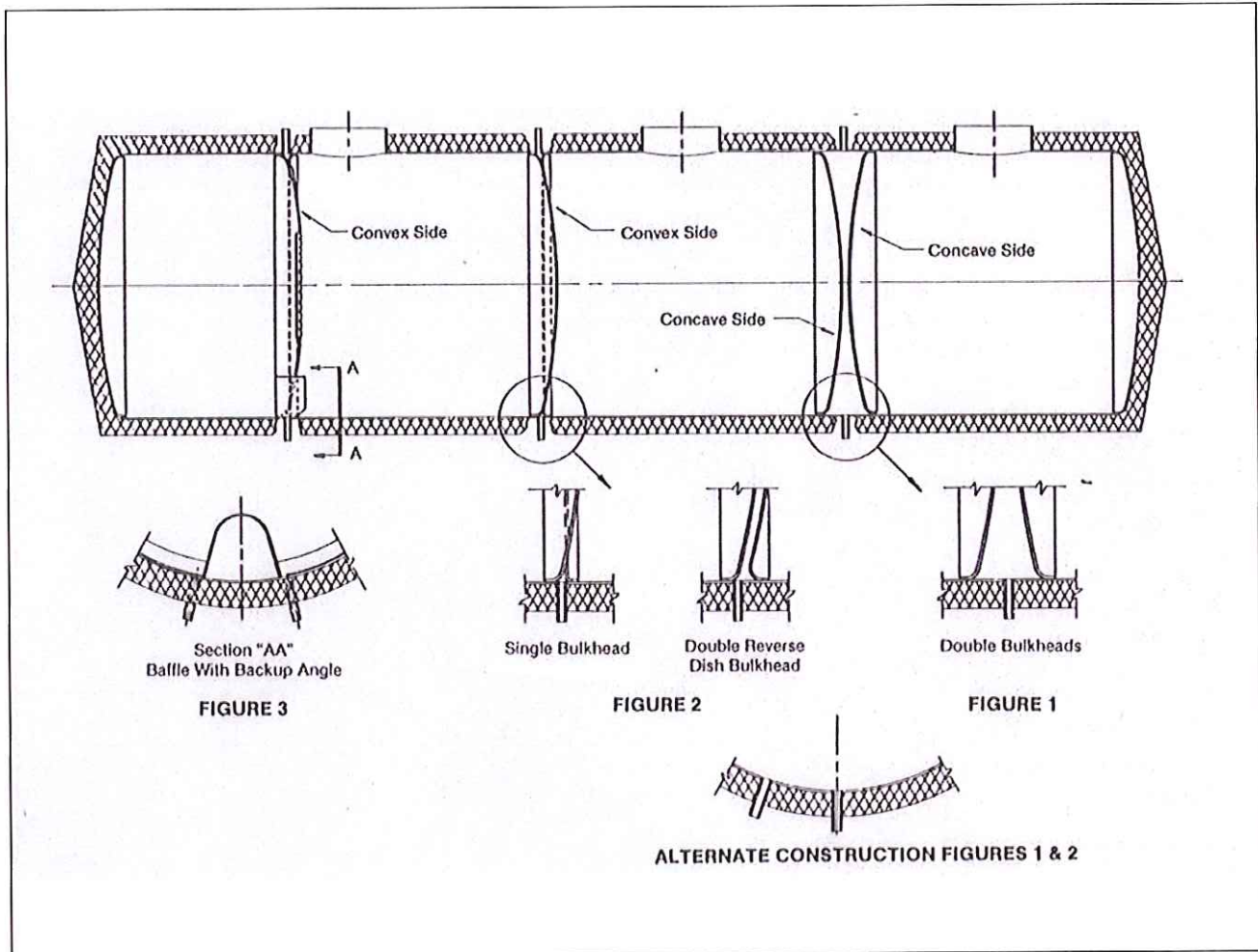
Void drains and vents are to be open and unplugged at all times when in service and during repair and should only be plugged during certain pressure tests. Void vents or drains with plugs installed may indicate a leak into the void. If plugs are found in void drains or vents, check the void carefully for the presence of liquid or vapors. Assurance that there are no flammable or combustible vapors in a void space may require the insertion of a gas test probe into the void.

Clean out the void with steam or appropriate cleaning solution. If solid material remains, clean by mechanical means with a rod or wire. If it is questionable that the void space is clean and vapor free, cut an opening in the void space bottom with an ignition

free method and remove all foreign material. **DONOT WELD IN AN AREA WHERE IT IS QUESTIONABLE IF PRODUCT IS TRAPPED OR SOLIDIFIED PRODUCT IS PRESENT.** Solidified product can give off hazardous or flammable vapors when exposed to heat from cutting or welding.

WARNING: Void drains may become clogged with rust, dirt, or solidified product. **TO PREVENT PERSONAL INJURY OR DAMAGE TO THE BULKHEADS,** make certain that the void is not over pressurized by steam or compressed air. Steam or purge media should be introduced in the void vent at the top of the void area. Ensure that the void will not become over pressurized if the void drain becomes clogged with solidified product, rust, or other debris.

If the void section is to be continuously purged during a repair, compressed air should be introduced into the drain, forcing any residual or newly formed vapors out the top vent. This will disburse the vapors and prevent their accumulation in a stagnant area of the facility.



INSPECTION AND MAINTENANCE OF CARGO TANK BARRELS (TTMA TB#80)

DOT regulations require that MC and DOT specification cargo tanks be inspected periodically per 49 CFR 180.407. Any repair or alteration to a non-ASME MC or DOT specification tank shall be done by a shop possessing an ASME "U" or a National Board "R" stamp. Any repair or alteration to a MC or DOT specification cargo tank built to the ASME Code shall be done by a shop possessing a National Board "R" stamp.

The inner tank barrel itself is a very important piece of equipment. The barrel serves the dual purpose of product retention and must carry the weight of the product in addition to the weight of the barrel itself. The barrel is strongest when it is in its originally manufactured condition. A substantial amount of its load bearing capability is lost if buckling or distortion occurs in the tank shell due to an accident, overloading or any of the following:

- Fast filling of hot product in a cold tank that has not been prewarmed in a building or by other means that are not detrimental to the tank, lading and/or safety of the loader or operator. Slow initial filling should be considered.

- Loading with product that is hotter than the maximum temperature rating of the trailer.
- Vacuum created by the unloading process (or by tank cooling after unloading) with the manhole closed and the vents plugged with solidified materials or otherwise rendered inoperative.
- Repeated travel over rough roadways at speeds that are not reasonable for longevity of any type of vehicle.
- Dropping the loading trailer on the landing gear, which creates unusual shock, in lieu of setting it down.
- Operating the trailer at a continuous speed at which resonant frequency (vibration) is at its peak. Every trailer has such a frequency and a change in speed of two or three miles per hour either faster or slower reduces the vibration out of the peak range.

The structural integrity must be maintained. It is recommended that the barrel and all internal members be checked regularly at intervals of every (3) months or 15,000 miles whichever occurs first. Corrective repairs should be made as soon as possible.

Work inside the cargo tank requires entrance into a "confined space" and may be hazardous. Work in this area must be performed in accordance with the regulations of the Occupational Safety and Health Administration found in 29 CFR 1910.146.

CARGO TANK VEHICLE OPERATING INSTRUCTIONS

GENERAL OPERATING INSTRUCTIONS

INSPECTION AND PREPARATION BEFORE OPERATION – THE NEW WEST-MARK CARGO TANK TRANSPORT UNIT SHOULD BE THOROUGHLY INSPECTED AFTER DELIVERY.

Our Experience has shown that initial mechanical operation or transportation of new units and extended stowage may cause subsequent loosening and or maladjustment of component parts. We therefore recommend a close inspection of the unit as follows, all tank components and hoses upon delivery/returned to service, and after approximately four (4) hours of operation, to prevent malfunction or damage. Re-torque all fasteners and U-bolts as required.

These suggested directions are not exhaustive since tank vehicles are of varying design to meet the requirements of the first purchaser, therefore, the user must satisfy himself that his safety, the safety of the public, the integrity of the transport and the load are not jeopardized.

Before operating, become familiar with the message indicated on all information and caution plates on the vehicle. If a plate or label has become illegible or lost, request replacement from the vehicle manufacturer.

Before loading and/or unloading the product, the user must familiarize himself with its operational characteristics, including manholes, vents, gravity discharge valves, pump off valves, heating procedures, etc.

WARNING: Know What Product You Are Loading And Know What Product Was Last Carried In The Vehicle.

Never exceed the design criteria on the tank manufacturing data plate, located on front side filler, driver side. The following data may include code, capacity, temperature, mawp, maximum product load, weight limits, etc.

Avoid loading products into a cargo tank which may become contaminated from the residue of the previous load. Do not mix dissimilar products in a cargo tank or introduce a product into a cargo tank which may react violently with the residue of the previous load. For example, avoid loading gasoline into a cargo tank with fuel oil residue, loading fuel oil into a cargo tank with gasoline residue, or loading caustic into a tank with acid or water residue. Food grade products should never be loaded into cargo tanks which have previously contained a non-food product.

CAPABILITIES

MC306 & DOT406	Used primarily for the transportation of flammable liquids such as refined gasoline. They are also used commonly for combustible products such as No. 2 fuel oil and diesel fuel. Other applications include flammable solvents and non-regulated chemicals. Some of these may be classed "WATER WHITE CLEAR" where contamination could be a problem, and others, while they may not be classed as dangerously corrosive, may damage the cargo tank or its accessories. (Refer to Corrosion Prevention sections).
MC307 & DOT 407	MC 307 and DOT 407 cargo tanks are pressure vessels used for the hauling of flammable liquids with vapor pressures in excess of that permitted by MC 306 or DOT 406 cargo tanks. The MC 307 and DOT 407 specification is used for Class B poisons and flammable liquids which are also corrosive or oxidizing materials.
MC312 & DOT412	MC 312 and DOT 412 cargo tanks are used primarily for the transportation of corrosive liquids such as caustic soda, phosphoric acid, sulfuric acid, and hydrochloric acid, etc. In addition, certain oxidizers, organic peroxides, flammable solids and Class B poisons can be shipped in MC 312 and DOT 412 tanks. Examples are Cumene Hydroperoxide (organic peroxide) and Mercuric Iodide Solutions (Class B poisons).

It is important to know that the materials of construction of the cargo tank and accessories are compatible with the liquid being carried in the cargo tank. In addition, if other products have been carried in the tank previously, it is important to know if a contamination problem or dangerous condition has been created. The best source of this information is the shipper. The fact that a product is authorized for transportation by an MC 312 or DOT 412 specification cargo tank does not mean that a particular MC 312 or DOT 412 cargo tank is automatically suitable for this product. The following questions must be answered first:

1. Does the product attack or pit the shell or any of the tank components such as valves, piping, gaskets material, etc?
2. Does the product density exceed that for which the tank is rated?
3. Does the product temperature exceed that for which the tank is rated?
4. Is the product so viscous as to require special venting and valving?
5. Do regulations require special equipment, extra venting or special venting?
6. Does product require insulation and/or heating equipment?
7. Does tank have a proper pressure rating and safety relief devices for the product?

SANITARY / NON-SANITARY TRANSPORT UNITS - NON-CODE

INSPECTION AND PREPARATION BEFORE OPERATION—THE NEW WEST-MARK WATER TRANSPORT UNIT SHOULD BE THOROUGHLY INSPECTED AFTER DELIVERY.

DANGER HAZARDOUS MATERIALS—The fumes discharged by the engine exhaust, when partial or full pumping operation must be piped to and discharged in a safe area. All operating employees should be supplied with the proper safety equipment required to handle that particular material. The interior and other portions of the unit which may have come in contact with salt, or mica in the water, shall be thoroughly cleaned as soon after the unloading process as feasible and prior to the subsequent reloading of the unit. Some bacteria in water are incompatible with and or will react with an un-sanitized tank. A system of monitoring safety assurance procedures for loading, transporting and unloading of all materials is required.

CAUTION

1. When handling water all plumbing, valves, fittings, and hoses must be checked and working properly before using the pumping system.
2. Keep clear of the inlet valve and hose because of strong suction during loading operations. Only use a vacuum reinforced type hose.
3. The discharge hose will have a tendency to whip under pressure, and therefore must be secured. Only use a pressure type hose for discharge.
4. Never attempt to open any valve under pressure or close all valves completely while pumping. All caps and hoses should remain secured during the pumping operation. Never remove a cap or hose under pressure or vacuum or while the system is running. Never switch the water flow/direction until the pumping system is off.
5. Familiarize all operating employees with the detailed operations and maintenance instructions for your specific pumping system. Direct all operating employees to read and observe the instructions of any DANGER or CAUTION labels affixed to the unit.

WATER LOADING/DRAFTING

1. Before start-up always check fluid levels in engine, hydraulic gearboxes and pump. See component manuals for proper maintenance and operation procedures. All valves: hydraulic and water are in off or neutral positions before starting. Pre-check entire tank system and all components. Check that the tank is vented and overfills is unobstructed.
2. Engine start-up: To start engine push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 3-5 minutes to insure proper warm-up.
3. Install a suction hose on pump inlet. Open the required valves to allow water from the outlet side of the pump to tank inlet circuit. Install a foot valve on suction hose when using main tank water for pump priming. A full charge of water is required in suction hose.
4. Check that the tank is vented properly.
5. Open the pump-priming valve and allow the water pump, supply hose and discharge plumbing to fill using the water from the main tank. Close all other valves that are not part of the load circuit, priming circuit or pump to tank inlet line. When draft circuit is flooded close priming valve (priming valve is optional).
6. Open all valves between the draft hose and the water pump.
7. Clutch: While engine is idling activate clutch, before engagement of PTO, system air pressure must be 75 PSI min. PTO can only be engaged while clutch is activated and transmission is in neutral for automatic transmissions. Engage PTO, red light should appear upon engagement. (Engine should be left in idle until during draft mode). Step 7 is required on clutch type units only.
8. Turn bypass valve on hydropak to "ON" position. (Hydrapak is located on the truck chassis frame.) or engage hydraulic system through the use of the dash or control valve. (Hydrapak and hydraulic system are optional equipment). Step 8 is required on hydropak / hydraulic systems only.

Engine start-up: To start engine push button must be held in the depressed position while starting engine until running oil pressure is established to open switch gauge contacts. Idle engine for approx. 3-5 minutes to insure proper warm-up. Water will bypass through relief.

9. Load tank with the water pump. Monitor loading circuit and suction hose while tank is filling. The water pump requires a minimal amount of air until the drafting hose and plumbing to pump is full. Once flow is continuous and smooth, close primer circuit.
10. Increase engine speed.
11. Decrease engine speed when water has reached the top quarter of the tank, or stop loading when desired level is reached. Stop filling before water overflows from tank.
12. Disengage water pump from all power: PTO, engine, or hydraulics, by deactivating clutch, shutdown or switch power on hydraulics. Close inlet valve at tank. Close all remaining valves.
13. Close all remaining valves.
14. Remove suction hose foot valve and store properly.

TOP FILLING

1. Connect pressure hose to tank top fill inlet connection. Check that tank is vented properly and overfill and top fill opening is unobstructed.
2. Open hydrant valve or external water source slowly until water is flowing at top fill opening. Increased hydrant flow until water starts to splash out of fill opening. Maintain this flow until water level is at top quarter of the tank. Stop loading when desired level is reached or before water overflows from tank.
3. Close hydrant valve. Remove pressure hose and store properly. Install cap on tank top fill inlet.

GRAVITY UNLOADING

1. Connect pressure hose to discharge outlet. Check that tank is vented properly.
2. Open tank valve, open discharge outlet valve on desired side of vehicle.
3. After load is discharged, close all valves that were opened. Remove discharge hose and store properly.

PRESSURE UNLOADING

1. Connect pressure hose to discharge outlet. Check that tank is vented properly. Relief valve at pump is set to 75 psi.
2. Open tank valve circuit, open discharge outlet valve on (spraybar) desired side of vehicle. Do not open discharge valve if flusher system is used.
3. Before start-up always check fluid levels in engine, pump, and gearboxes. See Component Manuals for proper maintenance and operation procedures. All other tank valves are in off position before starting. Pre-check entire tank and pressure unloading components.
4. Engine start-up: To start engine push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 3-5 minutes to insure proper warm-up. Increase engine speed.
5. Clutch: While engine is idling activate clutch, before engagement of PTO, system air pressure must be 75 PSI min. PTO can only be engaged while clutch is activated and transmission is in neutral for automatic transmissions. Engage PTO, red light should appear upon engagement. (Engine should be left in idle until operation mode is selected). Step 5 is required on clutch type units only. Flusher system requires water flow valve set at 0.
6. Turn bypass valve on hydropak to "ON" position. (Hydrapak is located on the truck chassis). Engage hydraulic system, through the use of the dash switch or control valve. (Hydrapak/hydraulic power is optional equipment). Step 6 is required on hydraulic systems only. Master switch in dash controls hydraulics system on flusher units.

FLUSHER / SPRAYING

1. Engage transmission and drive at desired speed. Open spray valves with dash switches as required. (see diagram in cab). Increase water flow valve until desired spray pattern is achieved. Note: truck speed is independent of water flow. Water flow valve, controls the volume of water in spraying system.
2. After spraying is complete turn water flow valve to 0. Close all spray valves, and disengage hydraulic system using master switch in dash. Decrease truck speed and disengage transmission.

PRESSURE UNLOADING CONTINUED

1. Open tank valve, open outlet valve on spray bar. Open discharge valve on spray bar. Make sure spray valves are closed. Connect pressure hose to discharge outlet. Check that tank is vented properly.
2. Before start-up always check fluid levels in engine, pump, and gearboxes. See Component Manual for proper maintenance and operation procedures. All other tank valves are in off position before starting. Pre-check entire tank and pressure unloading components.
3. Engine start-up: To start engine push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 3-5 minutes to insure proper warm-up. Max engine speed 2500 rpm.
4. Watch all pumping systems. When water level has reached bottom quarter of tank, decrease engine speed to an idle until desired level is reached. Non hydraulic operated systems.
5. Disengage water pump from all power engine or hydraulic, by deactivating clutch, PTO or hydraulics. Close inlet valve at tank.
6. After load is discharged, close all valves that were opened. Remove discharge hose and store properly.

HOSE REEL SPRAYING

1. Uncoil hose and nozzle off hose reel. Check that tank is vented properly. Relief valve at hose reel is set to 50 psig max.
2. Open tank valve, open valve on manifold bar. Do not open discharge valve on spray bar if flusher system is used.
3. Before start-up always check fluid levels in engine, pump, and gearboxes. See Component Manuals for proper maintenance and operation procedures. All other tank valves are in off position before starting. Pre-check entire tank and pressure unloading components.

4. Engine start-up: To start engine push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 3-5 minutes to insure proper warm-up.
5. Increase engine speed.
6. Open nozzle on hose carefully always using both hands on hose assembly. If hose pressure feels too great close nozzle immediately. Readjust relief valve to lower pressure at reel. Reopen nozzle carefully to adjust flow pattern.
7. When spraying is complete close nozzle at hose. Water will bypass at relief valve until engine is shut down.
8. Disengage water pump from all power. Shut down engine, by deactivating switch on engine. Close inlet valve at tank. Close all remaining valves.
9. Rewind all hoses and store properly. It is advised to release pressure in hose and reel assembly by open nozzle after water system is shutdown.

CAUTION Do not exceed the water pump manufacturer's maximum recommended operating speed (R.P.M.). Power take-off and reduction gear ratios vary and the R.P.M. of the power source is seldom the same as the pump. An accurate tachometer on the power source and determination of drive ratio is essential to prevent damage. Water pumps operated in a dry condition will cause them to cavitate and chatter that can damage the pump. It is recommended that the water in the pump be drained to prevent damage when freezing or storing the unit for prolonged periods of time.

Do not pump water directly against the relief valve. Always open at least one valve so water can flow. Never pump water continually through overflow system on unit. It is designed for venting of the tank. Always check tank venting before loading or unloading water from your tank.

All equipment surfaces intended for potable water including source fill point equipment, caps, hoses, valves, pumps, tanks, fittings, or filters shall be inspected, washed, rinsed, sanitized, and replaced as often as necessary to maintain sanitation of all contact surfaces. Follow adequate sanitizing procedures of your local health and safety codes. **NO CHLORINE IS TO BE ADDED TO DRINKING WATER.**

All product containment surfaces intended for potable water including source fill point equipment, caps, hoses, valves, pumps, tanks, fittings, or filters and piping shall be drained completely if stored for extended periods of time or freezing conditions occur.

All product containment surfaces intended for storage as follows; source fill point equipment, caps, hoses, valves, pumps, tanks, fittings, or filters and piping shall be drained completely if stored for extended periods of time or freezing conditions occur.

Closing—The Water Pressure unit is a versatile piece of equipment which the water superintendent or operator will, as he acquires a personal working knowledge of its various functions, find many other applications for cleaning, servicing, transfer, and transportation. If these procedures outlined above will not work in your application please contact the factory before changing the operating procedures.

CLEANING TANKS

The cleaning of storage tanks and the removal of bottom sediments is easily accomplished with vacuum. Some larger tanks that do not have shell man-ways or clean-outs may require removal of lower shell section. Equipment used to assist the vacuum unit performing this service is as follows:

- Hydro blaster or roper type gear pump for pressure cleaning and wash down.
- Duckbill hose nozzles and industrial heavy-duty straight and curved squeegees.

DISPOSAL OF BOTTOM SEDIMENTS AND SEMI-SOLIDS

Materials that have a tendency to settle may require agitation prior to discharge. Agitation is accomplished by creating a partial vacuum in the unit, then rapidly opening and closing the discharge valve. Repeat this procedure several times until agitation is complete. Off loading should be completed as soon after agitation as possible.

TRANSFERRING FROM ONE TANK TO ANOTHER

Is accomplished by connecting the suction hose to the inlet riser pipe, and the discharge hose to the discharge valve and the point of discharge. Alternate vacuum and pressure procedures, until the transfer is complete, using only the amount of pressure required.

Replacement parts for damaged or worn items should be obtained from reputable sources that are of equal value to the parts being removed. One excellent source is the original equipment manufacture. Always stop operation or remove the tank from service when defective parts are found until they can be replaced or fixed properly. Note ASME relief vents require factory adjustment and replacement of all parts. Do not attempt to fix them yourself.

SPECIFICATION CARGO TANK UNITS (TTMA #80)

INSPECTION AND PREPARATION BEFORE OPERATION—THE NEW WEST-MARK TRANSPORT UNIT SHOULD BE THOROUGHLY INSPECTED AFTER DELIVERY.

PRE-LOADING INSTRUCTIONS: GROUND LEVEL

See that all product discharge valves and emergency valves are in operating order and are closed. Emergency mechanical trip or break-away should be functional and the fusible link(s)/plug(s) of the emergency valve operating system should be in place (if outlet valve is self-closing type).

If cargo tank has not bottom valves, check bottom sump for proper gasketing and blind flange bolt tightness.

If cargo tank is equipped with a "downline" from the top of the tank, check that the end of the downline is equipped with a properly operating valve and/or a blind flange or sealing cap properly gasketed and sealed.

If cargo tank is equipped with air unloading piping to the front or rear, check valves and pressure gauges for proper operation and gladhands or connectors for condition and gasketing.

The correct commodity placards shall be in place.

PRE-LOADING INSTRUCTIONS: TOP SIDE

If the cargo tank is equipped with a blow down valve (usually part of the "vent", "pressurizing" or "Christmas tree" assembly), crack open blow down valve to make certain there is no pressure in the cargo tank. Make sure discharge of blow down valve is not directed toward yourself or other personnel. If there is no blow down valve, find out from your supervisor how to make certain pressure in the cargo tank does not exist before proceeding any further.

Check manhole assembly for condition and proper functioning of closing mechanism to secure the manhole cover tightly.

Be sure that the cargo tank is equipped with adequate emergency venting. These vents should be checked for proper rating, condition, cleanliness, and function. Sometimes a relief valve is installed on top of a rupture disc. In this case, there should be a pressure gauge or test valve or plug between the two devices so the condition of the rupture disc can be determined. Fusible venting, if so equipped, must not be replaced with caps or plugs.

Check any other valves, gaskets, vacuum vents, pressure gauges and fittings on top of the tank for proper operation and condition. Fusible caps shall not be used on DOT 406, DOT 407, MC 412 and DOT 412 cargo tanks. If a cargo tank is equipped with dip pipe and top discharge valve, check operation, gasket condition, and flange bolt tightness. If there is not downline from top discharge, make certain blind flange is installed on valve discharge.

Since cargo tanks can be equipped with valves and fittings for many different uses, the shipper or cargo tank operator should furnish a detailed description for operator's understanding.

Check to see that tank is clean as many chemicals can react violently when mixed. Also, any product over 200°F should only be loaded in tanks free of moisture. Loading of hot products (over 180°F) in non-insulated cargo tanks is not recommended as personnel may be burned by the hot shell. Loading of hot products (over 180°F) in non-insulated tanks is not recommended as personnel may be burned by hot shell.

Know the maximum capacity of cargo tank to avoid overfilling (see Tank Data Plate on front sidefiller drivers side).

49 CFR 173.24b(a) requires that there be enough vapor space to allow for expansion due to any possible rise in product temperature during transit. In no case is this to be less than 1% and for products which meet the definition of poisonous by inhalation, the outage must be at least 5%.

Be sure ladder and walkways are well maintained. If abrasive on walkway surfaces are worn or missing, replace.

LOADING PRECAUTIONS

Always set parking brake before loading, then ground tank to loading rack to avoid static electrical sparks. If loading a specialized product such as JP4, follow product manufacturers' recommendations for the control of static electricity. For further information on the control of static electricity see API RP 2003 "Recommended Practice for Protection Against Ignitions Arising out of Static, Lightning and Stray Currents."

WARNING: All Loading And Unloading Operations Should Be Properly Supervised At All Times.

Do not load tank with hot product which exceeds cargo tank manufacturers' maximum temperature rating or with a product that will have a corrosive effect on the cargo tank. To do so endangers the structural capacity of the cargo tank to continue trouble-free performance. Aluminum, stainless steel, and carbon steel cargo tanks require close attention to this caution.

WARNING: do not mix product in tank. Example: Many acids react violently upon addition of water to the cargo tank.

Do not load the vehicle beyond the maximum product load or maximum product density specified on the metal certification plate or on the vehicle certification label which specifies the Gross Vehicle Weight Rating (GVWR). The GVWR is the maximum allowable total weight of vehicle, payload and equipment on the vehicle.

