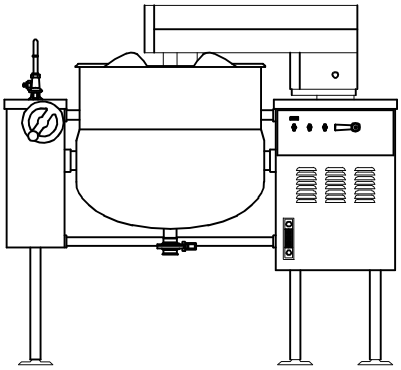
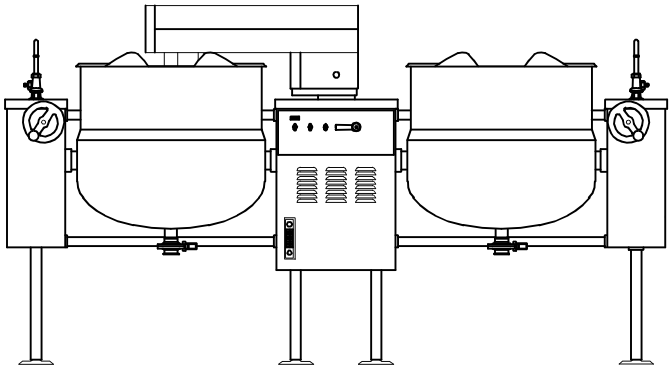
INSTALLATION AND OPERATION MANUAL

ELECTRIC SELF GENERATING SINGLE AND TWIN STEAM MIXER KETTLE

MODELS: ELTM-40 & ELTM-40-2
ELTM-60 & ELTM-60-2
ELTM-80 & ELTM-80-2
ELTM-100 & ELTM-100-2





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IMPORTANT NOTES FOR INSTALLATION AND OPERATION

	**This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.**

	**WARNING: Improper installation, operation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing, operating or servicing this equipment.**

Adequate clearances must be maintained for safe and proper operation.

Intended for commercial use only. Not for household use.

This manual should be retained for future reference.

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ϟ — ELECTRICAL CONNECTION: to be as specified on data plate.

(WI) — OIL COOLER WATER IN : 3/8" Tube bulkhead Union.

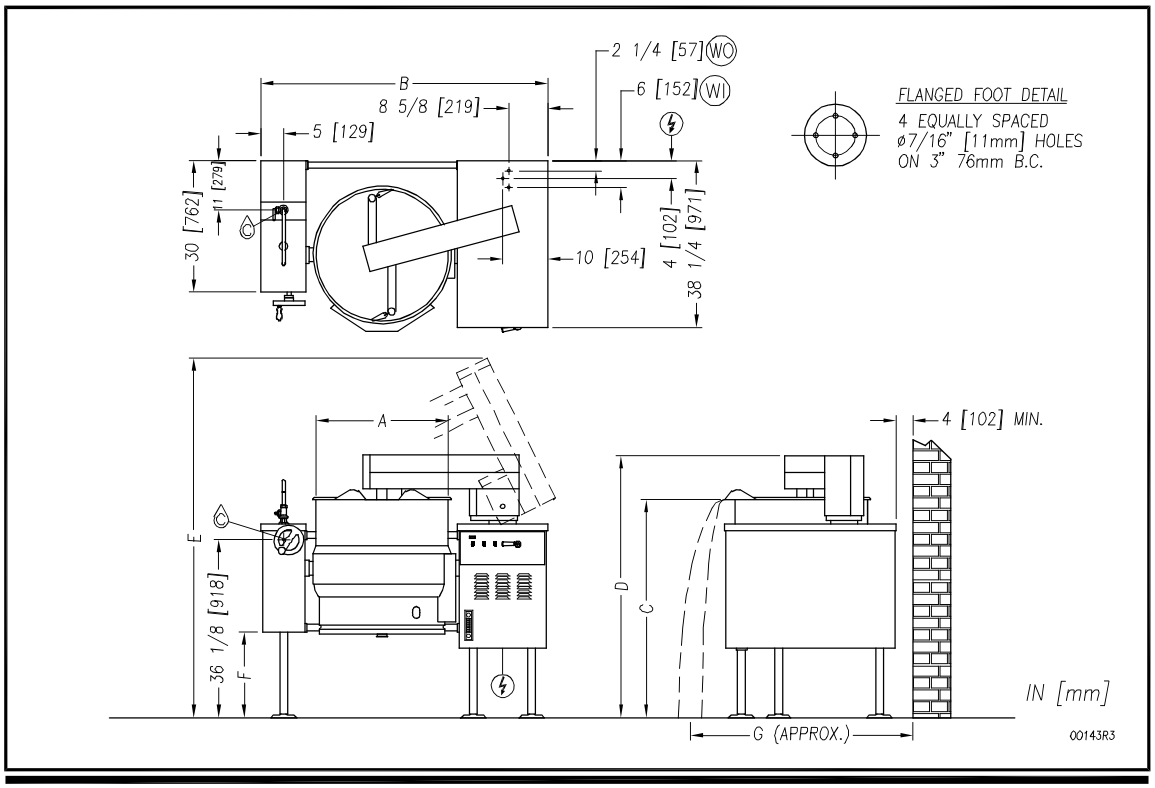
(WO) — OIL COOLER WATER OUT : 3/8" Tube bulkhead Union.

ELECTRICAL CHARACTERISTICS

Available kW			AMPS PER LINE								
MODEL	STD.	OPT.	KW	PHASE	208V	220V	240V	380V	415V	480V	600V
ELTM-40	24	N/A	24	3	79.6	75.3	69	43.6	39.9	34.6	27.6
ELTM-60	24	33	33	3	104.6	98.9	90.7	57.3	52.4	45.3	36.3
ELTM-80	24	33									
ELTM-100	24	33									

DIMENSIONS

MODEL	CAPACITY		A	B	C	D	E	F	G
ELTM-40	40 gallons	inches	26	62.25	43.25	55	75.625	15.125	56
	152 litres	mm	*660*	*1581*	*1099*	*1397*	*1921*	*384*	*1422*
ELTM-60	60 gallons	inches	29.5	66	49	58.5	80	19.5	58
	227 litres	mm	*749*	*1676*	*1245*	*1486*	*2032*	*495*	*1473*
ELTM-80	80 gallons	Inches	33	69.25	49	58.5	80	19.5	60
	303 litres	mm	*838*	*1759*	*1245*	*1486*	*2032*	*495*	*1524*
ELTM-100	100 gallons	inches	35.5	71.5	49	58.5	85	19.5	63
	379 litres	mm	*902*	*1816*	*1245*	*1486*	*2159*	*495*	*1600*



As continued product improvement is a policy of Crown, specifications are subject to change without notice.

