St. Clair River Replacement

Project Execution Plan

Appendix 3 – Drill Mud Recycling System

DRILL MUD RECYCLING SYSTEM

HORIZONTAL DIRECTIONAL DRILLING

MICHELS
DIRECTIONAL CROSSINGS

Horizontal Directional Drilling
Nov 10, 2010
Revision 1

DRILLING MUD RECYCLING

BENTONITE Bentonite is a Nitrite (clay) in powder form. It arrives at the job site on a flatbed trailer packaged in 50 or 80 pound bags in powder form. The powder is then mixed in a large 8'W x 16'L x 6.5'H tank with water (5,000 gal tank). It is mixed to a consistency, which is typically 15 - 20 pounds bentonite per 100 gallons water in good soils *(Mud Composition),* and used throughout the entire drilling process to establish and maintain optimum drilling fluid properties. Michels Mud Technician will be responsible for sampling, testing and recording of daily fluid properties during drilling operations. This person will be in charge of maintaining efficient drilling fluid rheology. **(See additional mixing ratios given on attached "Bentonite Information" sheets).** Once the bentonite is mixed into slurry consistency, it is directed to the back of the drive carriage where it is pumped under 500-1,000 pounds of pressure through the drill head or hole opener, depending upon what phase the drilling operation is in.

Essential to any successful HDD process is the selection and proper utilization of drilling fluid made up of primarily water and bentonite (de-hydrated clay) having pH values between 8 and 10. Bentonite is a naturally occurring, non-toxic, inert substance that meets NSF/ANSI-60 Drinking Water Additive Standards and is frequently used for drilling potable water wells. Therefore, the ecological/ environmental impacts of an inadvertent release of drilling fluid into a water body is a temporary increase in local turbidity until the drilling fluid dissipates with the current or settles out.

The use of Bentonite as a drilling medium serves many notable purposes, which include: 1) Cleans the drill cuttings from the drill bit and the end of the bore hole. 2) Transports cuttings to the surface for recycling. 3) Aids in stabilizing formations by supplying a cohesive nature to the surrounding geological formation. 4) Provides lubrication for the drill string and downhole assembly, which cuts down on subsurface pressures. 5) Drives a down-hole drill motor for rock drilling. Drilling fluid is composed of a carrier fluid and solids. The selected carrier fluid consists of water (approximately 96%) and an inorganic, bentonite clay (approximately 4%). The bentonite brands used by Michels are; Quick Gel, Super Gel-X, Max-Gel, Bara-Kade, which are all environmentally safe products.

Attachment – Bentonite MSDS Analysis Sheets

Some of the variables which affect the amount of bentonite consumption include but are not limited to: specific lithology of the formation encountered, cohesiveness of soil, abrasiveness of soil, amount recyclable and the number of drilling fluid change outs required to sustain efficient operations.

Targeted Viscosities Recommended

MATERIAL	VISCOSITY
Sand	60-80
Clay	40-50
Rock	60-80
Gravel	70-90

Michels does not plan on using additives at this time, however, If the need for drill fluid additives does arise, it is anticipated that one of the following frequently used products, or equal, listed below may be necessary to maintain adequate fluid rheology down-hole.

Potential Frequently Used Additives that may be required:

- Suspend-IT Used in Rock Formation
- Drill_Terge Used in Clay Formation
- InstaVis Plus Used in Clay Formation
- RelPac Xtra Low Used in Sand & Cobble
- Macro Fill Used as LCM – Drill Fluid Stabilizer

Attachment - Potential Additives - MSDS Product Sheets

It has been pre-determined and recommended that the ideal percentage of solids (sand content) to be maintained during the drilling process is 4% and the maximum percentage is 10%. If the sand/silt content consistently progresses above 10%, it is Michels' intention to slow down drilling penetration rates allowing the mud cleaning system to become stable and return to normal operating efficiency.

According to the Material Data Safety sheets, the only potential hazard in dealing with bentonite is the possibility of an individual contracting silicosis from prolonged exposure to the powdered form. The possibilities of this are avoided through proper handling procedures by Michels' personnel and, the fact that the bentonite powder is immediately mixed with water upon opening the bag. This minimizes the possibility of any airborne particles being inhaled.

DRILL MUD RECYCLING SYSTEM

The first phase of the mud cleaning system is displacement of solid returns at the shaker. Heavy solids are sifted out by a shaker with screens and deposited into a pit. The cuttings will then be transported by dump truck to a site for disposal.

Drill Mud Cleaning Equipment Specifications

Volume of Mixing/Scalper Tank	54.0-Bbls
Volume of Desander Tank	72.0-Bbls
Volume of Desilter Tank	72.0-Bbls
Quantity of Scalping Shakers	1.0-Shakers
Mesh Size of Scalping Shakers	10-20 Double Stacked
Desander Capability	2 @ 500-GPM (1,000 GPM Total)
Desander Cones	2.0-Cones
Desander Mesh Size	40 to 165
Quantity of Desilter Cones	10 Ea @ 100-GPM
Desilter Mesh Size	60 to 250
Steel Mud Circulating Tank Volume	160-Bbls
Returns Tank Volume (Mud Pit)	320-Bbls
Cuttings Tank Volume (20-yd Roll-off)	150-Bbls
Mud Screening, Max Pass Size	40 Mesh

Attachment - Mud Cleaning Equipment

Bentonite Pump Capabilities (ENTRY/EXIT) (Based on Availability)

Name Brand	Ellis Williams W-446 Triplex Piston Model
Liner Size	6-Inches
Maximum Pressure	1,027 PSI
Maximum Flow Rate	661 GPM

Gallons Per Stroke ..... 2.20 Gallons Per Stroke

Bentonite Pump Capabilities (ENTRY/EXIT) (Based on Availability)

Name Brand ..... Gardner Denver OPI-350

Liner Size.....6-Inches

Maximum Pressure.....1,469 PSI

Maximum Flow Rate..... 529 GPM

Gallons Per Stroke ..... 2.94 Gallons Per Stroke

For the purposes of calculating the volume of solid drill cuttings generated; it is assumed that approximately 90% of the cuttings will be removed from the borehole and circulated through the fluid maintenance and recycling system at the surface. A large portion of the suspended cuttings will be removed as the fluid passes through the shaker system (approximately 85% of the solids removed from the borehole). Therefore, the volume of the solids can be estimated by calculating 85% of the total volume of the reamed out hole (diameter to be field determined) by (X) length of reamed borehole. (Expansion effects of the soil are considered negligible for this estimate).

The volume of fluid generated during drilling will depend primarily on the specific lithology of the formation encountered along the borehole path and the efficiency of the fluid maintenance system. If the formation consists of a large percentage of silt or clay, the drilling fluid will likely retain a larger percentage of suspended solids each time it is recycled through the fluid maintenance system. Eventually the suspended solids will accumulate to the point where the fluid can no longer perform its basic function and may adversely affect the drilling equipment. The frequency of drilling fluid change-outs will directly affect the volume of fluid generated during the course of drilling. The volume of fluid to be used is estimated by taking two to three times the volume of the reamed borehole diameter. This estimate also takes into consideration the volume of fluid that will be displaced during installation of the product pipe.

Attachment – Solids Control Plant Flow Chart

The source for fresh water to be used for drilling fluid make-up and hydrostatic testing is typically determined on a crossing by crossing basis. If water is attainable from a nearby fire hydrant, 4-inch fire hose will be connected to a metering device and hydrant with the destination being either a holding tank or directly to the bentonite mixing tank for immediate processing. Due to the large capacity of Michels' mud mixing tank, use of possibly one frac tank may be necessary for water storage. The

disposal of spent drilling fluid and cuttings will be at an approved location to be determined immediately prior to set-up.

ATTACHMENT

MSDS SHEETS/ANALYSIS "MAX GEL"

MAX GEL ™

Certified to ANSI/NSF 60

MAX GEL viscosifier is a premium Wyoming bentonite blended with special extenders producing a viscosifier that will yield more than twice as much viscosity as regular Wyoming bentonite. MAX GEL is a high-yielding, easily mixed, superior mud making bentonite in fresh water.

APPLICATIONS

MAX GEL is used in the following applications to rapidly build mud viscosity and provide superior hole cleaning, as well as to help control lost circulation, formation sloughing and promote hole stability in unconsolidated formations.

- Potable water wells
- Mineral exploration (coring and rotary drilling)
- Horizontal directional drilling
- Blast holes
- Shaft drilling
- Monitor / observation wells
- Gel-foam air drilling applications

ADVANTAGES

- Yields more quickly than API-standard bentonite
- Non-toxic and proven suitable for use in drilling potable water wells
- Increased penetration rates are exhibited due to lower solids content than regular bentonite systems
- Transportation and storage costs are reduced due to lower treatment requirements as compared to bentonite

TYPICAL AMOUNTS OF MAX GEL ADDITIONS ADDED TO FRESH WATER

Drilling Application/Desired Results	lb/100gal	lb/bbl	kg/m3
Normal drilling	15 - 25	6 - 11	15 - 30
In gravel or other poorly consolidated formation	25 - 40	12 - 18	35 - 50
Lost circulation control	35 - 45	15 - 20	40 - 45
Added to freshwater mud to improve hole cleaning properties, increase hole stability and develop filter cakes	5 - 10	2 - 5	6 - 14

LIMITATIONS

- Loses effectiveness in water containing >7500 mg/l sodium chloride / 240 mg/l calcium
- If dispersants or thinners are to be used, they should be added sparingly, using 50% or less of the normal treatment

TYPICAL PHYSICAL PROPERTIES

Physical appearance..... Light tan / gray – green powder
Specific gravity ..... 2.3 - 2.5
Approximate yield..... 220 bbl/ton

TOXICITY AND HANDLING

Bioassay information available upon request. No special requirements are necessary for handling and storage. Avoid inhalation of dust. A dust respirator and goggles are recommended if mixing in an enclosed area.

PACKAGING AND STORAGE

MAX GEL is packaged in 50 lb. (22.7-kg), multi-wall, paper sacks and is available in bulk. Store in a dry location (slip hazard when wet) and minimize dust (use dust-less systems for handling, storage and cleanup).

MATERIAL SAFETY DATA SHEET
MAX GEL

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: MAX GEL

OTHER NAME: Bentonite

CHEMICAL CLASS: Naturally occuring mineral.

APPLICATIONS: Oil well drilling fluid additive. Viscosifier.

EMERGENCY TELEPHONE: 281-561-1600

SUPPLIER: Supplied by a Business Unit of
M-I L.L.C.
P.O. Box 42842, Houston, Texas 77242-2842
See cover sheet for local supplier.