Do not load a cargo tank semi trailer with an air operated suspension which has been disconnected from the tractor unless the suspension has first been purged of air pressure. **Air operated suspensions have been known to shift forward when the cargo tank is being loaded.**

TOP LOADING THROUGH MANHOLE

The loading pipe should be adequately secured, braced, or restrained to prevent accidental spill during loading.

Stay away from vicinity of manhole to avoid being splashed, burned or exposed product fumes during loading.

Be sure manhole cover is closed, seated, and securely latched before moving tank. Excessive tightening of manhole covers may damage gaskets.

BOTTOM LOADING

Make sure that all compartments being loaded are empty.

When the tank vehicle is equipped with vapor recovery piping, connect to the loading rack vapor receiver and make sure valves, if any, are open and there is no restriction in the line. If loading rack is not equipped with a vapor receiver, make sure vapor line on the vehicle is connected to hoses or lines which conduct vapor away from the tank to a safe venting area or the manhole is open.

When the cargo tank vehicle is not equipped with vapor recovery piping, open the manhole for loading.

When the cargo tank vehicle is equipped for vapor recovery, make sure high level shut-off devices are connected from loading rack to trailer.

When the cargo tank vehicle is equipped for vapor recovery, make sure meter on loading rack is set at a quantity equal to or less than the rated capacity of the compartment loaded.

After loading the cargo tank make sure all product hose and vapor hose as well as high level shut-off device connections are disconnected. A means must be provided by the shipper to depressurize hoses before they are disconnected.

HEATING PRECAUTIONS

CAUTION: the majority of products requiring an mc 312 or dot 412 cargo tank may become corrosive to the tank and/or heating system at elevated temperatures and should therefore not be heated or loaded warm.

Do not heat an empty cargo tank with on-board heating equipment unless manufacturer expressly states that the cargo tank is capable of this type of preheating. Otherwise for preheating, see cautions and recommendations in TTMA Technical Bulletin No. 61, "Preheating of General Purpose Chemical Tanks."

Do not exceed working pressure of the steam panel. Be sure correct pressure relief valve is on the steam panel and that it is functioning. Outlets should be directed away from personnel. Pressure gauges should be installed on steam supply to monitor the heating equipment. Be sure coupling of steam hose is secure before applying steam.

Handle steam hoses with gloved hands. Connect inlet hose to vehicle heat system inlet, return hose to vehicle heat system return or outlet connections if provided. After both ends of hose are secured, open valve(s) slowly to check for leakage before leaving valve(s).

If it is necessary to introduce steam into the vehicle heating system during the entire product unloading operation, the heating transfer system should be turned off AT THE HEAT SOURCE as promptly as possible after the product unloading operation is completed. When cold weather conditions may cause freezing of steam condensate in the vehicle heating system, leave connections uncovered to allow condensate to drain.

UNLOADING PROCEDURES

Always set parking brakes unloading.

See that discharge lines, valves, and transfer hose are empty and clean. Be sure hoses are compatible with product.

WARNING: All Loading And Unloading Operations Should Be Properly Supervised At All Times.

Valves, seats, grooved couplings and other mating surfaces should be periodically checked for excessive wear, scratches or gouges.

If vapor is to be recovered connect vapor hose from trailer to vapor connection on receiving tank. Make sure any valves that may be in this line are open. Also, make sure vent valves in the top of the tank are operating. If vapor is not be recovered open valve or remove caps on trailer vapor line. If trailer is not equipped with vapor recovery or vent valve, open manhole cover. Failure to provide vacuum relief by one of the above methods may result in tank collapse.

Connect product hose from trailer to receiving tank. After both ends of discharge hose are secured, open emergency valve. Open product discharge valve slowly to check for leakage before leaving valve.

CAUTION: Cam type couplers are a common piping/hose end fitting. Liquid and/or pressure build up behind the sealing cap may create a hazardous condition. Proper safety procedures are mandatory to assure safe operating when a carrier chooses to use cam type quick couplers.

Remain clear of rotating drives to prevent entanglement in machinery, if product is being pumped off.

When pumping off, start pump after hoses are connected and valves open. Run pump for several minutes after suction breaks air. Then close valve and open small air intake valve, if provided, to purge hose. Ground the tank to receiving line if loading or unloading flammables.

If unloading with pressure, be sure the pressure source is limited in both pressure and flow rate as stamped on tank's metal certification plate, if applicable. See TTMA Technical Bulletin No. 109, "Pressure Supply Manifold for Unloading Tank Vehicles."

After both ends of discharge hose have been properly secured from cargo tank vehicle to receiving tank, proceed as follows:

For cargo tanks having bottom unloading, open emergency valve or manually controlled sump valve. Then open product discharge valve slowly to check for leakage before leaving valve.

CAUTION: when unloading hot product, valves and hoses will be hot.

REMEMBER: In case of emergency, product flow can be stopped by remove emergency trip in the case of self-closing emergency valves, or by a remove manual closing feature (minimum of 10 feet from valve) in the case of a manual sump valve without a self-closing feature.

Know both location & type of closing feature.

For cargo tanks having top unloading, open valve on top of dip pipe slowly to check for leakage before leaving valve.

REMEMBER: Unless specifically equipped with air, hydraulic, or mechanical operator, there is no remote operator for closing this type of valve on MC-312 cargo tanks, so in case of emergency, the top valve itself must be closed manually. **Know location & type.**

For cargo tanks having top unloading with a down line and valve at bottom of down line, open top dip pipe valve, then slowly open down line valve to check for leakage before leaving valve.

REMEMBER: For emergency flow stoppage, top dip pipe valve is the preferable one to close. **Know location & type.**

When shutting down after pressure unloading the cargo tank, shut off pressure supply air at its source and allow the pressure in the vehicle's cargo tank to blow down through the product discharge hose into the consignee's tank. If this procedure is not allowed by the consignee, shut off the air supply at its source and allow air pressure in the vehicle's cargo tank to blow down using the blowdown valve in the pressure discharge manifold described in TTMA TB No. 109, "Pressure Supply Manifold for Unloading Tank Vehicles," if plant is so equipped.

CAUTION: blow down gas may contain product or dangerous vapors. Direct discharge vapors away from personnel.

If neither of above blow down procedures is permissible, check with the consignee for the proper procedure to be used.

When shutting down product transfer operation while there is the possibility of some pressure in the transfer line, always close the valve nearest the source of pressure first. If the valve at the receiving end of the transfer line is closed first, there is the possibility of a weak line or loose connection allowing bystanders to become sprayed with dangerous material.

CAUTION: Most Substances Hauled In Dot-407 Tanks Are Dangerous. Know What You Are Hauling And The Required First Aid In Case Of Emergency. Do Not Enter Tank Before It Is Purged; Then Have A Buddy Nearby And Use Forced Ventilation In All Sections Being Entered. Always follow an approved OSHA confined space entry program when entering a cargo tank.

After load is discharged, close all emergency valves, product discharge valves, manhole covers and return hoses to their place.

DOT 407 & DOT 412 UNITS TYPICAL VAPOR RECOVERY LINES (TTMA TB#122)

Increasingly, the recovery of potentially harmful vapors associated with certain hazardous materials has become mandated by Federal, state and local governments, and by shippers. Accordingly, DOT 407 and DOT 412 cargo tanks are commonly specified with a line to recover vapors (VPL) during loading and unloading.

TOP LOADING WITH TOP VAPOR RECOVERY

1. Ensure the tank's bottom VRL ball is closed.
2. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
3. Remove then tank's top VRL dust cap and connect the applicable loading facility fitting to the tank's top VRL camlock adapter.
4. Connect the applicable loading facility fitting to the cargo tank top load assembly.
5. Using the hydraulic pump on the trailer, open the T-valve (but not the hydraulic self-closing stop-valve at the tank bottom). The positive indicator on the T-valve will alert personnel that it is open.
6. Open the tank's top VRL ball valve.
7. Initiate the loading process in accordance with carrier and shipper procedures.
8. When loading is completed, check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier, shipper and consignee procedures before continuing.
9. Disconnect the loading facility fitting from the top VRL camlock adapter.
10. Reinstall the tank's top VRL dust cap (with seals if required).
11. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
12. Disconnect the applicable loading facility fitting from the top load assembly.
13. Close all hydraulic and manual valves on the VRL and the tank's outlet.

BOTTOM LOADING WITH BOTTOM VAPOR RECOVERY

1. Ensure the tank's top VRL ball valve is closed.
2. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
3. Check to ensure the vapor recovery line is not under pressure. If the VRL is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
4. Remove then tank's bottom VRL dust cap and connect the applicable loading facility fitting to the tank's bottom VRL camlock adapter.
5. Connect the applicable loading facility fitting to the cargo tank outlet assembly.
6. Using the hydraulic pump on the trailer, open the T-valve and the hydraulic self-closing stop-valve at the tank bottom. The positive indicator on the T-valve will alert personnel that it is open.
7. Open the tank's bottom VRL ball valve.
8. Open the tank's manual outlet valve.
9. Initiate the loading process in accordance with carrier and shipper procedures.
10. When loading is completed, check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier, shipper and consignee procedures before continuing.
11. Disconnect the loading facility fitting from the bottom VRL camlock adapter.
12. Reinstall the tank's bottom VRL dust cap (with seals if required).
13. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
14. Disconnect the applicable loading facility fitting from the tank outlet assembly and seal the end of it in accordance with carrier and shipper procedures.
15. Close all hydraulic and manual valves on the VRL and the tank's outlet

UNLOADING WITH BOTTOM VAPOR RECOVERY

1. Ensure the tank's top VRL ball valve is closed.
2. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
3. Check to ensure the vapor recovery line is not under pressure. If the VRL is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
4. Remove then tank's bottom VRL dust cap and connect the applicable unloading facility fitting to the tank's bottom VRL camlock adapter.
5. Connect the applicable loading facility fitting to the cargo tank outlet assembly.
6. Using the hydraulic pump on the trailer, open the T-valve and the hydraulic self-closing stop-valve at the tank bottom. The positive indicator on the T-valve will alert personnel that it is open.
7. Open the tank's bottom VRL ball valve.
8. Open the tank's manual outlet valve.
9. Initiate the unloading process in accordance with carrier and shipper procedures.
10. When unloading is completed, check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier, shipper and consignee procedures before continuing.
11. Disconnect the unloading facility fitting from the bottom VRL camlock adapter.
12. Reinstall the tank's bottom VRL dust cap (with seals if required).
13. Check to ensure the cargo tank is not under pressure. If the tank is under pressure, relieve the pressure in accordance with carrier and shipper procedures before continuing.
14. Disconnect the applicable unloading facility fitting from the tank outlet assembly and seal the end of it in accordance with carrier and shipper procedures.
15. Close all hydraulic and manual valves on the VRL and the tank's outlet

VACUUM / PRESSURE TRANSPORT UNITS

WARNING: Inspection and preparation before operation - the new west-mark vacuum-pressure unit should be thoroughly inspected after delivery.

DANGER HAZARDOUS MATERIALS - The fumes discharged by the vacuum pump exhaust, when handling hazardous materials under a partial vacuum, must be piped to and discharged in a safe area. All operating employees should be supplied with the proper safety equipment required to handle that particular material. The interior and other portions of the unit which may have come in contact with the hazardous materials, shall be thoroughly cleaned as soon after the unloading process as feasible and prior to the subsequent reloading of the unit. Many materials are incompatible and will react with each other. A system of monitoring safety assurance procedures for loading, transporting and unloading of all materials is required.

DANGER

1. When handling flammable waste non-sparking tools, fittings, and other equipment must be used in addition to proper grounding devices.
2. Keep clear of the inlet valve hose because of strong suction during vacuum operations.
3. The discharge hose will have a tendency to whip under pressure, and therefore must be secured.

OPERATING INSTRUCTIONS

Familiarize all operating employees with the detailed operations and maintenance instructions for your specific vacuum pump. Direct all operating employees to read and observe the instructions of any DANGER or CAUTION labels affixed to the unit.

VACUUM LOADING

1. Before start-up always check fluid level in engine, hyd. and pump. See Component Manuals for proper maintenance and operation procedures. All valves: Hydraulic and Air Pump 4-way are in off or neutral positions before starting. Pre-check entire tank system and vacuum components.
2. Engine start-up: To start engine, push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 1-2 minutes to insure proper warm-up.
3. Clutch: While engine is idling activate clutch, before engagement of PTO, system air pressure must be 75 PSI minimum. PTO can only be engaged while clutch is activated. Engage PTO, red light should appear upon engagement. (Engine should be left in idle until operation mode is selected) Step 3 is required on clutch type units only.
4. Increase engine speed. Max engine speed to be set at _____
5. Open air bleeder valve. Check 4-way valve for neutral position on pump.
6. Open in-transit shut-off valve. (Located between external scrubber and primary scrubber dome assembly, top of tank) In-transit valve is optional equipment.
7. Connect hose to inlet plumbing at rear of tank. Once hose is secure, open inlet valve. The type of hose used must be capable of full vacuum.
8. Turn 4-way valve to load [vacuum]. (Valve is located on top of vacuum pump) Throttle air bleeder valve to control desired amount of vacuum.

9. Turn bypass valve on hydropak to ON@ position. (Hydrapak is located on driver-side attached to truck chassis.) Or engage Hydraulic System through the use of the directional control valve. (Hydrapak is optional equipment)
10. Evacuation of air from tank will assist in product being loaded. The liquid automatically closes primary scrubbers float assembly when full or stop loading when desired level is reached.
11. Close inlet valve at rear of tank, open air bleeder valve.
12. Turn 4-way valve to neutral on vacuum-pressure pump.
13. Disengage Hydraulic or Engine System. Deactivate clutch or PTO.
14. Close in-transit valve. Close air bleeder valve and disconnect load hose.

GRAVITY UNLOADING

1. Connect pressure hose to discharge outlet.
2. Open bleeder valve *or tank inlet valve and let air into tank*, open discharge outlet valve.
3. After product is partially discharged; the inlet load valve may be opened to allow additional air to enter tank through riser pipe. (option equipment)
4. *Close discharge valve and then tank air inlet valve, let product drain from hose.*
5. *After load is properly drained, remove hose, cap the outlet and store hose properly.*

PRESSURE UNLOADING (VAC PUMPS)

1. Before start-up always check fluid levels in engine and pump. See Component Manuals for proper maintenance and operation procedures. All valves; Hydraulic and 4-way are in off or neutral position before starting. Pre-check entire tank and pressure components.
2. Engine start-up: To start engine, push button must be held in the depressed position while starting engine until running oil pressure is established to open switch-gage contacts. Idle engine for approximately 1-2 minutes to insure proper warm-up.
3. Clutch: While engine is idling activate clutch, before engagement of PTO, system air pressure must be 75 PSI minimum. PTO can only be engaged while clutch is activated. Engage PTO, red light should appear upon engagement. (Engine should be left in idle until operation mode is selected) Step 3 is required on clutch type units only.
4. Increase engine speed. Max engine speed _____
5. Open air *bleeder* valve. Check 4-way valve for neutral position on *pump*.
6. Open *in-transit shut-off* valve. (*Located between external scrubber and primary scrubber in dome assembly, top of tank*). *In-transit valve is optional equipment.*
7. Connect hose to outlet valve at rear of tank. Once hose is secure open outlet valve. Hose will tend to whip under pressure, use the minimum pressure required to unload product.
8. Turn 4-way valve to pressure tank. (Valve is located on *top of vacuum pump*). Close air bleeder valve or throttle to control desired pressure. *Close all tank openings except discharge line and tank air inlet valve.*
9. Turn bypass valve on hydropak to "ON" position. (Hydrapak is located on driver-side attached to truck chassis.) Engage Hydraulic System through the use of the directional control valve. (Hydrapak is optional equipment)
10. Pressurize tank assist in unloading product. Throttle air bleeder valve to maintain tank pressure until product is discharged.
11. Close outlet valve at rear of tank, open air bleeder valve.
12. Turn 4-way valve to neutral on vacuum-pressure pump *and close tank outlet valve at rear of tank, when finished unloading.*
13. Disengage Hydraulic or Engine System. Deactivate clutch or PTO.
14. Close in-transit and air bleeder valves, then disconnect outlet hose. *Close all tank openings and disconnect outlet hose. Store hose properly.*

PRECAUTIONS:

In-transit shut-off must be in the closed position when vacuum-pressure pump is not in use. In-transit shut-off must be placed in the open position before using vacuum-pressure pump. The in-transit shut-off is a safety device to prevent loss of product in case of a roll over accident when the tank remains on its side or inverted.

Do not exceed the vacuum pump manufacturer's maximum recommended operating speed (R.P.M.). Power Take-Off and reduction gear ratios vary and the R.P.M. of the power source is seldom the same as the pump. An accurate tachometer on the power source and determination of drive ratio is essential to prevent damage. Rotary vane pumps operated below recommended minimum speeds will cause vane chatter that can damage the pump.

Bleed all vacuum or pressure from the unit before changing position of 4-way valve, (*vacuum to pressure or pressure to vacuum*), to prevent damage to the pump. Always air bleed entire tank before transporting.

Never open the scrubber or liquid entry presenter drain valves while the unit is under vacuum or pressure. Vacuum will cause the injection of material into the External Scrubber or Vacuum Pump. *Excessive vacuum will cause the tank to collapse and over pressure to explode the vessel. Tank vacuum and pressure limits are stamped into the data plate. Never exceed them.* MAWP = max allowable working pressure.

With the bleeder valve open, drain both the inside scrubber and the liquid entry presenter through their respective drain valves after each load. In the event that an excess amount of material is drained from either component, check both float shut-off valves for adjustment or malfunction and for leaks in the Air System. (see the Air System diagram)

FUNCTION OF AIR SYSTEM COMPONENTS

When the unit is being loaded using vacuum, the **Primary Scrubber Float Shut-Off Valve** will automatically terminate the evacuation of air, when filled to capacity. By adjusting the height of the float ball the capacity can be increased or decreased.

The External Scrubber; will separate liquid carried past the primary float shut-off valve, caused by a surge or valve seat misalignment, from the air being evacuated. The scrubber will also liquefy condensation, which would otherwise pass through the secondary float shut-off valve and into the pump. Drain after every load. This scrubber contains the Secondary Float Shut-Off Valve, which will automatically terminate the evacuation of air if the primary fails, or the scrubber is filled beyond capacity.

The Air Bleeder Valve (Blow Down Line) is used to regulate the amount of vacuum or pressure being used and to neutralize the tank from the internal or external pressure condition. The air rushing into the dome area will also pocket material away from the primary float shut-off valve helping to prevent the carry over of light material.

CAUTION Never use relief devices to regulate vacuum or pressure in the tank. Always throttle the Air Bleeder Valve to regulate this condition.

The Inlet Riser Pipe is extended to the top of the tank, to allow for clearing a blocked suction hose using pressure, with out losing material already loaded, and for transfer service. (Optional equipment).

Efficiency in loading is directly proportional to the size of the lines or hose used between the unit and the material. Frequently heavier materials can be loaded much more rapidly when skimmed, allowing air to mix with the product at the suction end of the hose. Air can be injected into the suction end of the inlet hose to speed loading of viscous material and to greatly increase the depth or distance which material can be loaded by vacuum. In the event material must be pulled a great distance, lightweight aluminum tubing can be substituted for heavy vacuum hoses to make up the majority of the line.

Depending on density or viscosity, waste materials may be discharged by gravity or pressure. Connect and secure a suitable discharge line or hose from the discharge outlet to the dump site. During gravity discharge, open the bleeder valve to allow tank to atmosphere. When pressure is desired to speed up the operation or discharge the material to a higher elevation, use only the amount of pressure required. In the event that highly viscous materials are discharged under pressure, open the injection valve to speed the operation by aerating the material. The injection system is optional and is installed at the customer's request.

CAUTION Never leave the injection valve open while loading with partial vacuum as material carry-over into the pump may occur.

LOADING HOT OIL, LIGHT OIL AND DETERGENTS -- These materials may have tendency to foam or boil when subject to a partial vacuum. Load these material through the discharge valve, not the inlet valve, to avoid the agitation caused by transfer through the riser. Throttle the bleeder valve as required to maintain the minimum amount of vacuum necessary to lead. Keeping the bleeder valve throttled throughout filling causes air to rush into the some, pocketing and cooling the foam, thus preventing carry-over without activating the primary float shut-off valve. This filling operation may have to be periodically stopped to drain the inside scrubber and liquid entry presenter. It is important to remember that loading of these materials cannot be rushed due to their foaming characteristics.

CLEANING TANKS: The cleaning of storage tanks and the removal of bottom sediments is easily accomplished with the vacuum. Some larger tanks that do not have shell man-ways or cleanouts may require removal of lower shell section. Equipment used to assist the vacuum unit performing this service is as follows:

- Hydro blaster or Roper type gear pump for pressure cleaning and wash down.
- Duckbill hose nozzle and industrial heavy-duty straight and curved squeegees.

DISPOSAL OF BOTTOM SEDIMENTS AND SEMI-SOLIDS: Material that have a tendency to settle may require agitation prior to discharge. Agitation is accomplished by creating a partial vacuum in the unit, then rapidly opening and closing the discharge valve. Repeat this procedure several times until agitation is complete. Off loading should be complete as soon after agitation as possible.

CAUTION Do not let a vacuum-pressure unit loaded with suspended solids sit for an extended period of time. The solids will settle and compact making agitation difficult.

REAR CLEANOUTS: Can be provided to allow removal of compacted solids. Man-ways from 16" to 30" inside diameter are installed horizontal in rear head, between inlet and discharge valves, flush with the bottom of the tank, in compliance with ASME and DOT.

TRANSFERRING FROM ONE TANK TO ANOTHER: Is accomplished by connecting the suction hose to the inlet riser pipe, and the discharge hose to the discharge valve and the point of discharge. Alternate vacuum and pressure procedures, until the transfer is complete, using only the amount of pressure required.

PIPELINE SERVICING AND REPAIRS: In the event of a pipeline break, vacuum is the most efficient way of cleaning up the oil spill. When the escaping oil penetrates and softens the surrounding soil, your vacuum unit can load the mixture of soil and oil, exposing the pipeline break.

Replacement parts for damaged or worn items should be obtained from reputable sources that are of equal value to the parts being removed. One excellent source is the original equipment manufacturer. Always stop operation or remove the tank from service when defective parts are found until they can be replaced or fixed properly. Note ASME relief vents require factory adjustment and replacement of all parts. Do not attempt to fix them yourself.

CLOSING: The Vacuum-Pressure unit is a versatile piece of equipment which the refinery superintendent or engineer will, as he acquires a personal working knowledge of its various functions, find many other applications for cleaning, servicing, transfer and transportation. If these procedures outlined above will not work in your application, please contact the factory before changing the operating procedures.

HOT PRODUCTS TRANSPORT UNITS (TTMA TB#75 Apr. 2006)

WARNING: Inspection and preparation before operation - the new west-mark vacuum-pressure unit should be thoroughly inspected after delivery.

These suggested directions are not exhaustive since tank vehicles are of varying design to meet the requirements of the first purchaser, therefore, the user must satisfy himself that his safety, the safety of the public, the integrity of the transport and the load are not jeopardized.

Before operating, become familiar with the message indicated on all information and caution plates on the vehicle. If a plate or label has become illegible or lost, request replacement from the vehicle manufacturer.

Before loading and/or unloading the product, the user must familiarize himself with its operational characteristics, including manholes, vents, gravity discharge valves, pump off valves, heating procedures, etc.

KNOW WHAT PRODUCT YOU ARE LOADING AND KNOW WHAT PRODUCT WAS LAST CARRIED IN THE VEHICLE.

PERSONAL SAFETY & FIRE PREVENTION

When loading, unloading or handling hot products, wear protective equipment including chemical goggles with a 200 mm (8 in.) minimum size face shield. Loose fitting clothing in good condition with closed collar and cuffs should be worn. Boots at least 150 mm (6 in.) high and laced with no openings should be worn. Pants without cuffs should extend over the tops of the boots. Insulated gauntlet type gloves should extend loosely up the arms.

Always have a dry chemical type fire extinguisher full and in good condition at hand.

Refer to the Asphalt Institute's publication, #IS-180, "Safe Storage and Handling of Hot Asphalt." This is available by contacting the Asphalt Institute at P.O. Box 140512, Lexington, KY 40152-4052, phone (606) 288-4960.

Some hot products are normally considered to be non-flammable, yet are transported in a flammable condition at temperatures above their flash point. Some hot products emit vapors which are extremely flammable. You must know the characteristics of the product you are carrying to determine its ability to support a fire and the procedures necessary to avoid one.

REGULATED PRODUCTS, HAZARDOUS MATERIALS

The U.S. Department of Transportation published regulations in 49 CFR Parts 172 and 173 governing the transportation of "elevated temperature materials." These regulations became effective from 1993 through 1995.

Under these regulations products that are transported at temperatures above 100°C (212°F) are called "elevated temperature materials" and products that have a flash point above 38°C (100°F), but are transported at temperatures above their flash points, are called "flammable liquid elevated temperature materials."

These regulations require identification numbers, the word "HOT", and hazardous material placards on cargo tanks, and similar marking of bills of lading. They also include requirements for the design and construction of new cargo tanks and cargo tanks already in service. These regulations may require modification of cargo tanks already in service.

The owners and operators of Hot Products Tank Vehicles should become knowledgeable of these regulations to assure their compliance.

PRE-LOADING INSTRUCTIONS

At ground level

1. Extinguish all sources of ignition including all smoking materials, torches, burners, or nearby fires before proceeding.
2. See that all product discharge valves are closed.
3. If overflow pipe vent is provided, look at outlet to see that it is not plugged with solidified material.