1.0 **SERVICE CONNECTIONS** (Continued)

C — COLD WATER – 3/8" Nominal tubing to kettle fill faucet (OPTIONAL)

E — ELECTRICAL CONNECTION: to be as specified on data plate.

WI — OIL COOLER WATER IN : 3/8" Tube bulkhead Union.

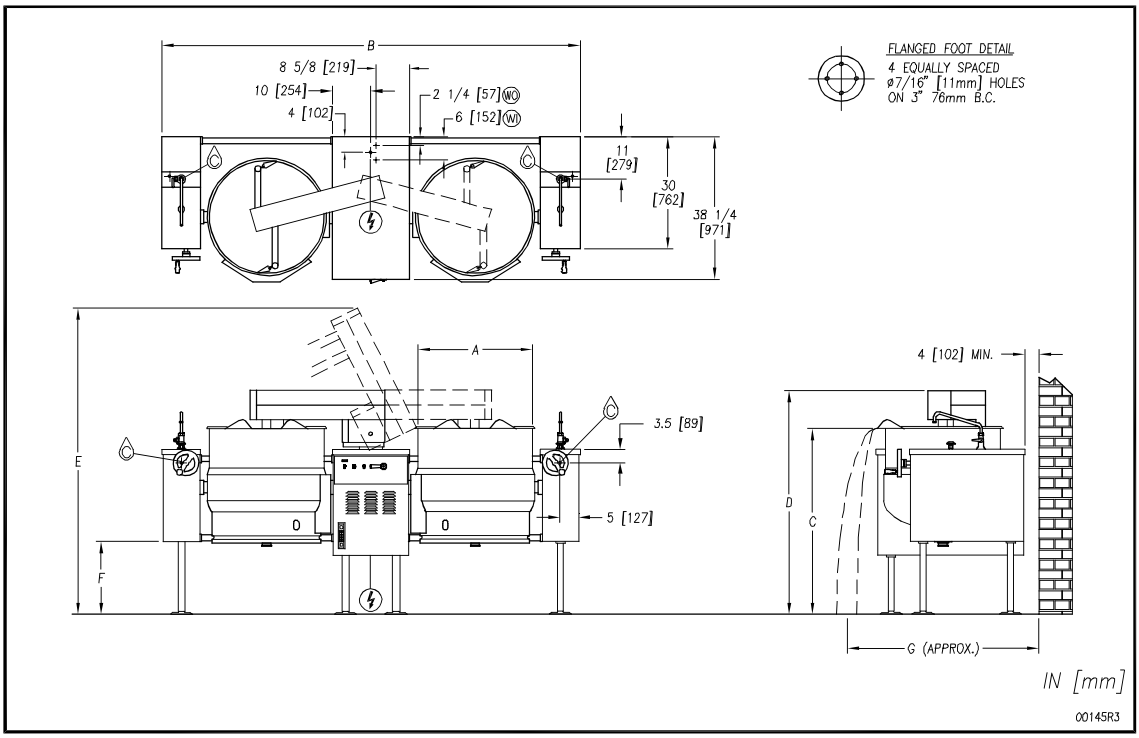
WO — OIL COOLER WATER OUT : 3/8" Tube bulkhead Union.

ELECTRICAL CHARACTERISTICS

Available kW/Kettle			AMPS PER LINE								
MODEL	**STD.**	**OPT.**	**KW**	**PHASE**	**208V**	**220V**	**240V**	**380V**	**415V**	**480V**	**600V**
ELTM-40-2	24	N/A	24	3	146.3	138.3	126.7	80.1	73.3	63.5	50.7
ELTM-60-2	24	33	33	3	196.3	185.5	170.1	107.3	98.3	85.1	68.1
ELTM-80-2	24	33									
ELTM-100-2	24	33									

DIMENSIONS

MODEL	CAPACITY		A	B	C	D	E	F	G
ELTM-40-2	40 gallons	**Inches**	26	104.5	43.25	55	75.625	15.125	56
	152 litres	***mm***	*660*	*2654*	*1099*	*1397*	*1921*	*384*	*1422*
ELTM-60-2	60 gallons	**inches**	29.5	112	49	58.5	80	19.5	58
	227 litres	***mm***	*749*	*2845*	*1245*	*1486*	*2032*	*495*	*1473*
ELTM-80-2	80 gallons	**Inches**	33	118.5	49	58.5	80	19.5	60
	303 litres	***mm***	*838*	*3010*	*1245*	*1486*	*2032*	*495*	*1524*
ELTM-100-2	100 gallons	**inches**	35.5	123	49	58.5	85	19.5	63
	379 litres	***mm***	*902*	*3124*	*1245*	*1486*	*2159*	*495*	*1600*



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2.0 INTRODUCTION

DESCRIPTION

All electrically powered kettles described and referred to in this manual are pressure vessels of a double-wall construction forming a sealed jacket (chamber) enveloping the lower two thirds of the kettle bowl surface.

The kettle bowl is the container for the food product which ideally should be a liquid or semi-liquid consistency to achieve complete contact with the bowl surface. Food products will fully absorb the heat transmitted through that surface from the pressurized steam generated in the kettle jacket.

The jacket is intended to function as a self contained sealed chamber with a permanent solution of water and antifreeze sufficient not only to immerse and thereby protect replaceable electric heating elements, but also provide the steam source during the steam generating process.

The heating elements are thermostatically controlled to provide precise temperatures throughout the range from slow simmer to rolling boil.

All tilting kettles are intended to be permanently floor mounted on legs with adjustable flanged feet.

A sealed stainless steel tilt mechanism permits the kettle to tilt forward a full 90° for complete emptying. The tilting mechanism is self locking for positive stop action.

