

Appendix A

Flood Technology Vendor Information

Architecture Metals Ltd. Co

Bowe, Pamela

From: Tom Osborne <tom@architecturemetals.com>
Sent: Monday, August 27, 2012 8:39 AM
To: Pugh, Terry
Cc: 'Larry Lopololo'; 'Tom Osborne'; 'Janet Tracy'
Subject: RE: Floodwall estimate
Attachments: 100 year level-8 ft ht-proposal_8.27.12.pdf; 1st significant damage-1 ft ht-proposal_8.27.12.pdf; 1st significant damage-3 ft ht-proposal_8.27.12.pdf; 100 year level-6 ft ht-proposal_8.27.12.pdf

Terry,

I re-ran the numbers for your quotes using mill runs rather than stock material numbers and came up with substantial savings.

Please find enclosed revised proposals assuming the use of mill runs for the materials. The mill is currently running 6 weeks for mill orders.

Best Regards,

Tom Osborne
President
Architecture Metals Ltd. Co.
5500 Military Trail
Ste 22-220
Jupiter, FL 33458
(O) 561.630.0020
(F) 561.744.2755
Tom@AM20.com
www.AM20.com



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From: Tom Osborne [mailto:tom@architecturemetals.com]
Sent: Monday, August 27, 2012 9:25 AM

To: PughTA@cdmsmith.com
Cc: 'Larry Lopololo'; 'Tom Osborne'; 'Janet Tracy'
Subject: RE: Floodwall estimate

Terry,

Thanks for your interest in our Flood mitigation products and our Flood Log system.

Per your request, please find enclosed proposals based on your level of protection scenario.

Please note that I have not included quotes for removable flood walls for the 270 yr and 500 yr floods.

From an engineering perspective it is not suggested that a removable design be used given the water heights projected. It would be more appropriate to use a removable system attached to the top of a concrete stem wall supported by a footer. We don't recommend a removable system to be over 8 feet in height. So the stem wall would have to be designed to meet that height requirement. The concrete wall would also be designed for the water height against the wall as well as the water pushing against the removable wall attached to the top of the support wall.

Please let me know if you need additional assistance.

Best Regards,

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From: Larry Lopololo [mailto:larry@am20.com]
Sent: Friday, August 24, 2012 3:23 PM
To: 'Tom Osborne'
Subject: FW: Floodwall estimate

[Here you go.](#)

From: Pugh, Terry [mailto:PughTA@cdmsmith.com]
Sent: Friday, August 24, 2012 3:19 PM
To: larry@am20.com
Subject: Floodwall estimate

Larry,

Thank you for your time.

The project that we are seeking costs for includes a couple of road crossings. Additionally the method of achieving flood protection may be a blend of technologies which could reduce the length of removable floodwall required. Please provide estimates for the types of flood protection you would recommend based on height and length. Additionally there are areas along the length which have limited width available for placement of flood protection materials.

Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall). Approximate flood wall lengths and heights:

Description of Level of Protection Scenario	Floodwall Height (feet)	Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com



Please consider the environment before printing this email.



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

FLOOD LOG™ PROPOSAL

Customer: CDM Smith
Project: Flood wall project

Date: 8/8/2012
Location: 9200 Ward Parkway
Suite 500
Kansas City, MO 64114

We are pleased to provide you with pricing for your project. This proposal is based upon the supply of custom Flood Log™ from Architecture Metals (AM). Flood Log™ are an exclusive design owned by Flood Panel LLC and Architecture Metals, Ltd. Any modifications to Flood Log™ that requires additional engineering or shop drawings will be at the expense of the owner.

Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	1st sig. damage	6240	W/W	6240	36	1560.00	520.00	47	48
					Totals	1560.00	520.00	47.00	48.00

Materials and Fabrication	\$	97,474.29
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	97,474.29

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (47 locations) measuring 24" x 24" x 18" deep.

Materials Proposal Includes: shop drawings, installation anchors, side walk bolts, flood logs, wall supports, mid-span supports and embeds.

Order Terms:

All domestic materials orders are by purchase order only.

All international materials orders are by purchase order only and are to be paid 100% by wire transfer with order. All international orders are FOB shipping forwarder in the state of Florida, USA.

Billing Terms:

For materials only orders:

- All orders under \$5,000.00 require 100% payment with purchase order
- All orders under \$10,000.00 require 50% payment with purchase order. 50% payment is due prior to shipment of product.
- All orders over \$10,000.00 require 25% with P.O.; 25% with submission drawings; 25% with approved drawings; 25% prior to shipping;

Payment Terms:

Checks made payable to:

Architecture Metals
5500 Military Trail, Suite #22-220
Jupiter, FL 33458
(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

The seller and purchaser agree to the sale and installation and/or delivery of the above specified goods for the above specified price upon the terms and conditions hereinafter set forth on this sales agreement and attached "Conditions of Sale" agreement hereinafter referred to as the "contract". The terms and the terms and conditions set forth on this contract, including the descriptions and The terms and the terms and conditions set forth on this contract, limitations of all warranties and guarantees are incorporated into this contract as if fully set forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed representative. Purchaser certifies by his signature that he fully understands and accepts all the terms and conditions of this contract and has received a copy of this contract .If installation or installation related services are included in this contract then: Installation is based on approved shop drawings. Installation does not include surface preparation, or demolition. Installation does not include obtaining or paying for permits.

NOTES

- 1) **BALANCE TO BE PAID IN FULL PRIOR TO RELEASE OF MATERIALS.**
- *2) **SHIPPING COST PRICED AT TIME OF ESTIMATE AND IS AN ESTIMATE ONLY. SHIPPING WILL BE RE-PRICED AT TIME OF SHIPPING. BALANCE WILL BE ADJUSTED PRIOR TO SHIPPING.**
- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 17055 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

The Panel size (height) proposed herein is based on the information provided to Architecture Metals, by others. The appropriate panel height can only be ascertained by a thorough review of the floor elevations and base flood elevation data. This data is generally available in a site specific Elevation Certificate.

Our Flood Panels are gasketed items that require a smooth, continuous and unbroken surface upon which the gaskets can effectively form a seal. Also, some modifications to the existing plans may need to be made in order to accommodate the anchorage and edge distance requirements as determined by the Structural Engineer. We have not had the opportunity to review a full set of the building's plans and can not make any representation at this point in time as to the extent or need for any potential modifications to accommodate the use of our Panels.

EXCLUSIONS: Unless specifically listed above, AM excludes all Permits, sealants, structural supports, concrete work, concrete repair, installation, anchors and fasteners, field measurements and signed/sealed structural calculations.

SHOP DRAWINGS: The first submittal drawings will be made within two (2) weeks following receipt of a fully executed purchase order and all required technical data. Detailed coordination with other trades is not included. The customer is expected to be able to provide complete and accurate information for use in shop drawing preparation.

PRODUCTION LEAD TIME: The current production lead time is six (6) to seven (7) weeks following receipt of approved shop drawings and field verified sizes, unless otherwise arranged for premium delivery. Production lead time is highly seasonal and will vary over the course of any year. AM suggests that the hardware requirement date be announced by the customer as soon as it is known in order that the best delivery service can be arranged.

DESIGN LOADS & STRUCTURAL SUPPORTS: This design as quoted will withstand FEMA suggested design load without additional supports. It is presumed that the conditions, whether illustrated or not, are capable of adequately supporting the flood shields at the FEMA specified design load.

STRUCTURAL CALCULATIONS: When required by the specifications, AM will provide an analytical report to verify that the provided material meets a particular design load or building code. If a professional engineer's signature or stamp is required (engineering charges will be quoted upon request)

DOCUMENTS: This quotation is based on information provided to AM at the time of quotation. Any project technical information revealed after submittal of this quotation will be subsequently evaluated for contractual impact.

- 1. Quotation based upon manufacturers specification and accessories.
- 2. Manufacturers warranties all pass directly to customer or end user.

EXPIRATION: This quotation is valid for sixty (60) days with release to occur within ninety (90) days from the date of this quotation.

Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



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FLOOD LOG™ PROPOSAL

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Project: Flood wall project

Date: 8/8/2012
Location: 9200 Ward Parkway
Suite 500
Kansas City, MO 64114

We are pleased to provide you with pricing for your project. This proposal is based upon the supply of custom Flood Log™ from Architecture Metals (AM). Flood Log™ are an exclusive design owned by Flood Panel LLC and Architecture Metals, Ltd. Any modifications to Flood Log™ that requires additional engineering or shop drawings will be at the expense of the owner.

Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	100 YR Level	6240	W/W	6240	96	4160.00	520.00	86	87
					Totals	4160.00	520.00	86.00	87.00

Materials and Fabrication	\$	258,434.67
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	258,434.67

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (86 locations) measuring 24" x 24" x 24" deep.

Materials Proposal Includes: shop drawings, installation anchors, side walk bolts, flood logs, wall supports, mid-span supports and embeds.

Order Terms:

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- All orders over \$10,000.00 require 25% with P.O.; 25% with submission drawings; 25% with approved drawings; 25% prior to shipping;

Payment Terms:

Checks made payable to:

Architecture Metals
5500 Military Trail, Suite #22-220
Jupiter, FL 33458
(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.

Material Terms:

Materials Terms after receipt of approved executed Purchase Order:

1/3 payment with order, 1/3 with approved submittal, balance due at time of shipping. No Retainage.



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- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 51523 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

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Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



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		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	1st sig. damage	20760	W/W	20760	12	1730.00	1730.00	143	144
Totals						1730.00	1730.00	143.00	144.00

Materials and Fabrication	\$	143,629.60
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	143,629.60

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (47 locations) measuring 24" x 24" x 18" deep.

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(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

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FLOOD PANEL

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Comments and Exclusions

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(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



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		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	100 YR Level	20760	W/W	20760	72	10380.00	1730.00	143	144
Totals						10380.00	1730.00	143.00	144.00

Materials and Fabrication	\$	512,874.93
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	512,874.93

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

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1/3 payment with order, 1/3 with approved submittal, balance due at time of shipping. No Retainage.

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- *2) **SHIPPING COST PRICED AT TIME OF ESTIMATE AND IS AN ESTIMATE ONLY. SHIPPING WILL BE RE-PRICED AT TIME OF SHIPPING. BALANCE WILL BE ADJUSTED PRIOR TO SHIPPING.**
- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 104958 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

The Panel size (height) proposed herein is based on the information provided to Architecture Metals, by others. The appropriate panel height can only be ascertained by a thorough review of the floor elevations and base flood elevation data. This data is generally available in a site specific Elevation Certificate.

Our Flood Panels are gasketed items that require a smooth, continuous and unbroken surface upon which the gaskets can effectively form a seal. Also, some modifications to the existing plans may need to be made in order to accommodate the anchorage and edge distance requirements as determined by the Structural Engineer. We have not had the opportunity to review a full set of the building's plans and can not make any representation at this point in time as to the extent or need for any potential modifications to accommodate the use of our Panels.

EXCLUSIONS: Unless specifically listed above, AM excludes all Permits, sealants, structural supports, concrete work, concrete repair, installation, anchors and fasteners, field measurements and signed/sealed structural calculations.

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DESIGN LOADS & STRUCTURAL SUPPORTS: This design as quoted will withstand FEMA suggested design load without additional supports. It is presumed that the conditions, whether illustrated or not, are capable of adequately supporting the flood shields at the FEMA specified design load.

STRUCTURAL CALCULATIONS: When required by the specifications, AM will provide an analytical report to verify that the provided material meets a particular design load or building code. If a professional engineer's signature or stamp is required (engineering charges will be quoted upon request)

DOCUMENTS: This quotation is based on information provided to AM at the time of quotation. Any project technical information revealed after submittal of this quotation will be subsequently evaluated for contractual impact.

- 1. Quotation based upon manufacturers specification and accessories.
- 2. Manufacturers warranties all pass directly to customer or end user.

EXPIRATION: This quotation is valid for sixty (60) days with release to occur within ninety (90) days from the date of this quotation.

Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____

Bowe, Pamela

From: Tom Osborne <tom@architecturemetals.com>
Sent: Monday, August 27, 2012 8:25 AM
To: Pugh, Terry
Cc: 'Larry Lopololo'; 'Tom Osborne'; 'Janet Tracy'
Subject: RE: Floodwall estimate
Attachments: 100 year level-8 ft ht-proposal_8.27.12.pdf; 1st significant damage-1 ft ht-proposal_8.27.12.pdf; 1st significant damage-3 ft ht-proposal_8.27.12.pdf; 100 year level-6 ft ht-proposal_8.27.12.pdf

Terry,

Thanks for your interest in our Flood mitigation products and our Flood Log system.

Per your request, please find enclosed proposals based on your level of protection scenario.

Please note that I have not included quotes for removable flood walls for the 270 yr and 500 yr floods.

From an engineering perspective it is not suggested that a removable design be used given the water heights projected. It would be more appropriate to use a removable system attached to the top of a concrete stem wall supported by a footer. We don't recommend a removable system to be over 8 feet in height. So the stem wall would have to be designed to meet that height requirement. The concrete wall would also be designed for the water height against the wall as well as the water pushing against the removable wall attached to the top of the support wall.

Please let me know if you need additional assistance.

Best Regards,

Tom Osborne
President
Architecture Metals Ltd. Co.
5500 Military Trail
Ste 22-220
Jupiter, FL 33458
(O) 561.630.0020
(F) 561.744.2755
Tom@AM20.com
www.AM20.com



"This email (including any attachments) is confidential. If you are not the intended recipient you must not copy, use, disclose, distribute or rely on the information contained in it. If you have received this email in error, please notify the sender immediately by reply email and delete the email from your system. Confidentiality and legal privilege attached to this communication are not waived or lost by reason of mistaken delivery to you.

Architecture Metals (AM) does not guarantee that this email or the attachment(s) are unaffected by computer virus, corruption or other defects. AM may monitor incoming and outgoing emails for compliance with its Email Policy. Please note that our servers may not be located in your country."

From: Larry Lopololo [<mailto:larry@am20.com>]
Sent: Friday, August 24, 2012 3:23 PM
To: 'Tom Osborne'
Subject: FW: Floodwall estimate

Here you go.

From: Pugh, Terry [<mailto:PughTA@cdmsmith.com>]
Sent: Friday, August 24, 2012 3:19 PM
To: larry@am20.com
Subject: Floodwall estimate

Larry,

Thank you for your time.

The project that we are seeking costs for includes a couple of road crossings. Additionally the method of achieving flood protection may be a blend of technologies which could reduce the length of removable floodwall required. Please provide estimates for the types of flood protection you would recommend based on height and length. Additionally there are areas along the length which have limited width available for placement of flood protection materials.

Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall). Approximate flood wall lengths and heights:

Description of Level of Protection Scenario	Floodwall Height (feet)	Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com



Please consider the environment before printing this email.