At top side

1. See that manhole cover gasket is intact and that the closing mechanism functions properly to secure lid tightly.
2. If cover is equipped with manual relief valve (pressure-vacuum), activate it with your foot or gloved hand to see that it functions.
3. Be sure the inside of the tank and the discharge piping is free of moisture before loading with hot product unless temperature of the product to be loaded does not exceed 212°F. This will prevent boiling over. There are techniques by which higher temperature product may be loaded into a tank having a small amount of moisture, however, only a loader having full knowledge of the correct procedures and proper hot product to introduce into the tank, should attempt such a loading.
4. If there is any possibility of moisture or standing water in the tank or discharge piping, the safest procedure is to remove the moisture physically after determining that the tank is safe to enter. Some sources of moisture are:
 - a) Condensation formed when the tank cools.
 - b) Previous load of emulsion products.
 - c) Water from rain, melting snow, or ice finding its way in through manhole or vent, possibly due to flashing drain tubes being plugged.
5. If there is any doubt about the presence of moisture, an anti-foam solution (wetting agent) may be used. However, it must be compatible with the product being loaded. Follow the recommendations of the anti-foam supplier for the quantity of material to be used.
6. Know the capacity in gallons of the tank to avoid overfilling it. Bitumens are normally sold by volume corrected to 60°F or by weight, hence, a hot bitumens load at 375°F, for example, will require approximately 8% greater volume of tank capacity than if the bitumen is 60°F.
7. **KNOW WHAT PRODUCT YOU ARE LOADING, KNOW WHAT PRODUCT WAS LAST CARRIED IN THE VEHICLE, AND IF THEY ARE COMPATIBLE.**

LOADING PRECAUTIONS

Do not load tank with hot product which exceeds tank manufacturer's maximum temperature rating. To do so endangers the structural capacity of tank to continue trouble-free performance. Aluminum tanks require close attention to this precaution.

Do not load the vehicle beyond the maximum product load specified on the metal certification plate or on the vehicle certification label which specifies the Gross Vehicle Weight Rating (GVWR). The GVWR is the maximum allowable total weight of vehicle, payload and equipment on the vehicle. See sticker typically located on front side filler on drivers side of tank.

The loading pipe should be adequately secured, braced, or restrained to prevent accidental spill during loading.

Stay away from vicinity of manhole to avoid being splashed and burned or exposed to product fumes during loading.

Be sure manhole cover is closed, seated, and securely latched before moving tank. Excessive tightening of some spring-loaded covers may not allow proper seating.

UNLOADING PROCEDURES

1. If heating of products to bring it up to flow temperature is required, see "HEATING". Be sure heating elements are turned off before unloading.
2. See that discharge lines, valves, transfer hose are empty and clean.
3. Operate manual relief valve in manhole before opening cover or unseat cover slowly to relieve any pressure on top of the load. Open manhole cover before discharge of load by either pump or gravity.
4. Handle the hose with gloved hands and connect to the discharge pipe. After both ends of hose are secured, open the valve(s) slowly to check for leakage before leaving valve.
5. Remain clear of rotating drives, as on pumps, to prevent entanglement in machinery.
6. When pumping off, run pump for several minutes after suction breaks air. Then close the valve and open the small air intake valve, if provided, to purge hose. If a wash-out solvent pressure system or other solvent suction system is provided, open the supply valve about 30-45 seconds to flush the hose and leave solvent residue in the pump.

7. When shutting down the product transfer operation while there is the possibility of some pressure in the transfer line, always close the valve nearest the source of pressure first. If the valve at the receiving end of the transfer line is closed first, there is the possibility of a weak line or loose connection allowing bystanders to become sprayed with hot material.
8. Close the product discharge valves securely while it and the product are still hot. If an attempt is made to close a valve that has cooled, it is possible that the valve will be broken while attempting to seat the valve disc against a hardened product.
9. Upon returning to the terminal, report repairs that should be performed before being dispatched for another load. This report should include all vehicle components including manhole gaskets and latching mechanisms, vents, valves, hoses, etc.

HEATING: FLUE AND BURNER SYSTEM

Do not use gasoline instead of required kerosene or fuel oil in generating or low pressure burners as use of gasoline will result in an extreme fire hazard.

Do not use burner(s) to preheat an empty tank.

Do not ignite or use the burner(s) to heat bitumen unless full length of flue(s) is covered by a 6 inch minimum depth of bitumen.

Position the tank across wind when operating burners.

Prop manhole cover partially open during heating of contents.

Do not use burner(s) under these conditions:

1. While loading, unloading or moving.
2. In a building, garage, or any confining area.

Be sure all fuel lines and connections are free of leaks before igniting burners.

Follow burner operation procedures furnished by the vehicle manufacturer or those of the burner system supplier.

For your personal safety, use a torch (not match or lighter) to ignite the burner.

Ignite inside burners first. Do not reach across a lit burner to reignite inside burner.

Do not leave a burner(s) in operation unattended and be ready to shut down the burner in an emergency.

Do not heat product beyond manufacturers recommended temperature. When burners go out, allow flues to ventilate before reigniting the burners.

HEATING: STEAM OR HOT OIL SYSTEM

Be sure heating media, such as steam or hot oil, which is to be connected to the vehicle heating system will not exceed the pressure rating indicated on the vehicle.

Handle steam or oil hoses with gloved hands. Connect inlet hose to the trailer heating system inlet and return the hose to trailer heat system return or outlet connections if provided. After both ends of the hose are secured, open the valve(s) slowly to check for leakage before leaving the valve.

If it is necessary to introduce steam or hot oil into the trailer heating system during the entire product unloading operation, the heating transfer system should be turned off **AT THE HEAT SOURCE** as promptly as possible after the product unloading operation is completed. When cold weather conditions may cause freezing of steam condensate in the vehicle heating system, leave connection uncovered to allow condensate to drain.

MAINTENANCE, FLUE TYPE TANKS

Every three months during continual usage, inspect and, if required, remove carbon accumulation (coked bitumen) from outside of flue in the tank. The heaviest deposit occurs at the flame area and should be removed periodically for efficiency of the heating system and for longer flue life.

Roofing bitumens (pitch, steep, flat) will buildup from the bottom under the flues and will sometimes push the flue upward and probably fracture it. Periodic removal of this buildup by chipping or "mining" is recommended.

Flue liners which reduce scaling and eventual burn-through in the flame impingement zone are recommended on tanks which routinely carry commodities requiring heating while in the tank. Inspect the liners often and replace as necessary.

Work inside the cargo tank requires entrance into a "confined space" and may be hazardous. Work in this area must be performed in accordance with the regulations of the Occupational Safety and Health Administration found in 29 CFR 1910.146.

ORDERING SERVICE & REPLACEMENT PARTS

West-Mark Service Centers are authorized to perform all required maintenance and service. A complete line of parts is stocked to meet your trailer and tank needs. All locations may be reached toll free at (800) 692-5844.

SCHEDULING SERVICE

West-Mark Service Managers are qualified to assist with tanker service needs. Our shops are National Board Certified and our mechanics are fully certified to work on West-Mark and other equipment needs. Call to schedule an appointment or schedule a West-Mark representative to inspect your units.

Darrel Watts, Service Manager West-Mark Service Center 2704 Railroad Avenue Ceres, CA 95307 (209) 537-4747	Scott Perkins, Service Manager West-Mark Service Center 303B Mt. Vernon Avenue Bakersfield, CA 93387 (661) 846-3200	Wayne Walker, Service Manager West-Mark Service Center 3050 Van Horn Road Fairbanks, AK 99709 (907) 451-8265
--	---	--

ORDERING REPLACEMENT PARTS

Our parts managers are experienced and will assist with order and your delivery needs. Phone orders may be placed at either of the numbers listed below for immediate service. Our policy is to handle these orders as quickly as possible and have them shipped within two working days, if possible.

Dale Steele, Parts Manager West-Mark Service Center P.O. Box 100 Ceres, CA 95307 (209) 343-3122	Eric Neufeld, Parts Manager West-Mark Service Center P.O. Box 70186 Bakersfield, CA 93387 (661) 846-3206	Wayne Olsen, Parts Manager West-Mark Service Center 3050 Van Horn Road Fairbanks, AK 99709 (907) 451-8265
---	--	---

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect that could cause an accident or could cause injury or death, you should immediately inform the *National Highway Traffic Safety Administration (NHTSA)* in addition to West-Mark.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealers or West-Mark.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, D.C. 20590. You can also obtain other information about motor vehicle safety from the hotline.

STATEMENT OF WARRANTY

West-Mark warrants the Equipment manufactured by it to be free from defects in material and workmanship under normal use, when proper service and maintenance as described in its Service Bulletins and Operation Manuals are performed, for a period of twelve (12) months from date of delivery to first purchaser.

This warranty is expressly limited to the repair or replacement of any component or part thereof, of any such unit manufactured by West-Mark, which is proven to West-Mark's satisfaction to have been defective in material or workmanship. Such components or parts thereof shall be repaired or replaced without cost to the first purchaser for parts and labor provided such unit is returned for such repair or replacement to a West-Mark Service Center, or other such place as may be designated by West-Mark, within twelve (12) months from the date on which unit was delivered to such first purchaser.

WEST-MARK MAKES NO WARRANTY, EXPRESSED OR IMPLIED, OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. WEST-MARK MAKES NO WARRANTY OF PRODUCTS MANUFACTURED BY OTHERS AND SUPPLIED BY WEST-MARK, THE SAME BEING DIRECTLY SUBJECT TO WARRANTIES, IF ANY, OF THEIR RESPECTIVE MANUFACTURERS.

West-Mark warrants this equipment is manufactured in accordance with the specifications on the order. West-Mark does not warranty this piece of equipment for use in hauling any particular product. West-Mark accepts no responsibility for damage to the equipment, or for cargo losses, due to an adverse effect on the equipment caused by the incompatibility of the product being hauled. West-Mark does not assume any other liabilities of any nature whatsoever, including but not limited to, any direct or indirect or consequential loss, transportation charges, loss of profits, damages, or delays.

West-Mark shall correct by repair or replacement any defect in material or workmanship in any part of a product manufactured by it subject to the following conditions: (a) Written notice of any such claimed defect must be given to West-Mark during the warranty period; (b) West-Mark shall have the right to inspect the claimed defective Equipment at such time and place as it reasonably requests; (c) Any improper use, operation beyond rated capacity, substitution of parts not approved by us, or any alteration or repair by others in such manner as in our judgment affects the product materially and adversely, shall void this warranty.; (d) This warranty does not apply to parts requiring replacement because of natural wear and tear, or to products, accessories, parts or attachments which were not manufactured by West-Mark; (e) This warranty shall not apply if parts and/or labor are required due to accident, abuse or improper or neglected maintenance; (f) When alterations are made or parts or attachments are installed by Buyer or for him by others, this warranty shall be void and West-Mark shall not be responsible for such alterations or installations, or for the operation of the Equipment thereafter; (g) This warranty shall be void when tanks are subjected to weight loads or pressures, or are used to contain, or are cleaned with, materials having corrosive temperature or other characteristics for which the tank was not designed; (h) West-Mark shall not be obligated to furnish "loaners" or any compensation for rented, loaned or borrowed equipment while repair is being made under this warranty; (i) All repairs under this warranty shall be made at a West-Mark Service Center, or at such other place designated by West-Mark, and Buyer must bear the risk and expense of transporting the Equipment to West-Mark's plant or such other designated place.

WEST-MARK DOES NOT ASSUME ANY LIABILITY FOR INTERIOR CLEANLINESS AND FINISH REQUIREMENTS DUE TO DIFFERENT OPERATIONS AND CIRCUMSTANCES. AS SUCH, WEST-MARK DOES NOT CERTIFY THAT EQUIPMENT IS READY TO BE PLACED INTO SERVICE UPON DELIVERY. THE EQUIPMENT MUST BE INSPECTED, CLEANED, WASHED AND OTHERWISE PREPARED FOR INTENDED SERVICE BY THE USER TO THE REQUIREMENTS OF THE CUSTOMER PRIOR TO PLACING INTO SERVICE.

THE FOREGOING WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED.



**WEST-MARK
P.O. BOX 100
CERES, CALIFORNIA
(209) 537-4747 Fax (209) 537-1753
(800) 692-5844
www.west-mark.com**



Parts Manual

EQUIPMENT ID: 38225

To order parts call West -Mark Service Centers - Parts Department (800) 692-5844
or visit one of our convenient locations
Atwater, California * Ceres, California * Bakersfield, California * Fairbanks, Alaska
Ask about next day delivery; large selection of parts in stock
Major Credit Cards Accepted

www.west-mark.com

Serial Number(s): 38225

<u>WM Part No.</u>	<u>Description</u>	<u>Qty</u>	<u>UOM</u>
B2-4510510	BRACKET, STATIC GROUNDING S/S	1.00	EA
B2-4510520	BRKT, "V" RAIL MOUNTING	1.00	EA
C1-0901880	ROPE, 3/16" GALVANIZED WIRE	10.00	FT
C1-6118800	PULLEY BLOCKS, 3/16" X 1-1/2" FLAT	4.00	EA
CB-38225001	BOTTOM, CABINET	1.00	EA
CB-38225002	WALL, CABINET REAR (RH)	1.00	EA
CB-38225003	TOP, CABINET	1.00	EA
CB-38225004	TOP, CABINET TRIM	1.00	EA
CB-38225005	WALL, CABINET REAR (LH)	1.00	EA
CB-38225006	DOOR, LEFT	1.00	EA
CB-38225007	WALL, CABINET SIDE	1.00	EA
CB-38225008	DOOR, CABINET (RH)	1.00	EA
CB-38225009	WALL, CABINET SIDE	1.00	EA
CB-38225010	VERTICLE DOOR STIFFENER	2.00	EA
CB-38225012	LOWER LIGHT VALANCE	1.00	EA
CB-38225013	BRACKET, CABINET LIGHT MOUNTING	1.00	EA
CB-38225014	BRACKET, CABINET LIGHT MOUNTING	2.00	EA
CB-38225015	HORIZONTAL ROOF STIFFENER	1.00	EA
CB-38225016	DOOR STAY REINFORCEMENT GUSSET	4.00	EA
CB-38225017	DOOR LATCH MOUTING CHANNEL	2.00	EA
E1-6100020	SOCKET, 4-PRONG	1.00	EA
E1-6100030	PLUG, 4-PRONG	1.00	EA
E1-6100130	SOCKET, SINGLE POLE	1.00	EA
E1-6100140	PLUG, SINGLE POLE W/ GRND	1.00	EA
EO-38026001	BRACKET, VALVE OPERATOR MTG.	1.00	EA
F3-0100130	SAFETY SNAP PIN, 3/8" DIA, 2-1/4"	7.00	EA
F3-0113110	FLANGE, 3" M/S FLUED	1.00	EA
F3-0114320	GASKET, 3" VITON TTMA FLANGE	1.00	EA
F3-0114520	GASKET, 3" BUNA-N DRAIN POCKET BETTS	1.00	EA
F3-2100480	HYD SOCKET WELD COUPLING X 1-1/4"NPT S/S	2.00	EA
F3-2183060	FLANGE, 3" TTMA T-316 S/S ASME	1.00	EA
F3-3100100	ELBOW, 1-1/4" ALUM. SLIP ON HANDRAIL	6.00	EA
F3-3100110	TEE, 1-1/4" ALUM. SLIP ON HANDRAIL	7.00	EA
F3-3100170	CROSS, ALUM. FOR 1-1/4" PIPE	1.00	EA
F3-6200470	DRY-DISCONNECT, 2" ALUM MD ADAPTER	3.00	EA
F3-6209070	CAP, DUST 2-1/2" ALUM	2.00	EA
F3-6301760	REDUCER, 2-1/2" X 2" M/S CONC.	1.00	EA
F3-6302420	NIPPLE, HALF 2-1/2" X 3" B.I. 150#	1.00	EA
F3-6302430	ELBOW, 2-1/2" 90o B.I. L.R. SCH 40 BW	1.00	EA
F3-6302730	NIPPLE, HALF 3/4" T-304 S/S X 3" LONG	1.00	EA
F3-6327790	KING NIPPLE, 2" B.I. THD	2.00	EA
F3-6327880	KING NIPPLE, 3" B.I. BW STB35	2.00	EA

To order parts call West-Mark parts department or visit our web site at www.west-mark.com

November 06, 2015

Page 2 of 5

Serial Number(s): 38225

<u>WM Part No.</u>	<u>Description</u>	<u>Qty</u>	<u>UOM</u>
F3-6331310	BUSHING, 1-1/2" x 1-1/4" T-304 S/S 150#	1.00	EA
F3-6333020	COUPLING, 1/4" T-304 S/S 150#	2.00	EA
F3-6333050	COUPLING, 3/4" T-304 S/S 150#	1.00	EA
F3-6342020	PLUG, 1/4" T-304 S/S 150#	2.00	EA
F3-6342050	PLUG, 3/4" T-304 S/S 150#	1.00	EA
F3-6352990	KING NIPPLE, 1-1/2" S/S T-316 BW	2.00	EA
F3-6357840	KING NIPPLE, 2" M/S VICT x BARB	2.00	EA
F3-6366890	NIPPLE, 2-1/2" X 2-1/2" NPT X VICT. GROO	1.00	EA
F3-6384010	ELBOW, 3" 90o M/S S.R. SCH 40 BW	4.00	EA
F3-6384090	ELBOW, 2" 90o B.I. L.R. B.W. SCH 40	2.00	EA
F3-6384110	ELBOW, 3" 90O M/S L.R. SCH 40 BW	1.00	EA
F3-6384200	ELBOW, 2" 90o B.I. S.R. B.W. SCH 40	1.00	EA
F3-6386110	TEE, 3" B.I. SCH 40 BW	1.00	EA
F3-6386120	TEE, 2" B.I. STD. RADIUS SCH 40 BW	2.00	EA
F3-6389490	ELBOW, 1-1/2" 90o T-304 S/S S.R. SCH 10	2.00	EA
F3-6397010	REDUCER, 3" x 2" M/S ECC. SCH 40 BW	1.00	EA
F3-6397720	REDUCER, 3" X 2-1/2" B.I. CONC. SCH 40 B	1.00	EA
F3-8600310	COUPLING, 2" VICTAULIC FIG. 75	3.00	EA
F3-8600320	COUPLING, 3" VICTAULIC FIG. 75	1.00	EA
F3-8600720	COUPLING, 2-1/2" VICTAULIC FIG. 75 W/ M-	1.00	EA
F3-8691410	NIPPLE, VICTAULIC 3" X 2.5" B.I. (GROOVE	1.00	EA
G1-7400130	GASKET, 3" BUNA-N TTMA 3/16" THK	1.00	EA
G4-0001000	GROUND BALL, 3/8" BRASS	4.00	EA
H1-3000090	HINGE, S/S STRAP W/ GREASE ZERK	4.00	EA
H1-4177460	PIPE, 1-1/2" SCH.10 W/ 7/16" HOLE	7.00	EA
H1-4500060	DOOR LATCH, AUSTIN #158	1.00	EA
H1-4500701	LEVER, DOOR CATCH NORTH SLOPE STYLE (LH)	1.00	EA
H1-4500702	LEVER, DOOR CATCH NORTH SLOPE STYLE (RH)	1.00	EA
H1-4500710	DOOR CATCH, NORTH SLOPE STYLE	2.00	EA
H1-4500720	BRACKET, NORTH SLOPE STYLE LATCH	2.00	EA
H1-4500751	LATCH, DOOR STOP NORTH SLOPE STYLE (LH)	1.00	EA
H1-4500752	LATCH, DOOR STOP NORTH SLOPE STYLE (RH)	1.00	EA
H5-2900320	HOSE, 2" DIESEL FUEL , RATED @ -40 F	2.59	FT
H5-2900750	HOSE, 3" DIESEL FUEL , RATED @ -40 F	0.51	FT
H5-2901750	HOSE ASSY, 1-1/4" x 50' W/MALE NPT BRASS	1.00	EA
H5-2901760	HOSE ASSY, 2" x 50' W/ MALE NPT BRASS EN	1.00	EA
H5-2915120	TUBING, 1-1/2" POLYETHYLENE WHITE	12.00	FT
H5-2924000	HOSE, 3-1/2" VAPOR VENT	0.29	FT
H5-7307120	CLAMP, 1-1/4 PIPE CUSIONED SINGLE SERIES	6.00	EA
H5-7702630	HYDRAULIC DISC. FITTING, 1-1/4" FEMALE 7	1.00	EA
H5-7702640	HYDRAULIC DISC. FITTING, 1-1/4" MALE 75	2.00	EA
H5-9900030	HYD. HOSES & FITTINGS PER ATTACHED	1.00	EA
H7-7310250	RING CHANNEL, 7GA. S/S 20' LONG, SK-1491	1.00	EA
H8-2901490	HOSE REEL, HANNAY# EPJ232-26-27-LH ELECT	2.00	EA

To order parts call West-Mark parts department or visit our web site at www.west-mark.com

November 06, 2015

Page 3 of 5

Serial Number(s): 38225

<u>WM Part No.</u>	<u>Description</u>	<u>Qty</u>	<u>UOM</u>
H8-4145260	HOSE REEL, HANNAY #EPJ16-30-31 ELEC REWN	2.00	EA
H9-3000240	VALVE, DIRECTIONAL CTRL 4-WAY, 3-POS	1.00	EA
H9-3700120	MOTOR, HYD CHAR LYNN	1.00	EA
H9-3701130	FLOW CONTROL FC-51-1-1/4	1.00	EA
H9-4600460	CHECK VALVE, 1-1/4" FPT 7# SPRING CN1-1/	1.00	EA
HS-38225002	MOUNTING PLATE	4.00	EA
HS-38225005	HOSE REEL MOUNTING TAB	8.00	EA
HS-38225006	BRACKET, STATIC REEL MOUNTING	1.00	EA
HS-38225007	FLOW CONTROL BRACKET	1.00	EA
L1-0111200	MULTI-PURPOSE LADDER ASSY. W/ PERFORATED	2.00	EA
L3-0933150	SWITCH, HEAVY DUTY ON/OFF TOGGLE 12VDC 2	2.00	EA
L3-1505050	GROUNDING STRAP, 18" LONG	1.00	EA
L3-2100581	WORKLIGHT, 4" SQUARE, 7 LED 6-WATT LED'S	3.00	EA
L3-7800690	LAMP KIT, RED STT LED SUPER 44	4.00	EA
L3-7803470	LAMP, L.E.D. CLEAR BACK-UP	2.00	EA
L3-8500010	RECEPTACLE, 7-WAY FEMALE SAE J560 STYLE	1.00	EA
LD-38225100	LADDER MOUNTING BRACKET	1.00	EA
LD-38225100M	LADDER MOUNTING BRACKET (OPPOSITE)	1.00	EA
LD-38225101	LADDER MOUNTING BRACKET BACKING PLATE	2.00	EA
LD-38225102	LADDER MOUNTING TAB	2.00	EA
LW-38225002	7-WAY MOUNTING BRACKET	1.00	EA
M1-0501040	MANHOLE, 20" PAF 406-98 W/ 10" FILL BET	2.00	EA
M1-0511440	COLLAR, 20" T-304 S/S MANHOLE	1.00	EA
M4-4600300	METER, #M-7-B-1 2" LIQUID W/ STRAINER, & L	1.00	EA
N2-1700340	NOZZLE, 1-1/4" OPW 190 SERIES	1.00	EA
P3-0510070	PLACARD BRACKET, S/S HEAD MT (SK-596-SS)	1.00	EA
P3-5300640	FORMED HEADS XXGA, T-XXX XX FINISH	6.00	EA
P3-6110100	PLACARD HOLDER, ALUM W/ CLIPS #1TPH	2.00	EA
P4-0400440	PUMP, BLACKMER #TXSD2.5A 2-1/2", BUNA-N	1.00	EA
PL-38225005	PIPE RUN, 3" SCH 40 B.I. BW x VIC	1.00	EA
PL-38225008	PIPE RUN, 2" SCH 40 B.I. NPT x BW	1.00	EA
PL-38225009	PIPE RUN, 2" SCH 40 B.I. NPT x BW	1.00	EA
PL-38225010	PIPE RUN, 2" SCH 40 B.I. NPT x BW	1.00	EA
PL-38225011	PIPE RUN, 2" SCH 40 B.I. VIC x BW	2.00	EA
PL-38225013	PIPE RUN, 2-1/2" SCH 40 B.I. VIC x BW	1.00	EA
PL-38225030	BRACKET, 4-WAY VALVE SUPPORT	1.00	EA
PL-38225031	BASE, METER MOUNTING REMOVABLE	1.00	EA
PL-38225032	BASE, PUMP MOUNTING REMOVABLE	1.00	EA
PL-38225034	PIPE RUN, 2" SCH 40 B.I. NPT X BW	1.00	EA
PL-38225036	PIPE RUN, 2" SCH 40 B.I. NPT X BW	1.00	EA
PL-38225038	PIPE RUN, 2" SCH 40 B.I. VIC x BW	1.00	EA
PL-38225100	PLUMBING BASE	1.00	EA
PL-38225101	PLUMBING BASE MOUNTING TAB	8.00	EA
R2-0150210	REEL, STATIC W/ STD. 50 ft. GALV. CABLE	1.00	EA

To order parts call West-Mark parts department or visit our web site at www.west-mark.com

November 06, 2015

Page 4 of 5

Serial Number(s): 38225

<u>WM Part No.</u>	<u>Description</u>	<u>Qty</u>	<u>UOM</u>
S2-7710250	TANK MOUNT SILL, 2-1/2" X 1" X 10' RUBB	3.00	EA
SD-382251001	PAD, VAPOR RAIL END CAP	1.00	EA
SD-382251002	SIDE, VAPOR RAIL	1.00	EA
SD-382251003	END CAP, VAPOR RAIL	1.00	EA
SD-382251004	END CAP, VAPOR RAIL	1.00	EA
SD-382251005	PIPE, S/S 1-1/2" SCH 10 T-304	2.00	EA
SD-382251006	SIDE, VAPOR RAIL	1.00	EA
T4-0001000	BOLT PLATE, HOLE PATTERN FOR H1-3000090	4.00	EA
T4-0001010	BOLT PLATE, HOLE PATTERN FOR H1-3000090	4.00	EA
V1-0500810	VALVE, 1-1/4" NPT BALL 3,625PSI MED DUTY	2.00	EA
V1-0501040	VALVE, 3/4" BRONZE BALL	1.00	EA
V1-0501080	VALVE, 2" BRONZE BALL	2.00	EA
V1-0700010	BY-PASS VALVE, 3" PVB 4-WAY W/ THD. CONN	1.00	EA
V1-0700070	FLANGE, 2" FOR 3" PVB 4-WAY BUTT-WELD CO	2.00	EA
V1-0700080	FLANGE, 3" FOR 3" PVB 4-WAY BUTT-WELD CO	2.00	EA
V1-3300120	VALVE, INTERNAL 3" ALUM. 90o FLANGED	1.00	EA
V1-8510110	DRAIN POCKET, 2", 2-1/2", 3" T-304 S/S	1.00	EA
V1-8510830	REMOTE CONTROL HANDLE,	1.00	EA
V1-8511110	OPERATOR, 1 COMPARTMENT DELTA NON LUBE	1.00	EA
V1-8519120	FUSIBLE LINK, 1600	1.00	EA
V2-0500500	VENT, 3-1/2" BETTS PUSH	1.00	EA
V2-0500550	HOOD, VAPOR RECOVERY 3-1/2" VENT	1.00	EA
VR-0000003	TUBE, STUB 3" VAPOR	1.00	EA
VR-0000004	SCREEN, VAPOR VENT	1.00	EA