TELEPHONE: 281-561-1509
FAX: 281-561-7240

CONTACT PERSON: Sam Hoskin - Manager, Occupational Health

2. COMPOSITION, INFORMATION ON INGREDIENTS

INGREDIENT NAME:	CAS No.:	CONTENTS :	EPA RQ:	TPQ:
Silica, crystalline, quartz	14808-60-7	2-15 %		
Bentonite	1302-78-9	70-95 %		
Silica, crystalline, Cristobalite	14464-46-1	2-12 %		
Silica, crystalline, Tridymite	15468-32-3	1-5 %		
Gypsum	13397-24-5	0-1 %		

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

CAUTION! MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

This product is a/an gray to tan powder. Slippery when wet. No significant immediate hazards for emergency response personnel are known.

ACUTE EFFECTS:
HEALTH HAZARDS, GENERAL:

Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.

INHALATION: May be irritating to the respiratory tract if inhaled.

INGESTION: May cause gastric distress, nausea and vomiting if ingested.

SKIN: May be irritating to the skin.

EYES: May be irritating to the eyes.

CHRONIC EFFECTS:
CARCINOGENICITY:
IARC: Not listed. NTP: Not listed. OSHA: Not regulated.

ATTENTION! CANCER HAZARD. CONTAINS CRYSTALLINE SILICA WHICH CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC classification Group 1.

ROUTE OF ENTRY:
Inhalation. Skin and/or eye contact.

TARGET ORGANS:
Respiratory system, lungs. Skin. Eyes.

4. FIRST AID MEASURES

GENERAL: Persons seeking medical attention should carry a copy of this MSDS with them.

INHALATION: Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Get medical attention.

INGESTION: Drink a couple of glasses water or milk. Do not give victim anything to drink of he is unconscious. Get medical attention.

SKIN: Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYES: Promptly wash eyes with lots of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

AUTO IGNITION TEMP. (?F): N/D
FLAMMABILITY LIMIT - LOWER(%): N/D
FLAMMABILITY LIMIT - UPPER(%): N/D

EXTINGUISHING MEDIA:
This material is not combustible. Use extinguishing media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING PROCEDURES:
No specific fire fighting procedure given.

UNUSUAL FIRE & EXPLOSION HAZARDS:
No unusual fire or explosion hazards noted.

HAZARDOUS COMBUSTION PRODUCTS:
Not relevant.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:
Wear proper personal protective equipment (see MSDS Section 8).

SPILL CLEAN-UP PROCEDURES:

Avoid generating and spreading of dust. Shovel into dry containers. Cover and move the containers. Flush the area with water. Do not contaminate drainage or waterways. Repackage or recycle if possible.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:

Avoid handling causing generation of dust. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed. Provide good ventilation. Mechanical ventilation or local exhaust ventilation is required.

STORAGE PRECAUTIONS:

Store at moderate temperatures in dry, well ventilated area. Keep in original container.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

		OSHA PEL:		ACGIH TLV:		OTHER:		
INGREDIENT NAME:	**CAS No.:**	**TWA:**	**STEL:**	**TWA:**	**STEL:**	**TWA:**	**STEL:**	**UNITS:**
Silica, crystalline, quartz	14808-60-7	*		0.1				mg/m3 resp.dust
Bentonite	1302-78-9	5		3				mg/m3 resp.dust
Silica, crystalline, Cristobalite	14464-46-1	*		0.05				mg/m3 resp.dust
Silica, crystalline, Tridymite	15468-32-3	*		0.05				mg/m3 resp.dust
Gypsum	13397-24-5	15						mg/m3 total dust

INGREDIENT COMMENTS:

* OSHA PELs for Mineral Dusts containing crystalline silica are 10 mg/m3 / (%SiO2+2) for quartz and 1/2 the calculated quartz value for cristobalite and tridymite.

PROTECTIVE EQUIPMENT:

ENGINEERING CONTROLS:

Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to reduce air contamination and keep worker exposure below the applicable limits.

VENTILATION: Supply natural or mechanical ventilation adequate to exhaust airborne product and keep exposures below the applicable limits.

RESPIRATORS: Use at least a NIOSH-approved N95 half-mask disposable or reuseable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reuseable particulate respirator. For exposures exceeding 10 x PEL use a NIOSH-approved N100 Particulate Respirator.

PROTECTIVE GLOVES:

Use suitable protective gloves if risk of skin contact.

EYE PROTECTION:

Wear dust resistant safety goggles where there is danger of eye contact.

PROTECTIVE CLOTHING:

Wear appropriate clothing to prevent repeated or prolonged skin contact.

HYGIENIC WORK PRACTICES:
Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possibility of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE: Powder, dust.
COLOR: Grey. to Tan.
ODOR: Odorless or no characteristic odor.
SOLUBILITY DESCRIPTION: Insoluble in water.
DENSITY/SPECIFIC GRAVITY (g/ml): 2.3-2.6 TEMPERATURE (?F): 68
BULK DENSITY: 67 lb/ft3; 1068 kg/m3
VAPOR DENSITY (air=1): N/A
VAPOR PRESSURE: N/A TEMPERATURE (?F):

10. STABILITY AND REACTIVITY

STABILITY: Normally stable.

CONDITIONS TO AVOID:
N/A.

HAZARDOUS POLYMERIZATION:
Will not polymerize.

POLYMERIZATION DESCRIPTION:
Not relevant.

MATERIALS TO AVOID:
N/A

HAZARDOUS DECOMPOSITION PRODUCTS:
No specific hazardous decomposition products noted.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION:
No toxicological data is available for this product.

12. ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION:
Contact M-I Environmental Affairs for ecological information.

13. DISPOSAL CONSIDERATIONS

WASTE MANAGEMENT:
This product does not meet the criteria of a hazardous waste if discarded in its purchased form. Under RCRA, it is the responsibility of the user of the product to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because product uses, transformations, mixtures, processes, etc, may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

DISPOSAL METHODS:

Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that containers are empty by RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

PRODUCT RQ: N/A

U.S. DOT:
U.S. DOT CLASS: Not regulated.

CANADIAN TRANSPORT:
TDGR CLASS: Not regulated.

SEA TRANSPORT:
IMDG CLASS: Not regulated.

AIR TRANSPORT:
ICAO CLASS: Not regulated.

15. REGULATORY INFORMATION

REGULATORY STATUS OF INGREDIENTS:

NAME:	CAS No:	TSCA:	CERCLA:	SARA 302:	SARA 313:	DSL(CAN):
Silica, crystalline, quartz	14808-60-7	Yes	No	No	No	Yes
Bentonite	1302-78-9	Yes	No	No	No	Yes
Silica, crystalline, Cristobalite	14464-46-1	Yes	No	No	No	Yes
Silica, crystalline, Tridymite	15468-32-3	Yes	No	No	No	Yes
Gypsum	13397-24-5	Yes	No	No	No	Yes

US FEDERAL REGULATIONS:
WASTE CLASSIFICATION: Not a hazardous waste by U.S. RCRA criteria. See Section 13.

REGULATORY STATUS: This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

SECTION 313: This product does not contain toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372.

SARA 311 Categories:
1: Immediate (Acute) Health Effects.
2. Delayed (Chronic) Health Effects.

The components of this product are listed on or are exempt from the following international chemical registries:
TSCA (U.S.)
DSL (Canada)
EINECS (Europe)

STATE REGULATIONS:

STATE REGULATORY STATUS:

This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):.

None.

PROPOSITION 65: This product contains the following chemical(s) considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer or reproductive toxicity, and for which warnings are now required: Silica, crystalline

CANADIAN REGULATIONS:
LABELS FOR SUPPLY:

REGULATORY STATUS:

This Material Safety Data Sheet has been prepared in compilance with the Controled Product Regulations.

Canadian WHMIS Classification: D2A - Other Toxic Effects: Very Toxic Material

16. OTHER INFORMATION

NPCA HMIS HAZARD INDEX: * 1 Slight Hazard
FLAMMABILITY: 0 Minimal Hazard
REACTIVITY: 0 Minimal Hazard
NPCA HMIS PERS. PROTECT. INDEX: E - Safety Glasses, Gloves, Dust Respirator

USER NOTES:

N/A = Not applicable N/D = Not determined

INFORMATION SOURCES:

OSHA Permissible Exposure Limits, 29 CFR 1910, Subpart Z, Section 1910.1000, Air Contaminants.

ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (latest edition).

Sax's Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed.), VNR, New York, New York, (1997).

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Silica, Some Silicates, Coal Dust, and para-Aramid Fibrils, Vol. 68, World Health Organization, Lyon, France, 1997.
Product information provided by the commercial vendor(s).

PREPARED BY: Sam Hoskin/bb

REVISION No.: 0

MSDS STATUS: Approved.

DATE: June 1, 1999

DISCLAIMER:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditiions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

ATTACHMENT

MSDS SHEETS/ANALYSIS
“SUPER-GEL X”

MATERIAL SAFETY DATA SHEET May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: SUPER GEL-X®

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:

CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Date Prepared: June 1, 2004

Telephone Number: 847-392-5800 Fax 847-506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS: (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Crystalline Quartz: CAS# 14808-60-7			*	< 6%
Respirable Crystalline Quartz:			NIOSH	< 2%
Present (TWA)	0.1 mg/m^3	0.1 mg/m^3	50 ug/m^3	
Proposed (TWA)		50.0 ug/m^3		
Nuisance Dust:				
Respirable	5 mg/m^3	5 mg/m^3		
Total Dust	15 mg/m^3	10 mg/m^3		

*** WARNING:** This product contains a small amount of crystalline silica, which may cause delayed respiratory disease if inhaled over a prolonged period of time. Avoid breathing dust. Use NIOSH/MSHA approved respirator where TLV for crystalline silica (Quartz) may be exceeded. IARC Monographs on the evaluation of the Carcinogenic Risk of Chemicals to Humans (volume 68, 1997) concludes that crystalline silica is carcinogenic to humans in the form of quartz. IARC classification 1.

The small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (vol. 42, 1987, p. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect...due mainly to clay minerals..."

National Institute for Occupational Safety and Health (NIOSH) has recommended that the permissible exposure limit be changed to 50 micrograms respirable free silica per cubic meter of air (0.05 mg/ m^3) as determined by a full shift sample up to a 10 hour working day, 40 hours per week. *See*: 1974 NIOSH criteria for a recommended Standard for Occupational Exposure to Crystalline Silica should be consulted for more detailed information.

PEL - OSHA Permissible Exposure Limit.

TLV - American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value.