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

FLOOD LOG™ PROPOSAL

Customer: CDM Smith
Project: Flood wall project

Date: 8/8/2012
Location: 9200 Ward Parkway
Suite 500
Kansas City, MO 64114

We are pleased to provide you with pricing for your project. This proposal is based upon the supply of custom Flood Log™ from Architecture Metals (AM). Flood Log™ are an exclusive design owned by Flood Panel LLC and Architecture Metals, Ltd. Any modifications to Flood Log™ that requires additional engineering or shop drawings will be at the expense of the owner.

Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	1st sig. damage	6240	W/W	6240	36	1560.00	520.00	47	48
Totals						1560.00	520.00	47.00	48.00

Materials and Fabrication	\$	136,464.00
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	136,464.00

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (47 locations) measuring 24" x 24" x 18" deep.

Materials Proposal Includes: shop drawings, installation anchors, side walk bolts, flood logs, wall supports, mid-span supports and embeds.

Order Terms:

All domestic materials orders are by purchase order only.

All international materials orders are by purchase order only and are to be paid 100% by wire transfer with order. All international orders are FOB shipping forwarder in the state of Florida, USA.

Billing Terms:

For materials only orders:

- All orders under \$5,000.00 require 100% payment with purchase order
- All orders under \$10,000.00 require 50% payment with purchase order. 50% payment is due prior to shipment of product.
- All orders over \$10,000.00 require 25% with P.O.; 25% with submission drawings; 25% with approved drawings; 25% prior to shipping;

Payment Terms:

Checks made payable to:

Architecture Metals
5500 Military Trail, Suite #22-220
Jupiter, FL 33458
(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

The seller and purchaser agree to the sale and installation and/or delivery of the above specified goods for the above specified price upon the terms and conditions hereinafter set forth on this sales agreement and attached "Conditions of Sale" agreement hereinafter referred to as the "contract". The terms and the terms and conditions set forth on this contract, including the descriptions and The terms and the terms and conditions set forth on this contract, limitations of all warranties and guarantees are incorporated into this contract as if fully set forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed representative. Purchaser certifies by his signature that he fully understands and accepts all the terms and conditions of this contract and has received a copy of this contract .If installation or installation related services are included in this contract then: Installation is based on approved shop drawings. Installation does not include surface preparation, or demolition. Installation does not include obtaining or paying for permits.

NOTES

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- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 17055 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

The Panel size (height) proposed herein is based on the information provided to Architecture Metals, by others. The appropriate panel height can only be ascertained by a thorough review of the floor elevations and base flood elevation data. This data is generally available in a site specific Elevation Certificate.

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DESIGN LOADS & STRUCTURAL SUPPORTS: This design as quoted will withstand FEMA suggested design load without additional supports. It is presumed that the conditions, whether illustrated or not, are capable of adequately supporting the flood shields at the FEMA specified design load.

STRUCTURAL CALCULATIONS: When required by the specifications, AM will provide an analytical report to verify that the provided material meets a particular design load or building code. If a professional engineer's signature or stamp is required (engineering charges will be quoted upon request)

DOCUMENTS: This quotation is based on information provided to AM at the time of quotation. Any project technical information revealed after submittal of this quotation will be subsequently evaluated for contractual impact.

- 1. Quotation based upon manufacturers specification and accessories.
- 2. Manufacturers warranties all pass directly to customer or end user.

EXPIRATION: This quotation is valid for sixty (60) days with release to occur within ninety (90) days from the date of this quotation.

Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

FLOOD LOG™ PROPOSAL

Customer: CDM Smith
Project: Flood wall project

Date: 8/8/2012
Location: 9200 Ward Parkway
Suite 500
Kansas City, MO 64114

We are pleased to provide you with pricing for your project. This proposal is based upon the supply of custom Flood Log™ from Architecture Metals (AM). Flood Log™ are an exclusive design owned by Flood Panel LLC and Architecture Metals, Ltd. Any modifications to Flood Log™ that requires additional engineering or shop drawings will be at the expense of the owner.

Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	100 YR Level	6240	W/W	6240	96	4160.00	520.00	86	87
					Totals	4160.00	520.00	86.00	87.00

Materials and Fabrication	\$	387,652.00
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	387,652.00

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (86 locations) measuring 24" x 24" x 24" deep.

Materials Proposal Includes: shop drawings, installation anchors, side walk bolts, flood logs, wall supports, mid-span supports and embeds.

Order Terms:

All domestic materials orders are by purchase order only.

All international materials orders are by purchase order only and are to be paid 100% by wire transfer with order. All international orders are FOB shipping forwarder in the state of Florida, USA.

Billing Terms:

For materials only orders:

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- All orders under \$10,000.00 require 50% payment with purchase order. 50% payment is due prior to shipment of product.
- All orders over \$10,000.00 require 25% with P.O.; 25% with submission drawings; 25% with approved drawings; 25% prior to shipping;

Payment Terms:

Checks made payable to:

Architecture Metals
5500 Military Trail, Suite #22-220
Jupiter, FL 33458
(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.

Material Terms:

Materials Terms after receipt of approved executed Purchase Order:

1/3 payment with order, 1/3 with approved submittal, balance due at time of shipping. No Retainage.



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- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 51523 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

The Panel size (height) proposed herein is based on the information provided to Architecture Metals, by others. The appropriate panel height can only be ascertained by a thorough review of the floor elevations and base flood elevation data. This data is generally available in a site specific Elevation Certificate.

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(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

FLOOD LOG™ PROPOSAL

Customer: CDM Smith
Project: Flood wall project

Date: 8/8/2012
Location: 9200 Ward Parkway
Suite 500
Kansas City, MO 64114

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Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	1st sig. damage	20760	W/W	20760	12	1730.00	1730.00	143	144
Totals						1730.00	1730.00	143.00	144.00

Materials and Fabrication	\$	215,444.40
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	215,444.40

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (47 locations) measuring 24" x 24" x 18" deep.

Materials Proposal Includes: shop drawings, installation anchors, side walk bolts, flood logs, wall supports, mid-span supports and embeds.

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Architecture Metals
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(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.



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- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 21816 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

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Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne _____
Title: President _____
Date: 8/8/2012 _____



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

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Date: 8/8/2012
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Item	Door type	OPENING SIZE	MOUNT-WALL OR JAMB	MAXIMUM FLOOD SHIELD SIZE		Total SQ FT	Total linear feet	mid-span support	Spans
		WIDTH (in)	CONFIG.	WIDTH (in)	HEIGHT (in)				
1	100 YR Level	20760	W/W	20760	72	10380.00	1730.00	143	144
Totals						10380.00	1730.00	143.00	144.00

Materials and Fabrication	\$	769,312.40
Sales Tax 6%		None
Freight*		To be determined
Project Total	\$	769,312.40

For signed and sealed shop drawings and calc set with PE stamp ADD: \$1500.00

Notes: Installation not included in quote. The initial installation for this proposal will require a level concrete sill measuring 520 feet x 12" wide x 6" deep with concrete in-ground supports at the mid-span support locations (47 locations) measuring 24" x 24" x 18" deep.

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Payment Terms:

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(o) #561-630-0020
(f) #561-744-2755
Sales@am20.com

Freight Terms: Prepaid

ORDER/SHIP BY: Quote subject to receipt of order within 30 days, due to fluctuations in the metals and fuel markets. Shipment of order being made 6 months from the date of this quotation and AM' s Terms & Conditions of Sale.

Material Terms:

Materials Terms after receipt of approved executed Purchase Order:

1/3 payment with order, 1/3 with approved submittal, balance due at time of shipping. No Retainage.



5500 military Trail, Ste# 22-220, Jupiter, FL 33458 O (561) 630-0020 FAX (561) 744-2755 www.am20.com

The seller and purchaser agree to the sale and installation and/or delivery of the above specified goods for the above specified price upon the terms and conditions hereinafter set forth on this sales agreement and attached "Conditions of Sale" agreement hereinafter referred to as the "contract". The terms and the terms and conditions set forth on this contract, including the descriptions and The terms and the terms and conditions set forth on this contract, limitations of all warranties and guarantees are incorporated into this contract as if fully set forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed forth on this page, the terms and conditions may not be modified except in writing by sellers duly appointed representative. Purchaser certifies by his signature that he fully understands and accepts all the terms and conditions of this contract and has received a copy of this contract .If installation or installation related services are included in this contract then: Installation is based on approved shop drawings. Installation does not include surface preparation, or demolition. Installation does not include obtaining or paying for permits.

NOTES

- 1) **BALANCE TO BE PAID IN FULL PRIOR TO RELEASE OF MATERIALS.**
- *2) **SHIPPING COST PRICED AT TIME OF ESTIMATE AND IS AN ESTIMATE ONLY. SHIPPING WILL BE RE-PRICED AT TIME OF SHIPPING. BALANCE WILL BE ADJUSTED PRIOR TO SHIPPING.**
- 3) **SHIPPING EXPENSE IS BASED ON AN ESTIMATED WEIGHT OF: 104958 Lbs**

Comments and Exclusions

Terms to be mutually agreed upon.

We will provide the Owner with a blank copy of FEMA's Form 81-65, Flood proofing Certificate. The Owner's design professional (Registered Professional Engineer or Architect) is responsible to certify the building's compliance with the specific provisions contained therein.

Field testing of Flood Panels (if required) is not included in the Scope of Work encompassed by this Proposal.

The Panel size (height) proposed herein is based on the information provided to Architecture Metals, by others. The appropriate panel height can only be ascertained by a thorough review of the floor elevations and base flood elevation data. This data is generally available in a site specific Elevation Certificate.

Our Flood Panels are gasketed items that require a smooth, continuous and unbroken surface upon which the gaskets can effectively form a seal. Also, some modifications to the existing plans may need to be made in order to accommodate the anchorage and edge distance requirements as determined by the Structural Engineer. We have not had the opportunity to review a full set of the building's plans and can not make any representation at this point in time as to the extent or need for any potential modifications to accommodate the use of our Panels.

EXCLUSIONS: Unless specifically listed above, AM excludes all Permits, sealants, structural supports, concrete work, concrete repair, installation, anchors and fasteners, field measurements and signed/sealed structural calculations.

SHOP DRAWINGS: The first submittal drawings will be made within two (2) weeks following receipt of a fully executed purchase order and all required technical data. Detailed coordination with other trades is not included. The customer is expected to be able to provide complete and accurate information for use in shop drawing preparation.

PRODUCTION LEAD TIME: The current production lead time is six (6) to seven (7) weeks following receipt of approved shop drawings and field verified sizes, unless otherwise arranged for premium delivery. Production lead time is highly seasonal and will vary over the course of any year. AM suggests that the hardware requirement date be announced by the customer as soon as it is known in order that the best delivery service can be arranged.

DESIGN LOADS & STRUCTURAL SUPPORTS: This design as quoted will withstand FEMA suggested design load without additional supports. It is presumed that the conditions, whether illustrated or not, are capable of adequately supporting the flood shields at the FEMA specified design load.

STRUCTURAL CALCULATIONS: When required by the specifications, AM will provide an analytical report to verify that the provided material meets a particular design load or building code. If a professional engineer's signature or stamp is required (engineering charges will be quoted upon request)

DOCUMENTS: This quotation is based on information provided to AM at the time of quotation. Any project technical information revealed after submittal of this quotation will be subsequently evaluated for contractual impact.

- 1. Quotation based upon manufacturers specification and accessories.
- 2. Manufacturers warranties all pass directly to customer or end user.

EXPIRATION: This quotation is valid for sixty (60) days with release to occur within ninety (90) days from the date of this quotation.

Accepted (Signature): _____

(Print Name): _____
Title: _____
Date: _____

By: Tom Osborne
Title: President
Date: 8/8/2012

Eko Flood Systems USA, LLC

Bowe, Pamela

From: Wayne Flittner <wayne@ekofloodusa.com>
Sent: Thursday, September 06, 2012 1:45 PM
To: Pugh, Terry
Subject: EKO info for Terry Pugh at CDM Smith Kansas City Mo

To ; Terry Pugh CFM
CDM Smith
Kansas City Missouri

Hello Terry;

We have done some digging in our current project records to develop estimates for the foundation work for a typical EKO knee wall topped by a removable barrier. Now these estimates should be understood as “estimates only” as they do not include the engineering work nor any dry side drainage collection and pump station work.

Here are some examples close to your indicated needs:

Knee Wall and Foundation to be topped by 5 foot EKO removable barrier—total height 8 feet per lineal foot	\$ 225
Knee Wall and Foundation to topped by 7.5 foot EKO removable barrier—total height 10.5 feet per lineal foot	\$ 285
Knee Wall and Foundation to be topped by 11 foot EKO removable barrier—total height 14 feet per lineal foot	\$ 420
Knee Wall and Foundation to be topped by 9 foot EKO removable barrier ---total height 12 feet per lineal foot	\$415

The EKO components are included in our per square foot estimates for the various wall heights which we supplied a few days ago.

While these are not exact matches to your table , they are close. And they would meet all FEMA, BUREC and CORPS standards as well as those of FM Global—the casualty insurance rating firm. Please call so we can discuss, let us help you on your project.

Heinz and Wayne

Wayne Flittner

Marketing Director, EKO Flood USA, LLC.

1155 Deer Creek Road, Jackson, Wyoming 83001

Mailing Address:

P.O. Box 7475, Jackson, Wyoming 83002

wayne@ekofloodusa.com

307-739-2538

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Bowe, Pamela

From: Heinz Munz <heinz@ekofloodusa.com>
Sent: Friday, August 24, 2012 2:01 PM
To: Pugh, Terry
Subject: Re: Floodwall estimate

Thanks Terry , we are working on it . Give me 1 hour .
Thanks Heinz

----- Original Message -----

From: Pugh, Terry
To: heinz@ekofloodusa.com
Sent: Friday, August 24, 2012 12:59 PM
Subject: Floodwall estimate

Heinz,

Thank you for your time. Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall).

Description of Level of Protection Scenario	Floodwall Height	Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pugh@cdmsmith.com | cdmsmith.com



Please consider the environment before printing this email.

Bowe, Pamela

From: Heinz Munz <heinz@ekofloodusa.com>
Sent: Friday, October 05, 2012 1:02 PM
To: Pugh, Terry
Subject: Re: Floodwall estimate

Importance: High

Hello Terry , thanks for taking my phone call . Like I told you on the phone , we will fabricate our EKO Parts in the US and will be more competitive with our f2 price. We are talking in the \$120.00 range .

Thanks again and please let me know what else we can do to help you with the project.

Heinz

Heinz Munz

CEO, President, Eko Flood Systems USA, LLC.

1155 Deer Creek Road Jackson, Wyoming 83001

Mailing Address:

P.O. Box 7475, Jackson, Wyoming 83002

heinz@ekofloodusa.com

307-739-2538 Office

307-730-0010 Cell

----- Original Message -----

From: [Pugh, Terry](#)
To: [Heinz Munz](#)
Sent: Friday, August 24, 2012 1:12 PM
Subject: RE: Floodwall estimate

Heinz,

A few other details. This project does have a couple of roads that it crosses and may end up being a blend of technologies so the length may be less. One possible scenario includes making the taller wall (shorter section) a permanent flood wall, this reduces the length of the overall project for removable floodwall to around 1700 feet in length. The heights with the 1730 length below would remain the same.