To order parts call West-Mark parts department or visit our web site at www.west-mark.com

November 06, 2015

Page 5 of 5



M/MA Meters

Installation and Parts Manual

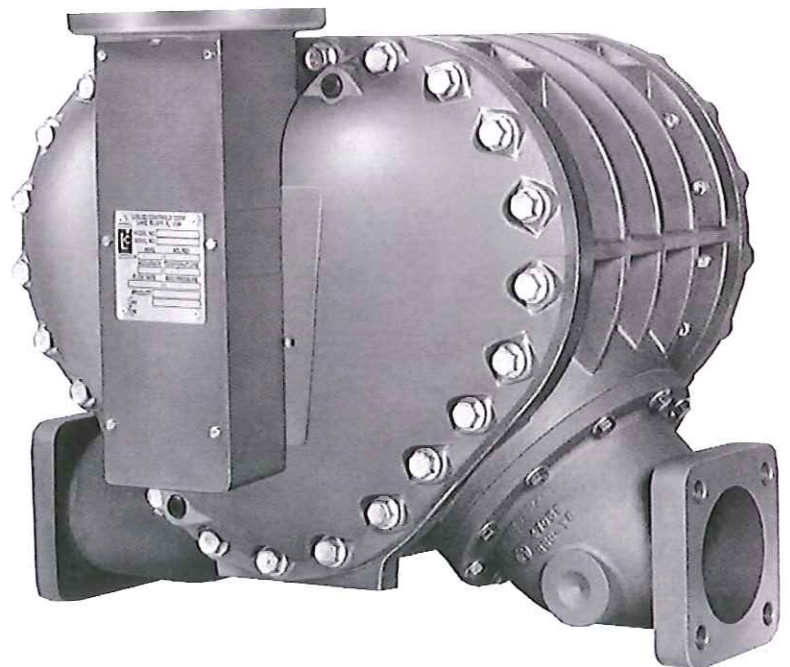
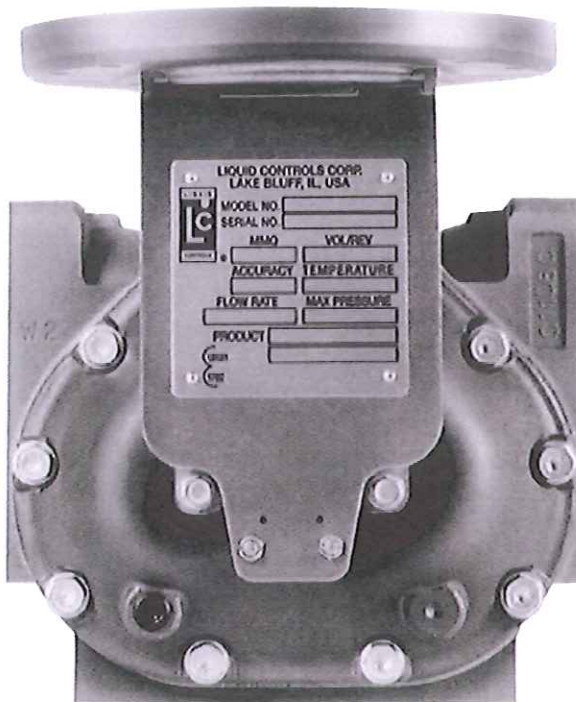


Table of Contents and Safety Procedures

<u>Description</u>	<u>Page Number</u>		
Safety Procedures	3	Buna/Viton/Teflon Packing Gland	16
Owner's Information Packet	4	The Retaining Plate	16
How LC Meters Work	6	Disassembling the Meter	17
Meter Maintenance	7	Removing the Non-Corroded	
Relieving Internal Pressure	7	Rotor Gears	19
Installation Requirements	8	Removing Corroded Rotor Gears	20
Operation Requirements	9	Reassembling the Meter	21
Meter Start Up and Operation	10	Timing the Rotor Gears	22
Reversing the Meter Registration	11	Torque Chart	23
Setting the Standard Adjuster	12	Wrench and Socket Size Chart	24
Servicing the Drive Components	13	Troubleshooting	25
Removing the Dust Cover	13	How to Order Replacement Parts	27
Removing the Adjuster and		Illustrated Parts Breakdown	28-31
Adjuster Drive Assembly	13		

Please have the following information available when you make inquiries, order replacement parts, or schedule service. If a specific meter accessory is involved, please provide the model and serial number of the accessory in question (see page 4).

Your Meter's Serial Number: _____

Your Full-Service Distributor: _____

Your Full-Service Distributor's
Telephone Number: _____

NOTICE

This manual provides warnings and procedures that are intended to inform the owner and/or operator of the hazards present when using the Liquid Controls Meter on LP-Gas and other products. The reading of these warnings and the avoidance of such hazards is strictly in the hands of the owner-operators of the equipment. Neglect of that responsibility is not within the control of the manufacturer of the meter.

Publication Updates and Translations

The most current English versions of all Liquid Controls publications are available on our website, www.lcmeter.com. It is the responsibility of the Local Distributor to provide the most current version of LC Manuals, Instructions, and Specification Sheets in the required language of the country, or the language of the end user to which the products are shipping. If there are questions about the language of any LC Manuals, Instructions, or Specification Sheets, please contact your Local Distributor.

WARNING

- Before using this product, read and understand the instructions.
- Save these instructions for future reference.
- All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of equipment and/or systems in accordance with all applicable codes and ordinances.
- Failure to follow the instructions set forth in this publication could result in property damage, personal injury, or death from fire and/or explosion, or other hazards that may be associated with this type of equipment.

Safety Procedures

⚠ WARNING

Before disassembly of any meter or accessory component, **ALL INTERNAL PRESSURES MUST BE RELIEVED AND ALL LIQUID DRAINED FROM THE SYSTEM IN ACCORDANCE WITH ALL APPLICABLE PROCEDURES.** Pressure must be 0 (zero) psi. Close all liquid and vapor lines between the meter and liquid source.

For **Safety Rules Regarding LPG**, refer to **NFPA Pamphlet 58** and local authorities.

Failure to follow this warning could result in property damage, personal injury, or death from fire and/or explosion, or other hazards that may be associated with this type of equipment.

Be Prepared

Make sure that all necessary safety precautions have been taken. Provide for proper ventilation, temperature control, fire prevention, evacuation and fire management.

Provide easy access to the appropriate fire extinguishers for your product. Consult with your local fire department and state and local codes to make sure that you are adequately prepared.

Read this manual as well as all the literature provided in your owner's packet.

In the Event of a Gas Leak

In the event of a large gas leak: Evacuate the area and notify the fire department.

In the event of a small, contained gas leak:

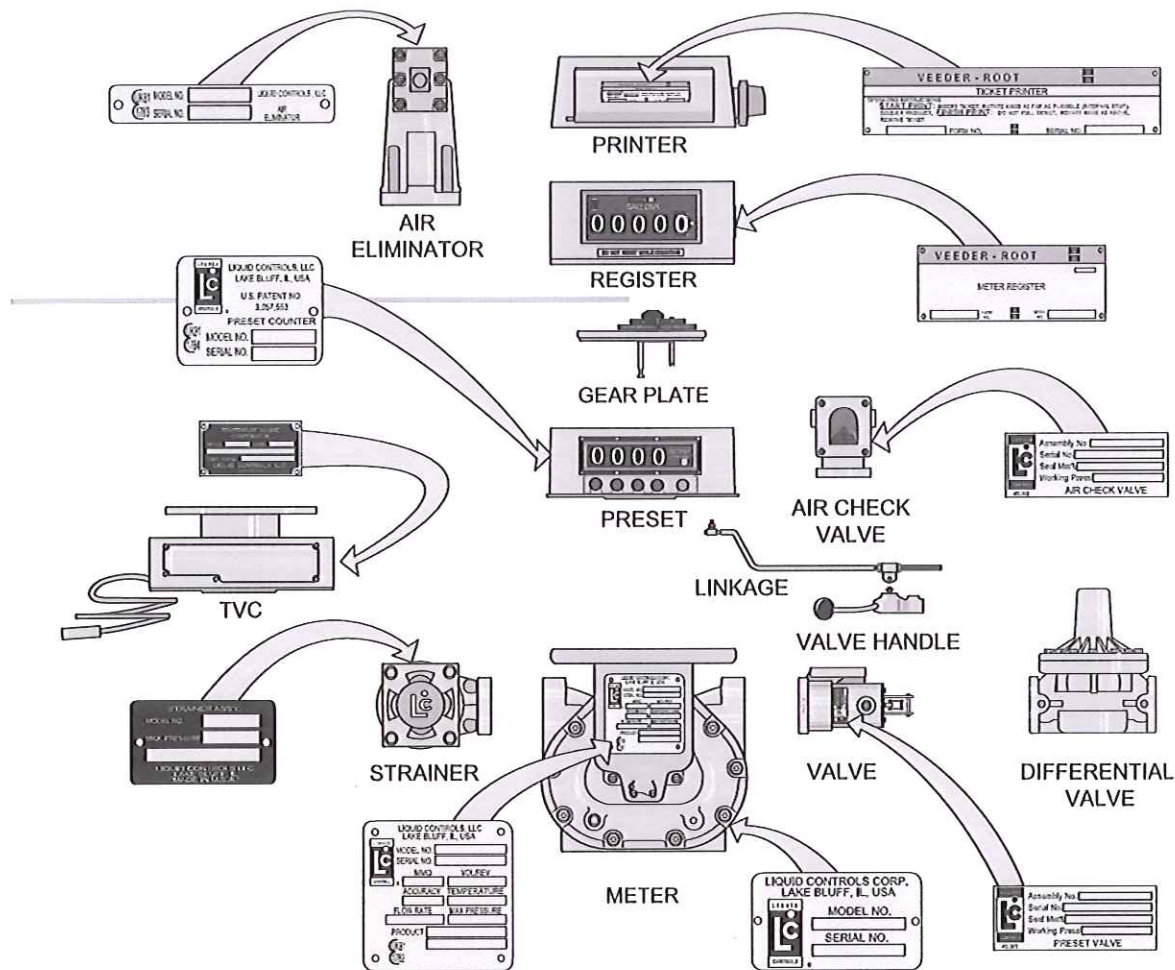
1. Stop the leak and prevent accidental ignition.
2. Prevent the entrance of gas into other portions of the buildings. Some gases, such as LPG, seek lower levels, while other gases seek higher levels.
3. Evacuate all people from the danger zone.
4. See that the gas is dispersed before resuming business and operating motors. If in doubt, notify your local fire department.

In the Event of a Gas Fire

In the event of large fires or fires that are spreading: Evacuate the building and notify your local fire department. Stop the leakage only if you can safely reach the equipment.

In the event of small, contained fires that you can safely control: Stop the leakage if you can safely reach the equipment. Then use the appropriate extinguisher: Class B fire extinguisher, water, fog, etc., depending on the materials. If in doubt, call your local fire department.

Owner's Information Packet



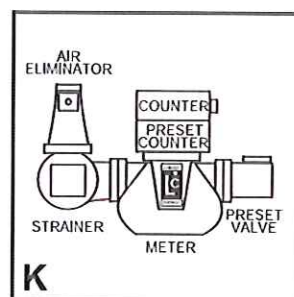
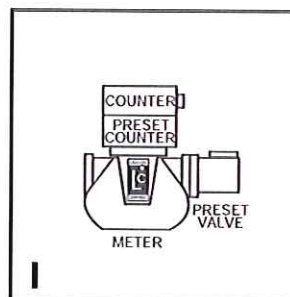
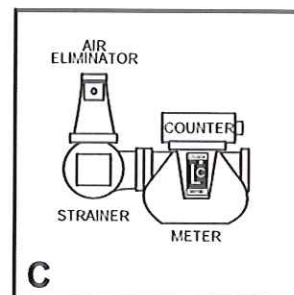
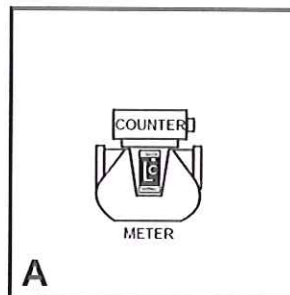
Specification and Serial Number Plate Location

NOTE: Meter and accessories are not drawn to scale. Data on the Specification and Serial Number Plates: Model No., Element No., Serial No., Flow Rate, Minimum Measured Quantity, etc., are subject to change.

1. **Is all your documentation included with your meter?** LC meters come in many variations. The information sent to you depends on the accessories you have ordered with your meter. Make an inventory of your owner's information packet. First, find your LC packing slip with the computer printout. Locate the serial number and the meter model number on this printout. Cross reference the packing slip number with the actual meter numbers. The illustration on this page will help you locate the Specification and Serial Number Plates on the meter and its accessories.
2. **Record your meter serial number in the space provided on the inside cover of this manual.** The inside cover also provides a space for your full-service distributor's name and telephone number. Fill in this information and keep it handy. You will always need your meter serial number and model number when calling for service or parts! See 'How to Order Replacement Parts' in this manual.

Owner's Information Packet

3. Identify your meter's model-accessory letter. Use the charts shown above to familiarize yourself with meter accessories. Find the meter and letter on the chart which represents your meter, then check with the chart below to see that your red owner's information packet is complete. Not all accessory levels are available for every model of LC meter.



4. Check your owner's information packet with the chart shown above to make sure that all the documentation needed for your meter and accessories is in your red information packet. If documentation is missing, call your full-service distributor or Liquid Controls for replacement materials.

LITERATURE DESCRIPTION	ACCESSORY MODEL			
	A	C	I	K
LC PACKING LIST (COMPUTER PRINTOUT)	✓	✓	✓	✓
CUSTOMER RESPONSE CARD	✓	✓	✓	✓
M/MA METER MANUAL	✓	✓	✓	✓
"Your Meter" SUPPORT AND PARTS MANUAL	✓	✓	✓	✓
AIR ELIMINATOR MANUAL		✓		✓
STRAINER MANUAL		✓		✓
PRINTER MANUAL				
COUNTER MANUAL	✓	✓	✓	✓
PRESET COUNTER MANUAL			✓	✓
PRESET VALVE MANUAL			✓	✓
OTHER ACCESSORIES				

How LC Meters Work

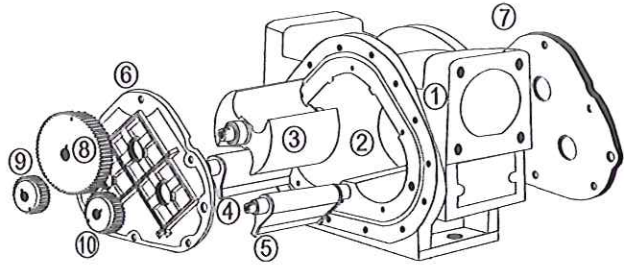
Liquid Controls meters are positive displacement meters. They are designed for liquid measurement in both custody transfer and process control applications. They can be installed in pump or gravity flow systems. Because of their simple design, they are easy to maintain, and easy to adapt to a variety of systems.

The meter housing (1) is designed with three cylindrical bores (2). Three rotors, the blocking rotor (3) and two displacement rotors (4, 5), turn in synchronized relationship within the bores. The three rotors are supported by bearing plates (6, 7). The ends of the rotors protrude through the bearing plates. Blocking rotor gear (8) is placed on the end of the blocking rotor. Displacement rotor gears (9, 10) are placed on the ends of the displacement rotors. These gears create the synchronized timed relationship between the three rotors.

As fluid moves through the meter housing, the rotor assembly turns. The liquid is broken into uniform sections by the turning rotors. Fluid displacement happens simultaneously. As fluid enters, another portion of the fluid is being partitioned and measured. At the same time, the fluid ahead of it is being displaced out of the meter and into the discharge line. Since the volume of the bores is known, and the same amount of fluid passes through the meter during each revolution of the blocking rotor, the exact volume of liquid that has passed through the meter can be accurately determined.

This true rotary motion is transmitted through the packing gland, the face gear, the adjuster drive shaft, and the adjuster to the register stack and counter. True rotary motion output means consistent accuracy since the register indication is in precise agreement with the actual volume throughput at any given instant.

At any position in the cycle, the meter body, the blocking rotor, and at least one of the displacement rotors form a continuous capillary seal between the un-metered upstream product and the metered downstream product.



Meter Element Exploded Line Drawing

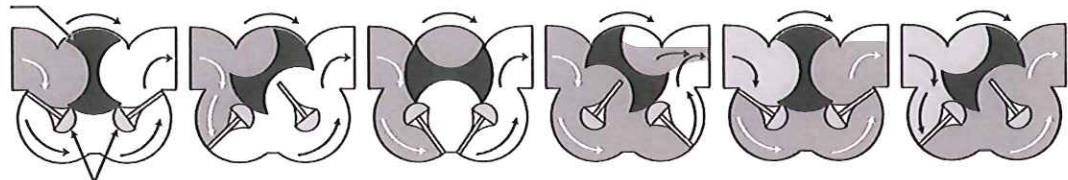
Capillary seals mean no metal-to-metal contact within the metering element. This means no wear. No wear means no increase in slippage, and no increase in slippage means no deterioration in accuracy.

Throughout the metering element, the mating surfaces are either flat surfaces or cylindrical faces and sections that are accurately machined. These relatively simple machining operations, plus the fact that there is no oscillating or reciprocating motion within the device, permits extremely close and consistent tolerances within the LC meter.

The product flowing through the meter exerts a dynamic force that is at right angles to the faces of the displacement rotors. The meter is designed so that the rotor shafts are always in a horizontal plane. These two facts result in no axial thrust. Therefore, with no need for thrust washers or thrust bearings, the rotors automatically seek the center of the stream between the two bearing plates eliminating wear between the ends of the rotors and the bearing plates. Once again, no wear results in no metal fatigue and no friction.

The Liquid Controls meters are made of a variety of materials to suit a variety of products. Because of our no-wear design, capillary seals, and unique rotary metering, LC meters provide unequalled accuracy, long operating life, and unusual dependability.

Blocking rotor



Displacement rotors

Meter Maintenance and repeatability.

Prevent pipe strain or stress from occurring when making meter or accessory repairs. Pipe strain and stress occurs when the pipes are not supported or are not aligned correctly to the meter. The weight of the pipes must always be supported independent of the meter. This means that the meter and accessories can be easily removed without affecting the pipes or the pipe alignment. Never leave any of the pipes hanging.

Seasonal meter storage If the meter is used for seasonal work, at the end of each season the meter should be removed from the system and thoroughly flushed with a compatible liquid. This includes removing the drain on the front and rear covers. Then flush the product from the front and rear covers. If flushing with water is preferred, extra care should be taken to drain the meter completely and dry all internal parts. Immediate refilling with a compatible liquid (or oil misting) is essential to prevent corrosion as well as ice damage to parts from moisture that was overlooked after flushing and drying.

Do not mar or scratch any of the precision machined surfaces by prying or sanding parts.

Torque all fasteners such as screws and bolts in accordance with specifications listed in the 'Torque Chart' in this manual (page 22).

Stone the machined surfaces when reassembling the meter to assure that the machined surfaces are free of burrs and mars.

Repair pulled threads with threaded insert fasteners. These can be used in many instances. Contact your full-service distributor for advice if this occurs.

Coat threads with anti-seize when removing and replacing bolts and castings in a meter.

Removing flange gaskets When removing the flange assembly, always carefully scrape off the flange gaskets. Make sure that the flange surface has been scraped clean. Discard the old flange gasket and install a new flange gasket. Never reuse old flange gaskets.

Examine all fasteners to make sure they are not bent, rusted, or have pulled threads. The threads should all appear evenly placed. If the bolts are bent, check the housing and cover for flatness. Use a straight edge to determine flatness.

Look for gaps when disassembling a meter. Use a feeler gauge to check for gaps between the bearing plate and housing. If you do find gaps, check the bearing plates for flatness with a straight edge. Gaps can be caused by shock problems that must be resolved. Contact your full-service distributor for assistance if this occurs.

Check the O-rings for damage. Cracked, rough, or worn O-rings should be replaced. However, a more serious problem of shock may be indicated if the O-rings look nibbled. Shock problems must be verified and resolved. Contact your full-service distributor for assistance if this occurs.

Check the bearing plates for flatness. Use a straight edge. Warped bearing plates can be caused by shock problems that must be resolved. Contact your full-service distributor for assistance if this occurs.

Check with regulatory agency that governs Weights & Measures in your area. Removing the dust cover seal wire or other maintenance procedures may require Weights & Measures recalibration.

WARNING

Relieving Internal Pressure

All internal pressure must be relieved to zero pressure before disassembly or inspection of the strainer, air eliminator any valves in the system, the packing gland, and the front or rear covers.

Serious injury or death from fire or explosion could result from maintenance of an improperly depressurized and evacuated system.

Procedure for Non-LPG Meters

1. Turn off pump pressure to the system.
2. Close valves before and after the meter.
3. Remove pressure by removing the drain plugs and draining the meter.

Procedure for LPG Meters

1. Close the belly valve of the supply tank.
2. Close the valve on the vapor return line.
3. Close the manual valve in the supply line on the inlet side of the meter. If no manual valve exists on the inlet side, consult the truck manufacturer for procedures to depressurize the system.

4. Slowly open the valve/nozzle at the end of the supply line.
5. After product has bled off, close the valve/nozzle at the end of the supply line.
6. Slowly crack the fitting on top of the differential valve to relieve product pressure in the system. Product will drain from the meter system.
7. As product is bleeding from the differential valve, slowly reopen and close the valve/nozzle on the discharge line. Repeat this step until the product stops draining from the differential valve and discharge line valve/nozzle.
8. Leave the discharge line valve/nozzle open while working on the system.

Installation Requirements

Make sure that all necessary safety precautions have been taken. Provide for proper ventilation, temperature control, fire prevention, evacuation and fire management.

Provide easy access to the appropriate fire extinguishers for your product. Consult with your local fire department and state and local codes to make sure that you are adequately prepared.

Read this manual as well as all the literature provided in your owner's manual. If you have any questions, consult with your full-service distributor or call the Service Department at Liquid Controls.

Install the meter and accessories in conformance with applicable state and federal construction, electrical and safety codes.

NOTE: Class 10 LPG meters must be installed in accordance with the requirements of ANSI-NFPA 58 in addition to all other state and local codes.

WARNING: Under normal operation, do not expose any portion of the LP-Gas system to pressures in excess of rated working pressures without an automatic safety valve to vent the over pressure discharge to a place of safety away from the operator and other people. Failure to provide such a safety relief may result in leakage or rupture of one or more of the components in the system. This can result in injury or death from the gas, a fire, or pieces of flying debris from the rupture.

Before shipment, protective thread caps were placed in all meter and accessory openings. They should remain in place until you are ready to attach piping.

Prior to meter installation, the entire piping system should be thoroughly flushed of all debris, with a liquid that is compatible with the construction of the meter.

Keep external surfaces of the meter clean.

The meter must always be securely bolted to a platform or supporting member, regardless of the mounting position of the meter. **Never "hang" a meter on the connecting piping.**

Prevent pipe strain or stress from occurring when making meter or accessory repairs. Pipe strain and stress occur when the pipes are not supported or are not aligned correctly to the meter. **The weight of the pipes must always be supported independent of the meter.** This means that the meter and accessories can easily be removed without affecting the pipes or the pipe alignment. Never leave any of the pipes hanging.

Install meter only on the discharge side (downstream) of the system pump.

Apply pipe compound to male threads only.

Position the meter with service in mind. Provide ample work space. Removing covers can be difficult when work space is not available. Always supply a platform or support for the meter mounting.

A meter is metallurgically designed to be physically compatible with a given type of liquid, as originally specified by the customer, and as indicated on the Serial Number Plate. A meter should not be used with a liquid different from the liquid originally specified, unless the physical characteristics and pH rating are similar and the application has been checked with LC Sales and Engineering through your full-service distributor.

Install a strainer on the meter inlet to avoid damage from foreign matter, such as weld slag, from entering the system. The strainer must always be located on the inlet side.

All meters are tagged identifying their direction of flow. Meters are set with a flow direction of left to right as standard. However, when a meter is ordered, the customer can specify that the flow be set from either direction. If the meter register counts in reverse, the meter is reading the direction of flow in reverse. If this occurs, the meter registration must be reset. See 'Reversing the Meter Registration' in this manual for mechanical output meters. Refer to your accessory manual for electrical output meters (such as meters equipped with a pulser).

NOTE

Always request up-to-date, engineering approved, dimensional drawings before starting any construction. Do not rely on catalog pictures or drawings which are for reference only. After receiving prints, check to see that all equipment ordered is shown and that any extra pressure taps, plugs, etc. are noted and their size specified.

Operation Requirements

The meter must remain full of product at all times. An easy way to accomplish this is to put the meter assembly in the line below the piping center-line (a sump position). This requires adding elbows and flanges prior to installing the meter. The meter should be installed in a bypass loop, below the pipe center-line, with block valves upstream and downstream. A block valve should be located in the mainstream, labeled as the bypass valve.

Caution: Any portion of pipe system that might isolate or block flow should be provided with a pressure relief to prevent damage from thermal expansion. There are excellent benefits to this type of installation. First, the meter is kept full. Second, this type of installation allows the meter to be isolated for servicing and calibration while continuing flow through the bypass valve.

Upstream lines must be maintained full to prevent air from entering the meter. If upstream or inlet lines are constructed in a manner which allows reverse flow, foot valves or back checks must be installed.

Underground tanks that are furnished with a submersible pump will eliminate many problems that occur with positive displacement pumps (suction pumps) when suction piping is incorrectly sized or when the lift is too great.

Every meter should be calibrated under actual service and installation conditions per the API Manual of Petroleum Measurement Standards:

Chapter 4 - Proving Systems
Chapter 5 - Metering
Chapter 6 - Metering Assemblies
Chapter 11 Section 2.3 -
Water Calibration of Volumetric Provers
Chapter 12 Section 2 -
Calculation of Petroleum Quantities

These chapters of the API Manual of Petroleum Measurement Standards supersedes the API standard 1101.