TWA - 8 hour time weighted average

Note: The Permissible Exposure Limits (PEL) reported above are the pre - 1989 limits that were reinstated by OSHA June 30, 1993 following a decision by the United States Circuit Court of Appeals for the 11th Circuit. Federal OSHA is now enforcing these PELs. More restrictive exposure limits may be enforced by some other jurisdictions.

PRODUCT IDENTIFICATION:

Chemical Name: Dry Mixture of Inorganic Mineral Compounds.
NFPA/HMIS: Health - 2, Fire - 0, Reactivity - 0, Specific Hazard - *See Section VI.*
Shipping Class: Not Regulated (DOT / 49CFR, IMDG, ICAO / IATA).

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Applicable.
Vapor Pressure (mm Hg.)**:** Not Applicable.
Vapor Density (AIR = 1)**:** Not Applicable.
Solubility in Water: Negligible.
Specific Gravity (H_2O = 1)**:** 2.5
Melting Point: 1400°F
Evaporation Rate (Butyl Acetate = 1)**:** Not Applicable.
Appearance and Odor: Tan or beige to light gray colored powder to fine granules, odorless.

PRODUCT NAME: SUPER GEL-X®

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (*Method Used*)**:** Not Available. **Flammable Limits:** Not Available. **LEL** - NA. **UEL** - NA.

Extinguishing Media: Not Applicable. **Special Fire Fighting Procedure:** Not Applicable.

Unusual Fire/Explosion Hazards: Product may pose possible dust explosion under *extremely rare* circumstances or conditions.

Section V REACTIVITY DATA

Stability: Stable **Conditions to Avoid** - None Known.

Incompatibility (*Materials to Avoid*)**:** Powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, etc.

Hazardous Decomposition or By-products: Silica will dissolve in hydrofluoric acid producing a corrosive gas, silicon tetrafluoride.

Hazardous Polymerization: Will Not Occur **Conditions to Avoid** - None Known.

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? No Ingestion? No

Health Hazards (Acute and Chronic):

Inhalation: Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may have the following serious chronic health effects:

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. Smoking exacerbates this disease. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 - carcinogenic to humans). Refer to *IARC Monograph 68, Silica, Some Silicates and Organic Fibers* (published in June 1997) in conjunction with the use of these materials. The National Toxicology Program classifies respirable crystalline silica as "reasonably anticipated to be a carcinogen". For further information *See*: "Adverse effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, page 761-765, 1997.

Other Data with Possible Relevance to Human Health: The small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined, citing studies in IARC (Vol. 42, 1987 pg. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect....due mainly to clay minerals..."

Carcinogenicity: NTP? No IARC Monographs? Yes OSHA Regulated? No

Signs and Symptoms of Exposure: Excessive inhalation of generated dust may result in shortness of breath and reduced pulmonary function.

Medical Conditions Generally Aggravated by Exposure: Individuals with respiratory disease, including but not limited to, asthma and bronchitis, or subject to eye irritation should not be exposed to respirable crystalline silica (quartz) dust.

Emergency and First Aid Procedures:

Eyes & Skin: Flush with water.

Gross Inhalation of Dust: Remove to fresh air; give oxygen or artificial respiration if necessary; seek medical attention.

Ingestion: If large amounts are swallowed, get immediate medical attention.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water; product will become slippery when wet.

Waste Disposal Method: Dispose in accordance with federal, state and local regulations. Super Gel X can be safely landfarmed if in accordance with local and state regulations.

Precautions to Be Taken in Handling and Storing: Avoid breathing dust, use NIOSH/MSHA approved respirator where TLV limits for Crystalline Silica may be exceeded.

Other Precautions: Slippery when wet.

PRODUCT NAME: SUPER GEL-X®

Section VIII CONTROL MEASURES

Respiratory Protection: Use appropriate respiratory protection for respirable particulate based on consideration of airborne workplace concentration and duration of exposure arising from intended end use. Refer to the most recent standards of ANSI (z88.2) OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic.

Ventilation: Use local exhaust as required to maintain exposures below applicable occupational exposure limits (*See Section II*). See also ACGIH "Industrial Ventilation – A Manual for Recommend Practice", (*current edition*).

Protective Gloves: Not Required. **Eye Protection:** Recommended.

Other Protective Clothing or Equipment: None. **Work/Hygienic Practices:** Use good housekeeping practices.

Section IX REGULATORY INFORMATION

SARA 311/312: Hazard Categories for SARA Section 311/312 Reporting: Chronic Health
SARA 313: This product contains the following chemicals subject to annual release reporting requirements under the SARA section 313 (40 CFR 372): None

CERCLA section 103 Reportable Quantity: None

California Proposition 65: *This product contains the following substances known to the state of California to cause cancer and/or reproductive harm: This product contains crystalline silica (respirable); however, the user should note that the small quantities of crystalline silica (quartz) found in this product are, under normal conditions, naturally coated with an unremovable layer of amorphous silica and/or bentonite clay. IARC (Vol. 68, 1997, pg. 191-192) has stated that crystalline silica (quartz) can differ in toxicity depending on the minerals with which it is combined. Citing studies in IARC (Vol. 42, 1987, p. 86) which stated that the toxic effect of crystalline silica (quartz) is reduced by the "protective effect...due mainly to clay minerals..."*

Toxic Substances Control Act: All of the components of this product are listed on the EPA TSCA Inventory or are exempt from notification requirements.

Canadian Environmental Protection Act: All the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

European Inventory of Commercial Chemical Substances: All the components of this product are listed on the EINECS Inventory or exempt from notification requirements. (The EINECS number for Quartz: 231-545-5)
European Community Labeling Classification: Harmful (Xn)
European Community Risk and Safety Phrases: R40, R48, S22

Japan MITI: All the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

Australian Inventory of Chemical Substances: All the components of this product are listed on the AICS Inventory or exempt from notification requirements.

Canadian WHMIS Classification: Class D, Division 2, Subdivision A (Very Toxic Material causing other Toxic Effects)

NF-+PA Hazard Rating:	Health: 2	Fire: 0	Reactivity: 0
HMIS Hazard Rating:	Health: *	Fire: 0	Reactivity: 0

***Warning** - Chronic health effect possible - inhalation of silica dust may cause lung injury/disease (silicosis). Take appropriate measures to avoid breathing dust. *See Section II*.

REFERENCES:

Registry for Toxic Effects of Chemical Substances (RTECS), 1995.

Patty's Industrial Hygiene and Toxicology.

NTP Seventh Annual Report on Carcinogens, 1994.

IARC Monograph Volume 68, Silica, Some Silicates and Organic Fibers, 1997.

ATTACHMENT

MSDS SHEETS/ANALYSIS "QUIK-GEL"

QUIK-GEL®

Viscosifier

Description

QUIK-GEL is an easy-to-mix, finely ground (200-mesh), premium-grade, high-yielding Wyoming sodium bentonite. QUIK-GEL imparts viscosity, fluid loss control and gelling characteristics to freshwater-based drilling fluids.

Applications/Functions

- Mix with fresh water to form a low-solids drilling flluid for general drilling applications
- Viscosify water-based drilling fluids
- Reduce filtration by forming a thin filter cake with low permeability
- Improve hole-cleaning capability of drilling fluids
- Mix with foaming agents to make "gel/foam" drilling fluids for air/foam drilling applications

Advantages

- ANSI/NSF Standard 60 certified
- Single-sack product and cost effective
- Provides lubricity for drilling fluids
- Mixes easily and quickly reaches maximum viscosity
- Yields more than twice as much mud of the same viscosity as an equal weight of API oilfield grades of bentonite

Typical Properties

• Appearance	Grey to tan powder
• Bulk density, lb/ft^3	68 to 72 (compacted)
• pH (3% solution)	8.9

Recommended Treatment

Mix slowly through a jet mixer or sift slowly into the vortex of a high-speed stirrer.

Approximate Amounts of QUIK-GEL Added to Freshwater			
Application/Desired Result	**lb/100 gal**	**lb/bbl**	**kg/m^3**
Normal Drilling Conditions	15-25	6-10	18-30
Unconsolidated Formations	35-50	15-21	42-60
Make-Up For Gel/Foam Systems	12-15	5-7	14-18

- 1 bbl = 42 U.S. gallons

Additional Information

***Note*:**

- For optimum yield, pre-treat make-up water with 1-2 pounds of soda ash per 100 gallons of water (1.2-2.4 kg/m^3).

Rev. 6/2001 · IDP 009

Packaging QUIK-GEL® is packaged in 50-lb (22.7-kg) multiwall paper bags.

Availability QUIK-GEL can be purchased through any Baroid Industrial Drilling Products Distributor. To locate the Baroid IDP distributor nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products,

A Product and Service Line of Halliburton Energy Services, Inc.

3000 N. Sam Houston Pkwy. E.

Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

HALLIBURTON

MATERIAL SAFETY DATA SHEET

QUIK-GEL®

Revision Date: 02/25/2002

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: QUIK-GEL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier
Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251

Telephone: (281) 871-4000
Emergency Telephone: (800) 666-9260 or (713) 676-3000

Prepared By
Product Stewardship
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substance	Weight Percent (%)	ACGIH TLV-TWA	OSHA PEL-TWA
Crystalline silica, cristobalite 14464-46-1	0 - 1%	0.05 mg/m3	1/2 x 10 mg/m3 %SiO2 + 2
Crystalline silica, tridymite 15468-32-3	0 - 1%	0.05 mg/m3	1/2 x 10 mg/m3 %SiO2 + 2
Bentonite 1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, quartz 14808-60-7	1 - 5%	0.05 mg/m3	10 mg/m3 %SiO2 + 2

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin
Wash with soap and water. Get medical attention if irritation persists.

Eyes
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion
Under normal conditions, first aid procedures are not required.

Notes to Physician
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media
All standard firefighting media.

Special Exposure Hazards
Not applicable.

Special Protective Equipment for Fire-Fighters
Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMIS Ratings: Flammability 0, Reactivity 0, Health 0*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures
Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures
None known.

Procedure for Cleaning/Absorption
Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions
This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection
Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product.

Hand Protection
Normal work gloves.

Skin Protection
Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection
Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Various
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	47.6 (uncompacted) 72.1 (compacted)
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Slightly soluble
Solubility in Solvents (g/100ml):	Not Determined
Solubility in Sea Water (g/100ml):	Insoluble Sinks
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid
None anticipated

Incompatibility (Materials to Avoid)
Hydrofluoric acid.

Hazardous Decomposition Products
Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

Additional Guidelines
Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure
Eye or skin contact, inhalation.