Sincerely,

Terry Pugh

From: Heinz Munz [<mailto:heinz@ekofloodusa.com>]
Sent: Friday, August 24, 2012 2:01 PM
To: Pugh, Terry
Subject: Re: Floodwall estimate

Thanks Terry , we are working on it . Give me 1 hour .
Thanks Heinz

----- Original Message -----

From: [Pugh, Terry](#)
To: heinz@ekofloodusa.com
Sent: Friday, August 24, 2012 12:59 PM
Subject: Floodwall estimate

Heinz,

Thank you for your time. Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall).

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	8.5	1730
500- Year Level	14	520
	12	1730

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com



Please consider the environment before printing this email.

Bowe, Pamela

From: Wayne Flittner <wayne@ekofloodusa.com>
Sent: Friday, August 24, 2012 2:47 PM
To: Pugh, Terry
Subject: Re: Floodwall estimate

Hello Terry:

While Heinz is assembling per square foot costs , he asked me to provide data on the foundations required. You already ' get it ' in that the footer for a one foot wall is less than for a fourteen foot wall.

Now,since we are "holding back water", as the height increases, the subsurface seepage issues become critical—and this depends on the soil conditions as you can imagine. So estimates here are dangerous unless we have soil test data.

We also consider blending removable barriers where they make sense with permanent but pleasing concrete walls as illustrated by the Grand Ol Opry photos. There we achieved a balance in appearance to match the brick character of Opryland buildings and walkways. Our openings were used to give all the required easy public access as well as the needed commercial and safety access. FM Global—the casualty insurance rating firm -- approved the installation, a key requirement of Gaylord Entertainment, the owners and funding source.

For your scenarios, you may want to consider our low knee wall (3-4' high) with removable barrier on top to achieve the protection height needed at a lower cost. The knee walls can include "pedestrian or road ground level openings" which can easily be closed with our stop log system. This gives you the first 3-4 feet of protection needed, then you can add the removable barrier on top to meet the rising flood crest. Now this can be done in stages, for example ,if you need 12 feet, the knee wall gives you the first 3-or 4 feet. Close the openings. If the crest rises, add your 8 foot posts but for speed just add 4 feet of logs. If the crest continues to rise, add the final four feet. It is a doable flexible system.

At Opryland they did a trial with untrained staff/management people and the barriers were up in less than half the calculated time. We can provide crew size and time elements for a wall of x feet high, assuming storage is not miles away from the wall site.

This information may help you in your analysis.

Wayne

Wayne Flittner

Marketing Director, EKO Flood USA, LLC.
1155 Deer Creek Road, Jackson, Wyoming 83001
Mailing Address:
P.O. Box 7475, Jackson, Wyoming 83002
wayne@ekofloodusa.com
307-739-2538

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----- Original Message -----

From: [Pugh, Terry](#)

To: heinz@ekofloodusa.com

Sent: Friday, August 24, 2012 12:59 PM

Subject: Floodwall estimate

Heinz,

Thank you for your time. Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall).

Description of Level of Protection Scenario	Floodwall Height
First Significant damage	3
	1
100- Year Level	8
	6
270- Year Level (1993 Flood)	10.5
	8.5
500- Year Level	14
	12

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pugh@cdmsmith.com | cdmsmith.com



Please consider the environment before printing this email.

Bowe, Pamela

From: Heinz Munz <heinz@ekofloodusa.com>
Sent: Friday, August 24, 2012 2:54 PM
To: Pugh, Terry
Subject: Your request
Attachments: Installation Document and Manuel.docx

Importance: High

Hello Terry , Thanks for giving us the opportunity to provide you with prices for your project. You will get 2 e-mails , 1 with the price per square foot , and one with suggestions and ideas for your project .

Flood Wall Height :	3	price per F2 :	\$ 125.00
Flood Wall Height :	1	price per F2 :	\$ 105.00
Flood Wall Height :	8	price per F2 :	\$ 135.00
Flood Wall Height :	6	price per F2 :	\$ 130.00
Flood Wall Height :	10.50	price per F2 :	\$ 140.00
Flood Wall Height :	8.50	price per F2 :	\$ 135.00
Flood Wall Height :	14.00	price per F2 :	\$ 145.00
Flood Wall Height :	12.00	Price per F2 :	\$ 140.00

All prices include delivery to Kansas City jobsite and installation blueprints and installation training . We also can provide foundation engineering blueprints and storage containers.

Construction, on –site supervision , for the EKO related installation will be billed at \$850 per day plus travel costs.

I am attaching an installation manual . If you need any technical information please send me an e-mail.

Thank you for contacting EKO.

Regards Heinz

Heinz Munz

CEO, President, Eko Flood Systems USA, LLC.
1155 Deer Creek Road Jackson, Wyoming 83001

Mailing Address:

P.O. Box 7475, Jackson, Wyoming 83002

heinz@ekofloodusa.com

307-739-2538 Office

307-730-0010 Cell

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Operation and Maintenance Manual



EKO Removable Barrier Installation

Copyright November 2011

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Securing The Braces

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Securing The Container

Introduction:

The EKO Removable Barrier Floodwall will perform dependably and reliably in the future. Each component has been carefully engineered to be easy to work with, handle and install. All the special tools, rubber mallet, wrenches and, Allen wrenches for cover plates are supplied in a tool box... Since the EKO wall for your installation is less than 7 feet tall, the components are all light enough that what 'heavy lifting and transporting " is needed can be done with an average size forklift. The "spare parts"" needed are supplied and included in the Storage Container.

The Storage Container:

The storage container is a "customized" standard 20 foot cargo container with a large side opening for easy forklift access, is well ventilated to provide air circulation to reduce interior temperatures. Special racking for the posts and beams is included to make storing easy, to make inventory checks easy and accurate. Everything has a place, clearly marked. Secure exterior locking pads are provided for the installation of whatever security system you prefer.

Each Container is clearly marked on the outside indicating the wall sections where the components in the container go. If the storage site is remotely located from the wall alignment, the Container can easily be loaded onto a flatbed trailer and transported to the appropriate location along the wall alignment where it can be opened, the contents removed and positioned along the wall using a forklift.



Wall storage



Checking the Inventory in the Container.

A check of the components in the Container of posts , beams, bolts, tension hold downs for each section against the Recorded Inventory should be done to make sure when you get it all to the wall site for set up all parts are there.

This is a double check against the Inventory recorded after the prior event or after a scheduled routine Maintenance review. The Parts Inventory is also part of this recording process.



Site Preparations;

This is a routine check of making sure access gates are open, walking the alignment and removing any accumulated dirt or residue from the sealing strips and post anchor plates with a pressure washer or broom. The cover plates on the wall end brackets should be removed as well as the post anchor plate cover plates .This can be done with the appropriate size Allen wrench.



Transporting The Posts and Beams;

Generally, if possible it is advisable to transport the Storage Container to the site on a flatbed trailer. Or transport the posts to the alignment on a forklift. Take the posts first. Doing so will let you have two men immediately begin erecting the posts.



Putting the Posts up.

The posts are not too heavy for two men to tilt up into position on the post anchor plate assuming the final design uses a 6 foot post. If higher three men will be needed to position a post .When they have tilted it up, one man can kneel down and rotate the anchor bolt about 90 degrees until the anchor lugs lock into place, then tighten the nuts using the supplied crescent wrench .This team can then move on to the next post and repeat the steps.









Securing The Braces ,

On walls over 6 feet high , back braces are used to provide the needed support for the posts. Two or three men can easily position the brace, tilt it up, and one can then insert the connection pins and secure the pin locking retainers. The men can use a magnetic speed level as a guide while they adjust the screw adjustments assuring a vertical position for the post and assuring the proper loading of the brace support pads. The braces are color coded to the posts to make installation foolproof.







Placing the Beams.

When a load of beams arrives via the forklift, two men can begin positioning the beams in the retaining brackets in the wall end brackets and posts. Pick up one beam at a time with a man at each end to make positioning easier and faster.

The beams are symmetrical and all are of the standard length and weigh about 10 pounds. All the men do is lower the beam with the gasket edge down, into place.













Securing The Hold-Down Clamps:

When all the beams in a section have been properly placed, a few turns of the hold-down clamp wing nut which is an integral part of the post will provide adequate down pressure to firmly hold the beams in place and provide a watertight seal. This step should be repeated as you go down the length of the wall section by section. And this is the last step in erecting the EKO Removable Barrier Flood Wall.

Monitoring The Wall;

when all the set up steps have been completed and the water begins to rise, there are no "operational adjustments" that need to be made. There is nothing that needs to be adjusted. All components have been put in place correctly and secured. As with any levee or floodwall installation during a flood event, normal monitoring /observation is recommended.

Part Two:

Removing the EKO Barrier After the Flood Event

Release the Hold-Down Clamps And Remove the Beams.

This is the first step in removing the barrier components. Releasing the clamps will allow the workers to remove the beams and place them on the forklift for transport back to the Storage Container. Before placing the beams in their racks in the Storage Container. It is advisable to pressure wash the beams to remove any scum or residue. The beam gaskets should be checked for any signs of damage.

Remove The Posts and Braces .

Since the bolts are on the wet side of the post/ barrier, it may be necessary to pressure wash the posts while they are standing in order to remove any silt or residue buildup. This will make it easier to remove the anchor bolts. Place the posts on the forklift for transport to the Storage Container and place them in their racks.

Inventory The Contents.

As the components for each section are returned and placed in the Storage Container an inventory count of beams posts and anchor bolts should be made and recorded on the Inventory Sheet. Any discrepancies should be noted, the sheet signed and dated. Any parts that appear to be damaged should be noted and replaced in the Storage Container from the Spare Parts supply and replacements ordered immediately from EKO to maintain the proper Spare Parts inventory.

Replace The End Bracket and Post Anchor Cover Plates.

This is the final step in securing the wall installation for the next event. Simply screw them in place securely using the Allen wrench.

Maintenance.

A routine "maintenance" schedule can be established on an annual or semi-annual basis. These activities include checking the inventory counts of components for each section in each Storage Container, visually

inspecting the gaskets and noting any need for replacement which can then be scheduled.

Gasket replacement is easily done. There are no adhesives, just use soapy water to make it easy to slip off the old gasket and slide, press on the new .Trim to length. This procedure is the same for the posts and for the end brackets. All use the same gasket.

Examine the posts to make sure all the hold-down wing nuts are in place and visually inspect the sealing strip which is the same material as the beam gaskets and can be replaced in the same manner if necessary.

On site maintenance consists of removing the end bracket cover plates, removing any residue and visually inspecting the gaskets which are of the same material as the posts and beams and can easily be replaced if necessary in the same manner.

Replacement Components.

Any replacement components can be obtained by contacting Customer Service,
info@ekofloodusa.com

Phone: 1-307-739-2538

EKO Flood Systems, LLC

P.O.Box 7475, Jackson ,Wyoming 83002

Flood Control America

Bowe, Pamela

From: George Fryklund <georgefryklund@comcast.net>
Sent: Tuesday, August 28, 2012 3:21 PM
To: Pugh, Terry
Subject: Re: Floodwall Quote

Terry
Suggest using \$100 per square foot for your guidance, which provides all removeable wall elements + tax for the various dimensions in your schedule. Foundation costs are in addition.
Please advise for further assistance.\,

George Fryklund
Flood Control America
978-440-8902

----- Original Message -----

From: [Pugh, Terry](#)
To: floodwall@floodcontrolam.com
Sent: Monday, August 27, 2012 10:41 AM
Subject: Floodwall Quote

Hello Mr. Fryklund,

I am currently working on a project that is in the study phase of determining possible best solutions for flooding issues along a stretch of the Missouri River and a tributary to the Missouri River. I am collecting estimates for both types of temporary flood protection and cost per square foot.

The project that we are seeking costs for includes a couple of road crossings. Additionally the method of achieving flood protection may be a blend of technologies which could reduce the length of removable floodwall required. Please provide estimates for the types of flood protection you would recommend based on height and length. Additionally there are areas along the length which have limited width (between buildings and other natural and built up areas) available for placement of flood protection materials.

Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall).
Approximate flood wall lengths and heights:

Description of Level of Protection Scenario	Floodwall Height (feet)	Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

Thank you for your time.

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com



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Hydrological Solutions, Inc

Bowe, Pamela

From: Kathy Sullivan <KSullivan@HydrologicalSolutions.com>
Sent: Monday, August 27, 2012 11:51 AM
To: Pugh, Terry
Subject: RE: Floodwall Quote
Attachments: ERT.pdf; WIPP features and benefits.pdf; ERT_Page_12.jpg; PRICE CHART.docx

Terry, thank you for your time today. The literature attached shows our size options. All WIPP barriers are custom made to fit the specific size needs you would have. I have listed some prices in the attachment. Freight is based on order size. I will mail a presentation folder, ppt CD and material sample today. Please let me know if you need anything else.

Kathy Sullivan
Hydrological Solutions, Inc.
41232 Park 290 Drive Bldg A
Waller, TX 77484
Toll Free: 800/245-0199
Cell: 281/627-8792
Fax: 936/372-1223

www.hydrologicalsolutions.com

[Learn More About Hydrological Solutions – to watch our 3 minute video please click HERE](#)

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From: Pugh, Terry [<mailto:PughTA@cdmsmith.com>]
Sent: Monday, August 27, 2012 10:24 AM
To: Kathy Sullivan
Subject: Floodwall Quote

Hello,

Thank you for your time. Below is the information referred to as see attached. I am currently working on a project that is in the study phase of determining possible best solutions for flooding issues along a stretch of the Missouri River and a

tributary to the Missouri River. I am collecting estimates for both types of temporary flood protection and cost per square foot for the flood protection.

The project that we are seeking costs for includes a couple of road crossings. Additionally the method of achieving flood protection may be a blend of technologies which could reduce the length of removable floodwall required. Please provide estimates for the types of flood protection you would recommend based on height and length. Additionally there are areas along the length which have limited width (between buildings and other natural and built up areas) available for placement of flood protection materials.

Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example if a footer is needed: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall). Approximate flood wall lengths and heights:

Description of Level of Protection Scenario	Floodwall Height (feet)	OVERALL Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

The terrain along the placement of the floodwall varies by 2 feet as part of the natural terrain, moderately -no extremely steep areas. Slope is based on Lidar information, as this project is in the first stages of research.

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com



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ERT

Emergency Response Tools – Solutions Made Easy



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WIPPTM
Property Protector



Water-Inflated
Spil Stop
Spill Barrier



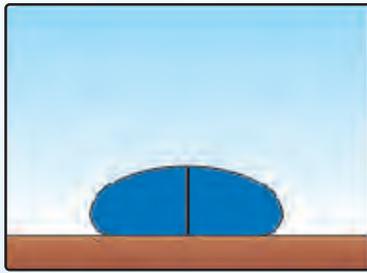
Fluid Filled
Insta-TankTM
Flexible Container



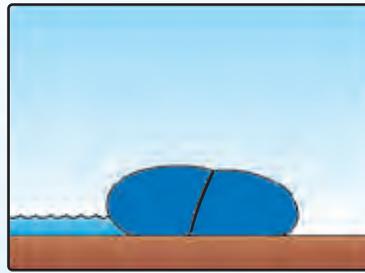
Hydrological Solutions, Inc.