Provide a means of conveniently diverting liquid for calibration purposes.

Give careful attention to your system's pumping equipment and piping because of their influence on liquid being measured as it enters the metering assembly. Systems should be made free of conditions that cause or introduce entrained air or vapor.

Follow the manufacturer's recommendation fully when installing pumps. Give particular attention to factors like: use of foot valves, pipe size to the inlet and conformance to net positive suction head (NPSH) conditions when suction pumping is required. Following the manufacturer's recommendations will minimize air and vapor elimination problems.

For liquids such as light hydrocarbons that tend to flash or vaporize easily at higher ambient temperatures, it is desirable to use flooded suctions and piping sized larger than the nominal pump size.

On systems such as vehicle tank installations, piping layout is important in preventing problems with split compartment test conformance. Piping should slope away from a P.D. pump to prevent resurgent re-priming of the pump due to drain back.

Hydraulic shock is harmful to all components of an operating system including valves, meter and the pump. In particular, meters must be afforded protection from shock because of their need to measure with high precision. Generally the best protection is prevention, which can be readily accomplished by adjusting valve closing rates in such a manner that shock does not occur.

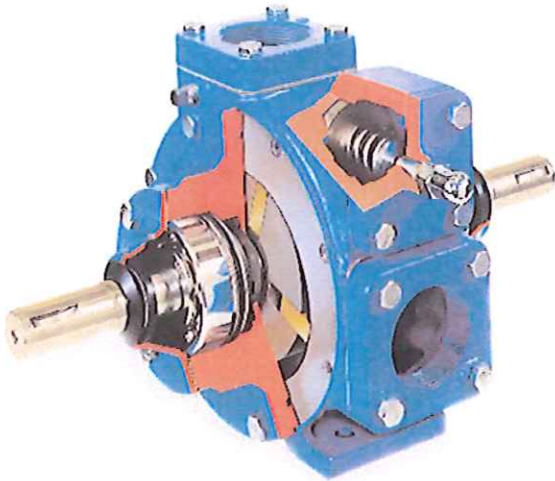
Thermal expansion like hydraulic shock is a phenomenon that can easily damage meters and systems in general. Care should be taken in designing the system to include pressure relief valves in any portion or branch of the system that might be closed off by closure of operating valves or block valves.

BLACKMER TRUCK PUMPS

INSTALLATION OPERATION AND MAINTENANCE INSTRUCTIONS

MODELS: TX, TXD - 1.5, 2A, 2.5A, 3E, 4A

960280	
INSTRUCTIONS NO. 201-A00	
Section	201
Effective	Jan 2012
Replaces	Aug 2010



Numbers in parentheses following individual parts indicate reference numbers on Blackmer Parts Lists 201-A01, 201-A02, 201-A03, 201-A04 and 201-A05. Blackmer pump manuals and parts lists may be obtained from Blackmer's website (www.blackmer.com) or by contacting Blackmer Customer Service.

TABLE OF CONTENTS

	Page
PUMP DATA	
Technical Data	2
Initial Pump Start Up Information	2
INSTALLATION	
Pre-Installation Cleaning	3
Location and Piping	3
Truck Mounting	3
Pump Drive	3
Pump Rotation	4
To Change Pump Rotation	4
OPERATION	
Pre-Start Up Check List	5
Start Up Procedures	5
Pump Speed	5
Reverse Rotation	5
Flushing the Pump	6
Pump Relief Valve	6
Relief Valve Setting and Adjustment	6
MAINTENANCE	
Strainers	7
Lubrication	7
Vane Replacement	8
Pump Disassembly	8
Pump Assembly	9
TROUBLE SHOOTING	10

SAFETY DATA



This is a SAFETY ALERT SYMBOL.

When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage



Warns of hazards that **WILL** cause serious personal injury, death or major property damage.



Warns of hazards that **CAN** cause serious personal injury, death or major property damage.



Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE:

Indicates special instructions which are very important and must be followed.

NOTICE:

Blackmer Truck Pumps **MUST** only be installed in systems, which have been designed by qualified engineering personnel. The system **MUST** conform to all applicable local and national regulations and safety standards.

This manual is intended to assist in the installation and operation of the Blackmer truck pumps, and **MUST** be kept with the pump.

Pump service shall be performed by qualified technicians **ONLY**. Service shall conform to all applicable local and national regulations and safety standards.

Thoroughly review this manual, all instructions and hazard warnings, **BEFORE** performing any work on the pump.

Maintain **ALL** system and pump operation and hazard warning decals.

SAFETY DATA



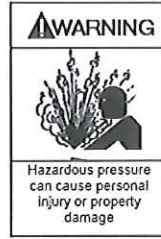
Failure to set the vehicle emergency brake and chock wheels before performing service can cause severe personal injury or property damage.



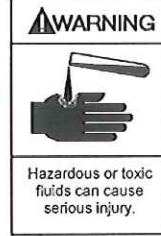
Failure to relieve system pressure prior to performing pump service or maintenance can cause personal injury or property damage.



Failure to disconnect and lockout electrical power or engine drive before attempting maintenance can cause severe personal injury or death



Disconnecting fluid or pressure containment components during pump operation can cause serious personal injury, death or major property damage



If pumping hazardous or toxic fluids, system must be flushed prior to performing service



Operation without guards in place can cause serious personal injury, major property damage, or death.

PUMP DATA

PUMP IDENTIFICATION

A pump Identification tag, containing the pump serial number, I.D. number, and model designation, is attached to each pump. It is recommended that the data from this tag be recorded and filed for future reference. If replacement parts are needed, or if information pertaining to the pump is required, this data must be furnished to a Blackmer representative.

TECHNICAL DATA

	TX (D) Models
Maximum Operating Temperature *	240 – 300°F (115 – 149°C)
Maximum Speed	
size 1.5, 2, 2.5	780 RPM
size 3	640 RPM
size 4	500 RPM
Maximum Viscosity	20,000 SSU (4,250 cSt)
Maximum Differential Pressure	125 psi (8.6 Bar)
Maximum Working Pressure	175 psi (12.1 Bar)

* Maximum operating limits are dependent on the materials of construction. See Blackmer Material Specs 201-091.

INITIAL PUMP START UP INFORMATION

Model No.: _____

Serial No.: _____

Date of Installation: _____

Pressure Gauge Reading: _____

Vacuum Gauge Reading: _____

Flow Rate: _____

INSTALLATION

NOTICE:

Blackmer truck pumps must only be installed in systems designed by qualified engineering personnel. System design must conform with all applicable regulations and codes and provide warning of all system hazards.

PRE-INSTALLATION CLEANING

NOTICE:

New pumps contain residual test fluid and rust inhibitor. If necessary, flush pump prior to use.

Foreign matter entering the pump WILL cause extensive damage. The supply tank and piping MUST be cleaned and flushed prior to pump installation and operation.

LOCATION AND PIPING

An improperly designed piping system or unit installation WILL significantly reduce pump performance and life. The following are piping system guidelines for pump installation.

1. To minimize intake losses, locate the pump as close as possible to the source of supply.
2. Piping MUST be properly supported to prevent any piping loads from being placed on the pump.
3. Intake piping and fittings MUST be at least as large in diameter as the pump intake connection.
4. Minimize the number of intake line fittings (valves, elbows, etc.) and piping turns or bends.
5. Install vacuum and pressure gauges in the 1/4" NPT ports located on the pump cylinder near the intake and discharge flanges to check pump at start-up
6. Install a strainer in the inlet line to protect the pump from foreign matter. Place the intake strainer to allow frequent cleaning.
7. Intake and discharge piping MUST be free of all leaks.

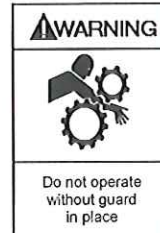
TRUCK MOUNTING

The pump will operate satisfactorily in any position. Consult Blackmer factory for vertical shaft mounts. The pump can be bolted to the truck frame or on a saddle hung below the frame, and MUST be adequately supported. Mounting the pump with the cylinder feet down, or with the intake port up, is recommended for thorough draining of the pump.

PUMP DRIVE

The pump may be driven by a power take-off through universal joints. When using universal joints, a splined slip joint, properly lubricated, must be used on the connecting jackshaft to prevent end thrust on the pump shaft.

It is very important to install a proper drive line to avoid excessive wear, vibration and noise see Fig. 2 and Table 1.



A drive shaft guard between the PTO and pump must be provided to prevent personal injury, property damage, or death.

Note: A Drive Shaft Guard Between the Pump and PTO Must Be Provided (Not Shown)

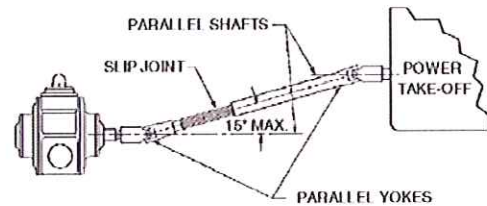


Figure 2 Pump Drive

Angle of Drive Shaft

1° through 5°	6° through 10°	11° through 15°
Very Good	Good	Fair

Table 1

General guidelines to follow for proper pump drive:

1. DO NOT use Square slip joints.
2. Use the least number of jackshafts as is practical.
3. Use an even number of universal joints.
4. The pump shaft and power take-off shaft must be parallel in all respects. Use an angular level measuring device to ensure the PTO and pump shaft are parallel to each other. If necessary, the pump can be shimmed to correct any misalignment. The PTO shaft coming off at the transmission does not need to be perfectly horizontal as long as the pump is shimmed to have its shaft parallel in all respects to the PTO shaft.
5. The yokes of the universals at both ends of the jackshaft must be parallel and in phase.
6. The maximum angle between the jackshaft and the pump shaft is 15 degrees. Refer to Table 1.

Failure to follow any of these guidelines may result in a gallop or uneven turning of the pump rotor, which will in turn cause a surging vibration to the liquid stream and piping system. Contact the supplier of the drive line components for specific design assistance.

INSTALLATION

Hydraulic Drive

Pump sizes 1.5" – 3" may also be driven hydraulically. Hydraulic motors need to be well supported with their shafts parallel to the pump shaft in all respects. Blackmer provides an optional close-coupled hydraulic motor adapter. The adapter provides for straight alignment of a hydraulic motor drive through a solid coupling connected to a straight key shaft. This coupling connection requires grease lubrication every three months at **minimum**. Refer to the "Lubrication" section of this manual.

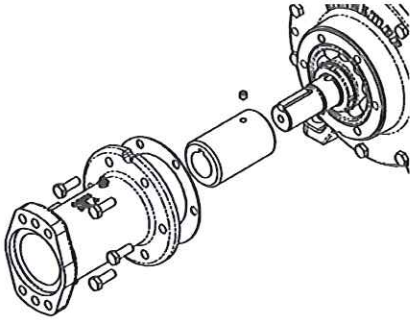


Figure 3 Hydraulic Drive

PUMP ROTATION

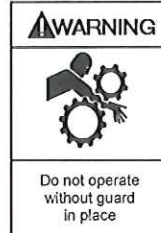
NOTICE:

Confirm correct pump rotation by checking the pump rotation arrows respective to pump driver rotation.

TO CHANGE PUMP ROTATION

TXD Models

The TXD pump models are equipped with a double ended rotor and shaft, enabling them to be driven from either shaft end. To change rotation, rotate the pump 180 degrees so that the opposite shaft becomes the driven shaft. On TXD pump models, the shaft protector (186) **MUST** be mounted over the non-driven shaft end.

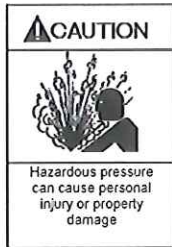


Operation without shaft protector can cause serious personal injury, major property damage, or death.

TX1.5, TX4 Models

To reverse rotation, the pump must be disassembled then reassembled with the shaft on the opposite side of the pump. See the 'Maintenance' section for instructions.

OPERATION



Pumps operating against a closed valve can cause system failure, personal injury and property damage



Disconnecting fluid or pressure containment components during pump operation can cause serious personal injury, death or major property damage



If pumping hazardous or toxic fluids, system must be flushed prior to performing service



Failure to relieve system pressure prior to performing pump service or maintenance can cause personal injury or property damage.

PRE-START UP CHECK LIST

1. Check the alignment of the pipes to the pump. Pipes must be supported so that they do not spring away or drop down when the pump flanges or union joints are disconnected.
2. Install vacuum and pressure gauges in the 1/4" NPT ports located on the pump cylinder near the intake and discharge flanges. These can be used to check the actual suction and discharge conditions after pump start-up.
3. Inspect complete piping system to ensure that no piping loads are being placed on the pump.
4. Secure appropriate hose connections.

START UP PROCEDURES

NOTICE:

Consult the "General Pump Troubleshooting" section of this manual if difficulties during start up are experienced.

1. Ensure that appropriate valves are open in the inlet and discharge lines.
2. Start the pump. Priming should occur within one minute.
3. Check the vacuum and pressure gauges to ensure the system is operating within expected parameters. Record the gauge readings in the "Initial Start Up Information" section of this manual for future reference.
4. Inspect piping, fittings, and associated system equipment for leaks, noise, vibration and overheating.
5. Check the flow rate to ensure the pump is operating within the expected parameters.
6. Check the pressure setting of the relief valve by momentarily closing a valve in the discharge line and reading the pressure gauge. This pressure needs to be 15 -20 psi (1.0 - 1.4 Bar) higher than the maximum system operating pressure or the external bypass valve setting (if equipped). **DO NOT operate the pump against a closed discharge valve for more than 15 seconds.** If adjustments need to be made, refer to the "Relief Valve Setting and Adjustment" section of this manual.

PUMP SPEED

PTO and hydraulically driven units MUST contain speed control devices to prevent pump speeds above the maximum RPM specifications, regardless of the truck engine unloading speeds. If fluid delivery is less than expected, see the "General Pump Troubleshooting" section

REVERSE ROTATION

NOTICE:

When pumps are operated in reverse a separate pressure relief valve must be installed to protect the pump from excessive pressure.

It may be desirable to run the pump in reverse rotation for system maintenance. The pump will operate satisfactorily in reverse rotation for a LIMITED time, at a reduced performance level. When operating the pump in reverse, a separate bypass valve MUST be installed to protect the pump from excessive pressure.

OPERATION

FLUSHING THE PUMP

NOTICE:

If flushing fluid is to be left in the pump for an extended time, it must be a lubricating, non-corrosive fluid. If a corrosive, non-lubricating fluid is used, it must be flushed from the pump immediately.

To flush the pump, use the following procedure:

1. Allow the pump to evacuate as much fluid as possible.
2. Run cleaning fluid through the pump intake. The cleaning fluid should be compatible with the pump O-rings and vane material. When handling "sticky" fluids that solidify within the pump (i.e., waxes, adhesives, resins, asphalts, etc.), use a fluid that will prevent solidification of the fluid being transferred and facilitate flushing.
3. Operate the pump against a closed discharge for 15 seconds to allow the cleaning fluid to recirculate through the internal relief valve.

NOTICE:

After flushing the pump some residual fluid will remain in the pump and piping.

NOTICE:

Properly dispose of all waste fluids in accordance with the appropriate codes and regulations.

RELIEF VALVE

NOTICE:

The pump internal relief valve is designed to protect the pump from excessive pressure and must not be used as a system pressure control valve.

Pumping volatile liquids under suction lift may cause cavitation. DO NOT partially close the discharge valve. This WILL result in internal relief valve chatter. For these applications, install an external bypass valve, and any necessary piping, back to the storage tank. Use a bypass system when operating for extended periods (more than 1 minute) against a closed discharge valve.



Failure to disengage PTO before adjusting pump relief valve can cause severe personal injury or death



Incorrect settings of the pressure relief valve can cause pump component failure, personal injury, and property damage.

RELIEF VALVE SETTING AND ADJUSTMENT



Relief valve cap is exposed to pumpage and will contain some fluid

NOTICE:

If the pump is equipped with a Blackmer air valve, refer to setting and adjustment procedures in Blackmer Air Valve Instructions and Parts List No. 201-G00 (Piston Air Valve), or 201-F00 (Diaphragm Air Valve).

The relief valve pressure setting is marked on a metal tag attached to the valve cover. Generally, the relief valve should be set at least 15 - 20 psi (1.0 - 1.4 Bar) higher than the operating pressure, or the external bypass valve setting (if equipped).

DO NOT remove the R /V Cap OR adjust the relief valve pressure setting while the pump is in operation.

1. To **INCREASE** the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw *inward*, or clockwise. Retighten the locknut and replace the valve cap.
2. To **DECREASE** the pressure setting, remove the relief valve cap, loosen the locknut, and turn the adjusting screw *outward*, or counterclockwise. Retighten the locknut and replace the valve cap.

Refer to the individual Blackmer pump parts lists for spring pressure ranges. The pumps are supplied from the factory with the relief valve adjusted to the mid-point of the spring range, unless specified differently.

NOTICE:

Where regulations require, holes in R/V cap (1) and capscrew with hole (5C) are used by the weights and measures official(s) to apply a security seal or tag.

MAINTENANCE



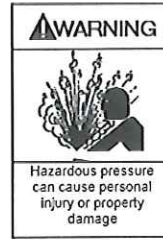
Failure to set the vehicle emergency brake and chock wheels before performing service can cause severe personal injury or property damage.



Failure to relieve system pressure prior to performing pump service or maintenance can cause personal injury or property damage.



Failure to disconnect and lockout electrical power or engine drive before attempting maintenance can cause severe personal injury or death



Disconnecting fluid or pressure containment components during pump operation can cause serious personal injury, death or major property damage



If pumping hazardous or toxic fluids, system must be flushed prior to performing service



Operation without guards in place can cause serious personal injury, major property damage, or death.

NOTICE:

Maintenance shall be performed by qualified technicians only, following the appropriate procedures and warnings as presented in this manual.

STRAINERS

Strainers must be cleaned regularly to avoid pump starvation. Schedule will depend upon the application and conditions.

LUBRICATION

NOTICE:

To avoid possible entanglement in moving parts do not lubricate pump bearings, hydraulic adapter coupling or any other parts while the pump is running.

Lubricate the ball bearings, and hydraulic motor couplings (if equipped), every three months at a minimum.

Recommended Grease:

Mobil® - Mobilgrease XHP222,
Exxon® - RONNEX MP Grease, or
or equivalent.

Greasing Procedure:

1. Remove the grease relief fittings (76A) from the bearing covers (27A) or hydraulic motor adapter (135).
2. Apply grease with a hand gun until grease begins to escape from the grease relief fitting port.
3. Replace the grease relief fittings (76A).

DO NOT overgrease pump bearings. While it is normal for some grease to escape from the grease tell-tale hole after lubrication, excessive grease on pumps equipped with mechanical seals can cause seal failure.

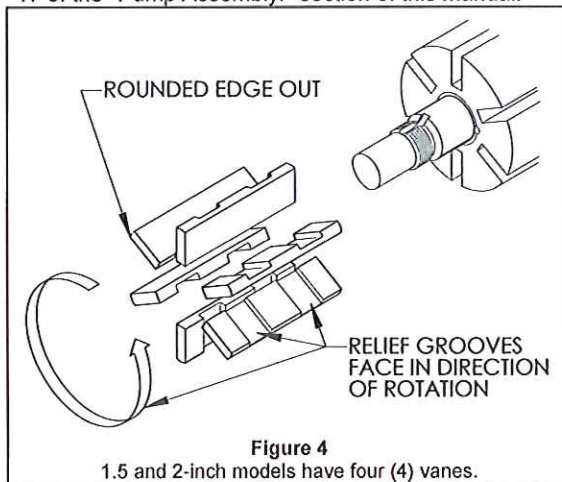
MAINTENANCE

VANE REPLACEMENT

NOTICE:

Maintenance shall be performed by qualified technicians only, following the appropriate procedures and warnings as presented in manual.

1. Remove the head assembly from the **outboard** (non-driven) side of the pump according to steps 2 - 6 in the "Pump Disassembly" section of this manual.
2. Turn the shaft by hand until a vane comes to the top (12 o'clock) position of the rotor. Remove the vane.
3. Install a new vane, ensuring that the rounded edge is UP, and the relief grooves are facing towards the direction of rotation. See Figure 4.
4. Repeat steps 2 and 3 until all vanes have been replaced.
5. Reassemble the pump according to steps 2 - 7 and 12 - 17 of the "Pump Assembly" section of this manual.

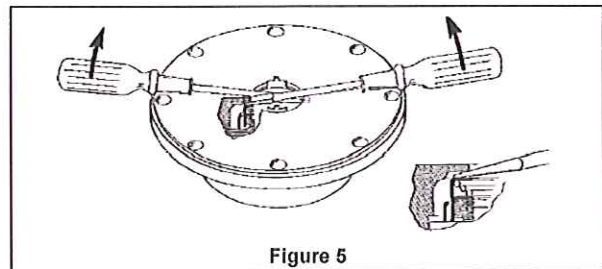


PUMP DISASSEMBLY

NOTICE:

Follow all hazard warnings and instructions provided in the "Maintenance" section of this manual.

1. Starting on the **inboard** (driven) end of the pump, clean the pump shaft thoroughly, making sure the shaft is free of nicks and burrs. This will prevent damage to the mechanical seal when the inboard head assembly is removed.
2. Remove the inboard bearing cover capscrews (28) and slide the inboard bearing cover (27A) and gasket (26) off the shaft. Discard the bearing cover gasket. On the 1.5, 2, and 2.5 inch pump models, the dirt shield (123A) will come off with the bearing cover.
3. Remove the outboard bearing cover capscrews (28) and slide the outboard bearing cover (27A) and gasket (26) off the shaft. Discard the bearing cover gasket.
4. If equipped with locknuts and lockwashers (24A, 24B):
 - a. Bend up the engaged lockwasher tang and rotate the locknut counterclockwise to remove it from the shaft.
 - b. Slide the lockwasher off the shaft. Inspect the lockwasher for damage and replace as required.
 - c. Repeat steps a and b on the opposite shaft end.
5. The TX4-inch pump model is equipped with bearing lock collars (24A). To remove:
 - a. Remove the jam nuts (24C) and loosen the two set screws (24B).
 - b. Slide the lock collar off the shaft.
 - c. Repeat steps a and b on the opposite shaft end.
6. Remove the head capscrews (21) and carefully pry the head (20) away from the cylinder.
7. Slide the head off the shaft. The head O-ring (72), bearing (24), and mechanical seal (153) will come off with the head assembly. Remove and discard the head O-ring.
 - a. Pull the bearing (24) from the housing in the head.
 - b. To remove the **mechanical seal** (153), use two screw drivers to gently push the backside of the seal jacket to push the seal from the head (see Figure 5). Use care when placing the screwdrivers to prevent damage to the seal faces. Remove and discard mechanical seal O-rings.
8. Pull the rotor and shaft (13) from the cylinder (12). While one hand is pulling the shaft, the other hand should be cupped underneath the rotor to prevent the vanes (14) and push rods (77) from falling out. Carefully set the rotor and shaft, vanes and push rods aside for future vane replacement and reassembly.
9. Remove the remaining components from the outboard side of the pump, as instructed in steps 6 and 7 above.



MAINTENANCE

PUMP ASSEMBLY

Before reassembling the pump, inspect all component parts for wear or damage, and replace as required. Wash out the bearing/seal recess of the head and remove any burrs or nicks from the rotor and shaft.

1. Reassemble the **OUTBOARD** side of the pump first:
 - a. For a **CLOCKWISE** rotation pump, position the pump cylinder with the **INTAKE** port to the **left**.
 - b. For a **COUNTERCLOCKWISE** rotation pump, position the pump cylinder with the **INTAKE** port to the **right**.
2. Install a new head O-ring (72) in the groove in the head. Lightly grease the outside circumference of the O-ring to facilitate head installation. Start in on one side of the groove, stretching ahead with the fingers. See Figure 6.

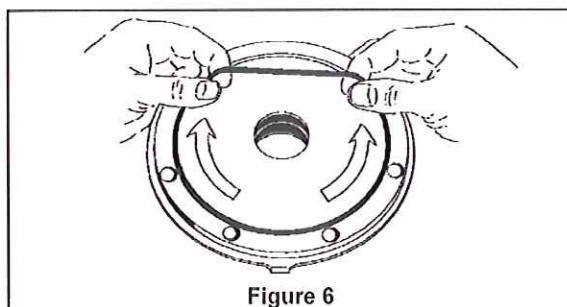


Figure 6

3. Install the head (20) on the outboard side of the cylinder. Install and uniformly tighten four head capscrews (21) 90° apart, torquing to 25 lbs. ft (34 Nm).
4. **MECHANICAL SEAL**
Apply a small amount of motor oil in the head recess. Push the mechanical seal assembly (153) into the recess of the head with seal jacket drive tangs inward. The pin in the stationary seat must be between the lugs in the back of the head recess.
5. Hand pack the ball bearing (24) with grease. Refer to the "Lubrication" section for the recommended grease.
6. Install the bearing into the head recess. The bearing balls should face outward, with the grease shield inward. Ensure the bearing is fully and squarely seated against the mechanical seal.
7. Turn the pump cylinder around and begin assembly on the opposite, inboard end.
8. Inspect the vanes (14) and push rods (77) for wear and damage, and replace as follows:
 - a. Partially install the non-driven end of the rotor and shaft (13) into the open side of the pump cylinder.
 - b. Leave part of the rotor outside of the cylinder so that the bottom vanes can be installed and held in place as the push rods are installed in the push rod holes of the rotor. Insert the new vanes into the rotor slots with the rounded edges outward, and the vane relief grooves facing **TOWARDS** the direction of rotation. See Figure 4.
 - c. After the bottom vanes (14) and push rods (77) are installed, insert the rotor and shaft (13) fully into the cylinder (12).
 - d. Install the remaining vanes into the top positions of the rotor. **Rotate the shaft by hand to engage the drive tangs of the seal jacket in the rotor slots.**

9. Install the inboard head (20), mechanical seal, and bearing as instructed in steps 2 through 7. Apply a thin coating of motor oil on the inboard shaft to aid installation.
10. Rotate the shaft by hand to engage the mechanical seal drive tangs, and to test for binding or tight spots. If the rotor does not turn freely, lightly tap the rims of the heads with a soft faced mallet until the correct position is found. Install all of the remaining head capscrews for each head and uniformly torque to 25 lbs. ft (34 Nm).