Inhalation
Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Skin Contact
May cause mechanical skin irritation.

Eye Contact
May cause eye irritation.

Ingestion
None known

Aggravated Medical Conditions
Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity
Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information
For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined

Carcinogenicity
Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).

Genotoxicity: Not determined

Reproductive/Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)
Not determined

Persistence/Degradability
Not determined

Bio-accumulation
Not Determined

Ecotoxicological Information
Acute Fish Toxicity:
TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity:
Not determined
Acute Algae Toxicity:
Not determined

Chemical Fate Information
Not determined

Other Information
Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method
Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging
Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG

Not restricted

ADR

Not restricted

Air Transportation

ICAO/IATA

Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory
All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances
Not applicable

EPA SARA (311,312) Hazard Class
Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals
This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity For This Product
Not applicable.

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65
The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law
One or more components listed.

NJ Right-to-Know Law
One or more components listed.

PA Right-to-Know Law
One or more components listed.

Canadian Regulations

Canadian DSL Inventory
All components listed on inventory.

WHMIS Hazard Class
D2A Very Toxic Materials
(Crystalline silica)

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Product Stewardship at 1-580-251-4335.

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.
Chronic Effects/Carcinogenicity	Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis. Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

ATTACHMENT

MSDS SHEETS/ANALYSIS "BARA-KADE"

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARA-KADE® BENTONITE**

Revision Date: 31-Mar-2005

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARA-KADE® BENTONITE
Synonyms: None
Chemical Family: Mineral
Application: Additive

Manufacturer/Supplier

BPM Minerals LLC
3000 N Sam Houston Parkway East
Houston, TX 77032

Telephone: (281) 871-7900
Fax: (281) 871-7940
Emergency Telephone: (800) 666-9260 or (713) 753-3000

Prepared By

Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.05 mg/m^3	1/2 x $\frac{10 \text{ mg/m}^3}{\%SiO2 + 2}$
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m^3	1/2 x $\frac{10 \text{ mg/m}^3}{\%SiO2 + 2}$
Crystalline silica, quartz	14808-60-7	1 - 5%	0.05 mg/m^3	$\frac{10 \text{ mg/m}^3}{\%SiO2 + 2}$
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 0*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid
Color:	Various
Odor:	Odorless
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.65
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	50-70
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).

Genotoxicity: Not determined

Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity For This Product	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory.
WHMIS Hazard Class	D2A Very Toxic Materials (Crystalline silica)

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

ATTACHMENT

POTENTIAL ADDITIVES

ATTACHMENT

POTENTIAL ADDITIVE-SUSPEND_IT

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals

CETCO® DRILLING PRODUCTS

MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFETY DATA SHEET May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: SUSPEND – IT™

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:

CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Date Prepared: February 10, 2005

Telephone: 847-392-5800 / Fax: 847-577-5571
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS: (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

THIS PRODUCT DOES NOT MEET THE DEFINITION OF A HAZARDOUS CHEMICAL GIVEN IN 29 CFR PART 1910.1200 (OSHA). INFORMATION ON THIS FORM IS FURNISHED AS A CUSTOMER SERVICE.

PRODUCT IDENTIFICATION

Chemical Name: Biopolymer (CAS# 11138-66-2)
Chemical Family: Polysaccharide Gum
Synonyms: Drilling Mud Additive
NFPA/HMIS: Health - 0, Fire - 1, Reactivity - 0, Specific Hazard - See Section VI
Transportation Class: Not Regulated (49 CFR, IMDG, ICAO / IATA).

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Applicable
Vapor Pressure (mm Hg): Not Applicable
Vapor Density (AIR = 1): Not Applicable
Solubility in Water: Complete
Appearance and Odor: White powder with a slight odor.
Bulk Density: 50 lbs./cu.ft. (approx.)
Melting Point: Not Applicable
Evaporation Rate: Not Applicable
pH: Neutral
Molecular Weight: 1,000,000 (approx.)

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)**:** Not Applicable (warning: combustible dust).
Flammable Limits: Not Established **LEL:** Not Applicable **UEL:** Not Applicable
Extinguishing Media: Dry chemical, foam or carbon dioxide, water spray or fog.
Special Fire Fighting Procedures: Evacuate area of all unnecessary personnel. Use NIOSH/MSHA approved self-contained breathing apparatus (SCBA) and other protective equipment described in Section VIII, if conditions warrant. Water fog or spray may be used to cool exposed containers and equipment.
Unusual Fire/Explosion Hazards: Carbon oxides and various hydrocarbons formed when burned. If in a finely divided and suspended state, treat as a flammable dust.

Section V REACTIVITY DATA

Stability: Stable (store in cool dry area) Conditions to Avoid: None Known.
Incompatibility (Materials to Avoid)**:** Strong Oxidizers
Hazardous Decomposition or By-products: Thermal decomposition may include carbon dioxide and carbon monoxide.
Hazardous Polymerization: Will Not Occur Conditions to Avoid: None Known

PRODUCT NAME: SUSPEND – IT™

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)**:**

Eyes: Dust may produce mechanical irritation.

Skin: May produce slight irritation with prolonged contact with moistened product.

Inhalation: Non-irritating to mucous membranes, however, breathing high concentrations of the dust may cause mechanical irritation of the nose, throat and upper respiratory tract.

Ingestion: Passes through relatively inert. May cause some gastrointestinal upset.

NOTE: No adverse effects have been noted in chronic feeding studies using laboratory animals and humans. Sarcomas were exhibited at injection sites of animals receiving repeated massive subcutaneous injections of aqueous solutions of the material. The effects may have been the result of local trauma.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No ACGIH? No

Medical Conditions Generally Aggravated by Exposure: Long term exposure to high dust concentrations may cause non-debilitating lung changes.

Emergency and First Aid Procedures:

Eyes: Flush with running water. If irritation or adverse symptoms develop, seek medical attention.

Skin: Wash with soap and water. If irritation or adverse symptoms develop, seek medical attention.

Inhalation: Remover from exposure. If illness or adverse symptoms develop, seek medical attention.

Ingestion: If illness or adverse symptoms develop, seek medical attention.

Toxicology: The dry powder may cause foreign body irritation in some individuals. Prolonged contact with dry powder may cause drying or chapping of the skin. Excessive inhalation of dust may be annoying and can mechanically impede respiration. Due to the hygroscopic properties of the bio-polymer, they can form a paste or gel in living airways. Note: Oral = rat LD50: >5,000 mg/kg.

NOTE: OSHA and ACGIH have not established specific exposure limits for this material. However, OSHA and ACGIH have established limits for particulates not otherwise regulated (PNOR) and particulates not otherwise classified (PNOC) respectively, which are the least stringent exposure limits applicable to dusts: OSHA PEL = 15mg/m^3 (total dust) 8 hr. TWA, 5mg/m^3 (respirable 8 hr. TWA / ACGIH TLV = 10mg/m^3 (inhalable) 8 hr. TWA, 3mg/m^3 (respirable) 8 hr. TWA.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Evacuate the area of all unnecessary personnel. Wear protective equipment and/or garments described in Section VIII if exposure conditions warrant. Contain spill and control dust. Keep out of water sources and sewers. Vacuum up or spray with water and sweep up and place in impervious bags or containers. If concentrations of finely divided powdered material in air are high, eliminate all possible ignition sources.

Waste Disposal Method: Dispose of in accordance with federal, state and local regulations. Material is not considered a hazardous waste under California Regulation Title 22, CAC.

Precautions to Be Taken in Handling and Storing: Avoid contact with eyes, skin or clothing. Avoid breathing vapors, mist, fume or dust. Wear protective equipment and/or garments described in Section VIII if exposure conditions warrant. Launder contaminated clothing before reuse. Wash thoroughly after handling. Use with adequate ventilation. Store in a well ventilated area. Store in a closed container.

PRODUCT NAME: SUSPEND – IT™

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type): Not generally required unless needed to prevent respiratory irritation. For concentrations exceeding the recommended exposure limit, use NIOSH/MSHA approved air purifying respirator.

Ventilation:	Local Exhaust: As Appropriate	Special - None
	Mechanical (General): As Appropriate	Other - None

Eye Protection: Use safety glasses with side shields.
Skin Protection: Avoid unnecessary skin contamination with material.
Other Protective Clothing or Equipment: None.
Work/Hygienic Practices: Use good housekeeping practices.

NOTE: Personal protection information shown in Section VIII is based upon general information as to normal uses and conditions. Where special or unusual uses or conditions exist, it is suggested that the expert assistance of an industrial hygienist or other qualified professional be sought.

SARA Hazard Information: Hazard Categories under SARA Title III Rules (40 CFR 370): Fire Section 302 Extremely hazardous Substances: Not Applicable. Section 313 Toxic Chemical(s): Not Applicable.

CERCLA Reportable quantity: Not Applicable.

ATTACHMENT

POTENTIAL ADDITIVE-DRILL_TERGE

CETCO® DRILLING PRODUCTS

MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFETY DATA SHEET May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: DRILL-TERGE™

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:
CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Date Prepared: February 10, 2005
Telephone Number: 847-392-5800 Fax: 847.506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

THIS PRODUCT DOES NOT CONTAIN ANY HAZARDOUS INGREDIENTS
REPORTABLE FOR SARA, TITLE III SECTION 313

PRODUCT IDENTIFICATION
CHEMICAL NAME: Liquid solution of nonionic surfactants.
NFPA/HMIS: Health - 1, Fire - 0, Reactivity - 1, Specific Hazard - See Section VI
DOT Class: Not Regulated

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	- Approx. 190°F	Specific Gravity (H_2O = 1)	- 1.080
Vapor Pressure (mm Hg.)	- Not Applicable	Melting Point	- Not Applicable
Vapor Density (AIR = 1)	- Heavier than air	Evaporation Rate (Butyl Acetate = 1)	- Slower than Ether
Solubility in Water	- Complete		
Appearance and Odor	- Clear blue liquid with mild odor.		

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used) - Not flammable
Flammable Limits - Not Applicable LEL- -Not Applicable UEL- - Not Applicable
Extinguishing Media - CO_2, dry chemical, foam or water. Class A, BC or ABC extinguishers.
Special Fire Fighting Procedures - Water can be used to cool containers adjacent to fire.
Unusual Fire/Explosion Hazards - Pressure may develop in closed containers if temperature over 190°F is achieved.