MIXER FEATURES

The mixer is a variable speed unit powered by a 5 hp electric motor driving a hydraulic pump. Two heavy duty hydraulic motors drive the primary scraper/agitator and secondary high speed mixer. Both are removable without tools for cleaning. They are housed in a stainless steel bridge that is power tilted and swings 140° out of the way for tilting the kettle(s).

CAPACITIES

All models are suffixed with either -40, -60, -80 or -100 to indicate the capacity of that kettle in US gallons. Models with the suffix -2 indicate a twin model. Thus a unit with suffix -40-2 has two 40 gallon kettles, one on each side of the mixer console. An ELTM-40 indicates a single 40 gallon kettle two thirds jacketed electrically powered steam kettle.

2.0 INTRODUCTION

FUNCTIONING MODE

All electrically powered self steam generating kettles consist of a jacket containing a permanent solution of water and antifreeze sufficient to completely immerse and protect replaceable electric heating elements.

To minimize tampering, the Safety Valve is plumbed toward the rear of the kettle jacket. Should any component malfunction and cause the pressure in the jacket to reach the rated pressure of the kettle, this protective device will open automatically and release excessive pressurized steam.

When the Power Switch is turned ON and the Temperature Control (Thermostat) Knob dialed, the TEMPERATURE pilot light will ignite and contactors will close to allow power to the elements. Steam generation will commence and continue until the preselected temperature is reached, at which point the contactors open, cutting off power to heating the elements. The TEMPERATURE pilot light will then extinguish. When the temperature of the water in the jacket drops slightly, the cycle will repeat itself thus making it possible to maintain any selected precise cooking mode temperature.

The temperature required for the cooking process to function adequately must be greater than the boiling point of the liquid food product. Further, the higher the temperature, the greater the steam pressure attained in the jacket and consequently the quicker the cooking process. For example, steam pressurized at 30 p.s.i. attains a temperature of 274º Fahrenheit.

Since air is an unsuitable media through which heat may be transferred, it has been removed from the kettle jacket during testing at the factory. The Pressure Gauge should indicate vacuum in the jacket in green zone on the gauge (approximately 20 - 25 inches Hg) when the kettle is cold or has been inoperative for some time. The kettle jacket is intended to function at all times as a completely sealed self-contained chamber and it is especially advisable not to trip the safety relief valve during inoperative periods since this will break the vacuum seal and allow air to enter the kettle jacket.

The Temperature Controls (thermostats) used in these kettles have been calibrated to prevent the heating elements from generating steam pressure that would exceed the rated working pressure of the kettle. In the unlikely event that the Temperature Control fails and the heating elements remain energized, the Safety Valve will blow and release the excessive pressure and steam from the jacket, consequently lowering the water level in the jacket. The Safety Probe sensing depletion of the water level in the kettle jacket will not only activate the LOW WATER level indicator pilot light, but also signal the Liquid Level Control to switch off power and de-energize the circuit to the heating elements (preventing element burn outs) until the water level is adequately replenished.

FUNCTIONING MODE (Continued)

The mixer is a variable speed unit powered by a 5 hp electric motor driving a hydraulic pump. Two heavy duty hydraulic motors drive the primary scraper/agitator and secondary high speed mixer. Both are removable without tools for cleaning. They are housed in a stainless steel bridge that is power tilt and swings 140° out of the way for tilting the kettles(s). Once the bridge has been lifted the agitators cannot be operated as a safety switch is activated. Bridge may now be moved out of the way or if a twin mixer, moved to the other kettle. The speed control is located on the front panel and may be set to the desired speed by turning. The maximum speed will not exceed 54 RPM on the smallest kettle and 40 RPM on the largest.

3.0 INSTALLATION INSTRUCTIONS

UNPACKING

Immediately after unpacking, check for possible shipping damage. If the kettle is found to be damaged, save the packaging material and contact the carrier within 15 days of delivery.

INSTALLATION

Before installing, verify that the electrical service agrees with the specifications on the rating plate located on the right side of the tilt console. If the supply and equipment requirements do not agree, contact your dealer or Crown Food Service Equipment Ltd.

The kettle must be installed in accordance with State and/or local codes. In the USA, the National Electrical Code, ANSI/NFPA-70 (latest edition). In Canada, the Canadian Electrical Code, Part 1, CSA Standard C22.1 (latest edition).

1. Select a location to provide drainage for kettle pour path when tilted and for butterfly valve if so equipped. Allow sufficient rear clearance from wall for access to rear service panel on hydraulic console.

2. Level unit. With kettle in the upright position, place a carpenter's level on top of the kettle and turn the adjustable feet to level kettle side-to-side and front to back. Mark hole locations on floor through anchoring holes provided in flanged adjustable feet.

3. Remove unit and drill holes where marked and insert expansion shields to accommodate 5/16" size lag bolts.

4. Reposition unit. Re-level kettle by making necessary adjustments on flanged feet.

5. Bolt down unit and seal with Silastic or equivalent sealing compound. Sealant must be applied not only to bolt heads but also around flanges making contact with the floor surface to fulfil NSF requirements. Wipe off excess sealant immediately.

6. Connect water drain line from cooling system to drain or return line.

7. Connect cold water supply line for cooling system as indicated in bottom of hydraulic console.

8. The relief valve on the kettles(s) must not be adjusted or closed off as they are set to relieve excess pressure in the kettle(s).

9. Do not make any adjustments to the hydraulic system as it has been set at the factory.

3.0 INSTALLATION INSTRUCTIONS

ELECTRICAL CONNECTIONS

A control box with a power supply equivalent to the electrical rating of the unit should be located nearby. A waterproof electrical connection for the power supply to the unit must be provided.

Remove the back panel of the hydraulic console and make electrical connection per wiring diagram located inside the console in plastic bag attached to tank. A waterproof electrical connection from power supply to rear of hydraulic console must be provided.

Ground kettle to terminal provided in the hydraulic console.

Once proper connections are made, replace the back panel on hydraulic console, turn power ON and check for proper operation.

SERVICE CONNECTIONS

All internal wiring for the kettle and hydraulic power unit is complete.

