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**Department of Energy**  
**Ohio Field Office**  
**Fernald Environmental Management Project**  
**P. O. Box 538705**  
**Cincinnati, Ohio 45253-8705**  
**(513) 648-3155**



JUN 28 2004

Mr. Tom Schneider, Project Manager  
Ohio Environmental Protection Agency  
401 East 5<sup>th</sup> Street  
Dayton, Ohio 45402-2911

DOE-0309-04

Dear Mr. Schneider:

**RESPONSE TO OHIO ENVIRONMENTAL PROTECTION AGENCY REGARDING SILO 3  
PNEUMATIC RETRIEVAL HOSE**

Reference: Letter, T. Schneider to W. Taylor, "Silo 3 - Pneumatic Retrieval Hose," dated  
May 14, 2002

This letter provides information for your review in response to your concerns (see  
referenced letter) regarding failure of the pneumatic retrieval hose during Silo 3 Integrated  
System Operability Testing (ISOT).

Throughout the design phase, the Silo 3 Project has used subject matter  
experts/consultants to supplement the Fluor Fernald design team, and has sought input  
from various manufacturers and vendors for product information. The project has  
performed several demonstrations and mock-ups to provide process improvement  
information during the design phase, as well as constructability, operability and  
maintainability information, and lessons-learned.

The pneumatic retrieval process requires operations personnel to be able to manipulate the  
hoses and vacuum wand assemblies through the man way openings to reach and retrieve  
the material. Important design considerations were the material characteristics and the  
flexibility and weight of the equipment being used. In the development of the vacuum  
retrieval system three demonstrations were conducted, as well as modeling of retrieval of  
the silo.

The first demonstration was conducted during initial design development at an off-site  
location to mock up the retrieval approach. The Ohio Environmental Protection Agency  
(OEPA) and United States Environmental Protection Agency (USEPA) were provided the  
opportunity to visit and see this demonstration. The objectives were to evaluate the  
effectiveness of range of motion, ease of handling, diameter of hose and lengths of hose  
sections, hose support systems, change out of sections, contamination controls, and other

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elements to improve the final Vacuum Wand Management System (VWMS) design. It was initially intended to use fly ash as the surrogate for the retrieval, but it was determined not to be practical to use at the shop where fabrication and storage was taking place, and it was also difficult to dispose. An alternate surrogate of chopped, moist soil was used since this also provided information on a possible worst-case vacuuming scenario. Hi-Vac Corporation provided a portable vacuum system for use and various diameters of hoses and connections. One of the results of this work was a recommendation to use a clear hose to allow the operator to see the retrieval and anticipate any plugging problems. Hi-Vac Corp., also the provider of the Silo 3 pneumatic retrieval system, recommended a brand of hose that was abrasion resistant. The data sheet for the pneumatic retrieval system specifies that the Silo 3 material has medium abrasiveness.

A second demonstration was done on Silo 4 for maneuverability at the furthest extension and strength of materials and connections.

The third demonstration, the ISOT was recently completed. The importance of the ISOT is that it allowed operation of the facility using installed equipment. During the ISOT fly ash was used as the recommended surrogate, however, fly ash is considered a higher abrasive material than Silo 3 material. Retrieval was simulated using an ISO container that was modified with a rooftop man way saved from the Silo 4 demolition. The vacuum hoses were routed from the main retrieval line at the silo dome outside of the east wall of the tension support structure and through an excavator roof opening to the ISO located inside. These openings had been planned for use during the ISOT to simulate the vacuuming operation. The hose leak occurred in the bend of the hose over the dome at a sharp bend where the hose exited the containment. At the time of the first leak, there were no operators on the dome to perform hose inspection since the retrieval was taking place in the excavator room. The leak was detected during a periodic inspection by operations. The hose section was replaced, and then a second leak was discovered using the camera in the containment which operations was monitoring.

As a result of the hose leaks the following evaluations and actions have taken place:

- There was a change in the engineering specification for selection of the pneumatic hose. The clear PVC hose that failed was selected based on vendor recommendation, and to address other requirements including operability concern for ease in handling, total weight of hose and material to address dome-loading technical safety requirement, and recommendation that clear hose would make retrieval easier. Prior to the hose failure, operators assigned to Silo 3 were able to train using the clear hose and gained valuable experience in handling and techniques for retrieval. As a result of the premature leaks, the clear hose has been abandoned for bulk retrieval. The project selected two other flexible hoses for use after reviewing other available hose materials with the technical representatives of several hose manufacturers. It was identified that the most abrasive-resistant materials are natural and synthetic rubber.