Section V REACTIVITY DATA

Stability - Stable Conditions to Avoid - None Known
Incompatibility (Materials to Avoid) - Strong oxidizing agents or anything reactive with water.
Hazardous Decomposition or By-products - CO, CO_2, ammonia and smoke.
Hazardous Polymerization - Will Not Occur Conditions to Avoid - None Known

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic):
Eyes: Contact will be painful and irritating.
Skin: Prolonged contact may cause irritation.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Emergency and First Aid Procedures:
Eyes: Flush with water for at least 15 minutes; get medical attention if needed.
Skin: Remove any contaminated clothing. Flush with water.
Inhalation: Remove to fresh air. If symptoms persist, contact a physician immediately.
Ingestion: Contact a physician immediately.

PRODUCT NAME: DRILL-TERGE™

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled:
Flush with water or soak up with sweeping compound or sand and transfer to a disposal container.

Waste Disposal Method:
Use methods which meet all federal, state and local regulations.

Precautions to Be Taken in Handling and Storing:
Store in cool, well ventilated area.

Other Precautions:
Do not take internally or inhale vapors. Avoid eye contact.

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type) - Not normally needed. However, if strong fumes are present, use a NIOSH or MSHA approved gas mask for organic vapors.

Ventilation	- Local Exhaust	- Preferable	Special	- None
	- Mechanical (General)	- Acceptable	Other	- None

Protective Gloves - Recommend plastic or rubber gloves.

Eye protection - Recommend, face shield or chemical safety goggles.

Other Protective Clothing or Equipment: Usually not needed unless splashing is excessive.

Work/Hygienic Practices: Use good housekeeping practices.

ATTACHMENT

POTENTIAL ADDITIVE-INSTAVIS PLUS

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals

CETCO® DRILLING PRODUCTS

MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFET DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.
Standard must be consulted for specific requirements

PRODUCT NAME: INSTA-VIS PLUS™

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:
CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Date Prepared: February 10, 2005
Telephone Number: 847-392-5800 Fax 847.506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
PETROLEUM SOLVENT NJ; TRADE SECRET	REG #99783600-5148P			
SURFACTANT; NJ TRADE SECRET	REG #99783600-5133P			
POLYOL; NJ TRADE SECRET	REG #99783600-5134P			

PRODUCT IDENTIFICATION

Chemical Name: Anionic acrylamide copolymer emulsion in hydrocarbon oil.
NFPA/HMIS: Health - 1, Fire - 1, Reactivity - 0, Specific Hazard - None
DOT Class: Not a DOT/IMO Hazardous Material -- Not Regulated

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Melting Point	- Not Applicable	Flash Point	> 212˚F
Vapor Pressure (mm Hg.)	- 0.002 @ 68 ˚F	Auto ignition Point:	< 392 ˚F
Vapor Density (AIR = 1)	- See Technical Bulletin		
Solubility in Water	- See Technical Bulletin		
Appearance and Odor	- Viscous liquid, milky, aliphatic odor		

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	- > 212°F			
Flammable Limits	- Not Available	LEL- -Not Available	UEL- -Not Available	
Extinguishing Media	- Water, water spray, foam, dry powder, carbon dioxide			
Special Fire Fighting Procedures	- Spills produce extremely slippery surfaces			
Unusual Fire / Explosion Hazards	- No special protective equipment required			

Section V REACTIVITY DATA

Stability	Stable	-	Conditions to Avoid	- None Known
Incompatibility (Materials to Avoid)	- Oxidizing agents may cause exothermic reactions.			
Hazardous Decomposition or By-products	- Thermal decomposition: CO, CO_2, and nitrogen oxides.			
Hazardous Polymerization	Will Not Occur	-	Conditions to Avoid	- None Known

PRODUCT NAME: INSTA-VIS PLUS™

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? No Skin? No Ingestion? Yes Eye? Yes
Health Hazards (Acute and Chronic): Oral: LD50/oral.rat > 5000 mg/kg. However, product is generally considered non-hazardous.
Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No ACGIH? No
Signs and Symptoms of Exposure: Irritating to the skin, irritating to the eyes, prolonged exposure to skin may cause dermatitis.
Medical Conditions Generally Aggravated by Exposure: Dermatitis

Section VI HEALTH HAZARD DATA CONTINUED

Emergency and First Aid Procedures:

Eyes:	Flush with water for 15 minutes, consult physician
Skin:	Wash with soap and water. Remove contaminated clothes & wash
Inhalation:	Remove to fresh air, consult physician.
Ingestion:	DO NOT INDUCE VOMITING. Consult a physical if discomfort or other symptoms develop.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled:
Absorb with inert absorbent material. Put into container for disposal. DO NOT flush with water.
Waste Disposal Method:
Dispose of in accordance with federal, state and local regulations. This is not a RCRA regulated waste.
Precautions to Be Taken in Handling and Storing:
Store in a cool, dry place. Freezing will affect the physical condition and may damage the material.
Other Precautions:
Avoid forming dust/mist. Wash hands before breaks and at the end of the workday.

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type): Use NIOSH approved or equivalent if needed.

Ventilation	- Local Exhaust	- As appropriate	Special - None
	- Mechanical (General)	- As appropriate	Other - None

Protective Gloves - Chemical Resistant
Eye Protection - Safety goggles with side shields. No contact lenses.
Other Protective Clothing or Equipment - Chemical resistant apron or suite if splashing repeatedly.
Work/Hygienic Practices - Use good housekeeping practices.

Section IX REGULATORY INFORMATION

Proper Shipping Name: NOT A DOT/IMO HAZARDOUS MATERIAL
ID Number: N/A RQ: N/A DOT Emergency Guide (ERG) #: 31
Hazard Class or Division: N/A Packing Group: -
TSCA List: Appears on TSCA Inventory
No components are SARA 313 reportable.

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, CETCO cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

1500 W. Shure Dr., Arlington Heights, Illinois 60004 USA / +1 800.527.9948 / tel +1 847.392.5800 / fax +1 847.577.5571

ATTACHMENT

POTENTIAL ADDITIVE-RELPAC

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals

CETCO® DRILLING PRODUCTS

MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFETY DATA SHEET

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: REL-PAC™ XTRA-LOW

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS:

CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Date Prepared: February 10, 2005

Telephone Number: 847-392-5800 Fax 847.506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Nuisance Dust				
Respirable Fraction	5mg/m^3	3mg/m^3		
Total Dust	15mg/m^3	10mg/m^3		

PRODUCT IDENTIFICATION

Chemical Name: Polyanionic Cellulose
Chemical Family: Cellulosic Polymer
NFPA/HMIS: Health - 1, Fire - 1, Reactivity - 0, Specific Hazard - See Section VI
DOT Class: Not Regulated

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	- Not Applicable	Specific Gravity (H_2O = 1)	- 1.55
Vapor Pressure (mm Hg.)	- Not Applicable	Melting Point	- Not Available
Vapor Density (AIR = 1)	- Not Applicable	Evaporation Rate (Butyl Acetate = 1)	- Not Applicable
Solubility in Water	- Complete		
Appearance and Odor	- White to yellow powder, no odor.		

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	- 350°F (Open cup)		
Flammable Limits	- Not Determined	LEL- - Not Determined	UEL- - Not Determined
Extinguishing Media	- Water spray, carbon dioxide, dry chemical extinguishers.		
Special Fire Fighting Procedures	- None Known.		
Unusual Fire/Explosion Hazards	- Product dust may form an explosive mixture with the air. Avoid dust producing conditions.		

Section V REACTIVITY DATA

Stability	Stable	Conditions to Avoid	- None Known
Incompatibility (Materials to Avoid)	- None Known		
Hazardous Decomposition or By-products	- None Known		
Hazardous Polymerization	Will Not Occur	Conditions to Avoid	- Conditions that produce dust.

PRODUCT NAME: REL-PAC™ XTRA-LOW

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? No Ingestion? No

Health Hazards (Acute and Chronic):

The toxicity and hazards under normal conditions of application appeared to have low effects in animal experiments. Exposure to dust in manufacturing operations over 30 years has not shown adverse effects. Inhalation may result in dry, irritated nasal passages.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Teratogenicity: No Mutagenicity: No

Signs and Symptoms of Exposure: None Known.

Medical Conditions Generally Aggravated by Exposure: Emphysema, other lung diseases, asthma.

Emergency & First Aid Procedures: Not Applicable

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Sweep up and flush area with water. Spilled product on wet floors can be very slippery.

Waste Disposal Method: Send to Sanitary Landfill or incinerate. Dispose of in accordance with federal, state and local regulations.

Precautions to Be Taken in Handling and Storing: During processing the dust of the dry product can be inconvenient.

Other Precautions: Slippery when wet. Although not dangerous, the use of a simple dust mask is recommended.

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type)	- Dust Respirator (NIOSH/MSHA #TC-21C-132) may be desirable when dumping bags.			
Ventilation	- Local Exhaust	- As appropriate	Special	- None
	- Mechanical (General)	- As appropriate	Other	- None
Protective Gloves	- Not Required			
Eye Protection	- Not Required			
Other Protective Clothing or Equipment	- None Known.			
Work/Hygienic Practices	- Use good housekeeping practices.			

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, CETCO cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

ATTACHMENT

POTENTIAL ADDITIVE

MACRO-FILL

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals

CETCO® DRILLING PRODUCTS

MATERIAL SAFETY DATA SHEET

MSDS

MATERIAL SAFETY DATA SHEET May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: MACRO-FILL™

Section I MANUFACTURER'S INFORMATION

MANUFACTURER'S NAME & ADDRESS: **Date Prepared: June 1, 2002**

CETCO – *Drilling Products Group*
1500 West Shure Drive
Arlington Heights, IL 60004

Telephone Number: 847-392-5800 Fax 847.506.6150
EMERGENCY CONTACT: CHEMTREC 800-424-9300
E-mail: www.cetco.com

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS: (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Manufacturer's Recommended Exposure Guideline for Respirable Particulate			0.05mg/m^3	

PRODUCT IDENTIFICATION

Chemical Name: Sodium Polyacrylate, lightly crosslinked CAS#-076774-25-9
NFPA/HMIS: Health - 1, Fire - 0, Reactivity - 0, Specific Hazard - See *Section VI.*
DOT Class: Not Regulated (49 CFR, IMDG, ICAO / IATA).

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Not Applicable. **Bulk Density** (Apparent - g/cc)**:** 0.5 - 0.7
Vapor Pressure (mm Hg.)**:** Not Applicable. **Melting Point:** Not Applicable.
Vapor Density (AIR = 1)**:** Not Applicable. **Evaporation Rate** (Butyl Acetate = 1)**:** Not Applicable.
Appearance: Off white color powder or granules, odorless.