Harnessing the Power of Water

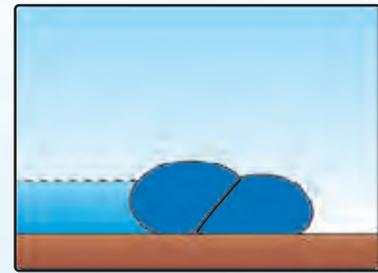
The Patented Baffle Makes the Difference



System prior to flooding.

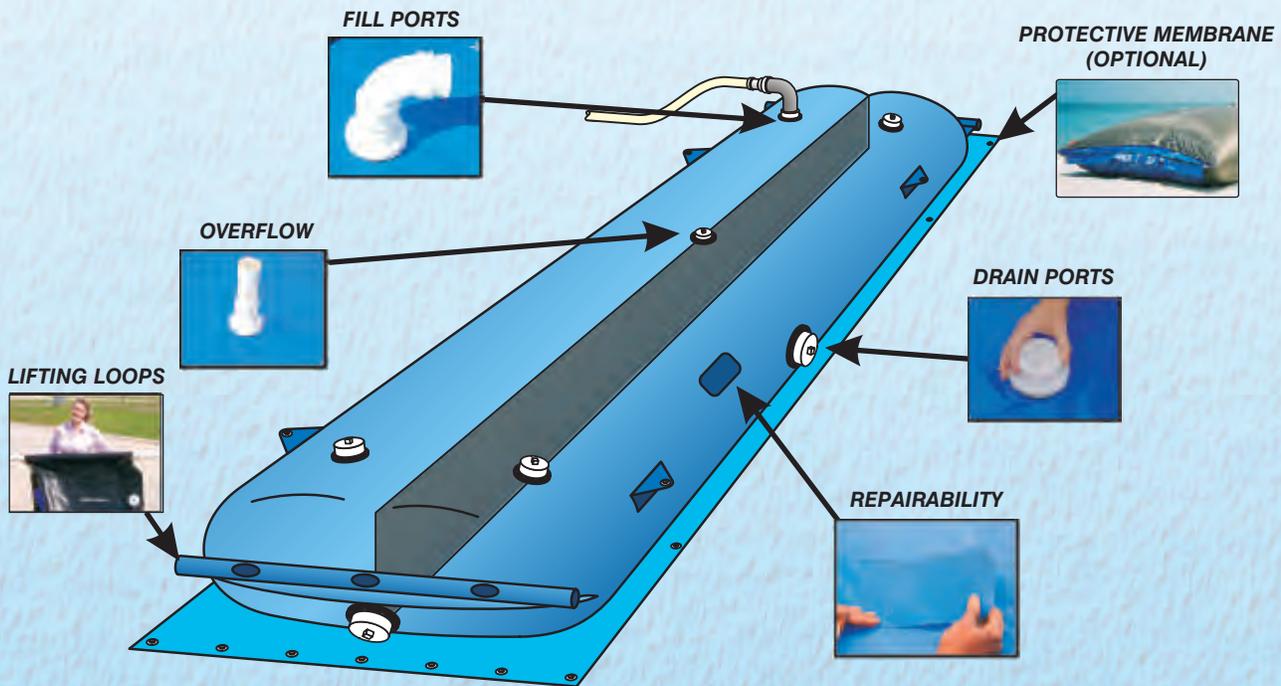


Baffle shifts to stabilize the unit.



Protected site. Baffle has stabilized.

Unique Accessories Make Installation A Snap



Fill port with adapter: Each unit will contain the appropriate number of female threaded fill ports and hose adapters. Available in: 3/4", 2", 3", and 4" inner diameter.

Drain ports: Each unit will be equipped with the appropriate number of drain ports and plugs. Available in: 2", 3", 4", and 8" inner diameter.

Overflow fitting: The overflow fitting provided will allow for proper inflation and over inflation protection.

The WIPP™, Spil-Stop™, and Insta Tank™ have standard sizes and accessories. All accessories are interchangeable on all inflatable systems. Each inflatable system can be custom built for your unique application.

Lifting loop: End loops are available and act as an aid in the installation and removal process.

Protective membrane: Optional outer membrane which provides additional protection to the barrier from rough terrain and debris.

Repairability: The external vinyl membrane is repairable in wet or dry conditions. A repair kit, with instructions, is provided with each order.



Made in the U.S.A.

www.wippsystem.com

800-245-0199



HS Hydrological Solutions, Inc.
Harnessing the Power of Water

COMPACT FOR MINIMAL SHIPPING COST AND EASY STORAGE



2ft x 20ft unit



3ft x 100ft unit



6ft x 100ft unit

All of our products come in custom sizes to fit the customer's needs and are compact for minimal shipping cost and easy to store.

Standard Heights and Dimensions

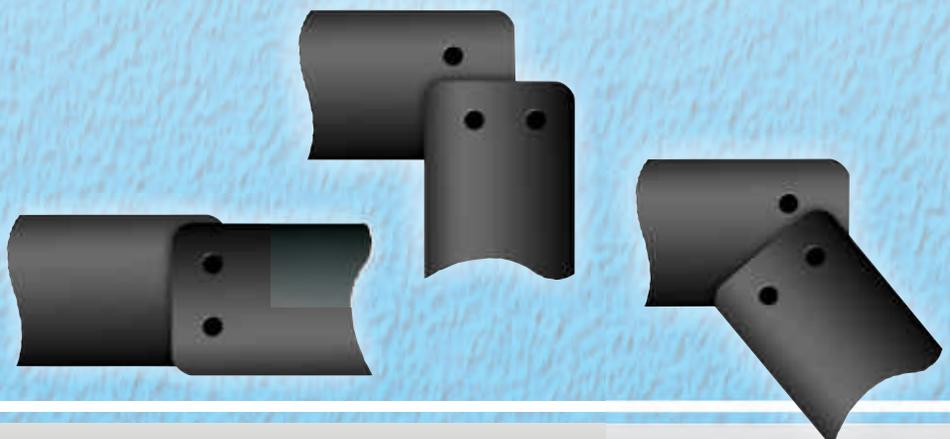
All units are available in customized lengths to suit your unique situation.

Inflated Height (ft/m)	Max. Controllable Water/Sediment Depth (in/cm)	Gallons per Linear ft (L/m)	Inflated Width (ft/m)	HD-22oz Vinyl Weight per (lb per linear ft/kg per linear m)	MD-30oz Vinyl Weight per (lb per linear ft/kg per linear m)
9in/ 0.23	6.75 / 17.18	10 / 130	1.69 / 0.52	1.00/1.50	1.31/1.96
1 / 0.31	9 / 22.9	14 / 174	2.25 / 0.69	1.34/2.00	1.75/2.61
2 / 0.61	18 / 45.7	56 / 695	4.50 / 1.37	2.21/3.29	2.97/4.42
3 / 0.92	27 / 69.6	131 / 1627	7 / 2.14	3.38/5.04	4.60/6.85
4 / 1.22	36 / 91.4	225 / 2794	9 / 2.75	4.21/6.27	5.76/8.58
5 / 1.53	45 / 114.3	352 / 4371	11.25 / 3.43	N/A	8.32/12.39
6 / 1.83	54 / 137.2	506 / 6284	13.5 / 4.12	N/A	10.40/15.49
7 / 2.14	63 / 160.0	688 / 8544	15.75 / 4.81	N/A	12.00/17.87
8 / 2.44	72 / 183.0	901 / 11189	18 / 5.50	N/A	13.64/20.32

Overlap Requirements

Inflated Height (ft)	Overlap Length (ft)
9"	14"
1	2.5
2	3
3	4.5
4	6
5	7.5
6	9
7	10.5
8	12

Units are joined together by an overlapping technique. The units can be joined end to end or at any angle.





WIPP™

for Residential and Commercial Flood Applications

The WIPP™ (water inflated property protector) flood protection system provides effective flood protection and can prevent costly damage to commercial and residential properties. Simply use any available water source, even approaching flood waters, to inflate the WIPP™ unit. The unit relies on a patented internal baffle system for stability. Each unit is manufactured using a commercial grade, flexible membrane and is available in sizes ranging from 1ft to 8 ft high, by 10ft to 100ft in length. The WIPP™ system is rapidly deployed, lightweight, compact in storage, repairable and reusable.



KEEPS ROADWAYS OPEN

If your neighborhood is located along a body of water, our WIPP™ system provides protection from the dangers of flooded streets.



Made in the U.S.A.

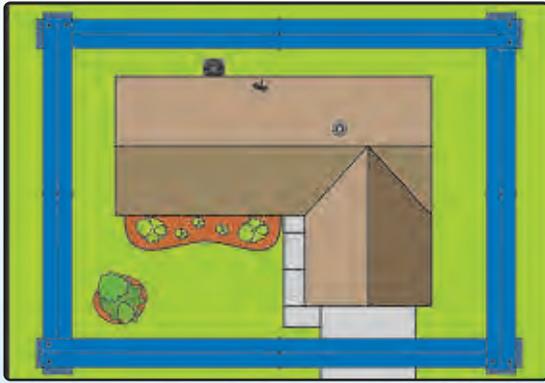
www.wippsystem.com

800-245-0199



HS Hydrological Solutions, Inc.
Harnessing the Power of Water

COMPLETE ENCLOSURE



Completely enclose your property using several barriers and a simple overlapping technique.

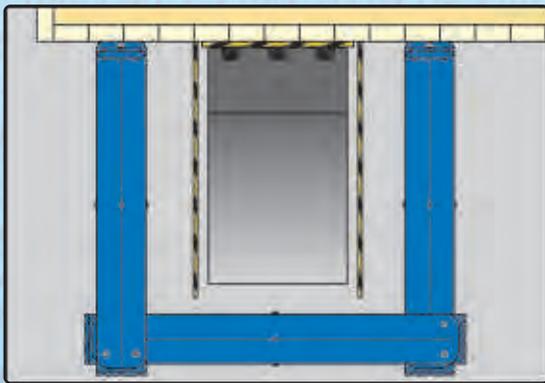
Partial enclosure allows protection on the most vulnerable side of your property.



PARTIAL ENCLOSURE



LOADING DOCK ENCLOSURE



Loading dock enclosure provides access to loading docks and doors while keeping flood waters at bay. In some cases, a pump should be kept on hand to remove rain waters that could accumulate.

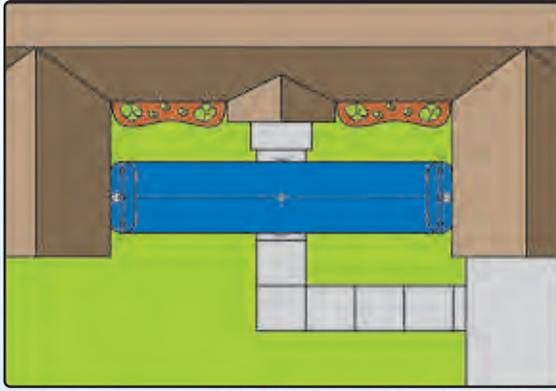


IN-LINE BLOCK

In many instances, one unit can be used to protect your assets.



BETWEEN VERTICAL OBJECTS



When installed between two vertical walls, the barrier creates a tight seal.



The WIPP™ system is reusable, not a loss revenue like sandbags.

WIPP System Height	Sandbag Wall Height	Sandbag per 100ft section filled size (6in H x 15in W x 6in L)	WIPP weight per 100ft section prior to inflation	Sandbag Weight per 100ft section (50lbs per bag)	WIPP Storage Requirements (Cubic Yards)	Sandbag Storage Requirements (20 bags per cubic yard)	WIPP System average cost Per linear foot	Sandbag cost per linear foot
1 foot	1 foot	850	115 lbs	42,000 Lbs	.07 c y	42.5 c y	\$24.75	\$17.39
2 feet	2 feet	1,800	188 lbs	90,000 Lbs	.20 c y	90 c y	\$37.25	\$36.83
3 feet	3 feet	3,450	270 lbs	172,500 Lbs	.33 c y	172.5 c y	53.250	\$70.59
4 feet	4 feet	5,600	392 lbs	280,000 Lbs	.66 c y	280 c y	\$63.88	\$114.58
5 feet	5 feet	8,250	930 lbs	412,500 Lbs	1.15 c y	412.5 c y	\$145.63	\$168.80
6 feet	6 feet	12,350	1098 lbs	617,500 Lbs	1.83 c y	617.5 c y	\$161.38	\$252.68
7 feet	7 feet	18,500	1227 lbs	925,000 Lbs	2.72 c y	925 c y	\$205.13	\$378.51
8 feet	8 feet	27,750	1620 lbs	1,387,500 Lbs	3.80 c y	1,387.5 c y	\$265.00	\$568.16

Sandbag costs are calculated as follows:

- Estimated bag cost per each \$.55
- Estimated sand cost per bag \$.28
- Cost of labor for filling & installing per bag \$.35
- Estimated removal & disposal costs per bag \$.88
- Total cost per sandbag \$2.06

* Sand bag costs vary greatly. Sandbag costs are derived from cost analysis provided by the U.S. Army Corps of Engineers. The above cost categories are subject to variations due to sandbag size, type, sand availability, and labor costs.

* The WIPP system cost are calculated by the purchase price plus \$0.20 a linear foot for labor required to install.



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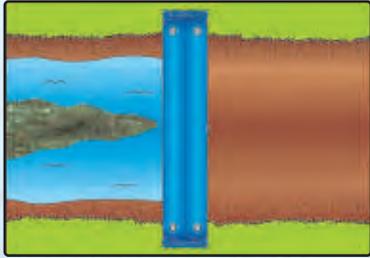
HS Hydrological Solutions, Inc.
Harnessing the Power of Water

SPIL- STOP™



Spil-Stop™ Spill Barriers are specifically engineered to contain accidental spills until they can be properly handled. The patented internal baffle system creates stability to keep the unit in place. The units are quick to deploy, easy to drain, roll, and store! Spil-Stop™ is custom made to fit your containment needs.

STREAM BLOCK



If a stream or water source has been contaminated, this application can be used to stop the contamination from spreading or entering a shared water supply until the contamination can be removed properly.

PLANT SPILL CONTAINMENT



This application is used to contain spills/overflows until they can be properly handled.

TRUCK SPILL CONTAINMENT



The truck containment method is used to contain potential hazardous substances until they can be properly disposed of by the appropriate emergency response team(s).

EMERGENCY SPILL CONTAINMENT

Spil-Stop™ can be used by emergency response teams to help prevent contamination. The units are compact for easy storage, easy installation, and quick deployment.



INSTA-TANK™



Insta-Tank™ units are constructed from a heavy duty polyester reinforced vinyl material suitable for containing fresh water. The durability of the material provides many years of use from one Insta-Tank™ water storage container. InstaTank™ is compact and lightweight allowing for easy storage, moving and deployment.