Connect water supply for cooling system as shown in Service Connections.

If faucet is provided connect water supply and check for proper operation.

INSTALLATION CODES AND STANDARDS

Your electric mixing kettle must be installed in accordance with:

1. Provincial and local codes, or in the absence of local codes, with C.S.A. C22.1 Canadian Electrical Code, Part 1, or in the U.S.A., the National Electrical Code ANSI/NFPA-70 (latest edition).

2. ANSI NFPA Standard #96 “Vapour Removal from Cooking Equipment”, (latest edition), available from the National Fire Protection Association, Batterymarch Park, Quincy, MA, 02269.

4.0 OPERATION INSTRUCTIONS

WARNING: The kettle and its parts are hot. Use care when operating, cleaning and servicing the kettle.

KETTLE

Ensure that the external electrical service to kettle is on.

Check pressure gauge for correct cold kettle reading. Reading should be in the green area of the gauge indicating 25 - 30 In. Hg (630 - 730 mm Hg) of vacuum. If reading is not low enough, follow VENTING procedure in Troubleshooting section prior to using kettle.

Place power switch to ON position.

Preheat kettle by placing thermostat knob at ‘10' and wait until TEMPERATURE light goes off.

NOTE: Preheating should not be used when cooking milk and egg food products which adhere to hot cooking surfaces. These foods should be placed into kettle before heating has begun.

Add food to be cooked into kettle.

Place thermostat knob at required temperature setting from 1 to 10 coinciding with the following table:

4.0 OPERATION INSTRUCTIONS (Continued)

THERMOSTAT SETTING	APPROXIMATE (JACKET) TEMPERATURE	
1	140° Fahrenheit	60°Celsius
2	155° Fahrenheit	68°Celsius
3	172° Fahrenheit	78° Celsius
4	187° Fahrenheit	86 °Celsius
5	205° Fahrenheit	96° Celsius
6	223° Fahrenheit	106° Celsius
7	240° Fahrenheit	116° Celsius
8	255° Fahrenheit	124° Celsius
9	271° Fahrenheit	133° Celsius
10	285° Fahrenheit	140° Celsius

When cooking is finished set thermostat knob and power switch to OFF position.

Pour finished product from kettle using tilt handle. Be careful to avoid splashing.

Add water to kettle for cleaning purposes.

Wash kettle thoroughly. See CLEANING procedure, next section.

4.0 OPERATION INSTRUCTIONS

OPERATION OF MIXER UNIT

Power to operate the mixer unit is controlled by the “Main Power” switch located on the left side of the control panel. Ensure that mixer “speed” control is set to the “stop” position. Place switch in the “ON” position. Set the mixer switch, located beside the main power switch, to “ON” position. Note that the agitators should not be turning. The speed control has four basic settings which are: stop, slow, medium and fast. Set the speed control to the slow position and observe that the agitators begin to turn.

CAUTION: Never place hands inside kettle when agitators are in motion.

Increasing the speed setting on the control will increase the speed at which the agitators turn.

NOTE: Always start agitators at the slow speed and then gradually increase to the desired speed to avoid splashing or “throwing” the product over edge of kettle.

TO RAISE MIXER BRIDGE

To tilt kettle for emptying or to clean agitators, the mixer bridge will tilt hydraulically upward and manually swing clear of the kettle. To do this, first turn speed control to “STOP” and then turn mixer switch to “OFF”.

NOTE: Mixer agitator arms must be stopped at 90 degrees to the mixer bridge before raising the bridge. If the agitator arms do not stop in this position when speed selector is set to stop, then “jog” the selector on and off to achieve this position.

Push the “TILT” switch to the “RAISE” position and hold. Bridge will raise to maximum height. Bridge will stop at any position if the tilt switch is released and will remain in that position until switch is pushed to either raise or lower. When the bridge is fully raised it can be manually turned to the side to be clear of the kettle.

4.0 OPERATION INSTRUCTIONS (Continued)

NOTE: The bridge is equipped with a safety switch which prevents turning of the agitators, regardless of the mixer switch, or speed control settings. Agitators will not engage unless the bridge is lowered so that the guide pin rests fully in the guide pin bracket on the side of the kettle.

OPERATION OF MIXER UNIT

REMOVAL OF AGITATORS

For ease of cleaning, the agitators are removable without tools. To remove, raise bridge as described above and swing clear of kettle. Grasp shaft of large agitator, push up and turn to disengage lock pin. Pull straight down on agitator. Remove the small agitator in the same manner. Soak and wash agitators in warm, soapy water. Never use abrasive cleansers or scouring pads on the stainless steel surfaces as this will damage the finish of the stainless steel.

If it is necessary to remove the scraper blades from the large agitator for cleaning purposes, do so by removing the pin at the end of the mounting shaft and then slide the scraper blades off of the shaft.

To clean the exterior stainless steel panels of your unit, use a damp soft cloth or soft cloth and stainless steel cleaner. Never use abrasive cleansers or scouring pads on the stainless steel surfaces as this will damage the finish of the stainless steel.

5.0 CLEANING INSTRUCTIONS

	**WARNING: Disconnect the power supply to the appliance before cleaning or servicing.**

	**WARNING: Never spray water into electric controls or components!**

	**CAUTION: The appliance and its parts are hot. Use care when operating, cleaning and servicing.**

	**CAUTION: Do not use cleaning agents that are corrosive.**

Your kettle should be cleaned immediately after each use or when cooking a different product. Before cleaning, check that the kettle has cooled enough to touch it.

1. Ensure that power supply is OFF.

2. Pre-rinse inside of kettle thoroughly and drain to remove any food particles.

3. Using a nylon brush, clean kettle with a mild detergent and warm water rinse. Never use steel wool or scouring powder as it will scratch stainless steel.

4. Tilt kettle fully or open the tangent draw-off valve if one is provided to allow soap and water solution to drain. Rinse with clean water.

5. Wipe the exterior of kettle with a clean, damp cloth.

	**WARNING: If you are cleaning a valve that is assembled to a kettle, be sure the kettle is completely empty of any product.**

5.0 CLEANING INSTRUCTIONS (Continued)

Use of cleaning agents that contain chloride, acids or salts are corrosive and may cause pitting and corrosion when used over a period of time; this will reduce the life of the appliance.