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (*Method Used*)**:** Not Available.
Flammable Limits: Not Available. **LEL** - Not Applicable **UEL** - Not Applicable
Extinguishing Media: As with any fire, wear positive pressure, self-contained breathing apparatus in any closed space when fighting fire.
Special Fire Fighting Procedures: Not Applicable.
Unusual Fire and Explosion Hazards: Becomes slippery when wet. Under certain confined conditions, a fine dust of this material in air may cause a dust explosion if ignited.

Section V REACTIVITY DATA

Stability: Stable - **Conditions to Avoid:** None Known.
Incompatibility (*Materials to Avoid*)**:** Strong Oxidizers.
Hazardous Decomposition or By-products: Thermal decomposition: CO, CO_2, and hydrocarbons.
Hazardous Polymerization: Will Not Occur **Conditions to Avoid**: None Known.

PRODUCT NAME: **MACRO-FILL™**

Section VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (*Acute and Chronic*)**:**

- Contact with eyes, skin or clothing may cause irritation. Care must be taken to minimize exposure and prevent workplace inhalation of respirable dust. Respiratory protection is required for exposures above the recommended level of respirable dust.

- A similar product, ground very finely, produced an inflammatory tissue response in the lungs in a lifetime exposure inhalation experiment with animals.

- According to the EPA "Hazard Categories" under sections 311 and 312 of SARA Title III, this product is considered to meet the applicable definitions of: A delayed health hazard.

Carcinogenicity: NTP? No. IARC Monographs? No. OSHA Regulated? No.

Signs and Symptoms of Exposure: Slight irritant effects.

Medical Conditions Generally Aggravated by Exposure: None Known.

Emergency and First Aid Procedures:

Eyes: Flush with large quantity of water, consult physician.
Skin: Wash with soap and water
Inhalation: Remove to fresh air, consult physician.

Section VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be taken in Case Material is Released or Spilled: Vacuum (using HEPA filter equipped system) if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator. Avoid adding water; product will become slippery when wet.

Waste Disposal Method: Dispose of in accordance with federal, state and local regulations.

Precautions to Be Taken in Handling and Storing: Store in a cool, dry place. Avoid breathing powder. Avoid skin and eye contact.

Other Precautions: Slippery when wet.

Section VIII CONTROL MEASURES

Respiratory Protection (Specify Type)**:** Use NIOSH/MSHA approved or equivalent with high efficiency filter for particulate levels above 0.05mg/m^3.

Ventilation	- Local Exhaust	- As appropriate	Special	- None
	- Mechanical (General)	- As appropriate	Other	- None

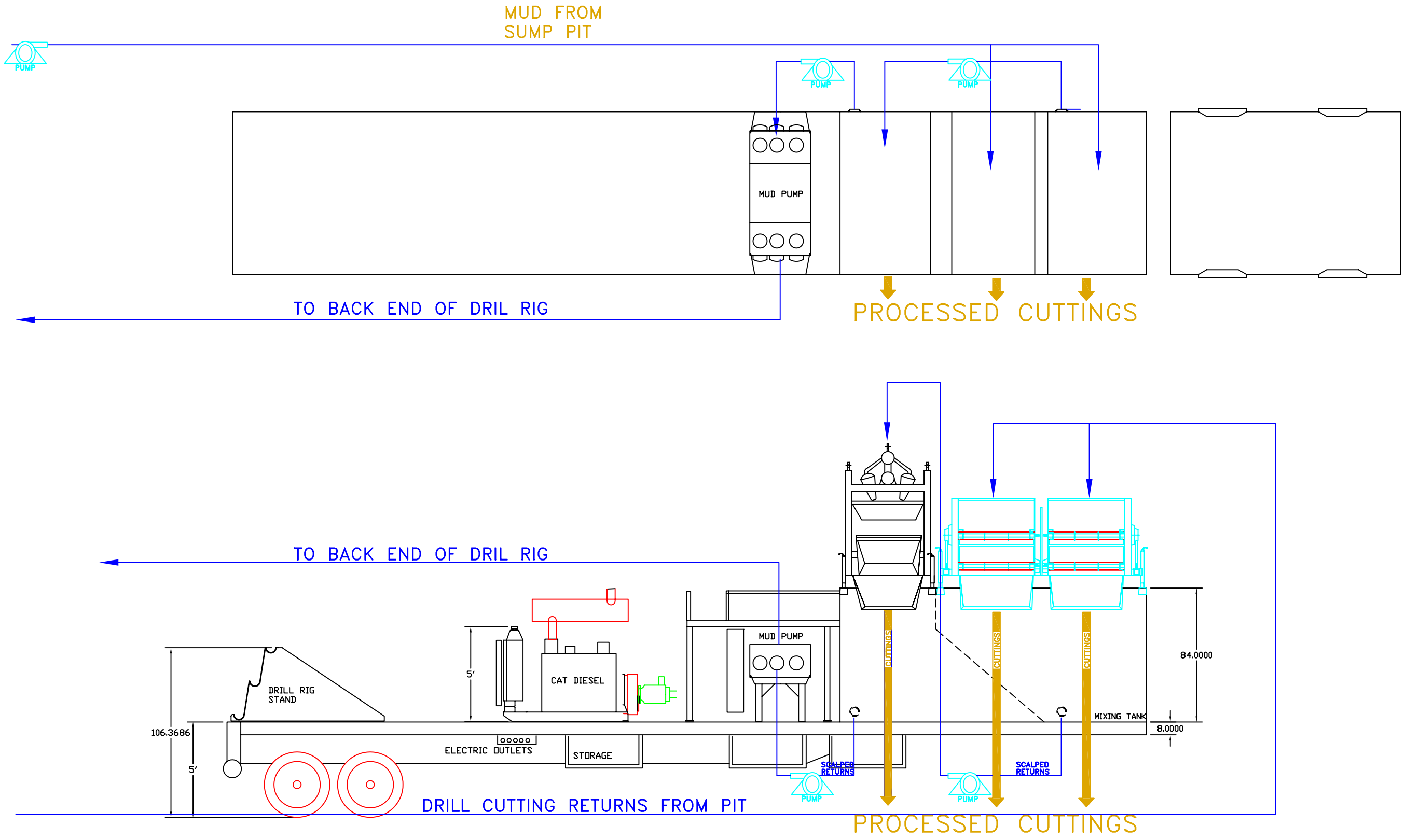
Protective Gloves: Impervious/rubber.
Eye Protection: Safety goggles recommended.
Other Protective Clothing or Equipment: If needed to avoid irritation.
Work/Hygienic Practices: Use good housekeeping practices.

ATTACHMENT

MUD CLEANING EQT

SOLIDS CONTROL FLOW CHART

MUD RECYCLE FLOW CHART



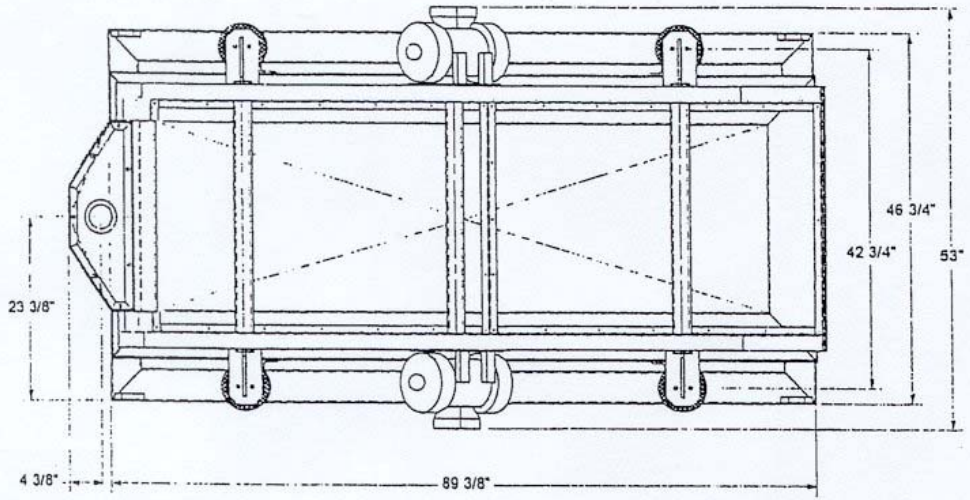
NOTE: BENTONITE SLURRY PUMPED FROM PIT, COLLECTED & RECYCLED OR DISPOSED OF AT AN APPROVED LOCATION

MICHELS DIRECTIONAL CROSSINGS

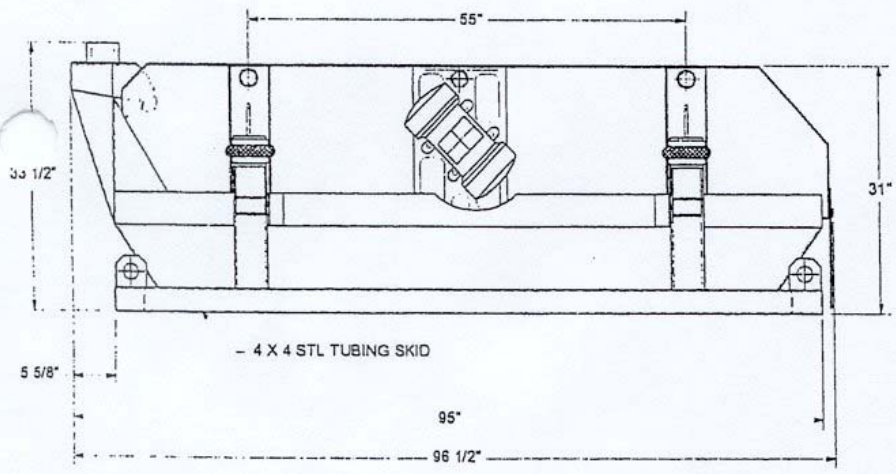
MICHELS DIRECTIONAL CROSSINGS
A DIVISION OF MICHELS CORPORATION
817 W. MAIN ST., P.O. BOX 128 BROWNSVILLE, WISCONSIN 53006
PHONE: (920) 583-3132 FAX: (920) 583-3429

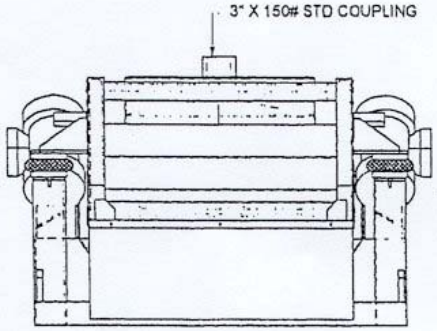
DIRECTIONAL BORE FOR: MUD SYSTEM FLOW CHART

DRAWING: MUD RIG		SCALE: NONE
LOCATION: TYPICAL CROSSING	USA/INTERNATIONAL	DATE 4 / 16 / 04
DRAWN BY: G.S.G.		SHEET 1 OF 1