Insta-Tank™ units can be installed on trailers, flatbeds, box units, and on raised areas created with blocks or pallets. To prepare the area where the Insta-Tank™ will be installed, simply remove debris where the base of the unit will be positioned. If necessary, an additional membrane can be placed on rough surfaces to prevent damage. Next, unroll the Insta-Tank™ and connect a hose from a water hydrant and fill! Fill ports are available in 3/4", 2", 3" and 4" sizes to fit your needs.



The Insta-Tank™ has a wide range of uses:

- ***Fresh Water Storage (cleaning)***
- ***Temporary Water Storage (events/festivals)***
- ***Rainwater Storage (commercial or residential)***
- ***Potable Water Storage (drinking/cooking)***



Multiple units can be delivered in a single shipment, to meet emergency needs.

Free Aqua-Comp analysis software allows you to replicate the behavior of a selected size unit in a chosen environment.



GSA Schedule # GS-07F-0543N

www.wippsystem.com
800-245-0199



WIPP SYSTEM FEATURES AND BENEFITS

PATENTED BAFFLE SYSTEM:

The WIPP System utilizes a patented fixed internal baffle system which insures a safe and stable system. When the WIPP System is exposed to uneven hydrostatic pressure, the internal baffle system locks into place. The WIPP Systems' system *guarantees* stability & safety.

USER FRIENDLY:

WIPP Systems have a unique lifting loop on each end to facilitate installation and removal. This allows for *minimal manual labor* during the installation & removal process.

ENVIRONMENTALLY FRIENDLY:

WIPP Systems are installed using any available water source, fire hydrants, river water, ocean water or even a garden hose on the smaller size units. With WIPP there is minimal adverse impact to the environment. Post job restoration is not needed using WIPP Systems. Simply drain and roll up the WIPP barriers for storage and future use.

LARGE SCALE JOBS:

Multiple WIPP Systems can be connected together to cover large areas. The WIPP Systems are connected to one another by utilizing a simple overlapping procedure that requires *no additional time* during the installation and WIPP units of varying sizes can be connected to each other.

SAVE TIME AND MONEY:

WIPP Systems install in less time than using sand bags with just a few people and a pump source. Larger WIPP units may need to be carried with fork lifts or pallet jacks. Several hundred feet of WIPP flood barriers can be installed in just one day with a team of 4-6 people, 2 pump hoses and 1 forklift. Smaller WIPP units can be installed with 1-2 people and a garden hose.

DURABILITY:

WIPP Systems are made with a scrim reinforced PVC material and industrial grade fittings and intended to be reused numerous times. The WIPP System system is infield *repairable* in wet or dry conditions utilizing a repair kit which is provided with each order.



Technical Characteristics

	Test Method	Unit	KPF-30
Total Weight	ASTM D-3776	oz / sq.yd	30
Coating			PVC
Base Fabric Denier			Polyester 1500D
Base Fabric Weight		oz / sq.yd	12
Vinyl Weight		oz / sq.yd	18
Surface			Matt
Tensile Strength	ASTM D 751	lbs. / inch	700X650(±30)
Tear Strength	ASTM D 751	lbs.	170 X 140(±20)
Adhesion	ASTM D 751	lbs. / inch	20 X 17(±2)
UV Resistance			Ultra Violet Protected
Cold Crack	MIL-C-20696	°F	-22
Color Fastness to Light	ISO105 B02:2000 Xenon-Arc.-Lamp	Grade	Above 5
Available Width		inch	61.5
Standard Roll Length		yd / roll	50
Remark			

We believe this information is the best currently available specification and above are average of our test result. All our technical characteristics are indicated with a 5% tolerance.

Primary color: Royal Blue
Alternative Colors: Orange



WIPP™ System Product Specification

1.1 WIPP™ Product Description

WIPPs™ are water inflated barriers used to control invasive floodwater. A WIPP™ is a single tube device which utilizes a patented inner restraint baffle/diaphragm stabilization system.

1.2 Specification

A water-inflated temporary barrier shall consist of the following:

- 1) **The water inflated barrier will consist of a self contained, single tube with an inner restraint baffle(s)/diaphragm(s) stabilization system. The water-inflated barrier must have the ability to stand alone, without any additional external mechanical or gravitational stabilization devices, as a positive water barrier and water management system.**
- 2) The water-inflated barrier shall be produced from heavy gauge polyvinyl chloride (PVC) reinforced with polyester. The PVC fabric used to create the inflatable barrier will be infield repairable utilizing a vinyl adhesive and patch material.
- 3) The water-inflated barrier must maintain mechanical stability in addition to providing anti rolling when exposed to uneven hydrostatic pressure from either side
- 4) The self-contained water inflated barrier shall have threaded fill ports and drain ports for rapid inflation and draining.
- 5) Method for connecting the individual units together will consist of overlapping the end of the units a specific length which will create a watertight connection. No other devices or methods for connecting the barriers are required.

1.3 Barrier size requirements

The water-inflated temporary barrier height shall be determined as follows:

- 1) Static water height conditions shall not exceed 75% of the properly filled height of the barrier.
- 2) Dynamic water height conditions shall not exceed stated value during hydrodynamic installation procedures (See dynamic installation instructions for complete list of requirements).
- 3) Installation site criteria are required for assessment of all relevant factors.

Excess slope, high water velocities, dynamic loads resulting from wave actions, mounting surface irregularities, and changes in interrelated hydrological conditions can increase the required water inflated barrier height verses retention height requirements.

The WIPP System when properly used is a temporary barrier against surface water. Due to the unknown variables involved with the complex task of preventing floodwater from entering a facility, Hydro-Solutions, Inc. accepts not responsibility for floodwater infiltration under or around a properly inflated WIPP System. The WIPP System cannot prevent water from migrating underneath the system via cracks, crevices, pipes, etc., and/or porous soil conditions. Preparations should be made prior to a flood event and the installation of the WIPP System to make sure any area where water can infiltrate is properly sealed.

WIPP™ System (100-ft long)				Sandbags (100-ft long wall)			
Height (ft)	Weight prior to inflation (lbs)	Storage Requirements (ft long x ft wide x ft high)	Storage Requirements (cubic yds)	Height (ft)	Number*	Weight (lbs)**	Storage Requirements (cubic yds)***
1	115	2 x 1 x 1	.7	1	850	42,000	42.5
2	188	3 x 1.25 x 1.25	1.6	2	1,800	90,000	90
3	270	4 x 1.5 x 1.5	3	3	3,450	172,500	172.5
4	392	4.5 x 2 x 2	6	4	5,600	280,000	280
5	930	5 x 2.5 x 2.5	10.4	5	8,250	412,500	412.5
6	1,098	5.5 x 3 x 3	16.5	6	12,350	617,500	617.5
7	1,227	6 x 3.5 x 3.5	24.5	7	18,500	925,000	925
8	1,620	6.5 x 4 x 4	34.7	8	27,750	1,387,500	1,387.5

*Based on a filled size of 27 in long x 15 in wide x 6 in high. **Based on 50 lbs per bag. ***Based on 20 bags per cubic yard.



WIPP Referrals

US Corps of Engineers-NOLA

New Orleans Branch
GSA Purchase of 1,435lf of 6ft & 8ft high barriers for the aftermath repairs of hurricane Katrina

Town of Westport-Wisconsin

Debra Flynn (608) 849-4372
Jan 2006 town purchased 850 linear feet of 2ft, 3ft and 4ft high barriers. After initial use and storage successfully used again in 2008. June 2008 bought 165 ft more of the 2ft high WIPP for perimeter of lake and marsh area

Washington State Dept Fish&Wildlife

Purchased 1,850 8ft high WIPP barriers to install behind a levee during repairs

LaPlaya Golf & Resort-Naples, FL

Ron Vuy (239) 598-5708
Purchased over 1,100ft of 6ft high WIPP barriers to protect cabanas along Gulf Coast. Barriers made with outer protective membrane to minimize damage from floating debris

North Dakota DOT

Through distributor: MACS Hardware
Purchased 7,800lf of 2ft high and 2,600lf of 3ft high WIPP to keep highways open

Branch Highways, Inc.-Roanoke, VA

Greg Montgomery (540) 366-3161
Purchased 425 lf of 1 ft high WIPP to divert water from concrete apron at Roanoke airport.

Cedar Falls Utilities, IA

Ed Oltoff (319) 268-5309
Purchased 1,000 ft of 6ft high barriers in 2007 and 1,200lf of 8ft high barriers in 2009 to protect plant from flooding if levee overtops

Denver Performing Arts Complex-CO

Joseph Cousineau (720) 865-4215
Upon suggestion of FM Global Insurance they purchased several 2ft high WIPP barriers for doorways

City of Fargo, ND

Through distributor: MACS Hardware
Purchased 1,350lf of 4ft high WIPP barriers

Industrial Brush Company

Fairfield, NJ

Tim Enchelmaier
(973)575-0455
Purchased 200 linear feet of 2 ft high WIPP units in 2002. Stored and used again 5 yrs later

Trunkline LNG-Lake Charles, LA
Jennifer DeBose (337) 475-4279
Purchased 5,275 lf of 4 ft high WIPP to surround several buildings.

Chester Water Authority-PA
Ken Lawrence (717) 529-2244
Purchased 38 lf of 4' to protect plant from previous flooding.

Town of Union-New York
Phillip Schmidt (607) 786-2980
Purchased 200ft of 6ft high WIPP barriers to protect the main building and 200ft to protect the state building

Paulding County Carnegie Library
Paulding, OH
Susan Hill (419) 399-2032
FEMA approved and funded the purchase of 167 lf of 2 ft high WIPP units for flood control.

City of DesPlaines-IL
Paul Berger (847) 391-5340
Purchased 4ft x 80ft WIPP for culvert work. WIPP was stored after initial use and used 18 months later for flood protection

Grand Casino Coshatta-LA
Gary Sonnier (337) 738-1370
Purchased 600 lf of 1 ft high WIPP units for flood protection at various locations around casino.

Arkansas Children's Hospital
Harvey Young (501) 364-5929
Purchased 170 lf of 1 ft high WIPP units per request of their insurance company to provide flood protection in three areas inside building

Michigan State University-Lansing, MI
Scott Gardner (517) 355-3372
At the request of their insurance company they bought 610 feet of 8 ft high WIPP units for perimeter protection of the Kellogg building

City of Houston Parking Garage-TX
Walter Kimble (713) 247-2754
Purchased 3ft high WIPP for flood protection in the entrance to parking garage.

Stadium Management-Denver, CO
Wayne Bottom (720) 258-3152
Purchased 150 lf of 2 ft high and 80 lf of 1 ft high WIPP units per request of their insurance company to provide protection of openings in dock area.

TECO – Thermal Energy-Houston, TX
Tiersa Webb (713) 791-6726
Purchased 6 barriers (4 ft & 5 ft high) for flood protection of entrance and exits in plant facility of Texas Medical Center.

Grand Casino, Tunica-MS
Ann Wallace (601) 363-2788
Purchased 4,000 lf of 3 ft high WIPP units and 500 lf of 6 ft high WIPP units to protect parking lot

TECO – Thermal Energy-Houston, TX
Tiersa Webb (713) 791-6726
Purchased 6 barriers (4 ft & 5 ft high) for flood protection of entrance and exits in plant facility of Texas Medical Center.
2/02

USACE – New Orleans
Michael Lowe (504) 862-2244
Purchased 1,350 lf of 3 ft high WIPP units for London Avenue Wall Test

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*Based on a filled size of 27 in long x 15 in wide x 6 in high. **Based on 50 lbs per bag. ***Based on 20 bags per cubic yard.

4ft high WIPP controls 3ft of water

4x25	\$2,090
4x50	\$3,390
4x75	\$4,445
4x100	\$5,370

5ft high WIPP controls 3.75ft of water

5x25	\$2,425
5x50	\$4,100
5x75	\$5,250
5x100	\$6,700

6ft high WIPP controls 4.5ft of water

6x25	\$2,725
6x50	\$4,750
6x75	\$6,975
6x100	\$9,000

7ft high WIPP controls 5.25ft of water

7x25	\$3,325
7x50	\$6,300
7x75	\$8,775
7x100	\$11,500

8ft high WIPP controls 6ft of water

8x25	\$4,025
8x50	\$7,400
8x75	\$10,875
8x100	\$14,200

Bowe, Pamela

From: Kathy Sullivan <KSullivan@HydrologicalSolutions.com>
Sent: Thursday, September 06, 2012 12:23 PM
To: Pugh, Terry
Subject: RE: Floodwall Quote
Attachments: WIPP property assessment.doc

Terry I have the following barriers in stock ready to ship They cost a little more because they are made with 4inch fittings instead of the standard 2inch size

(10) 2 x 50 \$1,915 each
(3) 3 x 50 \$2,790 each

Per each prices below include the standard 2inch fittings

2x25 \$1,075 each
2x50 \$1,675 each
2x75 \$2,325 each
2x100 \$2,875 each

If you would like a price quote for specific sizes or to place an order please return the form attached or call me for assistance – Thank You !

Kathy Sullivan
Hydrological Solutions, Inc.
41232 Park 290 Drive Bldg A
Waller, TX 77484
Toll Free: 800/245-0199
Cell: 281/627-8792
Fax: 936/372-1223

www.hydrologicalsolutions.com

[Learn More About Hydrological Solutions – to watch our 3 minute video please click HERE](#)

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From: Pugh, Terry [mailto:PughTA@cdmsmith.com]
Sent: Thursday, September 06, 2012 11:40 AM
To: Kathy Sullivan
Subject: RE: Floodwall Quote

Kathy,

Can I get a price quote on the 2-foot tall systems:

2x25
2x50
2x75
2x100

Sincerely,

Terry Pugh

From: Kathy Sullivan [mailto:KSullivan@HydrologicalSolutions.com]
Sent: Monday, August 27, 2012 11:51 AM
To: Pugh, Terry
Subject: RE: Floodwall Quote

Terry, thank you for your time today. The literature attached shows our size options. All WIPP barriers are custom made to fit the specific size needs you would have. I have listed some prices in the attachment. Freight is based on order size. I will mail a presentation folder, ppt CD and material sample today. Please let me know if you need anything else.

Kathy Sullivan
Hydrological Solutions, Inc.
41232 Park 290 Drive Bldg A
Waller, TX 77484
Toll Free: 800/245-0199
Cell: 281/627-8792
Fax: 936/372-1223

www.hydrologicalsolutions.com

[Learn More About Hydrological Solutions – to watch our 3 minute video please click HERE](#)

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From: Pugh, Terry [<mailto:PughTA@cdmsmith.com>]
Sent: Monday, August 27, 2012 10:24 AM
To: Kathy Sullivan
Subject: Floodwall Quote

Hello,

Thank you for your time. Below is the information referred to as see attached. I am currently working on a project that is in the study phase of determining possible best solutions for flooding issues along a stretch of the Missouri River and a tributary to the Missouri River. I am collecting estimates for both types of temporary flood protection and cost per square foot for the flood protection.