Should pitting or corrosion occur, this is not covered by warranty.

Follow the recommended cleaning instructions. Use a mild detergent, warm water and rinse thoroughly.

BUTTERFLY VALVE

WARNING: If you are cleaning a valve that is assembled to a kettle, be sure the kettle is completely empty of any product.

DISASSEMBLY AND MAINTENANCE

In the event that repairs or replacement becomes necessary, the following procedures are suggested.

1. Drain and flush the piping surrounding the valve.
2. To remove handle, remove the socket head screw found on top of the valve handle with proper size Allen wrench.
3. Remove the nut and cap screws.
4. Separate the valve body halves.
5. Set the butterfly disc to the open position.
6. Squeeze the seal until oval shaped, then slide the short end of the stem from the seal.
7. Pinch the disc between the thumb and forefinger and pull the long end of the stem.
8. Check for and replace a cracked or worn seal, bushing, stem and disc, or screws.
9. Reassembly is opposite of disassembly.

WHAT TO DO IF SURFACE RUST APPEARS

Metal utensils should never be used as they will scratch the surface of the equipment and rust may begin to form. To remove surface accumulation of rust from the inadvertent use of such utensils, the following procedure may be used.

	**CAUTION: Improper use of this procedure may damage your appliance!**

1. Use undiluted white vinegar with a non-abrasive scouring pad (plastic) or cloth on the affected area to remove the rust stain. The appliance should not be heated and remain at room temperature during the entire cleaning process.

2. If the stain resists removal, additional exposure time with vinegar may be required, to a maximum of one hour.

3. Thoroughly wash all of the vinegar away with fresh clear water. Dry the surface completely and allow one hour before using the appliance to cook.

Following daily and period maintenance procedures will prolong the life of your equipment. Climatic conditions - salt air - may require more thorough and frequent cleaning or the life of the equipment could be adversely affected.

STAINLESS STEEL

To remove normal dirt, grease or product residue from stainless steel, use ordinary soap and water (with or without detergent) applied with a sponge or cloth. Dry thoroughly with a clean cloth. Never use vinegar or any other corrosive cleaner.

To remove grease and food splatters or condensed vapours that have baked on the equipment, apply cleanser to a damp cloth or sponge and rub cleanser on the metal in the direction of the polishing lines. Rubbing cleanser as gently as possible in the direction of the polished lines will not mar the finish of the stainless steel. **NEVER RUB WITH A CIRCULAR MOTION.**

Soil and burn deposits which do not respond to the above procedure can usually be removed by rubbing the surface with **SCOTCH-BRITE™** scouring pads or **STAINLESS** scouring pads. **DO NOT USE ORDINARY STEEL WOOL** as any particles left on the surface will rust and further spoil the appearance of the finish. **NEVER USE A WIRE BRUSH, STEEL SCOURING PADS (EXCEPT STAINLESS), SCRAPER, FILE OR OTHER STEEL TOOLS.** Surfaces which are marred collect dirt more rapidly and become more difficult to clean. Marring also increases the possibility of corrosive attack. Refinishing may then be required.

5.0 CLEANING INSTRUCTIONS (Continued)

TO REMOVE HEAT TINT: Darkened areas sometimes appear on stainless steel surfaces where the area has been subjected to excessive heat. These darkened areas are caused by thickening of the protective surface of the stainless steel and is not harmful. Heat tint can normally be removed by the foregoing, but tint which does not respond to this procedure calls for a vigorous scouring in the direction of the polish lines using **SCOTCH-BRITE™** scouring pads or a **STAINLESS** scouring pad in combination with a powdered cleanser. Heat tint action may be lessened by not applying or by reducing heat to equipment during slack periods.

All food contact surfaces must be thoroughly drained and flushed prior to cooking in the kettle.

CONTROL PANEL: The textured control panel should be cleaned with warm water and mild soap. Never use an abrasive cloth or steel wool. Never use cleaning solvents with a hydrocarbon base.

6.0 MAINTENANCE

KETTLE

Trunnion block bearings, fitted with a grease nipple should be filled with grease every couple of months or more frequently if so required. They are located in each console box and support the kettle for ease of tilting. The segment gear and worm should be greased at the same time if required. These are located in the tilt console box. No other general maintenance is required other than adhering to the Cleaning Procedure instructions.

HYDRAULIC SYSTEM

SERVICE

Set up regular schedule for checking the oil temperature, hydraulic hoses and keeping the equipment clean. A thick layer of dirt acts as an insulation and prevents the hydraulic system from cooling.

The hydraulic system has been adjusted and tested at the factory and no adjustment should be needed. If the unit fails to operate properly, all service work must be performed by a qualified service agent.

A thermostat controlled cooling system has been installed in the hydraulic system to maintain oil temperatures while in operation. The oil is cooled by cold water flowing through a heat exchanger alongside of the oil. A thermostat activates at 140° Fahrenheit oil temperature opening the valve and releasing cold water into the heat exchanger, cooling the oil.

NOTE: At least twice a year have an authorized service person clean and service the unit for maximum performance.

6.0 MAINTENANCE (Continued)

SETTING UP HYDRAULIC SYSTEM FOR MIXING KETTLES

A. SETTING MIXER SYSTEM PRESSURE

1. On the operator panel, switch "POWER" to on, "MIXER" to on, and set mixer speed to "STOP".
2. Turn trim relief stem, item "B", completely in.
3. Increase the pump pressure by turning "A" inwards, until gauge "D" reads 1700 psi. The pressure must be 300 psi higher than the pump setting.
4. Adjust trim relief "B" outwards until pressure indicated on gauge "D" begins to drop.
5. Lock the trim relief "B".
6. Decrease the pump pressure by turning "A" outwards, until gauge "D" reads 1400 psi and lock in place.

