



FTB™ & Flowable Fill for Trench Backfill

Vermont Green Line Project

National Grid

April 5, 2016

WHAT IS FLUIDIZED THERMAL BACKFILL?

Flowable fill is an engineered backfill consisting of natural aggregates, a fluidizing agent, cementitious material and water that flows easily into the trench instead of attempting to compact.

Flowable fill is commonly referred to as controlled low strength material (CLSM), controlled density fill (CDF) and slurry.

WHY INTERRA BACKFILLS ?

Hand Excavate-able

Low strength (50-150 psi) like a stiff soil allowing for future access to the subsurface conduits if necessary.

Flow-ability

Flows fluently enough to fill all voids and crevices especially between the conduits, and to bond with the trench sidewalls, eliminating the possibility of settlement.

Maximum Density

Once hardened, flowable fill will be able to support load from the traffic above eliminating the possibility of future settlement. Designed to achieve maximum density at initial set.

Same Day Restoration

Install permanent base asphalt restoration in the same shift.



BENEFITS OF INTERRA BACKFILLS

Eliminate Trench Settlement

inTerra Flowable Fill will fill all voids within the trench and will achieve maximum density in its initial set, eliminating the potential for trench settlement.

Water Permeable

inTerra Flowable Fill's & FTB are water permeable and do not create water dams.

Eliminate Shrinkage and Heaving

inTera Flowable Fill will not shrink or heave once installed eliminating settlement and cracking of the asphalt surface above.

Same Day Restoration

Install permanent base asphalt restoration in the same shift.



PARAMETER	FTB / Flowable Fill	DOT Spec Gravel
Compaction Required?	No	Yes
Maximum Density Achieved	Always	Rarely (Trench too narrow and can't get between conduits)
Settlement	Never	Too Often
Resistance to Freeze-Thaw and Wet-Dry Cycles	Yes	Yes
Create Water Dams?	No	No
Durable over the Long-Term?	Yes	No (Gravel = Settlement)
Labor Resources	Conserved; More Economical	Wasted; Higher Cost
Public Relations:	Better ---	Worse ---
<i>Road Plates Required?</i>	<i>No</i>	<i>Yes</i>
<i>Speed of Trench Restoration</i>	<i>Fast</i>	<i>Slow</i>
<i>Roadway Disruption</i>	<i>Short</i>	<i>Long</i>
Liability	Low	High
Established Method?	Yes	Yes
Proven Method?	Yes	No
COMPARISON SUMMARY	FTB / Flowable Fill is superior to Gravel for Sub-base and Trench Backfill	

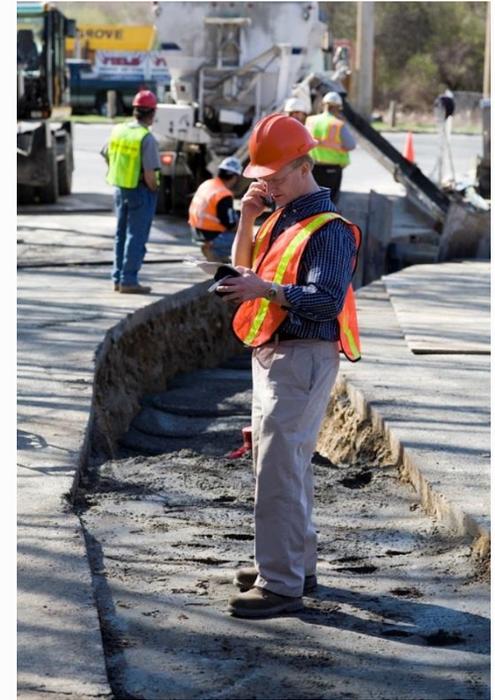
Background

- Permeability: 10^{-5} to 10^{-8} cm/s Native Soils: Glacial Till; Silty Sand; Clay
 10^{-4} cm/s Flowable Fill ('CLSM') vs.
 10^{-3} cm/s Fluidized Thermal Backfill ('FTB')
 10^{-1} to 10^{-3} cm/s DOT Gravel Borrow