The project that we are seeking costs for includes a couple of road crossings. Additionally the method of achieving flood protection may be a blend of technologies which could reduce the length of removable floodwall required. Please provide estimates for the types of flood protection you would recommend based on height and length. Additionally there are areas along the length which have limited width (between buildings and other natural and built up areas) available for placement of flood protection materials.

Below are four scenarios of protection levels that we are seeking cost estimates for, along with any support technology information. (For example if a footer is needed: the footer required for a 1 foot flood wall should be less than for the 14 foot flood wall). Approximate flood wall lengths and heights:

Description of Level of Protection Scenario	Floodwall Height (feet)	OVERALL Floodwall Length (feet)
First Significant damage	3	520
	1	1730
100- Year Level	8	520
	6	1730
270- Year Level (1993 Flood)	10.5	520
	8.5	1730
500- Year Level	14	520
	12	1730

The terrain along the placement of the floodwall varies by 2 feet as part of the natural terrain, moderately -no extremely steep areas. Slope is based on Lidar information, as this project is in the first stages of research.

Sincerely,

Terry Pugh, CFM | CDM Smith | 9200 Ward Parkway, Suite 500 Kansas City, MO 64114 | Main: (816) 444-8270 | Direct: (816) 412-3118 | pughta@cdmsmith.com | cdmsmith.com

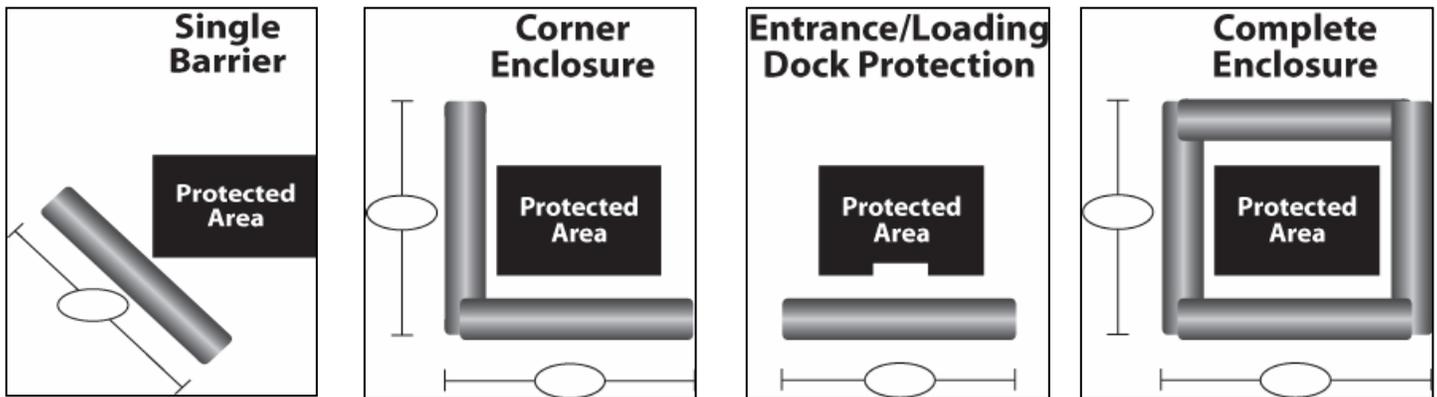


Please consider the environment before printing this email.

WIPP™ Property Assessment Sheet

Customer Name: CDM Smith Inc. on behalf of Municipal Client		Contact Person: Terry Pugh	Date WIPP™ required on site: cost quote
Bill to Address:		Ship to Address:	
City:	State:	Zip:	City: State: Zip:
Phone: 816-412-3118 Fax:		Required linear footage of WIPP™ System: See attached	
Email: pughta@cdmsmith.com		How did you hear about us? <input type="checkbox"/> Sales Rep <input checked="" type="checkbox"/> Web <input type="checkbox"/> Tradeshow <input type="checkbox"/> Trade Journal <input type="checkbox"/> Misc Name of Source: _____	
Anticipated flood water depth where units are to be installed: see attached		Type of water used to inflate the WIPP™ System? <input type="checkbox"/> Freshwater <input checked="" type="checkbox"/> Floodwater	
Surface conditions where the WIPP™ System will be installed? <input checked="" type="checkbox"/> Pavement/Concrete <input type="checkbox"/> Sand <input type="checkbox"/> Mud <input type="checkbox"/> Bed Rock <input type="checkbox"/> Cobble Rock <input type="checkbox"/> Other _____		Are objects present which could potentially damage the WIPP™ System? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Will the WIPP™ System be exposed to stagnant floodwater? <input type="checkbox"/> YES <input type="checkbox"/> NO (possibly) Dynamic or moving floodwater? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		If YES, check all that apply: <input type="checkbox"/> Broken Glass <input type="checkbox"/> Stumps <input type="checkbox"/> Sharp Rocks <input type="checkbox"/> Utility Boxes <input type="checkbox"/> Broken Concrete/Rebar <input type="checkbox"/> Other: _____	
Are slopes or grades present? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Degree of slope from one end of the barrier to the other end? _____ °	Degree of slope from one side of the barrier to the other side of the barrier? _____ °	

PLEASE INCLUDE, ON SEPARATE SHEET, HAND DRAWINGS OF HOW UNITS ARE TO BE PLACED
CIRCLE AND ADD DIMENSIONS TO THE APPROPRIATE STANDARD CONFIGURATION OR INCLUDE DRAWING:



WHEN CONNECTING ONE WIPP™ SYSTEM TO ANOTHER A LOSS OF BARRIER LENGTH WILL BE EXPERIENCED. ALLOWANCES SHOULD BE MADE FOR THE LOSS IN LENGTH OF THE WIPP™ SYSTEM DUE TO THE OVERLAP CONNECTION.

The WIPP™ System when properly used is a temporary barrier against surface water. Due to unknown variables involved with the complex task of preventing floodwaters from entering a facility, Hydro-Solutions, Inc. (HSI) accepts no responsibility for floodwaters infiltrating under or around an installed WIPP™ System. The WIPP™ System cannot prevent water from migrating underneath the system via cracks, crevices, grooves created in the concrete/asphalt surfaces by a broom or raked finish, pipes, etc., and/or porous soil conditions. Preparations should be made prior to the installation of the WIPP™ System to insure that any area where water can infiltrate is properly sealed. These preparations are not guaranteed to completely stop water infiltration but may reduce the amount of seepage under the barrier. A sump area where water can gather and be evacuated during the duration of the flood is required. The size and number of sump areas would depend upon the size of the area being dewatered and the porosity of the soil.

DISCLAIMER:

The WIPP™ Systems ability to control static water is limited to 75% of the recommended inflated height of the system. It is required that a 25% freeboard or amount of the system above the water level be maintained during all phases of flood protection, i.e. 3ft water level on a 4ft high properly inflated WIPP™ System. In moving water environments, or potentially moving water environments, (HSI) will designate a maximum water percentage height on a given WIPP™ System height. (HSI) is not responsible or liable for any damage or injury, and the WIPP™ System(s) are no longer under any implied or written warranty if the water levels exceed these and other stated limitations. The mandatory 25% freeboard requirement must also be maintained in wave or tidal influence environments. If moving water, wave action, tidal influences, slick soil conditions, and other relevant hydrological conditions are present, additional freeboard requirements may be needed. An additional mechanism or structure may be required to stabilize the WIPP™ System in the event that there is not enough surface friction for the system to become stable. In moving water environments the water current may require diverting, and or the WIPP™ System may require an additional external support structure to maintain stability during and after the installation process. (HSI) is not liable for barrier damage caused by exposure to freezing temperatures boats, birds, animals, vandalism, or other external objects or forces which could damage or destroy the WIPP™ System. The surface area where the WIPP™ System is to be installed must be cleared of all debris that could puncture the WIPP™ System (rocks, rebar, etc.) The buyer is responsible for all damages incurred due to objects damaging the WIPP™ System(s). **Rev 010108**

Port-A-Dam

Bowe, Pamela

From: Bob Gatta <bgatta@portadam.com>
Sent: Monday, October 01, 2012 9:49 AM
To: Bob Gatta; Pugh, Terry
Cc: Monte Hickman
Subject: RE: ACOE Presentation

Terry –
One other point – all pricing is FOB Williamstown, NJ.
Thanks,

BOB GATTA
CHIEF EXECUTIVE OFFICER
PORTADAM, INC.
3082 SOUTH BLACK HORSE PIKE, WILLIAMSTOWN, NJ 08094
PH 856.740.0606 x 207 | CELL 518.577.7034 | FX 856.740.0614 | WWW.PORTADAM.COM



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From: Bob Gatta
Sent: Monday, October 01, 2012 10:49 AM
To: 'Pugh, Terry'
Cc: Monte Hickman
Subject: RE: ACOE Presentation

Thank Terry –
Here's what we can provide from a height perspective:

4' high product – \$272.50/ln.ft.
5' high product – \$280.00/ln.ft.
7' high product – \$585.00/ln.ft.
10' high product – \$715.00/ln.ft.
12' high product - \$885.00/ln.ft.

All quantities are based on minimum orders of 100 linear feet, the next price break comes at 5,000 linear feet.
Please let me know if you have any questions.
Thanks,

BOB GATTA
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From: Pugh, Terry [<mailto:PughTA@cdmsmith.com>]
Sent: Monday, October 01, 2012 10:24 AM
To: Bob Gatta
Cc: Monte Hickman
Subject: RE: ACOE Presentation

Mr. Gatta,

Thank you for the information regarding the flood technologies.

Were you going to be able to send some quotes for the different heights of product? I have included the heights again for your reference. The cost comparison that is being performed is by linear foot.

6-foot tall by 745-foot length
8.5-foot tall by 745-foot length
12-foot tall by 745-foot length

8-foot tall by 617-foot length
10.5-foot tall by 617-foot length

Sincerely,

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From: Bob Gatta [<mailto:bgatta@portadam.com>]
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To: Pugh, Terry
Subject: ACOE Presentation

Here's an early presentation by the ACOE regarding their study....
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PORTADAM, INC.

DIVERSION AND COFFERDAM STRUCTURES



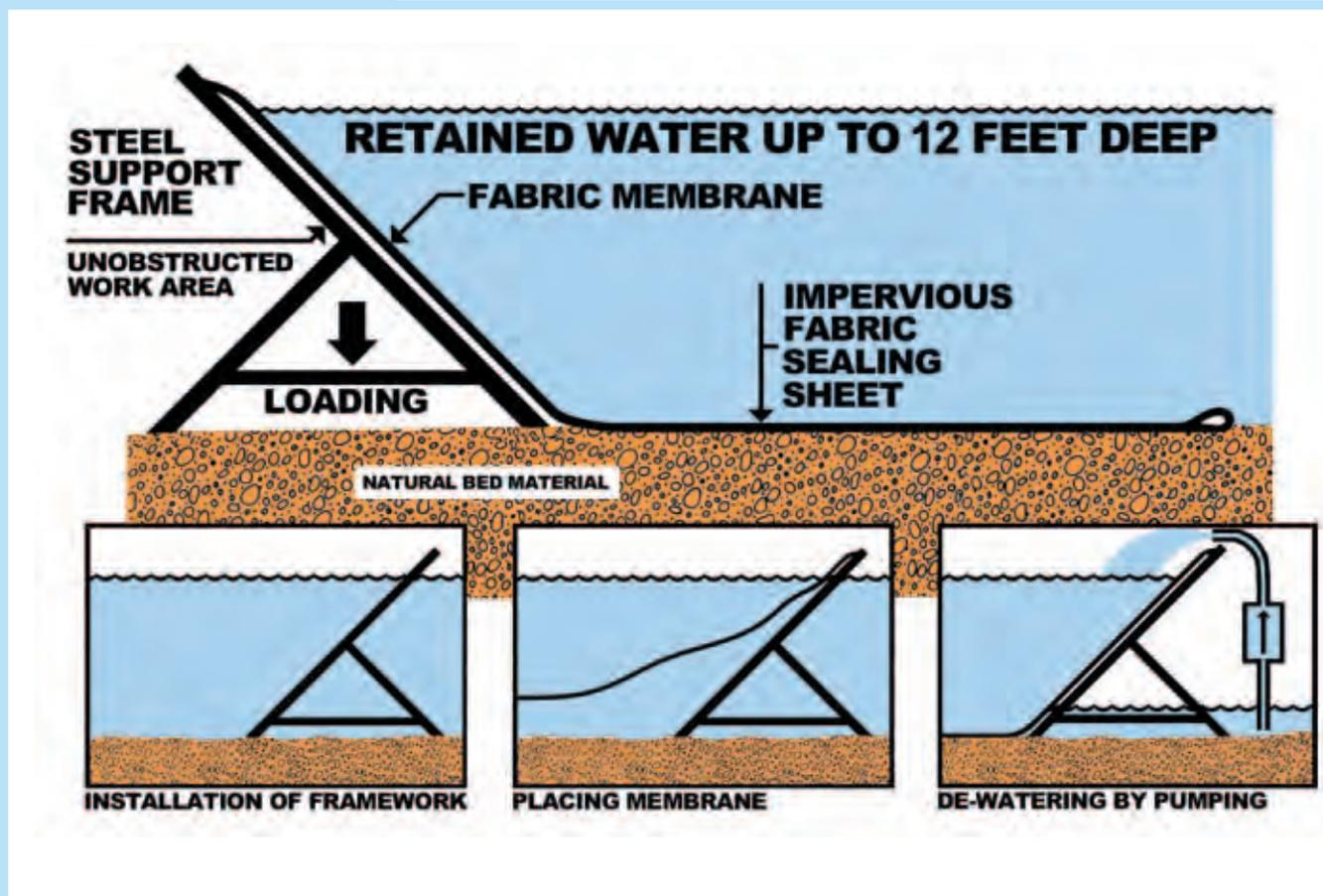
PORTADAM, INC. is equipped to provide you with approved technologies, recognized throughout the U.S. as the environmentally-friendly alternative to water diversion & cofferdamming.



Builders of
cofferdams and
diversion structures
for over 25 years.

With today's ever-growing concerns over environmental issues, PORTADAM, Inc., is equipped to provide you with approved technologies, recognized throughout the U.S. as the clean alternative to water diversion and cofferdamming.

We view each potential project with a plan to provide clean, feasible, engineered product to assist agencies and contractors in a combined effort to keep our waterways pristine for future generations. We pride ourselves in finding solutions to complex water control problems.



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 Holding Basins.....10
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The PORTADAM concept utilizes a steel supporting structure with a continuous reinforced vinyl liner membrane to effectively provide a means of water diversion, retention or impoundment. The support structure is designed to transfer hydraulic loading to a near vertical load, thereby creating a free-standing structure with no back brace to interfere with your work area. The liner system is very flexible, creating ease of sealing over most irregular contours. This system can be installed almost anywhere, in any configuration and to any length. The equipment is offered as rental item in heights of 3', 5', 7' and 10'.