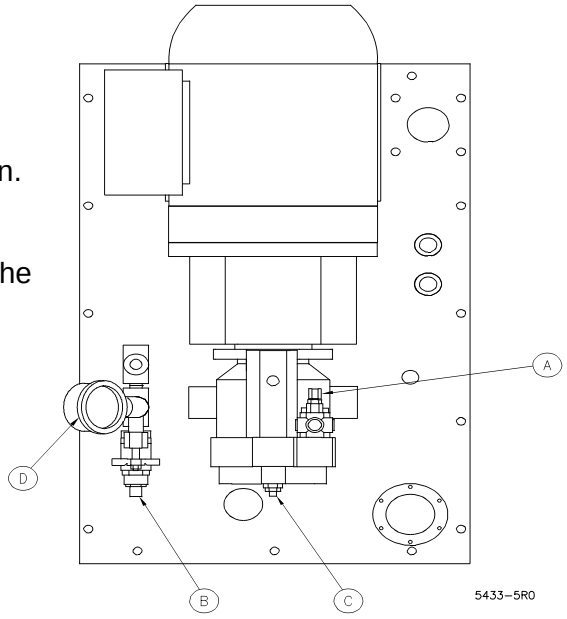

Figure 2

6.0 MAINTENANCE (Continued)

B. SETTING THE MIXER SYSTEM FLOW

1. On the operator panel, switch “POWER” to on, “MIXER” to on, and set mixer speed to “FAST”, the maximum speed.

2. Increase or decrease flow to maximum rpm as listed, or less if requested by customer. Turn in “C” to decrease, turn out to increase.

40 gallon kettle	54 RPM
60 gallon kettle	48 RPM
80 gallon kettle	43 RPM
100 gallon kettle	40 RPM

CAUTION: Do not exceed 54 rpm! Decreasing the flow to less than 10 rpm may over centre the swash plate and will damage the pump!

3. Use jam nut to lock adjusting screw when complete.

C. SETTING THE BRIDGE ACTUATOR

1. On the operator panel, switch “POWER” to on, “MIXER” to on, and set mixer speed to “STOP”.

2. The pressure reducing valve and associated gauge are located at the back of the hydraulic unit. Adjust it to 800 psi.

3. The speed of the actuator is controlled by an in-line flow control valve also located at the back of the unit. There is also a locking set screw provided on the adjusting knob.

4. Using the “RAISE/LOWER” tilt switch on the operator panel, adjust the flow control so that the stroke is completed at a safe speed.

7.0 TROUBLESHOOTING

KETTLE

LOW WATER LEVEL

Proper water level must be maintained within the jacket for the kettle to operate. Depletion of water may occur from excessive opening of or leakage through the safety relief valve.

If water is below required operating level, either initially at start-up or during use, the kettle will automatically shut off and the LOW WATER signal light will come on.

In order for the kettle to operate, the following procedure must be followed:

The kettle must be cool before proceeding with the following steps.

Trip the safety relief valve lever to relieve all pressure from the kettle jacket.

At exterior rear of kettle jacket remove nut from Air Vent.

Insert funnel into Air Vent opening and slowly add the indicated amount of clean water for:

	PER KETTLE		**PER KETTLE**	
MODEL	**ADD:**		**IF COMPLETELY EMPTY, ADD:**	
ELTM-40 (-2)	220 ounces	6.50 litres	548 ounces	16.20 litres
ELTM-60 (-2)	250 ounces	7.39 litres	586 ounces	17.33 litres
ELTM-80 (-2)	340 ounces	10.05 litres	850 ounces	25.12 litres
ELTM-100 (-2)	420 ounces	12.42 litres	1088 ounces	32.17 litres

Replace air vent nut.

Follow AIR VENTING INSTRUCTIONS.

Continue normal operating procedure of kettle.

7.0 TROUBLESHOOTING (Continued)

EXTREMELY SLOW COOKING TIME

1. If the cooking time is abnormally slow, then the difficulty may be due to air being present in the kettle jacket. To remove air, follow AIR VENTING INSTRUCTIONS.

2. If the kettle will not reach and maintain Pressure Gauge zone in the green area on the gauge when cold, a slow leak may have developed in the jacket. Check all fitting connections to jacket including the heating element gasket. Tighten or replace if necessary.

3. Slow cooking time may also be due to a burnt out heating element. Test elements and if defective, replace complete element assembly.

KETTLE WILL NOT OPERATE WHEN TURNED ON

1. Check that power supply is available to kettle.

2. Kettle will not operate if water level is inadequate in jacket. Follow LOW WATER LEVEL instructions.

3. If water level is sufficient and kettle refuses to operate, then check that Tilt Interlock Switch in Console is fully engaged when kettle is in its normally upright position. Adjust Retaining Tilt Collar if necessary to assure complete contact with switch and if kettle still does not operate, then check for defective switch and/or loose wiring connections.

4. When Thermostat Knob is dialed and TEMPERATURE indicator light does not come on, then it may be due to either a defective Thermostat or loose wiring connections(s).

5. Check that the Contactor(s) are being energized and power is being made available to the heating elements when thermostat is dialed. Replace defective Contactor(s).

AIR VENTING INSTRUCTIONS

Check vacuum/pressure gauge when the kettle is cold. Gauge should be in the green vacuum zone, indicating a vacuum between 25-30 In. Hg (630 - 730 mm Hg). If not, air must be vented (removed) for proper heating. Use the following procedures to vent air.

1. Place power switch ON with kettle empty.

2. Set temperature control thermostat to ‘10'. Heat kettle until indicator light goes off.

AIR VENTING INSTRUCTIONS (Continued)

3. Using a 7/16" wrench, open bleed vent one full turn for 10 seconds and then close. (Located on back of kettle, before pressure relief valve.)

	**WARNING: SCALD HAZARD. Live steam will escape the bleed nut when opened. Stay clear of live steam when performing this operation.**

4. Cool kettle. Check for proper vacuum in green area of gauge. If vacuum was not established, repeat steps 1 - 4.

7.0 TROUBLESHOOTING (Continued)

HYDRAULIC SYSTEM

TROUBLESHOOTING:

SOLENOID VALVES FAILED TO OPERATE

1. Voltage too low will not complete the stroke of alternating current (AC) and the solenoid will burn out the coil.

2. Signal to both solenoids of a double solenoid valve simultaneously. One or both of the valves will be unable to complete their stroke and burn out. Make certain the electrical signal is interlocked so that this condition cannot exist.