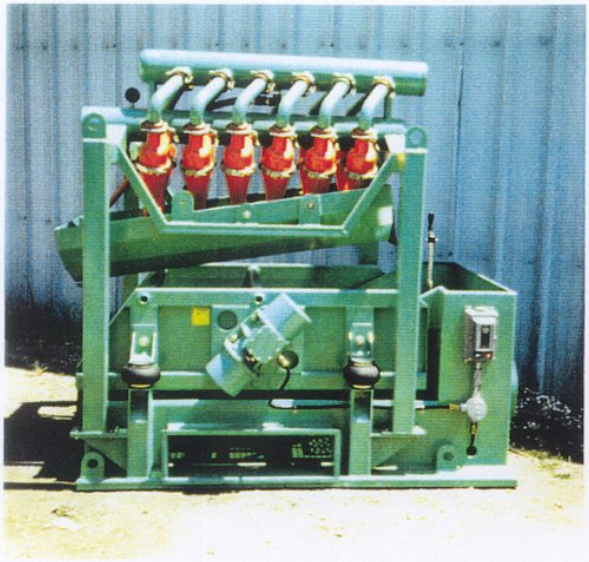
DIMENSIONS:	31" HIGH X 96" LONG X 53" WIDE
WEIR HEIGHT:	26"
WEIGHT:	1250 EST. LBS
MOTORS:	2 EA 1800 RPM, NON-EXPLOSION PROOF, TOTALLY-SEALED VIBRATORY MOTORS
HP:	0.50 EA, 1.0 TOTAL
MOTION:	LINEAR, 0.23"A, 4.5 G'S, 20Hz (ADJUSTABLE TO 4.8 G'S
SCREENS:	2 EA 29" X 42" PRETENSIONED PANELS
SCREENING AREA:	16.86 SQ FT
SCREEN DESIGN:	SQ TUBING FRAMES, S.S. SUPPORT LAYERS, POLYESTER OR S.S. TOP LAYER
FEATURES:	QUICK SCREEN CHANGE, NO LUBRICATION REQUIRED, MODULAR CONSTRUCTION





MODEL: 20L		FLUID SYSTEMS, INC	
		TITLE: 20L INSTALLATION	
		STATIONARY	
	DRAWN BY: MRC	CHECKED BY:	
	DATE: 7-29-94	DATE:	
	SCALE: 1/10	DRAWING NUMBER: 01-1030	SIZE: C
			SHT: 1 of 1
			REV: A

FLUID SYSTEMS, Inc.
SERIES SSR50 12H DESILTING MUD CLEANER



Side View - Desilting Mode

Side View - Mud Cleaner Mode

General Specifications

MOTORS: 2 ea. 1200 RPM EXPLOSION PROOF
HP: 0.62 ea., 1.24 total
BEARINGS: Permanently Sealed and Lubricated, 75,000 Hrs. B-10 Life
WEIR HEIGHT: 34"
MOTION: Linear, 0.23" A, 4.5 G's, 20 Hz (adjustable to 4.8 G's)
DECK ADJUSTMENT: Adjustable +5° to -5°
SCREENS: 2 ea. 29" x 42", Pretensioned Panels, *Wedgelok* Fasteners
SCREENING AREA: 16.87 sq.ft
DIMENSIONS: 91" L x 61" W x 80" H

FSI Series SSR50 12H is three units in one, on a single skid ! THIS MACHINE IS DESIGNED TO BE USED AS EITHER A DESILTER ONLY, SHAKER ONLY OR AS A MUD CLEANER. The adjustable deck makes it possible for materials to dewater before being discharged. Processing rates vary with slurry content, percent solids and viscosity. Each of the two pretensioned screen panels can be installed or replaced independently of each other. Installation of replacement screen panels can be accomplished in 2 - 5 minutes, the only tool required is a light/medium hammer.

Fluid Systems' Linear Screens are designed to require the lowest maintenance possible. Permanently sealed vibrators make lubrication systems totally unnecessary. The vibrator motors produce, 80 db; requiring no hearing protection. Routine maintenance required includes checking screen panels, deck rubbers and inflation of air spring assemblies. Quarterly maintenance requires checking torque on the vibrator motor bolts.

Houston, TX 713-895-8422 • New Orleans, LA 504-393-1804 • Lafayette, LA 318-232-7009

1.0 PURPOSE

This procedure sets forth the method for receiving, installation, maintaining, troubleshooting and operating a Series 20L Linear Shaker and describes the parts and replacement or optional part numbers herein.

2.0 APPLICATION

For the use of all customer personnel who need to know the installation instructions, maintenance instructions and schedules, and the daily operating instructions for the Series 20L Linear Shaker.

3.0 DEFINITIONS

3.1 Linear Shaker: the vibration induced by a pair of eccentric (or eccentrically weighted) shafts turning in opposite directions. This type of arrangement allows for the development of straight line or linear motion and the ability to run the shaker bed in a positive (uphill) incline.

3.2 Feed Tank: Tank on backside of skid used to slow the speed of the flow and distribute evenly over shaker bed.

3.3 Shaker Bed: Area of equipment that is actually vibrating.

3.4 Mud Pan: Screen under tank or tray.

4.0 RECEIVING

4.1 Upon receiving Fluid Systems, Inc. Series 20L Linear Shaker, check the contents very carefully in case of damage or loss of parts. If some damage or losses occur, please report them to Fluid Systems, Inc. at 504-393-1804 immediately.

4.2 In order to prevent damage during shipment, hold down brackets are provided. These brackets must be removed before starting the shaker.

4.3 All screen panels, spare and optional parts purchased with the machine will be packaged and shipped with the machine unless other instructions are given to Fluid Systems, Inc.

5.0 INSTALLATION

5.1 Four lift points have been welded on the skid near all four corners of the machine. It is recommended to use four hooks and spreader bars to lift the shaker. Do not lift shaker from shaker bed or with two hooks.

5.2 Remove shipping brackets from between shaker bed and mud pan.

5.3 Make sure air spring mounts are properly inflated (25 psi) and shaker bed is in fact free. Check this by rocking it up and down manually.

5.4 Level the skid/machine in both directions.

5.5 Each Fluid System, Inc. Series 20L Linear Shaker has four mounting holes on all four corners. Some units are customized and mounting holes may be missing or in another location on the skid. Be sure to bolt shaker down before running it.

5.6 Each Fluid System, Inc. Series 20L Linear Shaker has one 3" diameter x std 150# pipe coupling on the top of the weir cover feed tank.

5.7 A dump/by-pass line with a valve should be installed between shakers incorporated into the manifold. The valve will allow operator to any bypass shakers and prevent any contaminants from entering the shakers and contaminating the slurry.

5.8 Dump slides should be installed to collect all material going over the discharge end of the screen overs. The valve will allow operator to any bypass shakers and prevent any contaminants from entering the shakers and contaminating the slurry.

5.9 Do not weld or bolt shale/dump slide or chutes to vibrating shaker bed.

5.10 Bring electric service to junction box or starter (optional) mounted on the side of the machine (three phase 230v or 460v is required on most models).

5.11 It is the users responsibility to provide a fused disconnecting device in accordance with Local and National Electrical Codes.

5.12 The vibrator is a dual would device so modifications can be made by the user to fit the supply voltage.

5.13 If your unit contains mist sprayers (optional), a valve should be installed to control the flow of water. Water lines going to the mist sprayers should not rub against the air springs or any part of the shaker to avoid any wearing out of either.

5.14 If the slurry is gravity fed, the weir height should be lower than the feed line of slurry level to allow gravity to feed machine properly.

6.0 WEIGHT

6.1 Weight is approximately 1250 pounds.

7.0 DIMENSIONS

7.1 The dimensions are approximately 34" High x 96.5" Long x 54" Wide.

8.0 SCREEN AREA

8.1 The screen area is 16.86 square feet.

9.0 DESANDING MUD CLEANER OPTION

9.1 The Fluid Systems, Inc. Series 500 Linear Shaker can be outfitted with up to two 10” TU-10 involute feed desanding cyclones.

9.2 Fluid Systems, Inc. D.S.R. unit has been designed to remove all drill solids larger than 74 microns from the drilling mud without the loss of barite. The unit will process mud at a rate of 500 gpm per cone regardless of mud weight.

9.3 The D.S.R. unit is able to process this high volume regardless of mud weight without discarding barite. Therefore, it is not necessary to reduce the volume handling capacity of the unit as mud weight increases.

9.4 The TU-10 Cyclone is a low cost, lightweight, molded urethane cyclone providing excellent wear life with maximum economy and ease of handling.

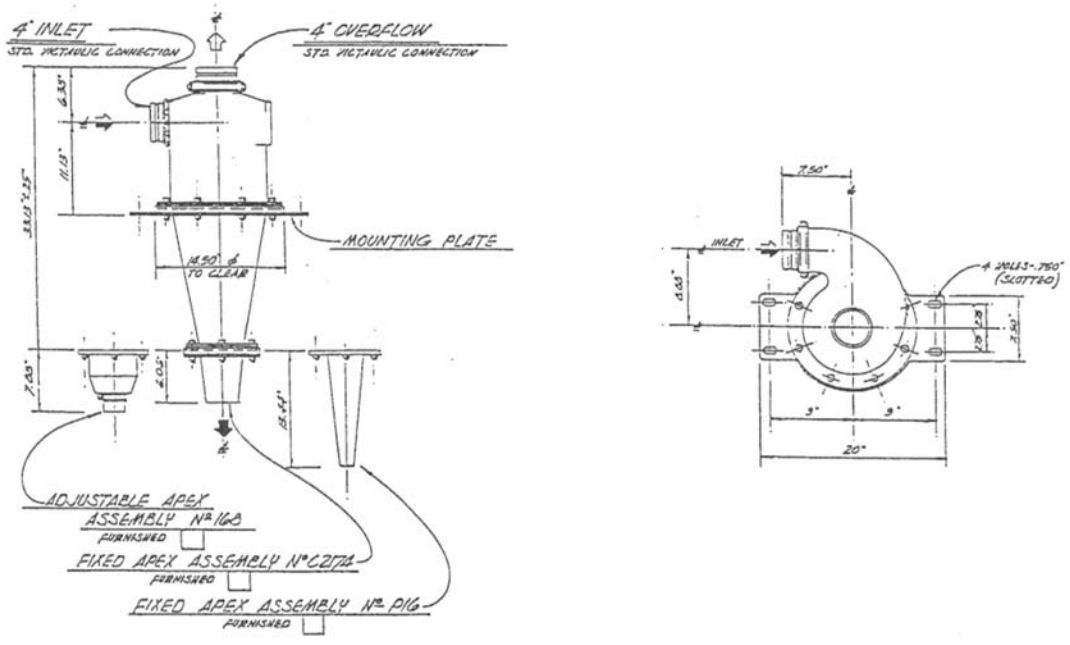
9.5 20L DSR2H weight is 1800 pounds.