11. LOCKNUT INSTALLATION (if equipped)

The bearing locknuts (24A) and lockwashers (24B) **MUST** be installed and adjusted properly. Overtightening locknuts can cause bearing failure or a broken lockwasher tang. Loose locknuts will allow the rotor to shift against the heads, causing wear. See Figure 7.

- a. On both ends of the pump shaft, install a lockwasher (24B) with the tangs facing outward, followed by a locknut (24A) with the tapered end inward. Ensure the inner tang "A" of the lockwasher is located in the slot in the shaft threads, bending it slightly, if necessary.
- b. Tighten both locknuts (24A) to ensure that the bearings (24) are bottomed in the head recess. **DO NOT** overtighten and bend or shear the lockwasher inner tang.
- c. Loosen both locknuts one complete turn.
- d. Tighten one locknut until a slight rotor drag is felt when turning the shaft by hand.
- e. Back off the nut the width of one lockwasher tang "B". Secure the nut by bending the closest aligned lockwasher tang into the slot in the locknut. The pump should turn freely when rotated by hand.
- f. Tighten the opposite locknut by hand until it is snug against the bearing. Then, using a spanner wrench, tighten the nut the width of one lockwasher tang. Tighten just past the desired tang, then back off the nut to align the tang with the locknut slot. Secure the nut by bending the aligned lockwasher tang into the slot in the locknut. The pump should continue to turn freely when rotated by hand.
- g. To check adjustment, grasp the nut and washer with fingers and rotate back and forth. If this cannot be done, one or both locknuts are too tight and should be alternately loosened one stop at a time (.001") (25 microns). Begin by loosening the locknut adjusted last.

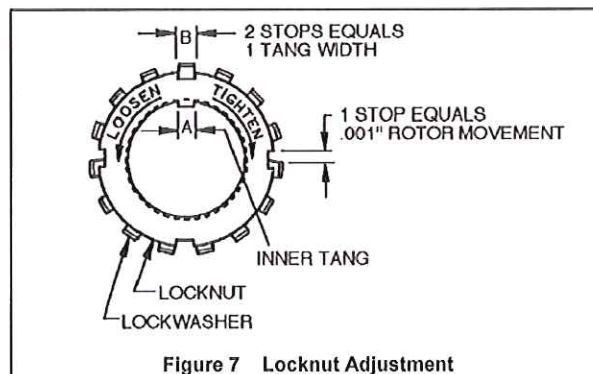


Figure 7 Locknut Adjustment

MAINTENANCE

12. LOCK COLLAR INSTALLATION – TX4 Models

- a. Slide the lock collar (24A) over the shaft and against the bearing (24), with the counterbored side towards the bearing.
 - b. Push the collar (24A) forcibly against the bearing (24) by hand, while tightening the two setscrews (24B). Install and tighten the two jam nuts (24C) against the collar.
 - c. Repeat this procedure on the opposite pump end. After installing both lock collars, verify the shaft turns freely when rotated by hand.
13. Inspect the grease seal (104) for wear or damage and replace as required. Grease the outside diameter of the grease seal and push it into the bearing cover (27 or 27A) with the lip of the seal inward. The lip will face outward when the bearing cover is installed on the head.
 14. Attach a new bearing cover gasket (26) and the bearing cover to the head. Install and torque the bearing cover capscrews (28) to 15 lbs. ft (20 Nm).
 15. Follow steps 14 and 15 to install the grease seal and bearing cover (27 or 27A) on the opposite side of the pump.
 16. On 1.5, 2 and 2.5-inch pump models, push the dirt shield (123A) over the inboard shaft and firmly against the bearing cover (27).
 17. On TXD models, attach the shaft protector (186) on the non-driven shaft end.



Operation without shaft protector can cause serious personal injury, major property damage, or death.

18. RELIEF VALVE ASSEMBLY

If the pump is equipped with a Blackmer air valve, refer to setting and adjustment procedures in Blackmer Air Valve Instructions and Parts List No. 201-F00, or 201B-B00.

- a. Insert the valve (9) into the relief valve bore of the cylinder with the fluted end inward.
- b. Install the relief valve spring (8) and spring guide (7) against the valve.
- c. Attach a new relief valve gasket (10) and the valve cover (4) on the cylinder.
- d. Screw the relief valve adjusting screw (2) into the valve cover until it makes contact with the spring guide (7).

NOTICE:

The relief valve setting **MUST** be tested and adjusted more precisely before putting the pump into service. Refer to "Relief Valve Setting and Adjustment"

- e. Install the relief valve cap (1) and gasket (88) after the relief valve has been precisely adjusted.

TROUBLESHOOTING

NOTICE:

Maintenance shall be performed by qualified technicians only, following the appropriate procedures and warnings as presented in this manual.

SYMPTOM	PROBABLE CAUSE
Pump Not Priming	<ol style="list-style-type: none">1. Pump not wetted.2. Worn vanes.3. Suction valve closed.4. Air leaks in the suction line.5. Strainer clogged.6. Suction line or valves clogged or too restrictive.7. Broken drive train.8. Pump vapor-locked.9. Pump speed too low for priming.10. Relief valve partially open, worn or not seating properly.11. Vanes installed incorrectly (see "Vane Replacement").

TROUBLESHOOTING continued

Reduced Capacity	<ol style="list-style-type: none"> 1. Pump speed too low. 2. Suction valves not fully open. 3. Air leaks in the suction line. 4. Excessive restriction in the suction line (i.e.: undersized piping, too many elbows & fittings, clogged strainer, etc.). 5. Damaged or worn parts. 6. Excessive restriction in discharge line causing partial flow through the relief valve. 7. Relief Valve worn, set too low, or not seating properly. 8. Vanes installed incorrectly (see "Vane Replacement").
Noise	<ol style="list-style-type: none"> 1. Excessive vacuum on the pump due to: <ol style="list-style-type: none"> a. Undersized or restricted fittings in the suction line. b. Pump speed too fast for the viscosity or volatility of the liquid. c. Pump too far from fluid source. 2. Running the pump for extended periods with a closed discharge line. 3. Pump not securely mounted. 4. Improper drive line (see "Pump Drive"). 5. Bearings worn or damaged. 6. Vibration from improperly anchored piping. 7. Bent shaft, or drive coupling misaligned. 8. Excessively worn rotor. 9. Malfunctioning valve in the system. 10. Relief valve setting too low. 11. Damaged vanes (see following category).
Damaged Vanes	<ol style="list-style-type: none"> 1. Foreign objects entering the pump. 2. Running the pump dry for extended periods of time. 3. Cavitation. 4. Viscosity too high for the vanes and /or the pump speed. 5. Incompatibility with the liquids pumped. 6. Excessive heat. 7. Worn or bent push rods, or worn push rod holes. 8. Settled or solidified material in the pump at start-up. 9. Hydraulic hammer - pressure spikes. 10. Vanes installed incorrectly (see "Vane Replacement").
Broken Shaft	<ol style="list-style-type: none"> 1. Foreign objects entering the pump. 2. Viscosity too high for the pump speed. 3. Relief valve not opening. 4. Hydraulic hammer - pressure spikes. 5. Pump/driver misalignment. 6. Excessively worn vanes or vane slots. 7. Settled or solidified material in the pump at start-up.
Mechanical Seal Leakage	<ol style="list-style-type: none"> 1. O-rings not compatible with the liquids pumped. 2. O-rings nicked, cut or twisted. 3. Shaft at seal area damaged, worn or dirty. 4. Ball bearings overgreased. 5. Excessive cavitation. 6. Mechanical seal faces cracked, scratched, pitted or dirty.



Sliding Vane Pumps: 5 to 2200 GPM
Refined Fuels, Liquefied Gases, Solvents, Process



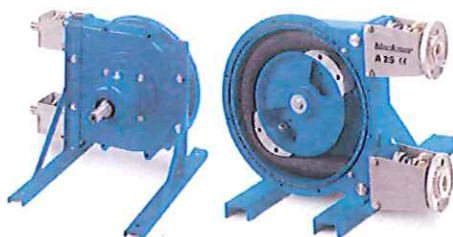
Stainless Steel Sliding Vane Pumps
1 to 265 GPM: Acids, Brines, Sugars, Syrups,
Beer, Beet Juice, Cider, Flavor Extracts, etc.



ProVane® Motor Speed Sliding Vane Pumps
1 to 100 GPM: Stainless and Ductile Iron
For low / medium viscosity process applications



Magnetic Drive Pumps
Stainless Steel: 14 to 215 GPM



Abaque Peristaltic Hose Pumps
0.1 to 210 GPM
High Lift, Solids, Abrasives



Reciprocating Gas Compressors
Liquefied Gas Transfer, Boosting, Vapor Recovery



Hand Operated Pumps
Dispensing, Transfer, In-line



Accessories
Gear Reducers, Bypass Valves, Strainers

Visit www.blackmer.com for complete information on all Blackmer products

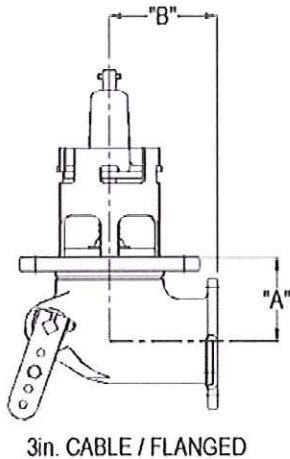


1809 Century Avenue, Grand Rapids, Michigan 49503-1530 U.S.A.
Telephone: (616) 241-1611 • Fax: (616) 241-3752
E-mail: blackmer@blackmer.com • Internet Address: www.blackmer.com



Betts Industries, Inc.
1800 Pennsylvania Ave. West | Warren, PA
16365-0888
(P) 1-800-831-7160 | (E) info@bettsind.com

3" flat seat aluminum



Description

Air or Cable Operated
Groove or Flange Outlet
Buna Urethane or Viton Seals

Betts flat seat style emergency valves combine Betts quality with an economical design. Valves feature aluminum construction with a specially designed seat disc to provide positive sealing. Shear section tested per TTMA RP84 and meets 49CFR178.345-8.

Air operated valves are provided with an external air cylinder to help prevent gasoline or other products from contaminating the air supply. The air cylinder is hard-coated aluminum with a polished stainless steel shaft. Cylinders have 1/8" NPT port for air connection and are supplied with a fusible plug installed.

Cable operated valves are supplied with a universal lever arm which provides up to 8 cable travel options to work with most operators. Lever arm is "E" Coated to provide exceptional corrosion resistance.

Left-hand valves are available with air cylinder or cable lever arm on opposite side of valve as shown at right. Add suffix -005 for left-hand option. Add suffix -004 for optional screen.

4" Valves are available with Stainless Trim, add suffix 010.

Parts List

90 DEGREE ELBOW

Size	*Assembly No.	Air/Cable	Outlet	Wt.	Dimensions		Inlet Flange		Outlet Flange	
					A	B	B.C.	Holes	B.C.	Holes
3"	EV46672ALB	Air	3" Grv	10.5	3.50"	6.06"	6.25"	6-9/16	N.A.	N.A.
	EV46673ALB	Cable	3" Grv	8.2						
	EV46670ALB	Air	3" Flg	10.5	3.50"	4.50"	6.25"	6-9/16	4.88"	8-7/16
	EV46671ALB	Cable	3" Flg	8.2						
4"	EV46435ALB	Air	4" Grv	12.7	4.38"	6.25"	7.25"	8-9/16	N.A.	N.A.
	EV46398ALB	Cable	4" Grv	10.4						
	EV46428ALB	Air	4" Flg	12.7	4.38"	5.00"	7.25"	8-9/16	5.88"	8-7/16
	EV46399ALB	Cable	4" Flg	10.4						

*Specify Viton seals by substituting "V" for "B" in Assembly Number.

Force rating from TTMA RP86: 3" Valves: $F_{b-max} = 21,035$ lb. 4" Valves: $F_{b-max} = 15,500$ lb.

CAUTION: Never bottom load through emergency valves without first opening valve. Failure to do so may result in damage to the tank and/or valve.

STRAIGHT

Size	*Assembly No.	Air/Cable	Outlet	Wt.	Dimensions	Inlet Flange		Outlet Flange	
					A	B.C.	Holes	B.C.	Holes
3"	Not Available	Air	3" Grv	N.A.	5.71"	6.25"	6-9/16"	N.A.	N.A.
	EV46539ALB	Cable	3" Grv	7.2					
	Not Available	Air	3" Flg	N.A.	4.25"	6.25"	6-9/16"	4.88"	8-7/16
	EV46540ALB	Cable	3" Flg	7.2					
4"	EV46436ALB	Air	4" Grv	11.1	6.38"	7.25"	8-9/16"	N.A.	N.A.
	EV46423ALB	Cable	4" Grv	8.9					
	EV46544ALB	Air	4" Flg	11.1	6.38"	7.25"	8-9/16"	5.88"	8-7/16"
	EV46543ALB	Cable	4" Flg	8.9					

* Specify Viton seals by substituting "V" for "B" in Assembly Number.

Force rating from TTMA RP86: 3" Valves : $F_{b-max} =$ Grooved 7,469 lb. / Flanged 10,754 lb. 4" Valves : $F_{b-max} = 10,000$ lb.

CAUTION: Never bottom load through emergency valves without first opening valve. Failure to do so may result in damage to the tank and/or valve.

TEE

Size	*Assembly No.	Air/Cable	Outlet	Wt.	Dimensions		Inlet Flange		Outlet Flange	
					A	B	B.C.	Holes	B.C.	Holes
3"	EV46536ALB	Air	3" Grv	11.8	3.50"	5.94"	6.25"	6-9/16	N.A.	N.A.
	EV46534ALB	Cable	3" Grv	9.5						
	EV46537ALB	Air	3" Flg	11.8	3.50"	4.50"	6.25"	6-9/16	4.88"	8-7/16
	EV46535ALB	Cable	3" Flg	9.5						
4"	EV46625ALB	Air	4" Grv	12.9	4.38"	6.63"	7.25"	8-9/16	N.A.	N.A.
	EV46623ALB	Cable	4" Grv	10.6						
	EV46626ALB	Air	4" Flg	12.9	4.38"	5.13"	7.25"	8-9/16	5.88"	8-7/16
	EV46624ALB	Cable	4" Flg	10.6						

*Specify Viton seals by substituting "V" for "B" in Assembly Number.

Force rating from TTMA RP86: 3" Valves: $F_{b-max}=15,300$ lb. 4" Valves: $F_{b-max}=15,500$ lb.

CAUTION: Never bottom load through emergency valves without first opening valve. Failure to do so may result in damage to the tank and/or valve.



6406
CONTROL VALVES


making **moves**

making moves

Introduction to the company

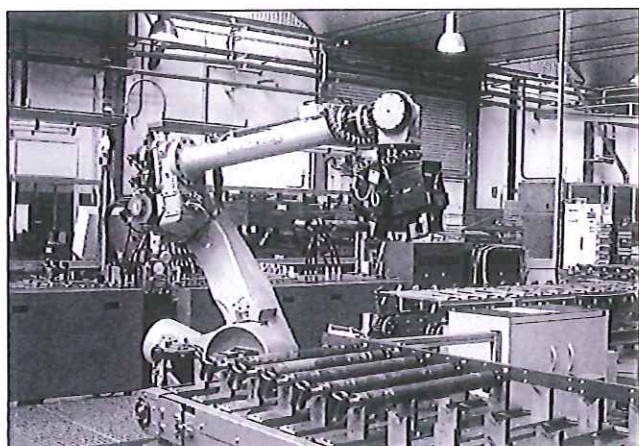
Type
6406

HISTORY Over fifty years experience in fluid power. Supplier to international manufactures of agricultural, construction, mining, mechanical handling, machine-tool and food machinery. Main supplier to the Spanish market with rapidly increasing presence in European and world markets.

TECHNOLOGY Roquet has a large design and development department with substantial fatigue, noise, corrosion-resistance, cleanliness and testing facilities, backed by a well-equipped metallurgical laboratory.

RELIABILITY A broad range of robust products: designed to perform, built to last. All products ranges life-tested under realistic conditions during development to ensure their suitability for use in applications such as tractors, fork-lift trucks, loaders, excavators, cranes, dumpers, dock-levellers... Each and every product tested to a stringent test specification prior to shipment.

CAPABILITY 400 well trained employees. Four factories with a total floor area of 30.000m² Current production 180.000 pumps, 300.000 control valve bodies, 500.000 cylinders and 30.000 power packs per year. Distribution network in over 35 countries.



This range of directional control valves is primarily intended for applications such as construction, material handling and agricultural machinery etc.

The valves are actuated by hand-levers, pneumatic operated, cable operated, etc.

Auxiliary valves can be fitted in each port.

Index

Technical data	4
Directional control valve curves	5-6
Directional control valve dimensions	7
Directional control valve, general view	8
Hydraulic circuit	8
Identification control valve parts	9
Coding system	10-11
Inlet section details	
Main relief valve and unloading valve	12
Unloading valve (electric - hydraulic)	13
Operating section details	
Spool types	14
Spool positions kits	15-16
Operators	16-17
Auxiliary valves	18-19
Direct solenoid operated section	20
Direct solenoid operated section with emergency operator	21
Pneumatic pilot	22
Hydraulic pilot	23
Additional sections	
3 way flow control for directional control valves	24
Mid-outlet details	
Mid-outlet scheme	25
Return configuration	26
Operating section details	
Position microswitch	27
Build sheet	28

This Catalogue shows the product in the most standard configuration; customized or special designs are also available, please contact to PEDRO ROQUET S.A. The specifications and data in this catalogue are not open to any interpretation, please contact with PEDRO ROQUET S.A. in case of doubt. PEDRO ROQUET S.A. reserves the right to modify, update or revise this catalogue without prior notice. PEDRO ROQUET S.A. IS NOT RESPONSABLE FOR ANY DAMAGE CAUSED BY AN INCORRECT USE OF THE PRODUCT.

6406

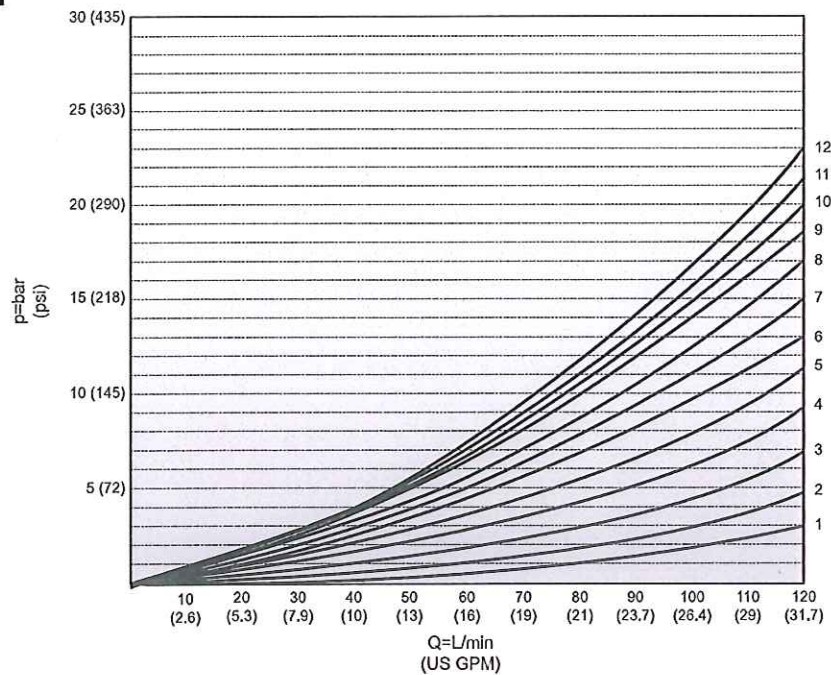


Technical data

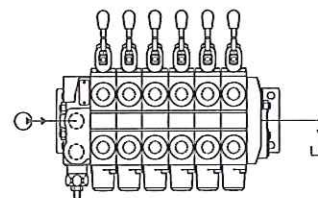
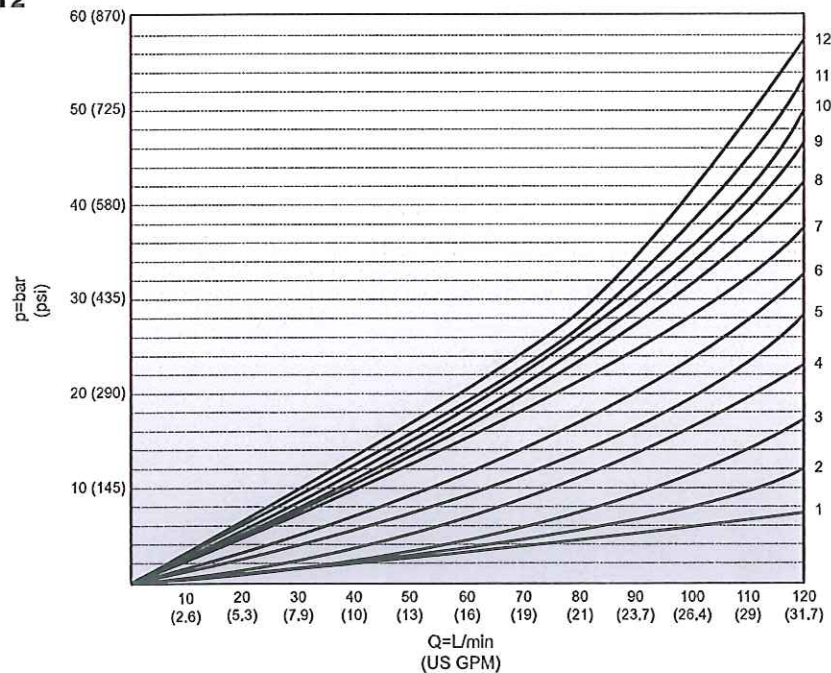
CONTROL VALVES TYPE		6406
Ports A and B		# 10 SAE - ORB 7/8"-14 UNF
Ports P and T		# 12 SAE - ORB 1 1/16"-12 UN
Maximum spool quantity		12
Spool diameter (mm)		18
Spool stroke (mm)		7
Type		Parallel
Nominal flow		100 (l/min) / 26 (US GPM)
Working max. pressure		350 bar / 5075 psi
Return max. pressure T port	Static spool	80 bar / 1160 psi
	During spool positioning	20 bar / 290 psi
Spool force (kg)		18 Kg
Fluid to be used		ISO 6742 mineral-oil-based hydraulic fluid
Temperature range (NBR)		-20°C...+80°C (-4° F...+176° F)
Viscosity range		ISO 3448 CAT. VG22-VG68
Recommended fluid cleanliness		16/13 s./ ISO 4406 o NAS 10

Diagrams

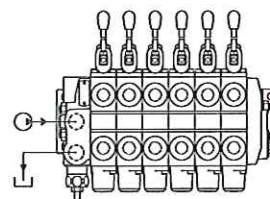
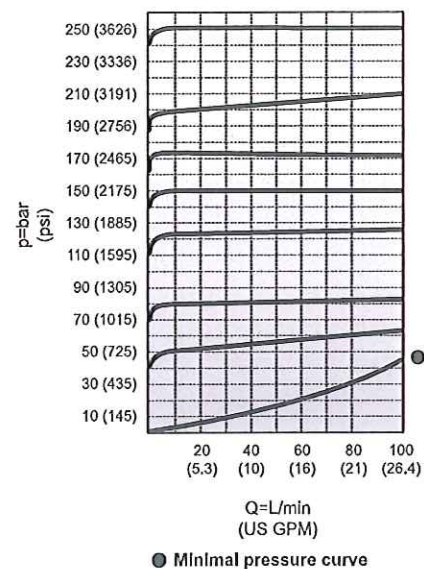
P→T



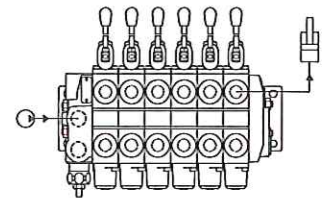
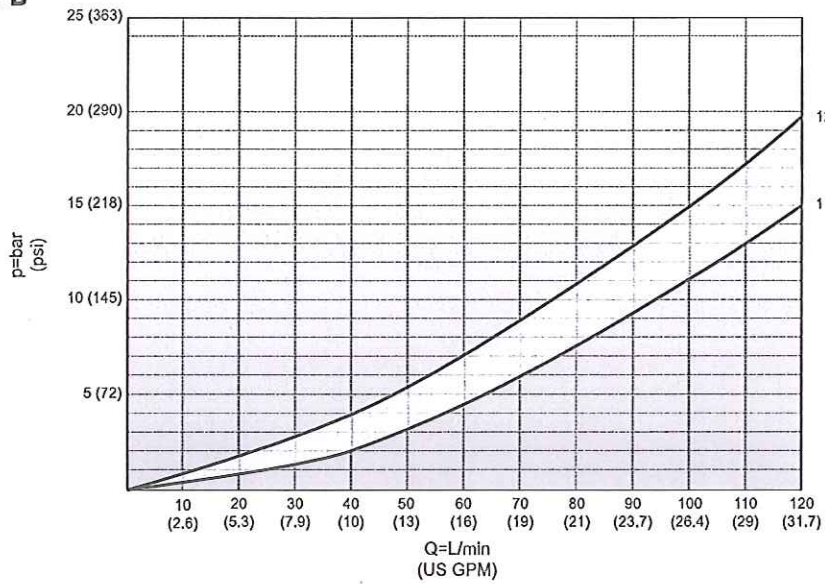
P→T2



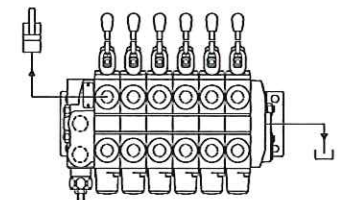
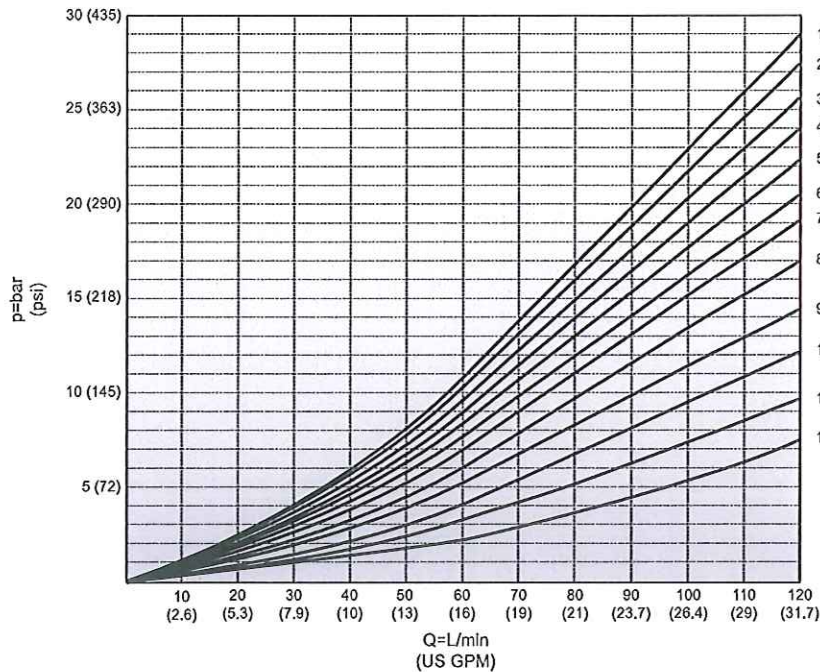
Relief valve