3. Incorrect voltage or frequency will prevent operation or burn out coil.

4. Foreign matter in valve.

5. Oil too hot.

PUMP

1. Excessive noise caused by vacuum leak in suction line.

2. Misalignment of drive mechanism will cause high noise level in operation.

3. Relief set too high.

4. Return line above fluid level.

5. Reversed rotation.

6. Filter breather plugged.

7. Viscosity of oil too high.

8. Loose or worn pump parts.

9. Air leak at pump shaft seal.

10. Oil too low, drawing in air.

11. Air bubbles in intake oil.

7.0 TROUBLESHOOTING (Continued)

EXCESSIVE WEAR

1. Abrasive material in oil causing wear.
2. Oil viscosity too low.
3. Pump misalignment.
4. Air being drawn in through inlet of pump.
5. System pressure exceeds pump rating.

BROKEN INTERNAL PARTS

1. Lack of oil.
2. Excessive torquing of housing bolts.
3. Solid matter being drawn in from reservoir.

DIRTY OIL

1. Components not cleaned properly after servicing.
2. Air breather left off.
3. Filter dirty or ruptured.

FOAMING OIL

1. Return line not below oil level.
2. Oil contaminated.
3. Suction leak to pump.

MOISTURE IN OIL

1. Water in oil supply.
2. Extreme temperature differential.

7.0 **TROUBLESHOOTING** (Continued)

OVERHEATING OF SYSTEM

1. Continuous operation at relief setting.
    1) Stalling under load.
    2) Viscosity of oil too high.
2. Excessive slippage or internal leakage.

    Fluid too low.
3. System relief valve set too high.
4. Power unit ambient too high.
5. Insufficient volume of water supply to oil cooler.

PETRO-CANADA

Material Safety Data Sheet

DSCL (Pictograms)	DSCL (Classification)	Protective Clothing	ADR (pictograms)
	Not classified under the Dangerous Substances or Dangerous Preparations Directives.		

Section 1. Chemical Product and Company Identification

Product Name	**PURITY FG AW 32, 46, 68, 100**	**Code**	491-010, PFAW32 491-011, PFAW46 491-012, PFAW68 491-013, PFAW100
Synonym	Not available	**Validated on**	**3/5/2003.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Purity FG AW 32, 46, 68, 100 are hydraulic fluids and light gear lubricants. All grades are NSF H1 Registered. CANADA Accepted for use in registered food processing plants. This product is intended for application on food equipment where incidental food contact may occur. It should not be added directly to the food product. UNITED STATES All components comply with FDA 21 CFR 178.3570 "Lubricants for Incidental Food Contact".		

Section 2. Composition and Information on Ingredients

				Exposure Limits (ACGIH)		
Name	**CAS #**	**EINECS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Mixture of severely hydrotreated and hydrocracked base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

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Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available
Flash Points	OPEN CUP: ≥200°C (392°F) (Cleveland)	**Auto-Ignition Temperature**	Not available
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), phosphorus compounds (POx), silicon oxides (SiOx), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.		

Section 6. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 171, Substances (low to moderate hazard). ELIMINATE ALL IGNITION SOURCES. Avoid contact. Stop leak if without risk. Contain spill. Absorb with inert absorbents, dry clay, or diatomaceous earth. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid inhalation and skin contact especially when handling used oil. Keep away from sources of ignition. DO NOT reuse empty containers without commercial cleaning or reconditioning. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
Storage	Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	32: 29.8 cSt @ 40ºC (104ºF), 5.2 cSt @ 100ºC (212ºF), VI=101 46: 45.4 cSt @ 40ºC (104º), 6.8 cSt @ 100ºC (212ºF), VI=102 68: 63.3 cSt @ 40º (104ºF), 8.4 cSt @ 100ºC (212ºF), VI=102 100: 101.5 cSt @ 40º (104ºF), 11.5 cSt @ 100ºC (212ºF), VI=99
Colour	Colourless.	**Pour Point**	32: -18ºC 46: -18ºC 68: -18ºC 100: -15ºC
Odour	Mild petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.

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Boiling Point	Not available	**Penetration**	Not applicable.
Density	0.8629 - 0.8731 kg/L @ 15ºC	**Oil / Water Dist. Coeff.**	Not available
Vapour Density	Not available	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile.	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids and alkalis.	**Decomposition Products**	May release COx, NOx, SOx, POx, SiOx, formaldehyde, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Based on toxicity of components. Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).
Chronic or Other Toxic Effects	
Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Based on actual test results of base oils and results of similar products, severely hydrotreated base oils give negative results when tested for: (a) Salmonella Typhimurium TA98 using the Modified Ames Assay for Petroleum Product; (b) Salmonella-Escherichia coli/Mammalian-Microsome Reverse Mutation Assay (Ames test) with a Confirmatory Assay; (c) Structural Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

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Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/used/waste oil may meet the requirements of a hazardous waste. Consult your local or regional authorities. Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

ADR Classification	Not classified as dangerous goods according to the Restructured ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Road) (ECE/TRANS/160)	**Special Provisions for Transport**	Not available

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

German Water Hazard Classification (Verwaltungsvorschrift wassergefährdende Stoffe - VwVwS) WGK=1

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

WHMIS (Canada)	Not controlled	**HCS (U.S.A.)**	Not controlled under the HCS (United States).
TDG (Canada) (Pictograms)		**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)

Rating	
0	Insignificant
1	Slight
2	Moderate
3	High
4	Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency

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FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 3/5/2003.

Data entry by Product Safety - JDW.