Reference

- Matt Campano, VP Utility Division, Daniel O'Connell & Sons
Mobile: 617 – 212 – 2496

Same Day Paving = Reduced Road Plates & Headaches





Controlled Low-Strength Material Waterville to Skowhegan, Maine

Prepared for:

ABB Inc. – Power Systems North America

Cianbro Corporation

Vermont Green Line Project

Background

- Trench:

4-8 feet Deep; ~2-3 feet Wide

~ 90% on Shoulder w/in 1-3 feet of Travel Lane; ~10% in Travel Lane

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Historical Proof

MassPike – Boston

Completed 2000
Photos taken 2006



- West-bound starting just after Copley Sq. Entrance



- No water dams
- No damage from freeze-thaw / wet-dry cycles
- Smooth
- No settlement
- Excellent performance 6-years running

MassPike, Boston

Completed 2000
Photos taken 2006



- No water dams
- No damage from freeze-thaw / wet-dry cycles
- Smooth
- No settlement
- Excellent performance 6-years running

- Same-day paving (3-inch overlay on CDF)
- **Traffic applied within 3-hours of paving**

Connecticut Route 34 (District III)



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- **Traffic applied within 3-hours of paving**

Completed 1999 Photos taken 2006



- No water dams
- No damage from freeze-thaw / wet-dry cycles
- Smooth
- No settlement
- Excellent performance 7-years running

Monroe, Connecticut (District III)



- Same-day paving (3-inch overlay on CDF)
- **Traffic applied within 3-hours of paving**

Completed 1999 Photos taken 2006



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- Smooth
- No settlement
- Excellent performance 7-years running

Harvard Avenue, Brookline, MA

Completed 2000
Photos taken 2006



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- No damage from freeze-thaw / wet-dry cycles
- Smooth
- No settlement
- Excellent performance 6-years running

- Same-day paving (3-inch overlay on CDF)
- **Traffic applied within 3-hours of paving**

Contact	Title	DPW/Company	Phone - Cell	Projects	Location	Owner	Product Supplied	Length	Date
Matt Campano	Vice President - Utility Division	Daniel O'Connell & Sons (Formerly)	617-212-2496	Summit Natural Gas Pipeline	Skowhegan, Maine	Maine DOT	Flowable Fill	8 miles	Summer 2012
				Electric Line	Cambridge, MA	NSTAR/Eversource	Flowable Fill	1 mile	Fall 2013
Brian Zaniboni	Director of Highway Operations	City of Newton, MA	(617) 594-2922	NSTAR Oil Cooling Line	Dedham Street, Newton, MA	NSTAR/Eversource	Flowable Fill	3 miles	Summer 2013
Mario Madrid	Construction Inspector	City of Lowell - Engineering Department	978-674-4070	Various Utility Installations	Lowell, MA	City of Lowell	Flowable Fill	---	2013 - Present
BG Chabot	Sr. Civil Supervisor	National Grid	508-631-1744	S-145 T-146 Cable Replacement Project	Salem, MA	National Grid	Flowable Fill & Fluidized Thermal Backfill	1.5 miles	Summer 2015
Tom Murphy	CM/Electrical Inspector	National Grid	339-221-3616	Carusso & McGovern (master contract)	Eastern MA	National Grid	Flowable Fill	---	November 2012 - Current
				Riley Brothers (master contract)	Eastern MA	National Grid	Flowable Fill	---	August 2011 - December 2012
				Feeney Brothers (master contract)	Eastern MA	National Grid	Flowable Fill	---	January 2013 - Current
					Shattuck Road, Andover, MA	National Grid	Ductbank Concrete	---	2015
Bill Dwyer	Superintendent of Streets	City of Cambridge, MA DPW	617-224-2859	Electric Line	Cambridge, MA	NSTAR/Eversource (Daniel O'Connell)	Flowable Fill	1 mile	Fall 2013