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- All pneumatic retrieval hose for actual Silo 3 operations will be the newly specified, highly abrasion-resistant hose (natural rubber for 4" and 6" hose – 688SB, natural rubber/synthetic rubber blend for 8" hose- Master-Flex 400). Enclosed are the product information sheets on the hoses. All of the original bulk retrieval hose has been replaced with this new hose material.
- All the new retrieval hose is sleeved in clear 6- mil plastic. The sleeve will not be undergoing extreme pressure during a failure since the hose is still operating under negative pressure. The failure was found to be progressive and the sleeve will provide protection and supports early detection of a leak.
- The hose is now arranged into longer radius bends than during the ISOT.
- Procedure(s) have been revised to address rounds and inspection of the hoses.

A failure analysis is not planned for the failed hose since it has been abandoned. ISOT has been formally completed for Silo 3 but operations will continue full-plant exercises with retrieval using fly ash. During this time, walk downs and evaluation of the hose will be made. At the completion of these exercises, which will last at least one week, the hoses will be inspected for wear on the internal surfaces.

The project is intending to continue with retrieval and packaging of fly ash, refinement of procedures, and training of personnel to ensure we are ready to go into operations. DOE and Fluor Fernald are of the opinion that the newly specified hose in combination with the secondary containment sleeve and a routine inspection program will provide a rational level of certainty that containment can be maintained throughout retrieval.

If you have any further questions on this matter, contact John Sattler (513) 648-3145.

Sincerely,

  
William J. Taylor  
Director

FCP:Sattler

Enclosure: As Stated

cc w/enclosure:

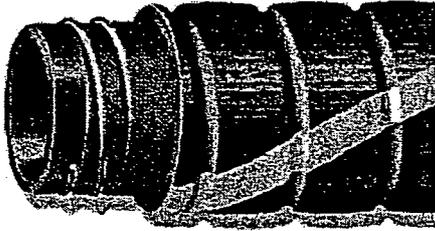
J. Saric, USEPA-V, SR-6J  
AR Coordinator, Fluor Fernald, Inc./MS78

cc w/o enclosure:

K. Johnson, OH/Springdale  
ECDC, Fluor Fernald, Inc./MS52-7

## 688SB

**Recommended for:** A tough corrugated cover makes the 688SB extremely flexible for the transfer of bulk materials via suction, gravity, or pneumatic systems. The natural rubber tube provides excellent resistance to abrasion for handling commodity materials such as dry cement, lime, sand, gravel, feed, seed, and slurries.



**Temperature range:** -40°F to +150°F (-40°C to +66°C) continuous service.

**Tube:** Type D<sub>3</sub> (Natural Rubber). Black. Static conductive. 3/16" thick.

**Reinforcement:** Synthetic, high tensile textile with steel wire helix.

**Cover:** Type D (SBR). Black corrugated with gray spiral stripe.

**Branding:** Continuous transfer label.

**Example:** Gates 688SB Wet-Dry Bulk Commodity 60 PSI (.41MPa) WP Made In U.S.A.

**Packaging:** Coiled and wrapped in polyethylene.

**Take the next step...**

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**Industrial Hose Catalog**

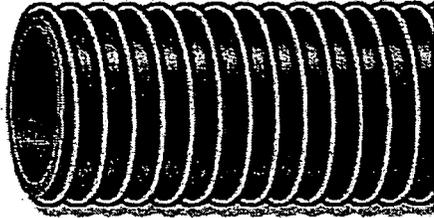
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Nom. I.D. (in.)	Nom. O.D. (in.)	Nom. (mm)	Max. W.P. (psi)	Suction (in. Hg)	Min. Bend Radius (in.)	Wt. Per Ft. (Lbs.)	Standard Pack	Stock (X) or Min. Order Qty.		Gates Product No.
2	50.8	2.77	70.4	60	30	16.0	100 ft.	X		4691-0305
3	76.2	3.81	96.3	60	30	24.0	100 ft.	X		4691-0325
4	101.6	4.77	121.2	45	30	32.0	100 ft.	X		4691-0340
4 1/2	114.3	5.27	133.9	40	30	36.0	50 ft.	X		4691-0355
5	127.0	5.77	146.6	40	30	40.0	50 ft.	X		4691-0360
6	152.4	6.76	171.7	40	30	48.0	50 ft.	X		4691-0346

# MASTER-FLEX® 400

Recommended for: A blend of SBR and NBR, the tube in Master-Flex 400 makes it a good choice for the transfer of bulk materials via suction, pneumatic, or gravity systems. Use it where abrasion resistance is the primary requirement and static conductivity is also needed. Available in sizes up to 8", it can also be used for vacuum or ducting service.