9.6 The 500 DSR2H working pressure is 25-35 psi.

9.7 The DSR2H cone cut range is 35-65 microns.

9.8 The 20L DSR2H cone capacity is 500 gpm each.

9.9 The 20L DSR2H dimensions are 69” High x 102 Long x 74” Wide.



DSR TU-10 General Arrangement Desander Cyclone

9.10 The TU-10 Cyclone is molded into three sections consisting of:

9.10.1 The inlet head feature with involuted feed entry design with ribbon type feed nozzle, integral molded vortex finder, and feed and overflow connections. The feed and overflow connections are replaceable metal inserts, Victaulic grooved.

9.10.2 The conical section incorporates flanges with centering rims and steel backing rings. The molded urethane part has a wall thickness of ½" at the top increasing to ¾" at the bottom.

9.10.3 The apex section which can be either the all molded standard urethane type, with centering rim and steel back-up ring or manually adjustable type with replaceable rubber insert in a metal housing.

9.11 Depending on the mud, if nothing seems to be coming out of the apexes, replace them with larger ones. By the same token, if too much liquid is being discharged over the screens, replace the apexes with smaller ones.

9.12 The cones are designed to handle larger volumes of fluid by making a finer cut than normal. It is the involute feature that starts the separation.

10.0 DESILTING MUD CLEANER IN LINE OPTION

10.1 The Fluid Systems, Inc. 20L Linear Shaker can be outfitted with up to 12-4" hydrocyclones. Standard unit is equipped with 10-4" standard feed cones.

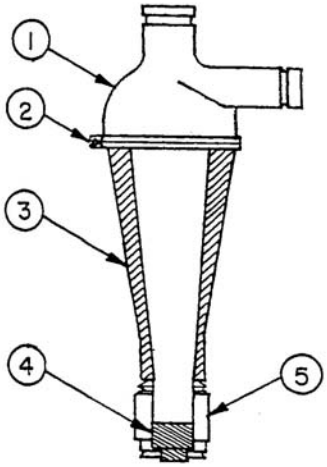
10.1.1 Standard 4" cyclone rated at 50 GPM each. Each standard cone can be adjusted by the apex nut on the bottom discharge side of the cyclone. Make sure apex has not been washed out if too much liquid is being discharged. Tighten the nut to lessen the discharge of the cones and vice versa.

10.2 The weight of the 20L SSR12HIL is 2150 pounds.

10.3 The working pressure is approximately 40-45 psi.

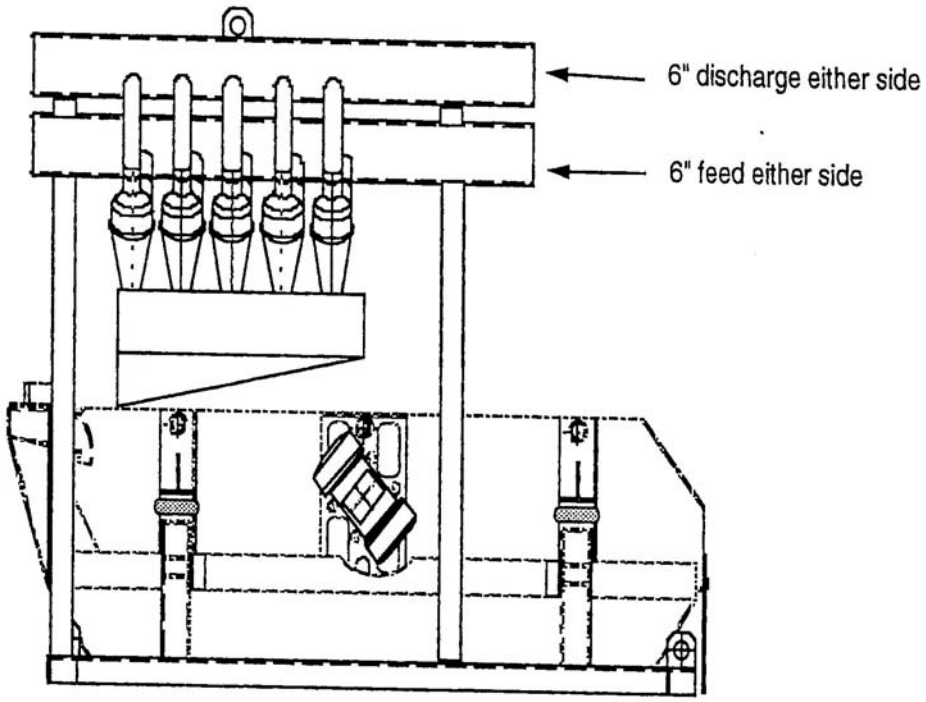
10.4 The cone cut range is between 15-30 microns.

10.5 The involute feed cone capacities are 100 gpm each for the 20L SSR12HIL.

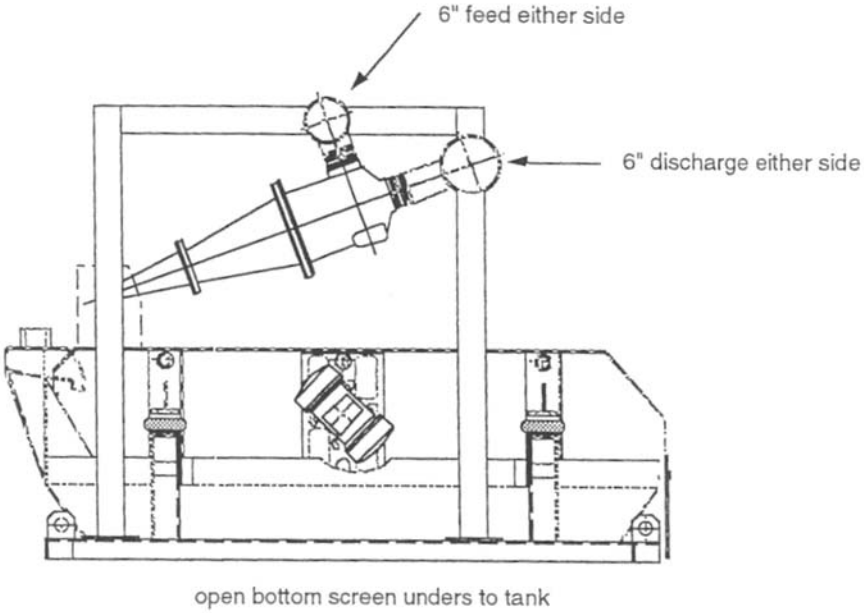


Standard 4” SSR Desilting Cyclone

REF.	WEIGHT Lbs.	DESCRIPTION
1-7	9	4” Cone, Complete
1	4	Fluids Splitter
2	1	Clamp Band
3	4	Bottom Cone
4	.25	Discharge Insert
5	.50	Adjust Nut
Not Shown	2	Elbow, Overflow

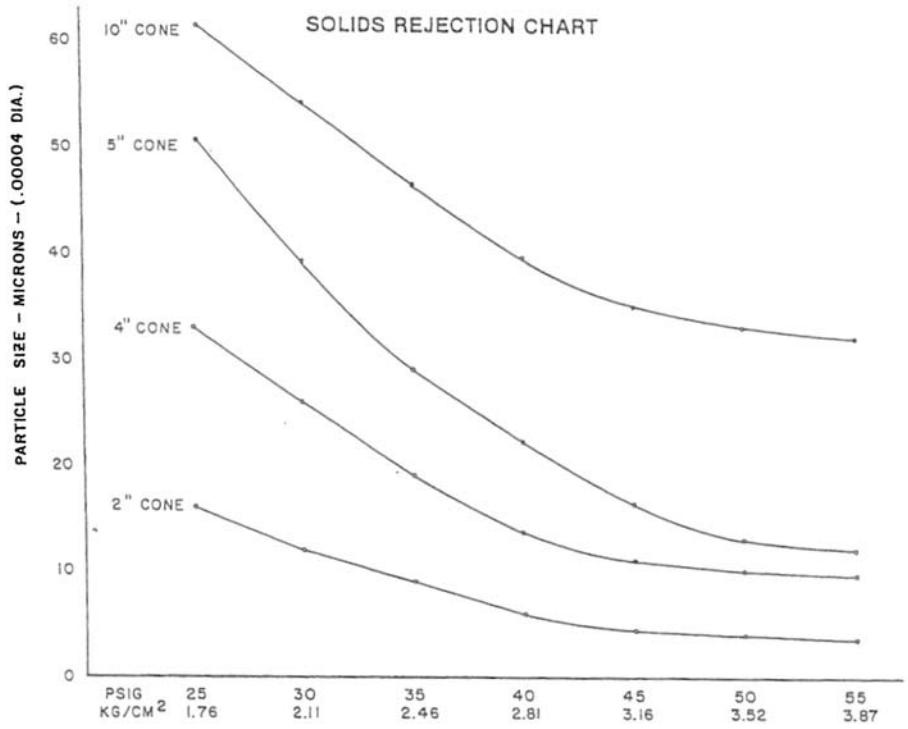


20L SSR12HIL



20L DSR 2H

DIFFERENTIAL PRESSURE										
CONE SIZE	PSI		25	30	35	40	45	50	55	60	65
2" 90 psi	1 CAPACITY — GPM/CONE 2 CAPACITY — LITERS/MIN/CONE	1	12	12.5	13.5	14.5	15.5	16	16.5	17.0	17.5
		2	45	47	51	55	59	61	62	64	66
4" 90 psi		1	35	40	45	50	53	55	57	59	62
		2	189	208	227	246	265	280	291	303	310
5" 90 psi		1	62	68	73	78	83	88	93	97	100
		2	235	257	276	295	314	333	352	367	378
10" 60 psi		1	400	425	450	480	510	560	585	600	—
		2	1514	1608	1703	1817	1930	2120	2214	2271	—
		OPTIMUM RANGE									
			1.76	2.11	2.46	2.81	3.16	3.52	3.87	4.22	4.57
DIFFERENTIAL PRESSURE — KG/CM²											



Standard 4” Cone Capacities and Solids Rejection Charts