MATERIAL SAFETY DATA SHEET

PREPARATION INFORMATION:

Prepared for use in Canada by: E H & S Product Regulatory Management Department
DOW CHEMICAL CANADA INC.
P.O. Box 1012
Sarnia, Ontario, N7T 7K7

(800) 331-6451

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

IN CASE OF EMERGENCY: Fort Saskatchewan, Alberta: (780) 998-8282
Sarnia, Ontario: (519) 339-3711
Varennes, Quebec: (450) 652-1000

Product:: **DOWFROST* HD HEAT TRANSFER FLUID, DYED**

Product Code: 04632

Effective Date: 2/20/01 Date Printed: 07/10/02 MSD: 002239

DOW CHEMICAL CANADA INC.
P.O. Box 1012
Sarnia, Ontario, N7T 7K7

Prepared for use in Canada by the E H & S Product Regulatory Management Department;
Phone: (800) 331-6451.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Propylene Glycol	CAS# 000057-55-6	94%
Dipotassium Phosphate	CAS# 007758-11-4	<5%
Deionized Water	CAS# 007732-18-5	<5%

** or (R) indicates a trademark of The Dow Chemical Company.*

MATERIAL SAFETY DATA SHEET

Product: DOWFROST* HD HEAT TRANSFER FLUID, DYED
Product Code: 04632
Effective Date: 02/20/01, Date Printed: 07/10/02, MSD: 002239

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3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Clear yellow liquid. Odourless. Avoid temperatures above 450°F, 232°C.

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Mists may cause eye irritation.

SKIN CONTACT: Prolonged contact is essentially nonirritating to skin. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated exposures may cause flaking and softening of skin.

INGESTION: Single dose oral toxicity is considered to be extremely low. No hazards anticipated from swallowing small amounts incidental to normal handling operations.

INHALATION: At room temperature, vapours are minimal due to physical properties. Mists may cause irritation of upper respiratory tract (nose and throat).

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Repeated excessive exposure to propylene glycol may cause central nervous system effects.

CANCER INFORMATION: Did not cause cancer in laboratory animals.

TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Exposures having no adverse effects on the mother should have no effect on the fetus.

REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

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4. FIRST AID

EYES:	Flush eyes with plenty of water.
SKIN:	Wash off in flowing water or shower.
INGESTION:	No adverse effects anticipated by this route of exposure incidental to proper industrial handling.
INHALATION:	Remove to fresh air if effects occur. Consult a physician.
NOTE TO PHYSICIAN:	No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: 214°F, 107°C (based on a similar material)

METHOD USED: PMCC

AUTOIGNITION TEMPERATURE: NOT DETERMINED

FLAMMABILITY LIMITS

LFL: Not determined

UFL: Not determined

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MATERIAL SAFETY DATA SHEET

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HAZARDOUS COMBUSTION PRODUCTS: During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to carbon monoxide and carbon dioxide.

OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Flammable concentrations of vapour can accumulate at temperatures above 214°F. Liquid mist of this product can burn. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. Container may rupture from gas generation in a fire situation.

EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. May spread fire.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Fight fire from protected location or safe distance. Consider use of unmanned hose holder or monitor nozzles. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of re-ignition has passed. Immediately withdraw all personnel from area in case of rising sound from venting safety device or discolouration of the container. Move container from fire area if this is possible without hazard.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

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MATERIAL SAFETY DATA SHEET

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6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls/ Personal Protection.

PROTECT THE ENVIRONMENT: Avoid contamination of all waterways.

CLEAN-UP: See Section 13, Disposal Consideration.

7. HANDLING AND STORAGE

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: No special handling requirements data available.

HANDLING: See Section 8, Exposure Controls/Personal Protection.

STORAGE: See Section 10, Stability and Reactivity.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use safety glasses. Safety glasses should be sufficient for most operations; however, for misty operations wear chemical goggles.

SKIN PROTECTION: Use gloves impervious to this material.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. In misty atmospheres, use an approved mist respirator.

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MATERIAL SAFETY DATA SHEET

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EXPOSURE GUIDELINES: Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg/m3 aerosol only.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE:	Clear yellow liquid.
ODOUR:	Odourless
VAPOUR PRESSURE:	0.22 mmHg @ 20°C
VAPOUR DENSITY:	2.6
BOILING POINT:	320°F, 160°C
SOLUBILITY IN WATER/MISCIBILITY:	Complete
SPECIFIC GRAVITY OR DENSITY:	1.058 @ 25/25°C

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Thermally stable at typical use temperatures.

CONDITIONS TO AVOID: Avoid use temperatures above 450°F, 232°C. Product can degrade at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials. Avoid contact with strong acids

HAZARDOUS DECOMPOSITION PRODUCTS: Hazardous decomposition products depend upon temperature, air supply and the presence of other materials.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

(See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1).

SKIN: The LD50 for skin absorption in rabbits is >10,000 mg/kg.

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MATERIAL SAFETY DATA SHEET

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Product Code: 04632
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SKIN:	The LD50 for skin absorption in rabbits is >10,000 mg/kg.
INGESTION:	The oral LD50 for rats is 20,000 - 34,000 mg/kg.
MUTAGENICITY:	In vitro mutagenicity studies were negative. Animal mutagenicity studies were negative.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1.)

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Based largely or completely on data for major component(s). Bioconcentration potential is low (BCF less than 100 or Log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50).

DEGRADATION AND PERSISTENCE: Based largely or completely on data for major component(s). Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Degradation is expected in the atmospheric environment within minutes to hours.

ECOTOXICITY: Based largely or completely on data for major component(s). Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50 >100 mg/L in most sensitive species).

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

** or (R) indicates a trademark of The Dow Chemical Company.*

MATERIAL SAFETY DATA SHEET

Product: DOWFROST* HD HEAT TRANSFER FLUID, DYED
Product Code: 04632
Effective Date: 02/20/01, Date Printed: 07/10/02, MSD: 002239

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 989-832-1556 for further details.

14. TRANSPORT INFORMATION

DEPARTMENT OF TRANSPORTATION (D.O.T.): For D.O.T. regulatory information, if required, consult transportation regulations, product shipping papers, or contact your Dow representative.

CANADIAN TDG INFORMATION: For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive – selected regulations represented).

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

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U.S. REGULATIONS

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Not to have met any hazard category.

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
1, 2-Propanediol	000057-55-6	PA1

PA1= Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).

OSHA HAZARD COMMUNICATION STANDARD:

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

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CANADIAN REGULATIONS

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

This product is not a "Controlled Product" under WHMIS.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)

This product contains one or more substances which are not listed on the Canadian Domestic Substances List (DSL). Contact your Dow representative for more information.

16. OTHER INFORMATION

MSDS STATUS: Revised to 16 section format.

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The information herein is given in good faith, but no warranty, express or implied, is made. Consult The Dow Chemical Company for further information.