**Temperature range:** -30°F to +140°F (-34°C to +60°C) continuous service.

**Tube:** SBR/NBR blend with carbon black for static dissipation. Black. RMA (Class B) medium oil resistance.

**Reinforcement:** Rigid PVC helix. Black.

**Cover:** Type G (PVC). Green and Black.

**Branding:** Unlabeled.

**Packaging:** Coiled and wrapped in polyethylene.

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Nom. I.D. (in.)	Nom. O.D. (in.)	Max. W.P. (psi)	Suction (in. Hg)	Min. Bend Radius (in.)	Wt. Per Ft. (Lbs.)	Standard Pack	Stock (X) or Min. Order Qty.	Gates Product No.
1 1/2	38.1	1.22	47.8	40	28	3.0	0.40	100 ft. X 7744-6102
2	50.8	2.41	61.2	35	28	4.0	0.54	100 ft. X 7744-6103
2 1/2	63.5	2.98	75.7	35	28	5.0	0.77	100 ft. X 7744-6104
3	76.2	3.87	98.3	30	28	6.0	1.05	100 ft. X 7744-6105
4	101.6	4.65	118.1	30	28	8.0	1.70	100 ft. X 7744-6106
5	127.0	5.77	146.6	30	28	9.0	2.40	100 ft. 1,000 ft 7744-6107
6	152.4	6.85	174.2	25	28	12.0	3.21	100 ft. X 7744-6108
8	203.2	9.10	231.1	25	28	16.0	5.77	50 ft. X 7744-6209

**CHARACTERISTICS AND RESISTANCE INFORMATION FOR HOSE TUBE AND COVER COMPOUNDS**

These ratings are for normal or usual range of the specified compounds.  
 Many are also modified to meet the needs of specific applications.  
 See notes below.

GATES TYPE	A	C	D	G	H	J	K	L	M	P	T	U	V	Z
Elastomer	Poly Chloroprene	Acrylonitrile and Butadiene	Natural Rubber or Styrene Butadiene	Polyvinyl Chloride (plasticized)	Isobutylene and Isoprene	Chlorinated Polyethylene	Cross Linked Polyethylene	Ultra High Molecular Weight Polyethylene	Chloro-sulfonated Polyethylene	Ethylene Propylene Diene	Teflon®	Polyurethane	Fluoro-carbon Fluoro-elastomer	Polyamide Resins
Common Name or Trade Name	Neoprene	Buna-N Nitrile	Gum Rubber, Buna-S	PVC	Butyl	CPE	Gatron™	UHMWPE	Hypalon®	EPDM	Teflon	Urethane	FKM Viton Fluorel	Nylon PA
ASTM	CR	NBR	NR or SBR	—	IIR	CM	XLPE	UHPE	CSM	EPDM	FEP/PTFE	EU	FKM	PA
Physical Strength	Good	Good	Excellent	Fair to Good	Fair to Good	Good	Good	Very Good	Good to Excellent	Good	Very Good	Excellent	Good	Good
RESISTANCE TO:	Good to Excellent	Fair to Good	Excellent	Good to Excellent	Fair to Good	Good	Good	Excellent	Good to Excellent	Good	Excellent	Excellent	Good to Excellent	Good to Excellent
Abrasion	Good	Good	Poor to Fair	Excellent	Excellent	Good	Excellent	Good	Excellent	Excellent	Excellent	Fair to Good	Excellent	Excellent
Weather/Ozone	Good	Good to Excellent	Good	Good	Excellent	Good	Good	Excellent	Good to Excellent	Fair to Good	Excellent	Fair to Good	Good	Excellent
Gas Permeation	Excellent	Excellent	Poor	Good to Excellent	Poor	Good	Excellent	Excellent	Good to Excellent	Poor	Excellent	Good	Excellent	Excellent
Petroleum Oils	Fair to Good	Excellent	Poor	Fair	Poor	Good	Excellent	Excellent	Fair	Poor	Excellent	Fair	Excellent	Excellent
Gasolines	Good	Good to Excellent	Fair	Poor	Excellent	Excellent	Good	Fair	Good to Excellent	Excellent	Excellent	Fair	Excellent	Good
High Temperatures	Fair to Good	Fair	Good	Poor	Good	Good	Good	Good	Good to Excellent	Excellent	Excellent	Fair	Excellent	Good
Low Temperatures	Fair to Good	Fair to Good	Good	Poor	Good	Good	Fair to Good	Fair	Fair	Fair to Good	Good	Excellent	Good	Excellent

A<sub>2</sub> White food grade Neoprene, complies with FDA (tube)  
 C<sub>2</sub> Modification of Nitrile with increased ozone resistance (tube and cover)  
 C<sub>4</sub> Modification to Nitrile tube  
 C<sub>4</sub> Modification of Nitrile with excellent abrasion, tearing and gouging resistance (cover)  
 D<sub>2</sub> White food grade Natural Rubber, complies with FDA (tube)  
 D<sub>3</sub> Natural Rubber  
 B<sub>1</sub> B<sub>2</sub> R Proprietary for special applications. Contact Denver Hose Product Application  
 P<sub>2</sub> Special for Steam Hose applications  
 T<sub>1</sub> FEP  
 T<sub>2</sub> PTFE