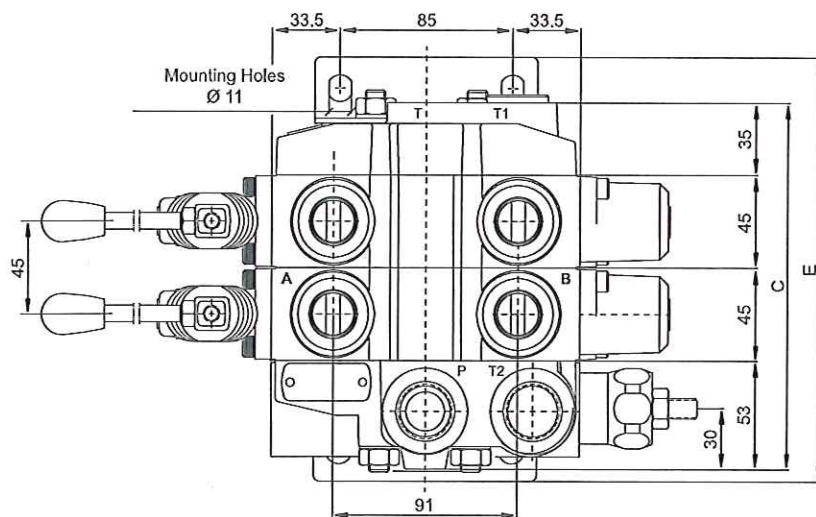
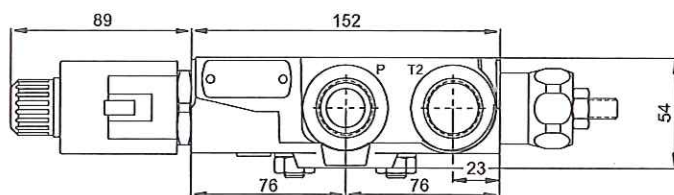
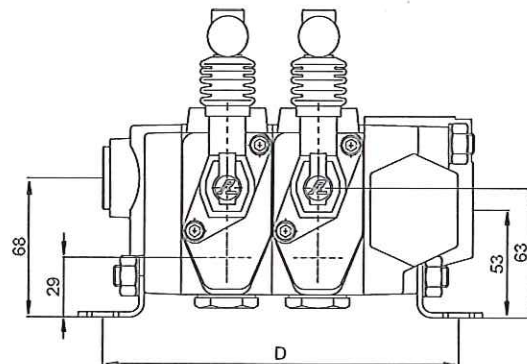
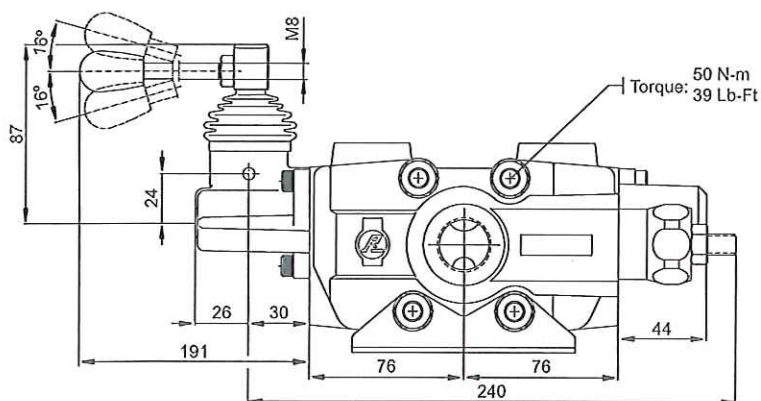


P→A or B

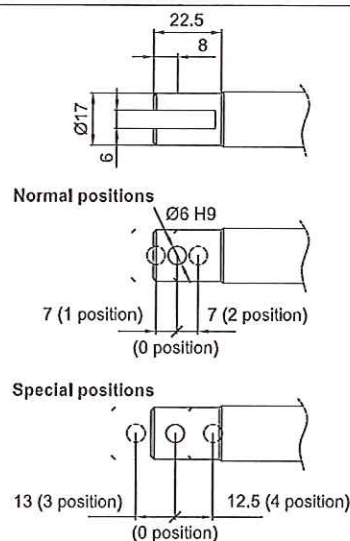


A or B→T





SPOOL DETAIL END



Ports A-B

#10 SAE-ORB
7/8"-14 UNF

Ports

P1-P T-T1-T2
#12 SAE-ORB
11/16"-12 UNF

P-P1	Pressure ports
A-B	Work ports

NOTE:

Port A is always next to operator side even if the section is assembled with levers on the other side.

Spool count	1	2	3	4	5	6	7	8	9	10	11	12
C (mm)	128	173	218	263	308	353	398	443	488	533	578	623
D (mm)	129	174	219	264	309	354	399	444	489	534	579	624
E (mm)	159	204	249	294	339	384	429	474	519	564	609	654
Weight in kg	8	12,5	17	21,5	26	30,5	35	39,5	44	48,5	53	57,5
Weight in Lb	17,7	27,6	37,5	47,4	57,3	67,2	77,1	87	96,9	106,8	116,7	126,6

FREE FLOW

T-T1-T2 All are tank ports

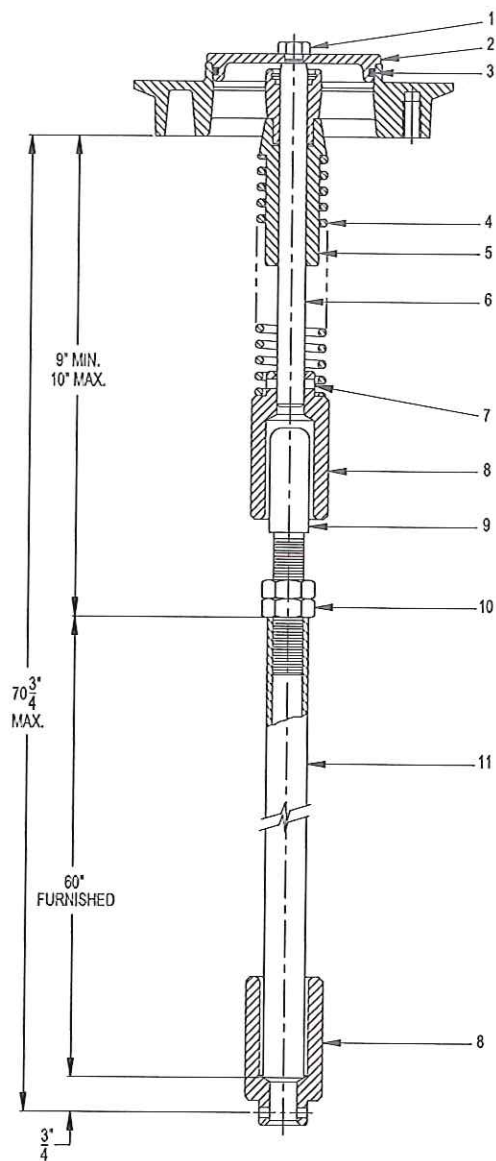
POWER BEYOND

T	Power
T1-T2	Tank port

CLOSED CENTER

T	Closed
T1-T2	Tank port

3 1/2" Push Vent



PARTS LIST

No.	Description	Req.	Material	Part No.
1	Cap Screw $\frac{3}{8}$ -16x $\frac{3}{4}$	1	Stnls	9Q5884
2	Disc Holder	1	Alum	17841AL
3	O-Ring	1	Tef/Sil	18106TS
4	Spring	1	Stnls	17052SL
5	Body	1	Alum	26856AL
6	Stem	1	Alum	16971AL
7	Spirol Pin $\frac{3}{16}$ x1	1	Stnls	9Q5901
8	Spring Retainer	2	Alum	16974AL
9	Adjusting Bar	1	Alum	16554AL
10	Hex Jam Nuts $\frac{5}{8}$ -18 Thd	2	Stnls	9Q5868
11	Push Rod	1	Alum	17074AL

MAINTENANCE INSTRUCTIONS

REPLACING O-RING SEAT: The O-ring can be replaced without removing the vent from tank. Open vent. For safety, insert a wooden stick between the disc holder #2 and body #4. Attach vice-grip pliers to stem. Remove screw #1 and O-ring holder #2. Replace O-ring #3. Re-assemble, then remove pliers.

INSTALLATION INSTRUCTIONS

Vent should be mounted directly over emergency valve. Cut push rod #11 to an approximate length. Install push rod and adjust item #9 allowing approximately $\frac{1}{8}$ " end clearance to ensure that vent will close.

Series 2"

To handle single 1-1/2" or 2" I.D. hose.

- Gear-driven crank rewind or chain and sprocket drive powered by an electric, hydraulic or compressed air motor.
- Optional auxiliary crank rewind for power rewind reels.
- Comet brake on power rewind without auxiliary crank.
- Standard inlet: 90° ball bearing swivel joint, 2" Victaulic groove.
- Standard outlet: flanged riser, 2" female NPT threads.
- Other sizes and/or threads can be furnished and must be specified.
- Standard: inlet, outlet riser, and hub assembly are steel. Options: also available in aluminum or stainless steel.
- Rollers and roller mounting brackets are accessories. Specify roller position.
- Standard pressures to 600 psi (41 bar).
- Temperatures from -30°F to +250°F (-34°C to +121°C).
- Consult factory for other pressures and temperatures.



Standard configuration with EPJ option shown



Chain Clutch - Reduction Units

- Recommended on reels with 39" diameter or larger drums, or when increased torque and slower rewind speeds are required.
- Factory installed.

PARTS DRAWING - ISO 35

Model Number For Power Rewind see Notes 3 & 4	Hose Capacity of Reel feet m			Approx. Weight Crank Rewind lb. kg See Note 3		Reel Dimensions*** In. mm									
	I.D. In. mm	1-1/2 38	2 51	NET	SHIP	A	B	D	E	F CRANK	F POWER	G	H	X	Y
	O.D. In. mm	2.06 52	2.67 68												
232-26-27		70	50	104	154	23.75	17.5	27	25.75	31	32.75	26.62	13.75	16.25	23.25
		21	15	47	70	603	445	686	654	787	832	676	349	413	591
238-26-27		100	75	145	195	30.25	24	27	25.75	37.5	39.25	26.62	13.75	22.75	23.25
		30	23	66	88	768	610	686	654	953	997	676	349	578	591
246-26-27		140	100	196	246	38.25	32	27	25.75	45.5	47.25	26.62	13.75	30.75	23.25
		43	30	89	112	972	813	686	654	1156	1200	676	349	781	591
224-33-34		60	50	70	140	15.75	9.5	31.5	31.75	23	24.75	33.38	17.5	8.25	27.75
		18	15	32	64	400	241	800	806	584	629	848	445	210	705
228-33-34		100	75	92	162	19.75	13.5	31.5	31.75	27	28.75	33.38	17.5	12.25	27.75
		30	23	42	73	502	343	800	806	686	730	848	445	311	705
234-33-34		140	100	133	203	26.25	20	31.5	31.75	33.5	35.25	33.38	17.5	18.75	27.75
		43	30	60	92	667	508	800	806	851	895	848	445	476	705
232-39-40		250	150	180	250	23.75	17.5	40	39	31	32.75	39.88	20.38	16.25	37
		76	46	82	113	603	445	1016	991	787	832	1013	518	413	940
240-39-40		350	200	218	288	32.25	26	40	39	39.5	41.25	39.88	20.38	22.75	37
		107	61	99	131	819	660	1016	991	1003	1048	1013	518	578	940

Notes:

- Specifications subject to change.
- Upon request, reels can be supplied with drum lengths other than shown and with disc sizes in other diameters.
- Weights shown in chart are for crank rewind models. ADD these amounts for power rewind models:

	Net lbs/kg	Ship lbs/kg
Electric	40/18.1	40/18.1
Hydraulic	20/9.1	20/9.1
Air	20/9.1	20/9.1

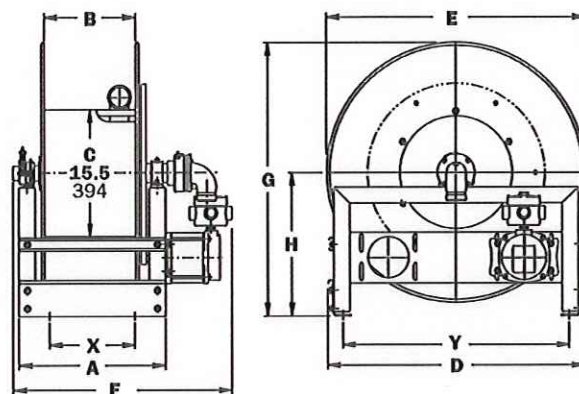
- When ordering power rewind models, prefix model number with:

- A** = Air Rewind - Supplied with control valve and 18" air hose.
- EP** = Electric Rewind (1/2 HP) - 12v and 24v DC rewind supplied with non-explosion-proof switch and solenoid; 115v AC rewind is not supplied with switch but it can be ordered separately.
- EPJ** = Explosion-Proof Electric Rewind (1/2 HP) - supplied with explosion-proof switch, solenoid, and junction box.
- HD** = Hydraulic Rewind - Not supplied with control valve.

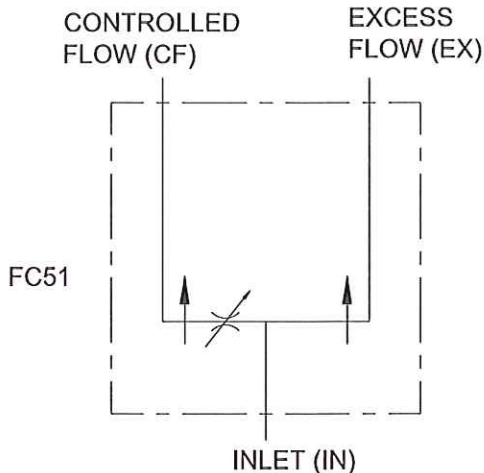
- Be sure to check dimensions and weights prior to ordering.

NOTICE: A flexible connector must be used between the inlet pipe and the inlet swivel joint.

***X, Y indicate mounting holes.



HIGH VOLUME FULL RANGE PRESSURE COMPENSATING VARIABLE FLOW CONTROL “FC”



FEATURES:

- PRECISION GROUND PLATED SPOOL that assures long life.
- DIAMOND HONED SPOOL BORE provides consistent spool fit with low leakage.
- EVERY FC IS TESTED for shutoff, linearity, and pressure compensation.
- STANDARD 3-PORT allows for pressure compensated flow out of two ports.

SPECIFICATIONS:

- See flow chart for capacity.
- Rated for 3000 psi (207 bar).
- Weighs 28 – 3/4 lbs. (13.0 kg).
- 30-Micron Filtration Recommended.
- Torque to turn side lever spool.
-40 in*lbs (4.5Nm) with 3000 (207 bar) psi
on CF port or the EX port.

MATERIALS:

- Ductile Cast Iron Body.
- Heat Treated Steel Spools.
- Buna N O'Rings.
- Consult factory for stainless steel rotary spool.

FC – GENERAL INFORMATION

The Brand, full range pressure compensating variable flow control is designed so that the orifice area varies as the lever is rotated. Fluid travels past the variable orifice, by the compensator spool and then out the controlled flow port. Therefore the flow out of the CF port is proportional to the orifice area which can vary from closed to wide open. The sum of the controlled flow and the excess flow equals the inlet flow and as the controlled flow increases the excess flow decreases. Both outlet flows are pressure compensated with a spool that maintains a constant flow while adjusting for pressure. Hunting between the compensated pump and our valve is dampened with a cross hole in the casting. Thus, the outlet flow is smooth and constant regardless of the pressure on the CF and EX port.



Flow Controls

FC – EXAMPLES OF COMMON MODEL CODES:

- FC51-1..... 1" ports and standard 50 gpm (189.3 lpm) rotary spool.
- FC51-1 1/2..... 1 1/2" ports and 90 gpm (340.7 lpm) rotary spool.
- FC51-24*100..... Number 24SAE ports and 50 gpm (189.3 lpm) rotary spool.

FC – CREATING A MODEL CODE FOR FC'S:

FC 51

PORT SIZE:

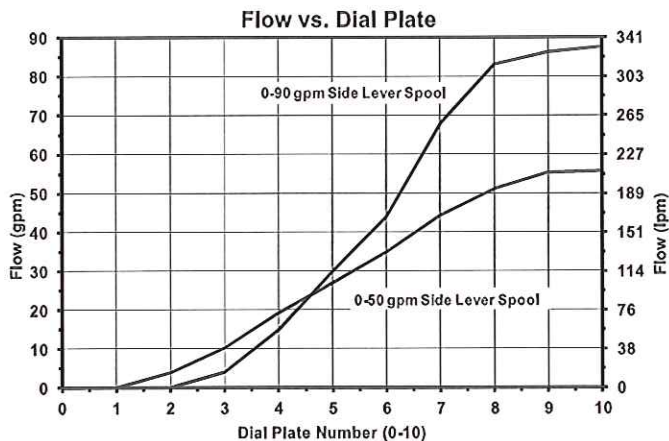
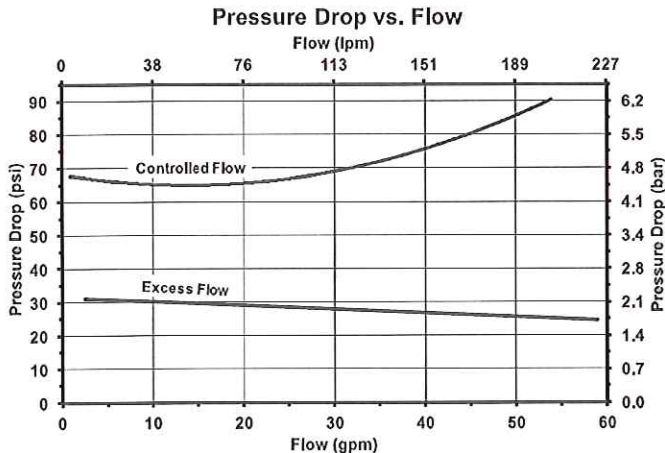
- 1 – 1" NPT (0-50 gpm (0-189.3 lpm) standard)
- 1 1/4 – 1 1/4" NPT (0-90 gpm (0-340.7 lpm) standard)
- 1 1/2 – 1 1/2" NPT (0-90 gpm (0-340.7 lpm) standard)
- 16 - #16SAE (1 5/16 – 12) (0-50 gpm (0-189.3 lpm) standard)
- 24 - #24SAE (1 7/8 – 12) (0-90 gpm (340.7 lpm) standard)

FLOW SETTING:

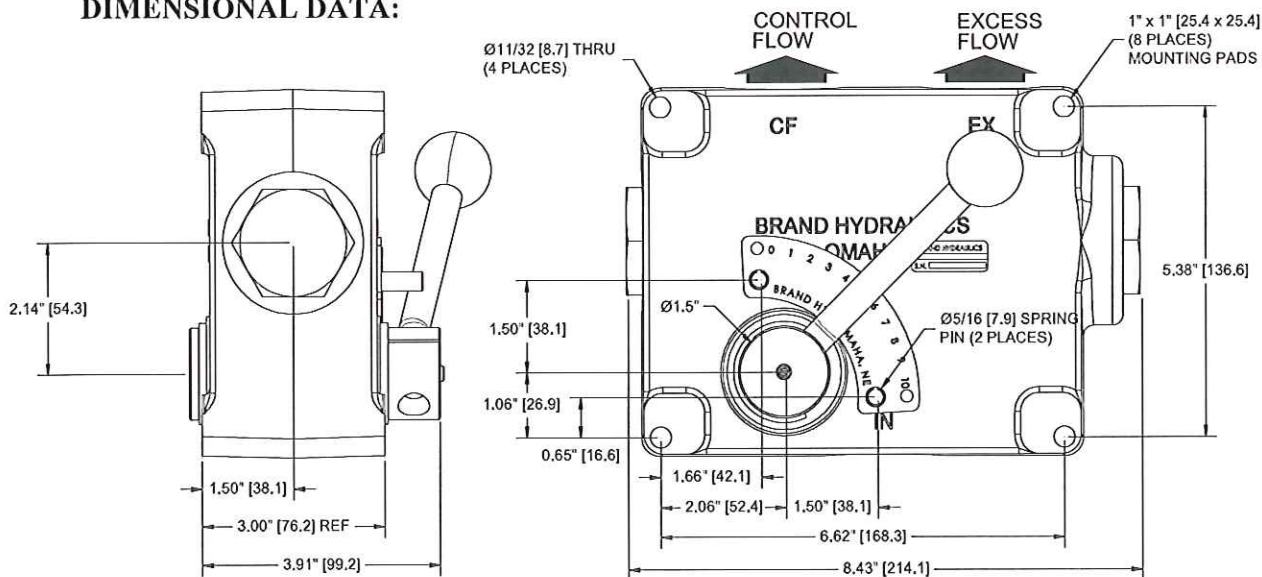
- *100 – 0-50 gpm (0-189.3 lpm)
- ** - Need not specify for standard flow

setting noted under "PORT SIZE"

FC FLOW & PRESSURE INFO:



DIMENSIONAL DATA:



Kassbohrer All Terrain Vehicles PistenBully Arctic & Antarctic



KASSBOHRER ALL TERRAIN VEHICLES, INC.

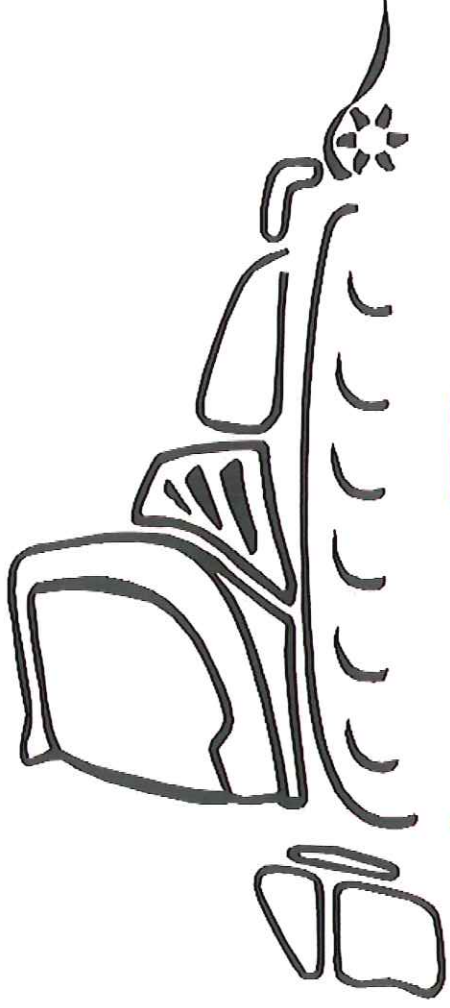


PistenBully *PowerBully* *BeachTech* **snOwsat**

Kassbohrer All Terrain Vehicles



KASSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully

One Machine... Many Capabilities



PistenBully *PowerBully* *BeachTech* **snOwsat**



One Machine... Many Capabilities

- All Terrain Tracks & Suspension
- Heated Aux Cabins for Personnel Transportation
- Pulling
- Lifting
- Drilling
- Dozing
- Transporting
- Dealing with the cold temps down to -60F



All Terrain Vehicle Track Options...



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.

- Rubber
- Steel
- Aluminum
- Smooth Summer Tundra



PistenBully® PowerBully® BeachTech® snowsat®

Alaska DNR Summer Tundra Certified



KASSBOHRER ALL TERRAIN VEHICLES, INC.



MEMORANDUM

Department of Natural Resources
Division of Mining, Land and Water

STATE OF ALASKA

Northern Regional Office

TO: Tundra Travel File DATE: November 8, 2013

FROM: Natural Resource Manager II SUBJECT: Pisten Bully 400 Trail
Summer Tundra Travel Test

Test Date: August 13, 2013

Manufacturer: Kassbohrer All Terrain Vehicles, Inc. (see attachments for full specifications)

Weight: 16,182 lbs (base), 3,300 lbs of payload + approximately 400 lbs passenger weight (tested)

Other: Tested with specialty Tundra Tracks, PSI = 0.98 - 1.28 (with steel tracks, PSI = 0.81)



PistenBully PowerBully BeachTech snOWsat

Summer Tundra Track



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.