If you have a need to control standing or flowing water—whether for construction, repair of structures, flood control, storage or diversion—let us help you. PORTADAM, Inc., offers free consultation, site surveys and budget pricing. We can handle your water control problems.

In the following pages you'll see a sampling of the various types of projects we have successfully handled in the past.

Pipeline River Crossings & Repairs

Pipeline river crossing in a two-phase operation.



PORTADAM can be used in most streams and rivers.

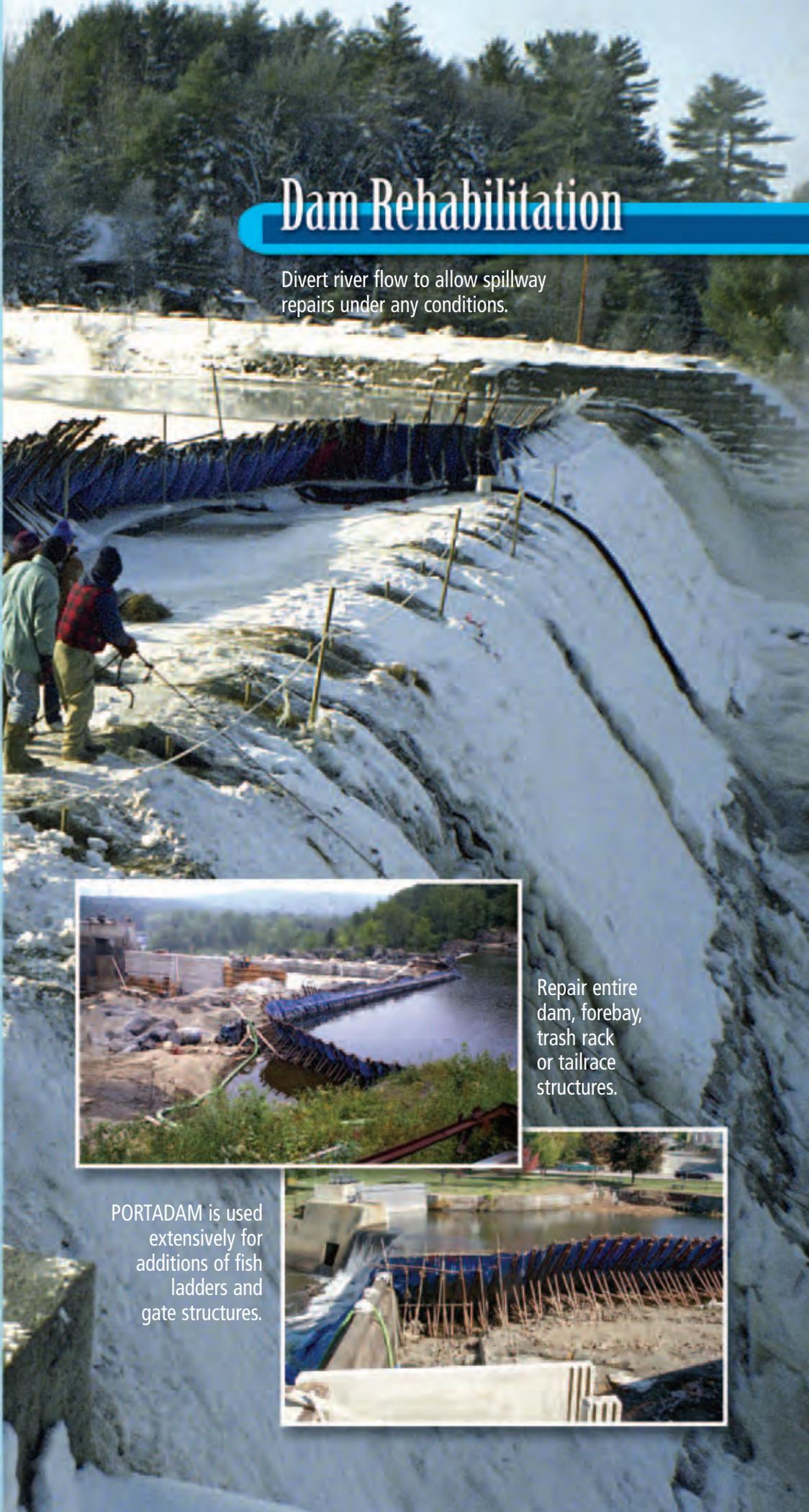
Much less costly than directional drilling.



The PORTADAM system has proven to be a clean and effective method of performing open cut construction of pipelines across rivers and streams. A two-phase operation allows for unimpeded flow of water around the work site while offering an environmentally-friendly cofferdam system with no introduction of harmful materials to the watercourse.

Adjustment of the river or streambed prior to installation is normally not required. Flexibility of the PORTADAM system equipment allows for installation over irregular contours and around obstructions.

The “free-standing” characteristic of this system leaves the work area unobstructed and completely free of cross bracing, allowing the pipeline installation to proceed from the land portion directly to the riverbed. Since no fill material is required, excavation depths are greatly reduced. Concrete encasement can be poured in the dry without fear of watercourse contamination.



Dam Rehabilitation

Divert river flow to allow spillway repairs under any conditions.

Low head dam rehabilitation and retrofit can easily be accomplished behind a PORTADAM cofferdam system.

Water flow can be diverted to one side of the river in a two phase construction sequence, or diverted through an alternate bypass channel.

The PORTADAM steel framework and liner components adapt easily to the spillway shape to construct a continuous cofferdam line, both upstream and downstream.

Dewatering upstream of a hydro plant intake structure can facilitate repair or replacement of old trashracks.

PORTADAM technology is also used for tailrace area de-watering, gate replacement and concrete spillway repairs. This equipment offers plant operators alternatives for dewatering areas without the problems associated with earthfill or the costs of sheet piling operations.



Repair entire dam, forebay, trash rack or tailrace structures.

PORTADAM is used extensively for additions of fish ladders and gate structures.



Intake & Outfall Pipelines/Structures

Intake structures and galleries built in the dry...



Concrete intake structures situated along the edge of a river or lake can be repaired or constructed in a dry work area behind a PORTADAM system.

The system can be installed in a 3-sided configuration to provide access into the water body without adverse effects to the water system. This cofferdam method produces an unobstructed work area for excavation and forming as required to construct a new intake structure.

Outfall pipelines with diffuser sections are easily installed in the dry behind a PORTADAM structure. The PORTADAM system provides river bed access in an unobstructed work area for trench excavation, pipe assembly and concrete encasement. Typically, no river bed preparation or fill material is required to install a PORTADAM system. No costly fill removal or contour grade adjustments are required after removal of the PORTADAM system. The water course remains virtually unaffected.



...Outfalls and discharge pipes constructed with ease...

Excavation for sub-structure work is easily achieved.



The flexibility of the PORTADAM system equipment allows for installation in practically any configuration and over almost any contour. This feature permits installation along stream banks for restoration such as bulkheads, gabion structures, architectural walls and geoliners.

Dewatering these work areas allows for better control of excavation at toe of slope, so that proper "key-in" can be made to achieve the best possible construction techniques.

Bank Restoration & Stream Channelization

Make your revetment job easier by dewatering the work area.



Channelizing the flow permits access to both sides of the stream.

...even makes building a seawall easier.



PORTADAM, INC.
DIVERSION AND COFFERDAM STRUCTURES

Environmental Remediation Projects

Environmental shoreline cleanup completed from the river side of your site.



Remove the water from your remediation site.



Access almost any area using "Best Management Practices".

Keeping the affected area separated from the clean area is a major consideration on all HazMat remediation sites. Especially in water, there is a great advantage to keeping the clean water from making contact with the contaminated materials.

The PORTADAM system offers an effective method of surrounding an in-water remediation site and separating the clean water from the work area while maintaining natural stream or river flow. In addition, by working in a dry area, excavated material dewatering is minimized.

This cofferdam method is clean and re-usable. It can be utilized in a multi-phase remediation project while offering clear, unobstructed access to the work area (lake or river bed). No fill material is typically required, therefore the customer does not add more contaminated materials to the site to be remediated.

Bridge Piers (Rehabilitation & New Construction)

Use laborers, not divers to complete your next bridge pier rehabilitation project...

PORTADAM can be installed in virtually any configuration. Also, since it is a lightweight system, it can be installed under existing spans, allowing for continued traffic flow. Span removal is not required as with driven sheeting methods.

Culvert rehabilitation is made easy by de-watering or diverting stream flows with the PORTADAM system.

If the bridge pier work area is close to shore, the customer might opt for a 3-sided cofferdam structure so that they can access the pier directly from the shore. This configuration will allow for construction equipment and supplies to be utilized directly from the river bed (fill material is not required). Excavation is made easier because the equipment operator is closer to the work (not digging through added fill) and can readily see the entire work area (not digging underwater).

If the bridge pier is away from shore, as in large multi-span bridges, the PORTADAM system can be installed in a box or rectangular configuration. Again, fill material is not normally required. The cofferdam is positioned directly on the river or lake bed. Access to the work area is either from the bridge deck or from floating equipment.

Because the system is "free-standing", the pier work area is unobstructed by cross-bracing or tie-backs to the pier face. This open space allows for clear access to excavate, assemble form-work and place protective measures. Also, with the area dry, concrete pours become more visible, controllable, non-polluting and successful.



dewater areas of any size...

...even under bridge spans where driven sheet piling is difficult.



Boat Ramps (Rehabilitation & New Construction)

Build your next boat ramp in the dry without costly sheet piling...



Installation or repair of boat ramps becomes an easy, land-based operation with the use of the PORTADAM cofferdam system. A 3-sided structure, open to the shore, allows full, open access to the boat ramp work area. No cross bracing is required, leaving the entire work area free of obstruction.

Since the main component of the PORTADAM system is a nylon reinforced vinyl liner, the water body is completely protected from the work area. All excavation and concrete work is conducted behind a barrier that keeps the lake, river or stream completely free of siltation, turbidity and pollution.

No floating equipment or heavy pile driving machinery is needed to install a PORTADAM.

...to a beautiful completed project.

...tie rebar, form and pour...

Adaptability of the PORTADAM system equipment has made it very useful as a temporary holding basin on land. By inverting the equipment installation procedure, the PORTADAM can be used to produce a holding basin of almost any size and configuration. Installation over irregular, unprepared contours makes it far superior to other, less flexible, equipment.

Thru-wall connection fittings are easily made with "boots" attached to the vinyl liner. Inlet and outlet pipes of any size can be added prior to shipping or in the field.

The unique structural steel wall configuration of the PORTADAM holding basin keeps the bracing system inside of the overall basin "Footprint", eliminating external bracing. Containment of most fluids can be achieved with the standard VCN liners, but the PORTADAM holding basin can be easily fitted with special liners to accommodate various hazardous liquids.

Holding Basins

Freestanding temporary basins can be constructed to any size or capacity.



Vinyl liners to handle most fluid types.



...in almost any location.

Flood Control & Prevention

Flood protection at a fraction of the cost, setup in a fraction of the time compared to sandbags.



The PORTADAM system can be used to divert floodwaters away from buildings, treatment plants, reservoirs, even entire towns. The flexibility of the equipment permits quick installation on unprepared surfaces and along almost any desired line.

Raise the height of existing levees with PORTADAM, which is 1/10th the weight of standard sandbag extensions, installs in less than 1/10th the amount of time and can achieve an added height of up to 9 feet over top of the existing levee. In addition, the long sealing apron used with the standard PORTADAM equipment will extend down the riverside face of the levee, effectively reducing saturation of the levee soils.

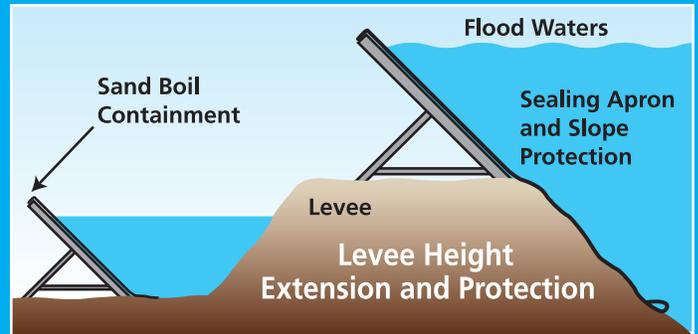
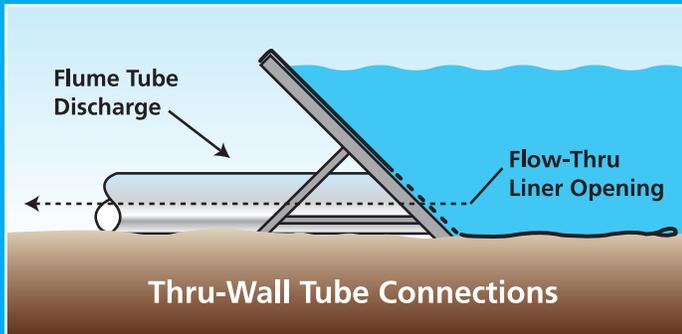
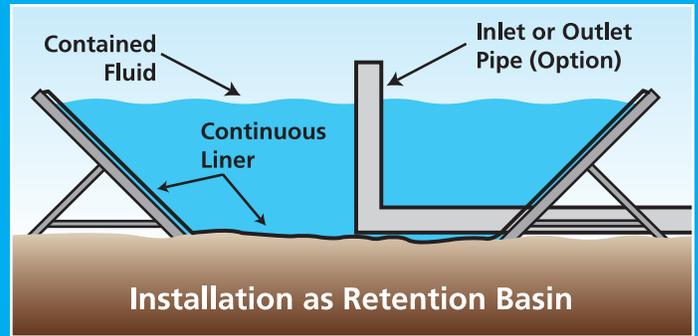
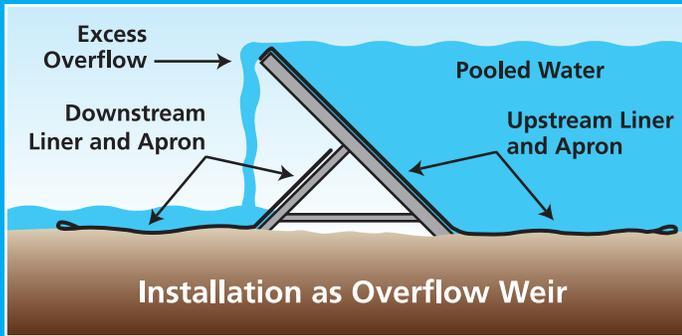
Anyone who has ever endured a flood fight realizes that clean-up after the floodwaters recede is very difficult. Not only is there a major disposal (sandbags) problem, but volunteers are not as easily found for the cleanup operation. The PORTADAM system equipment is completely RE-USABLE. All of the equipment is easily removed from the site and stored for the next flood fight. No need to re-purchase and dispose of thousands of sandbags all over again.



Plan your flood protection before loss of property begins.