PistenBully®

Track flexibility adapts to all uneven surfaces and has a contact area that is several times larger than present standards, which results in very low ground pressure 1 PSI



PistenBully® PowerBully® BeachTech® snowsat®

Summer Tundra Track



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



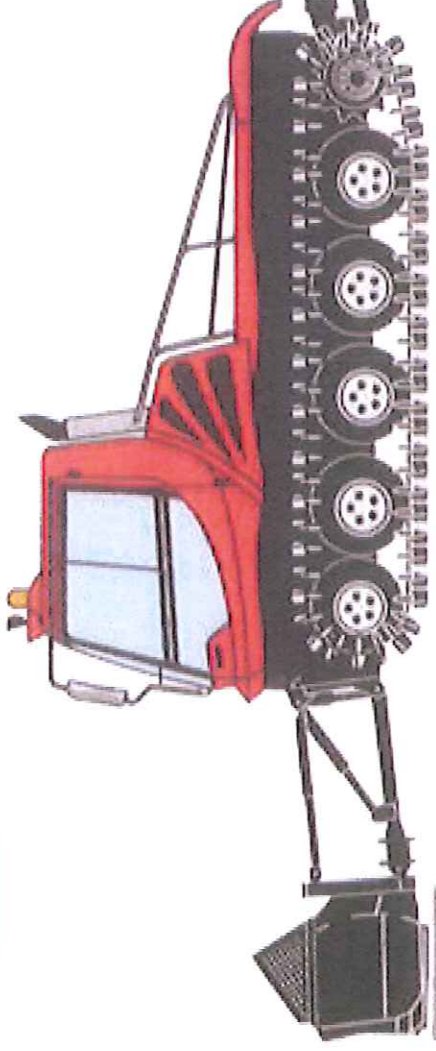
PistenBully®



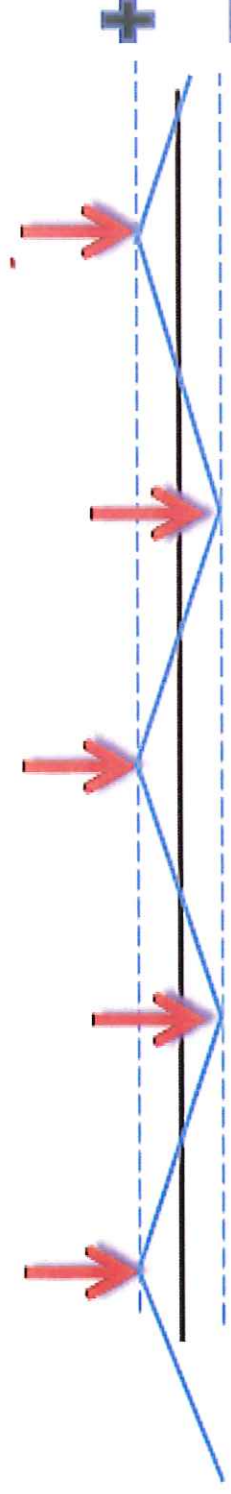
PistenBully PowerBully BenchTech snOwsat



Suspension System



- Under 1 PSI ground pressure is possible.



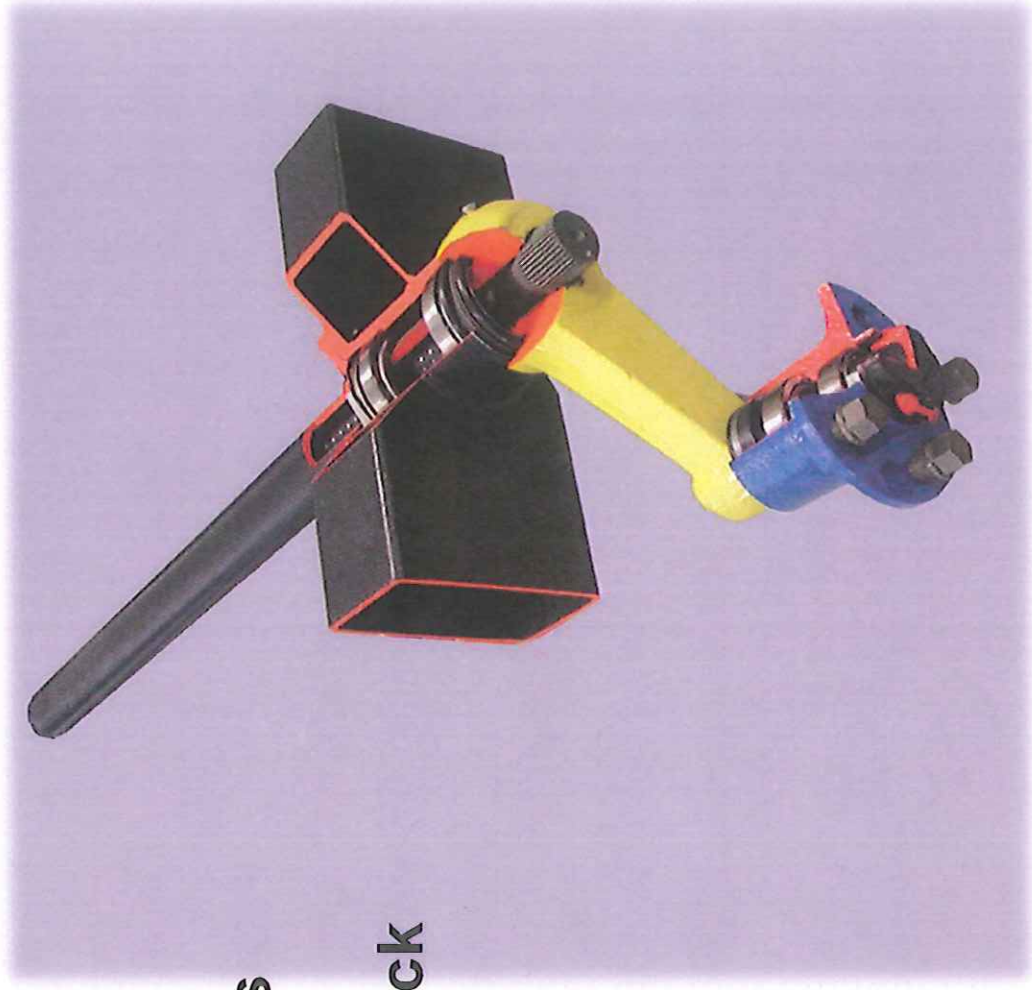
Total weight of PistenBully is distributed through
5 points of contact (suspension) per side

Suspension System



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.

- Torsion bar suspension has self-damping action
- Less transfer of terrain shock
- Vehicle center of gravity is kept low
- Axle can be used as a load carrying cross member



PistenBully PowerBully BeachTech snowsat

5,10,15 and 20 Man PB 400 Heated Personnel Cabins



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully ReachTech snowsat

5,10 Man PB 100 Heated Personnel Cabins



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PowerBully *PowerBully* *ReachTech* *snOwsat*

12 person transporter Tundra Certified



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully BenchTech snowsat

17 Person Transporter Tundra certified



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully *PowerBully* *ReachtTech* **snOwsat**

Tiller Attachments for Preparing Snow Roads



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



BLUEIG

PistenBully PowerBully ReachTech snowsat

Pull Heavy Loads up to 80,000 lbs



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully ReachTech snowsat

Pull Heavy Loads up to 80,000 lbs



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully BeachTech **snOwsat**

Pull up to 80,000 lbs



KASSBOHRER ALL TERRAIN VEHICLES, INC.

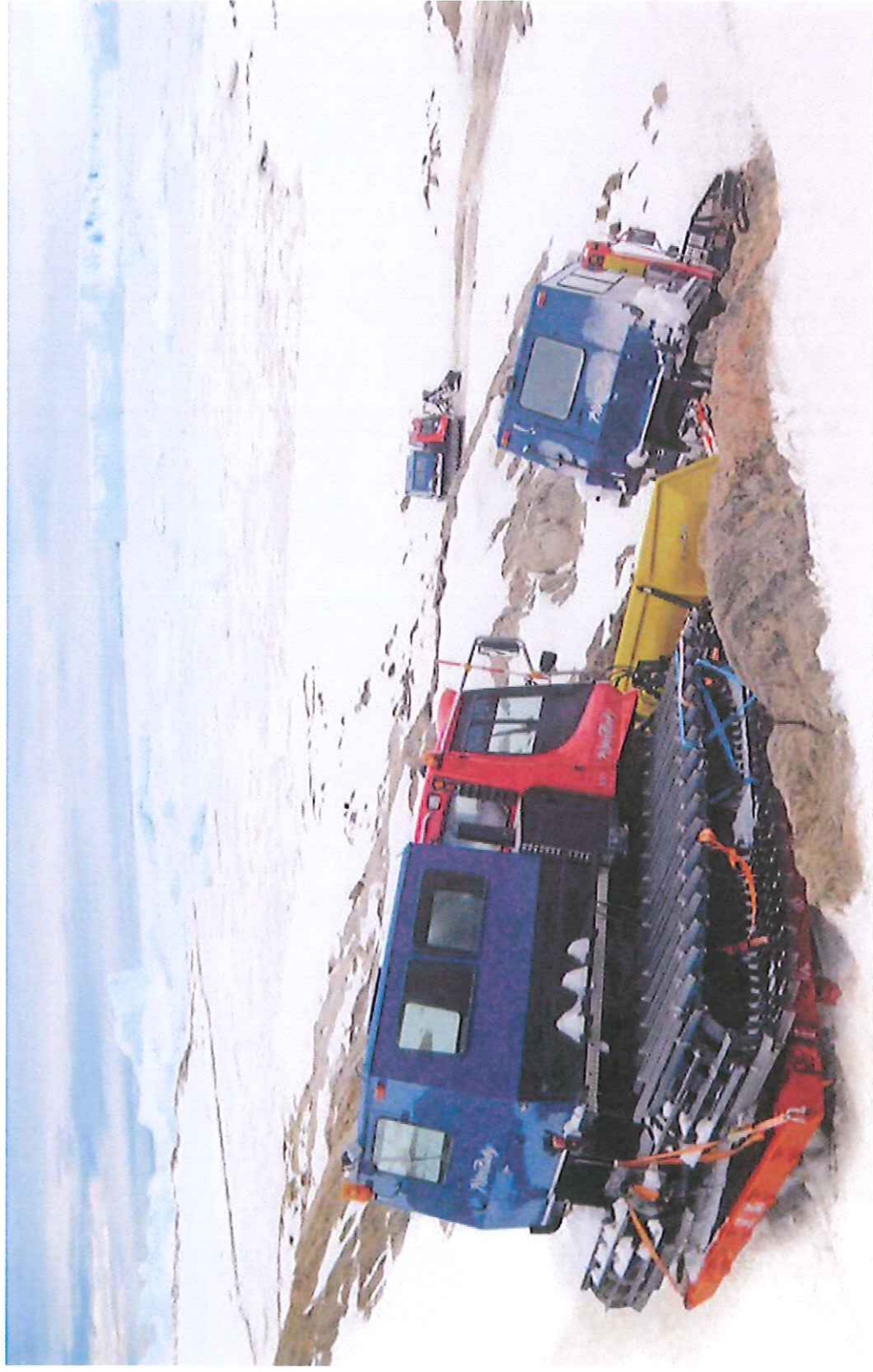


PistenBully *PowerBully* *ReichTech* **snOwsat**

Pull Heavy Loads up to 80,000 lbs



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully BeachTech snowsat



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



BLUEIG

PowerBully *PowerBully* *ReachTech* **snOwsat**

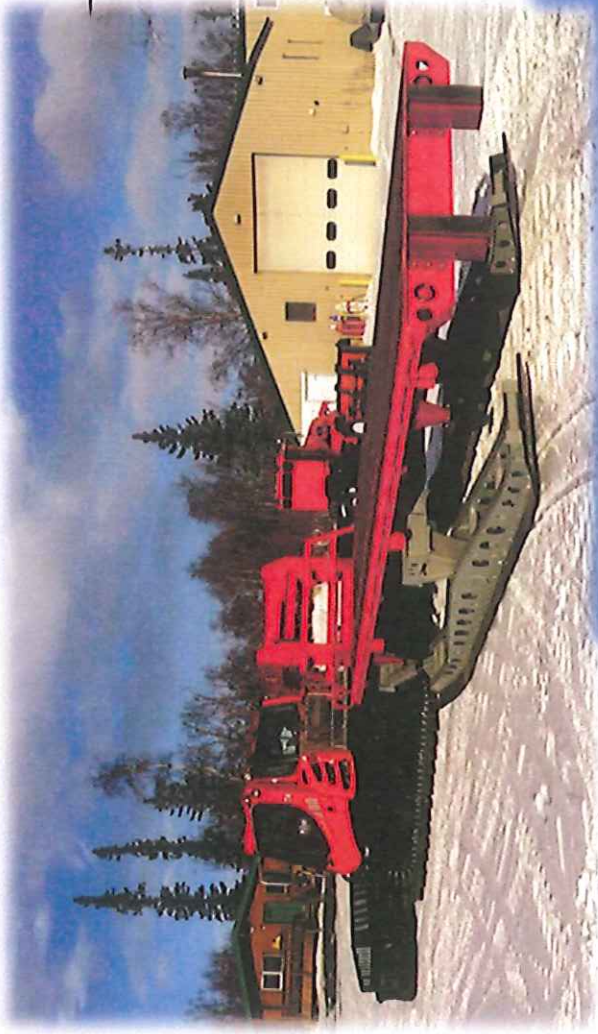
**Doze.....move snow and ice quickly and
have drilling capabilities**



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully ReachTech snOwsat



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully BeachTech snowsat



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.



PistenBully PowerBully BeachTech snowsat



KÄSSBOHRER ALL TERRAIN VEHICLES, INC.

PistenBully Well Known in Antarctica

Over 150 machines running on the ice...



PistenBully TowerBully BeachTech snowsat

CONSTITUTION AND BY-LAWS
OF THE
NATIVE VILLAGE OF NOATAK
ALASKA

+

RATIFIED DECEMBER 28, 1939

CONSTITUTION AND BY-LAWS OF THE NATIVE VILLAGE OF NOATAK

We, a group of Eskimos having the common bond of living together in the Village of Noatak, Territory of Alaska, in order to have better life and greater security, make for ourselves this Constitution and By-laws, by authority of the Act of Congress of June 18, 1934, as amended by the Acts of June 15, 1935 and May 1, 1936.

ARTICLE I—NAME

This organization shall be called the "Native Village of Noatak."

ARTICLE II—MEMBERSHIP

SECTION 1. *First Members*.—All persons whose names are on the list of native residents, made according to the Instructions of the Secretary of the Interior for organization in Alaska, shall be members of the Village.

SEC. 2. *Children of Members*.—All children of any members shall be members of the Village.

SEC. 3. *Loss of Membership*.—Any member may willingly give up his membership, or his membership may be taken away for good reason by the Village, or if he moves away from the Village, intending not to return, he shall lose his membership.

SEC. 4. *New Membership*.—Any person who has lost his membership and any other native person may be made a member if he sets up a home in the Village.

SEC. 5. *Membership Rules*.—The Village may make rules to govern membership, either for the purpose of carrying out this Article or covering membership matters not taken care of in this Article.

ARTICLE III—GOVERNING BODY

SECTION 1. *Choice of Governing Body*.—At a general meeting following the acceptance of this Constitution, the Village membership shall decide what kind of governing body it wishes to set up to speak and act for the Village and to use the powers of the Village. If there is a governing body already set up in the Village, at the time this Constitution is accepted, the membership may decide to keep that governing body, or it may choose a new form of government.

SEC. 2. *Choice of Officers*.—The Village shall at the same time decide how members and officers of the governing body shall be chosen and how long they shall serve. The Village shall then choose the members to serve on the governing body and such officers as may be thought necessary.

SEC. 3. *Meetings of Membership and Governing Body*.—The Village shall decide when and how often there should be meetings of the whole

Village membership as well as of the governing body; also it shall decide what notice shall be given for the calling of meetings and how many members must be present at such meetings in order to do business; and it may make any other rules necessary for the holding of meetings. A general meeting of the whole membership shall be held at least once a year.

SEC. 4. *Record and Report of Village Decisions.*—A record shall be made and kept of all the rules made under sections 1, 2, and 3 of this Article, which record shall be called the *Record of Organization* of the Native Village of Noatak. Copies of this record shall be given to the teacher or other representative of the Office of Indian Affairs serving the Village. There shall be put in the record the names of all persons chosen to be officers of the Village.

ARTICLE IV—POWERS OF THE VILLAGE

SECTION 1. *Powers held.*—The village shall have the following powers:

To do all things for the common good which it has done or has had the right to do in the past and which are not against Federal law and such Territorial law as may apply.

To deal with the Federal and Territorial Governments on matters which interest the Village, to stop any giving or taking away of Village lands or other property without its consent, and to get legal aid, as set forth in the act of June 18, 1934.

To control the use by members or nonmembers of any reserve set aside by the Federal Government for the Village and to keep order in the reserve.

To guard and to foster native life, arts and possessions and native customs not against law.

SEC. 2. *Grant of More Powers.*—The Village may have and use such other powers as may be given to it by the Federal or Territorial Government.

SEC. 3. *Use of Powers.*—The governing body shall put into use such of the powers of the Village as the Village may give to it at general meetings of the membership and shall make reports of its actions to the membership at general meetings.

SEC. 4. *Rule-making Power.*—The Village may make rules which are not against law to carry out the words of this Constitution.

ARTICLE V—RIGHTS OF MEMBERS

SECTION 1. *Right to Vote.*—All members of the Village 21 years of age or over shall have the right to vote in Village meetings and elections.

SEC. 2. *Right to Speak and Meet Freely.*—Members of the Village shall have the right to speak and meet together freely in a peaceable way.

SEC. 3. *Right to Share in Benefits.*—Members of the Village shall have equal chance to share in the benefits of the Village.

ARTICLE VI—CHANGES IN THE CONSTITUTION

Changes in this Constitution and By-laws may be made if the changes are approved by the Secretary of the Interior and by a majority vote

of the Village members voting in an election called by the Secretary of the Interior at which at least 30 per cent of the voting membership take part.

BY-LAWS OF THE NATIVE VILLAGE OF NOATAK

ARTICLE I—OFFICERS AND THEIR DUTIES

SECTION 1. *Village Records.*—The Village or the governing body shall choose one or more members who shall have the duty of keeping records of all actions and decisions of the Village and of the governing body and of giving copies of the records to the representative of the Office of Indian Affairs serving the Village.

SEC. 2. *Village Funds.*—The Village or the governing body shall choose one or more members who shall have the duty of caring for the Village funds and keeping records of all funds taken in and paid out and giving copies of the records to the representative of the Office of Indian Affairs.

SEC. 3. *Officers and Agents.*—The Village or the governing body may choose as many officers and agents as it may need to carry out its duties and shall state the length of service and the duties of each officer or agent when he is chosen.

ARTICLE II—ADOPTION

This Constitution and By-laws shall be in effect when it is agreed to by a majority vote of the Village members voting in an election called for the purpose by the Secretary of the Interior, provided that at least 30 per cent of the voting membership take part. The persons entitled to vote are all the adult native residents in the Village of Noatak.

APPROVAL

This Constitution and By-laws is hereby approved by the Assistant Secretary of the Interior and submitted for acceptance or rejection by the group of Eskimos having a common bond of living together in the Village of Noatak, Alaska, in an election called and held under the Instructions of the Secretary of the Interior.

All rules and regulations heretofore promulgated by the Interior Department or by the Office of Indian Affairs, so far as they may be incompatible with any of the provisions of the said constitution and by-laws will be inapplicable to the Village of Noatak, Territory of Alaska, from and after the date of adoption of this constitution.

All officers and employees of the Interior Department are ordered to abide by the provisions of the said constitution and by-laws.

OSCAR L. CHAPMAN,
Assistant Secretary of the Interior.
[SEAL]

WASHINGTON, D. C., May 23, 1939.

CERTIFICATION OF ADOPTION

Pursuant to an order, approved May 23, 1939 by the Assistant Secretary of the Interior, the attached constitution and by-laws was submitted for ratification to the group of Indians having a common bond

of residence in the Village of Noatak, Territory of Alaska, and was on December 28, 1939 duly ratified by a vote of 87 for and 0 against in an election in which over 30 per cent of those entitled to vote cast their ballots, in accordance with section 16 of the Indian Reorganization Act of June 18, 1934 (48 Stat. 984), as amended by the Act of June 15, 1935 (49 Stat. 378).

NEVILLE J. McMILLAN,
Government Representative.

ROBERT LEE,
Chairman, Election Board.

○

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

+

CONSTITUTION AND BY-LAWS
OF THE
NATIVE VILLAGE OF NOATAK

+

RATIFIED DECEMBER 28, 1939



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1957

CORPORATE CHARTER
OF THE
NATIVE VILLAGE OF NOATAK
ALASKA

+

RATIFIED DECEMBER 28, 1939

CORPORATE CHARTER OF THE NATIVE VILLAGE OF NOATAK

A FEDERAL CORPORATION CHARTERED UNDER THE ACT OF JUNE 18, 1934, AS AMENDED BY THE ACT OF MAY 1, 1936

Whereas, a group of Eskimos having a common bond of living together in Noatak, Territory of Alaska, seek to organize under Sections 16 and 17 of the Act of June 18, 1934, and Section 1 of the Act of May 1, 1936, by adoption of a constitution and by-laws and a charter approved by the Secretary of the Interior,

Now, therefore, I, Oscar L. Chapman, Assistant Secretary of the Interior, by virtue of the authority given to me by the above acts, do hereby submit this charter of incorporation to the group of Eskimos so organizing.

SECTION 1. *Purpose and Name.*—In order to enable the Village and its members to do various kinds of business for their good, the Village is hereby chartered as a corporation of the United States of America under the name of "Native Village of Noatak".

SECTION 2. *Membership.*—The corporation shall be a membership corporation, consisting of all persons of the Village considered members under the rules of its Constitution.

SECTION 3. *Management.*—The corporation shall be managed by the governing body set up under the constitution.

SECTION 4. *Powers.*—The corporation shall have the power to do the following things:

To own, hold, manage and dispose of all village property;

To make contracts;

To sue and be sued;

To borrow money from the revolving Indian credit fund and to use it under a loan contract;

To enter into any business or activity that will better the condition of the Village and its members;

To do such other things as may be necessary to carry on the business and activities of the Village.

SECTION 5. *Limits to Powers.*—In using its powers the corporation must not do the following things:

Go against any law or the constitution and by-laws of the Village;

Sell or mortgage any land set aside as a reserve for the Village;

Make leases, permits or contracts covering any lands or waters set aside as a reserve for the Village without the approval of the

Secretary of the Interior or his authorized representative.

SECTION 6. *Property of Members.*—Property owned by a member of the Village shall not be taken to pay the debts of the corporation without his consent.

SECTION 7. *Records.*—The corporation shall keep correct records of its business and activities and give copies of these records when asked

to do so to the representative of the Office of Indian Affairs serving the Village.

SECTION 8. *Changes in the Charter.*—Changes in the charter may be made by the Village and if approved by the Secretary of the Interior shall be in force when agreed to by a majority vote of those members voting in an election called by the Secretary of the Interior, provided, that at least 30 per cent of the voting membership votes. The charter itself shall continue in force for all time, unless taken away by act of Congress.

SECTION 9. *Adoption of Charter.*—This charter shall be in force when it is agreed to by a majority vote of those members voting in an election called by the Secretary of the Interior, provided, that at least 30 percent of the voting membership votes and provided that the Village has agreed to a constitution and by-laws approved by the Secretary of the Interior.

This Charter is hereby approved and submitted to the group of Eskimos having a common bond of residence in the Village of Noatak, Alaska, to be voted on in an election called and held under the Instructions of the Secretary of the Interior. The Charter shall be deemed issued when a petition for a charter, signed by one-third of the adult Eskimos, has been received by an authorized representative of the Department of the Interior.

OSCAR L. CHAPMAN,
Assistant Secretary of the Interior.
WASHINGTON, D. C., May 23, 1939.

CERTIFICATION

Pursuant to an order, approved May 23, 1939, by the Assistant Secretary of the Interior, the attached charter was submitted for ratification to the group of Eskimos having a common bond of residence in the Village of Noatak, Territory of Alaska, and was on December 28, 1939, duly ratified by a vote of 87 for and 0 against, in an election in which over 30 percent of those entitled to vote cast their ballots, in accordance with the Alaska Act of May 1, 1936 (49 Stat. 1250), and section 17 of the Act of June 18, 1934 (48 Stat. 984), as amended by the Act of June 15, 1935 (49 Stat. 378).

ROBERT LEE,
Chairman, Election Board.

NEVILLE J. McMILLAN,
Government Representative.

○

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

+

CORPORATE CHARTER
OF THE
NATIVE VILLAGE OF NOATAK
ALASKA

+

RATIFIED DECEMBER 28, 1939



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1957

Noatak Fuel Transport Cost Comparison

Pit 6 route NPS controlled Land

1) Estimated trail prep/maintenance:

3 man laborers crew, 3 snow machines w/ drags, purpose to profile creek crossings and pack approach ramps, groom trail, set markers. Early season duration 10 days. Price includes fuel, lodging, airfare, equipment/snowmachines \$45,000

2) Estimated daily operating cost during fuel haul:

One operator, one mechanic, mechanic can double as operator when required to run shifts longer than 12 hours, or as trail maintenance when needed. Price includes fuel, maintenance, lodging, airfare, spill response equipment, fuel transfer supplies, one additional snowmachine, tools, ect. Prices based on being provided with a heated shop in Noatak. \$6500.00 per day

Pit 9 route 9 (non NPS controlled)

1) Estimated trail prep/maintenance:

3 man crew, one operator, one mechanic, one laborer. This would require the use of an additional tracked vehicle or snow cat working in conjunction with the Cat Forwarder. Also would require 2 additional snowmachines for personnel transport/egress. Estimated 14 days of route recon and trail building if weather/ground conditions allow. Prices exclude mob of additional tracked vehicle from point of origin to Noatak/ Red Dog. \$150,000.00

2) Estimated daily cost during fuel haul:

3 man crew, two operators, one laborer. Both, the Snow Cat and Cat Forwarder working in conjunction with each other to haul fuel and simultaneously maintain route. Laborer would be used for logistic support, route maintenance, and equipment maintenance. Prices include lodging, airfare, and equipment maintenance. \$10,000.00 per day

*Prices provided are only an estimate based on observations made April 2015 and are the best recommendations by people experienced in this type of work. Pricing may change based on fuel rates, equipment availability, weather. This document is not a quote or a proposal, to be used only as reference and as a estimated cost comparison.



[about us](#) [lands](#) [natural resources](#) [companies](#) [shareholder relations](#) [careers](#) [news](#)



[home](#) [our shareholders](#) [shareholder services](#)

Village Economic Development

In May 2008, the Village Economic Development Committee (VEDC) was formed by unanimous consent of the Board of Directors. With a mission of partnering to achieve sustainable village economies, the committee envisions a thriving, economically viable region, and sets out to discover new savings and growth opportunities. This mission, and this vision, have guided the department's activities within the region, and in its outreach with state and national elected officials and agencies.

Under the VEDC program, each village is eligible to apply for grants of up to \$55,000 for energy efficiency projects. The key component of this program is choice. Each community chooses, for itself, how to strengthen its economy and how to use grant funds to build their link in the regional economic chain. Additionally, each community is eligible for a million dollar economic development grant.

Through regional collaboration, developing small businesses, reducing the cost of energy, helping local governments achieve goals, and coordinating infrastructure projects, NANA works to overcome the economic challenges that face the region and people.