Protection of buildings, treatment plants and reservoirs can be accomplished with a system that is installed and removed more quickly and easily than sandbags, which does not produce an eyesore for the community. Normal plant operations can continue during installation. The skeletal steel framework system can be pre-installed, with access gaps, with the liner being placed only at the final moments. The equipment is offered in various heights from 3' high to 12' high to allow for the desired measure of protection.

Installation Variations & Attachments



PORTADAM, INC.

DIVERSION AND COFFERDAM STRUCTURES

Corporate office
3082 South Black Horse Pike
Williamstown, NJ 08094
856-740-0606 phone
856-740-0614 fax
800-346-4793 toll-free

Southeast Region
154 Falcon Drive, Suite B
Forest Park, GA 30297
404-361-5770 phone

New England
92 Lincoln Street
Dover-Foxcroft, ME 04426
207-564-7878 phone

Northwest Region
Warehouse
Vancouver, WA

Dallas, Texas
2761 Oakland Avenue
Garland, TX 75041

California
Coming Soon



US Flood Control Corp

Bowe, Pamela

From: Cheryl Witmer <cheryl@usfloodcontrol.com>
Sent: Wednesday, September 05, 2012 12:01 PM
To: Pugh, Terry
Subject: FW: quotes for CDM
Attachments: CDM Smith first significant damage senairo USFCQ9012012.xls; CDM Smith 100 year level senairo USFCQ9012012.xls; CDM Smith 270 year level(1993 Flood) USFCQ9012012.xls; CDM Smith 500 Year Level USFCQ9052012.xls; Wenck Intertek Report 2012.PDF

Importance: High

Hi Terry,
Here are some quotes to get you going.
Do you need any additional info on the Tiger dams themselves? I have attached a test report just in case you do.

Please let me know if you need anything at all!

Cheryl Witmer
US Flood Control Corp
Direct 504-235-5233
Fax 985-308-0530
cheryl@usfloodcontrol.com



U.S. FLOOD CONTROL CORP.

121 Kayle Drive
Hahnville, LA 70057
Phone: 985-308-0037 Fax: 985-308-0530

Quote **USFCQ9042012**

Quote Date _ Sept 4 2012

TIGER DAM™ SYSTEM

Quote

Purchaser

Name CDM
Attn: Terry Pugh
City Kansas City MO ZIP
Email: pugh@cdmsmith.com

Vendor

Name U.S. Flood Control Corp.
Address 121 Kaylee Drive
City Hahnville ST LA ZIP 70057
Phone 504-235-5233

Qty	Units	Description	Unit Price	TOTAL
35	Each	Tiger Dams 50ft x19 inches (3ft x 520ft protection)	\$1,250.00	\$43,750.00
6	Each	Fill Attachment Assembly	\$145.00	\$870.00
105	Each	Straps	\$25.00	\$2,625.00
1	Each	Valve Tool	\$200.00	\$200.00
11	Each	Super Tiger Dams 50 ft x 3 ft (1 ft x 1730)	\$2,850.00	\$31,350.00
99	Each	Straps	\$35.00	\$3,465.00
80	Each	Tube chocks	\$10.00	\$800.00
230	Each	Earthen Anchors (5 per 50 ft section - total sections 46)	\$25.00	\$5,750.00

First Significant Level

This quote does not include shipping or taxes.

FED ID # 68-0549696

SubTotal	\$88,810.00
Tax	
TOTAL	\$88,810.00

Payment Details

- Check
- Cash
- Account No.
- Credit Card

AUTHORIZED SIGNATURE OF PURCHASER UPON ACCEPTANCE OF QUOTE

Name: _____ SIGNATURE: _____
DATE: _____

U. S. Flood Control Corp. (USFC) gives a limited warranty that the TIGER DAM™ System will function in material conformity with the specifications of the manufacturer in conjunction with proper deployment. Except for the foregoing, USFC makes no representation, condition, guarantee or warranty with respect to the Tiger Dam or any related systems, services or products, whether provided or to be provided hereunder by USFC or any third party vendors or suppliers to USFC or selected by USFC. Without limitation, USFC disclaims and does not make any representation, condition or warranty, express or implied, which exceeds or may exceed the specifications of the manufacturer, including, without limitation, any implied conditions or warranties of merchantability, non-infringement, or fitness for a particular purpose, or any other implied warranties or conditions, whether arising from statute, regulation, common law, course of performance, course of dealing or custom or usage of trade, or otherwise, which exceed the manufacturers' specifications or proper deployment.

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U.S. FLOOD CONTROL CORP.

121 Kayle Drive
Hahnville, LA 70057
Phone: 985-308-0037 Fax: 985-308-0530

Quote **USFCQ9042012**

Quote Date _ Sept 4 2012

TIGER DAM™ SYSTEM

Quote

Purchaser

Name CDM
Attn: Terry Pugh
City Kansas City MO ZIP
Email: pughta@cdmsmith.com

Vendor

Name U.S. Flood Control Corp.
Address 121 Kaylee Drive
City Hahnville ST LA ZIP 70057
Phone 504-235-5233

Qty	Units	Description	Unit Price	TOTAL
231	Each	Standard Tiger Dams 50ft x 19" (8ft x 520 ft protection)	\$1,250.00	\$288,750.00
10	Each	Fill Attachment Assembly	\$145.00	\$1,450.00
693	Each	Straps	\$25.00	\$17,325.00
4	Each	Valve Tool	\$200.00	\$800.00
105	Each	Super Tiger Dams 50 ft x 3 ft(6ft x 1730ft protection)	\$2,850.00	\$299,250.00
315	Each	Straps	\$35.00	\$11,025.00
1,000	Each	Tube chocks	\$10.00	\$10,000.00
230	Each	Earthen Anchors (5 per 50ft section - total sections 46)	\$25.00	\$5,750.00
100 Year Level				
This quote does not include shipping or taxes.				
FED ID # 68-0549696				

SubTotal	\$634,350.00
Tax	
TOTAL	\$634,350.00

Payment Details

- Check
- Cash
- Account No.
- Credit Card

AUTHORIZED SIGNATURE OF PURCHASER UPON ACCEPTANCE OF QUOTE

Name: _____ SIGNATURE: _____
DATE: _____

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121 Kayle Drive
Hahnville, LA 70057
Phone: 985-308-0037 Fax: 985-308-0530

Quote **USFCQ9052012**

Quote Date _ Sept 4 2012

TIGER DAM™ SYSTEM

Quote

Purchaser

Name CDM
Attn: Terry Pugh
City Kansas City MO ZIP
Email: pughta@cdmsmith.com

Vendor

Name U.S. Flood Control Corp.
Address 121 Kaylee Drive
City Hahnville ST LA ZIP 70057
Phone 504-235-5233

Qty	Units	Description	Unit Price	TOTAL
396	Each	Standard Tiger Dams (50ft x 19") 10.5 ft x 520 ft	\$1,250.00	\$495,000.00
10	Each	Fill Attachment Assembly	\$145.00	\$1,450.00
1,188	Each	Straps	\$25.00	\$29,700.00
4	Each	Valve Tool	\$200.00	\$800.00
735	Each	Standard Tiger Dams (50ft x 19") 8.5 ft x 1730 ft	\$1,250.00	\$918,750.00
315	Each	Straps	\$25.00	\$7,875.00
1,000	Each	Tube chocks	\$10.00	\$10,000.00
230	Each	Earthen Anchors (5 per 50 section - total sections 46)	\$25.00	\$5,750.00

270 Year Level

This quote does not include shipping or taxes.

FED ID # 68-0549696

SubTotal	\$1,469,325.00
Tax	
TOTAL	\$1,469,325.00

Payment Details

- Check
- Cash
- Account No.
- Credit Card

AUTHORIZED SIGNATURE OF PURCHASER UPON ACCEPTANCE OF QUOTE

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DATE: _____

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Quote **USFCQ9042012**

Quote Date _ Sept 4 2012

TIGER DAM™ SYSTEM

Quote

Purchaser

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Attn: Terry Pugh
City Kansas City MO ZIP
Email: pughta@cdmsmith.com

Vendor

Name U.S. Flood Control Corp.
Address 121 Kaylee Drive
City Hahnville ST LA ZIP 70057
Phone 504-235-5233

Qty	Units	Description	Unit Price	TOTAL
605	Each	Tiger Dams 50ft x19 inches (14ft x 520ft protection)	\$1,250.00	\$756,250.00
16	Each	Fill Attachment Assembly	\$145.00	\$2,320.00
165	Each	Straps	\$25.00	\$4,125.00
10	Each	Valve Tool	\$200.00	\$2,000.00
1,575	Each	Tiger Dams 50 ft x 19" (12 ft x 1730 protection)	\$1,250.00	\$1,968,750.00
405	Each	Straps	\$25.00	\$10,125.00
80	Each	Tube chocks	\$10.00	\$800.00
230	Each	Earthen Anchors (5 per 50 ft section - total sections 46)	\$25.00	\$5,750.00

500 Year Level

This quote does not include shipping or taxes.

FED ID # 68-0549696

Payment Details

- Check
- Cash
- Account No.
- Credit Card

SubTotal	\$2,750,120.00
Tax	
TOTAL	\$2,750,120.00

AUTHORIZED SIGNATURE OF PURCHASER UPON ACCEPTANCE OF QUOTE

Name: _____ SIGNATURE: _____
DATE: _____

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WENCK ASSOCIATES, INC.

TECHNICAL MEMORANDUM

TO: Mr. Dave Johnson, Assistant City Engineer
City of Fargo, ND

FROM: Rodney W. Ambrosie, PE and Paul T. Eickenberg, PE

RE: Review of the Tiger Dam System
US Flood Control Product (866/852-1118, www.usfloodcontrol.com)

DATE: March 22, 2010

Wenck Associates, Inc. (Wenck) has completed a general review of the Tiger Dam System by US Flood Control and is including our findings herein.

Within this technical memorandum are 3 sections. The first section, Section 1, provides a general introduction to the Tiger Dam System and includes a reference to an on-line video-clip showing an installation of the product. Section 2 includes seven (7) items that Wenck reviewed in preparation of this technical memorandum. These items were felt to be critical or notable in terms of the information known to date about the product, as well as specific knowledge about the Fargo area where the product is proposed for use. The last section, Section 3, provides a general summary of this memorandum. Additionally, the results of a performance verification program completed by Interlok Testing Services is included in the Appendix at the end of this technical memorandum.

Section 1. Introduction of the US Flood Control Tiger Dam System

The Tiger Dam System is a multi-tubular emergency levee concept (see Figure 1) composed of 19-inch diameter vinyl-coated polyester tubes filled with water and stacked on top of each other to create a temporary levee. These temporary levees are constructed by filling each tube with water from the

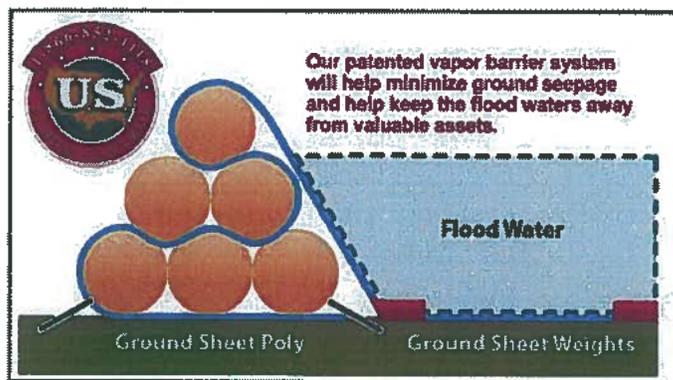


Figure 1. Section view of Tiger Dam System

approaching flood or water from local hydrants (or other means). They are then stacked in a triangular manner, tied together with polyester strapping, and fastened to the ground with a screw anchor. As shown in Figure 1, plastic membrane is weaved through the tubes to create a seepage barrier.

In addition to Figure 1 (which shows a generalized cross section of the Tiger Dam System with respect to the flood water), US Flood Control supplied Wenck an on-line video clip¹. This video

¹ http://www.youtube.com/watch?v=GwzUck_qvt4

clip was filmed on April 4, 2009 in Winnipeg, Canada during frozen/thawing flood conditions. It shows information about the installation of a system completed to heights up to about 5 feet with an overall length of approximately 1,000 feet. It specifically shows how the tubes are filled and general installation of the strapping. It does not provide any information about the screw anchors.

Section 2. Summary of Technical Review

Within this section are seven (7) specific items reviewed by Wenck (product length and weight, product size, internal burst pressure due to stacking height, long-term response to UV, anchor capacity, and strapping capacity). These items were felt to be critical or notable in terms of the information known to date about the product. Additionally, specific knowledge about the Fargo area is incorporated into this technical review and our subsequent summary.

- 1. Product Length and Weight:** Each tube is typically about 50 feet in length and weighs about 60 pounds when empty. Thus, when the tube is filled with water, it will be slightly heavier than the weight of water. The tubes will still require strapping and anchors to resist horizontal water pressure for most loading situations.
- 2. Product Size:** The tubes are approximately 19 inches in diameter. Note that the protective height of a 3-tube system (2 tubes on the bottom and 1 tube on top) will be less than 38 inches, because the top tube will sit in the crevice existing between the bottom tubes. Furthermore, the exact diameter of the tubes will vary depending on the pressure the tubes are filled to. It appears from general calculations that about 3 inches of height is lost per lift, therefore a 3-tube triangular system will measure about 35 inches (2.9 feet) in height, instead of 38 inches (3.2 feet). These values are approximate and were not physically measured by Wenck.
- 3. Internal Burst Pressure due to Stacking Height:** According to US Flood Control documentation, the maximum internal burst pressure is equal to 17 psi and the system typically experiences an internal operating pressure of 2 psi. Burst pressure should be evaluated at heights greater than 5 feet.
- 4. Freezing and Thawing and their Impact on Long-Term Usage:** It is not fully understood how the tubes will perform during and after freezing, being that water expands during the freezing process. It is understood that water is pumped into the tubes until full and then the tubes are sealed with a cap (as seen in the above-referenced video clip). Assuming that the tubes are completely filled and assuming that the water inside these tubes will expand about 9% when frozen², each tube will increase in diameter from about 19 inches to about 19.9 inches, leading to an increase in circumference of about 2.6 inches. This means that the membrane will strain approximately 4.7% during this loading scenario.

$$\begin{aligned} \text{Circumference}_{\text{initial}} &= \pi \times D = \pi \times 19 \text{ inches} = 59.7 \text{ inches} \\ \text{Area}_{\text{initial}} &= \frac{\pi}{4} \times D^2 = \frac{\pi}{4} \times (19 \text{ inches})^2 \cong 284 \text{ in}^2 \\ \text{Area}_{\text{frozen}} &= 284 \text{ in}^2 \times 9\% \text{ volume increase} \cong 310 \text{ in}^2 \\ \text{Area}_{\text{frozen}} &\cong 310 \text{ in}^2 = \frac{\pi}{4} \times D^2, \text{ thus } D \cong 19.9 \text{ inches} \\ \text{Circumference}_{\text{frozen}} &= \pi \times D = \pi \times 19.9 \text{ inches} = 62.5 \text{ inches} \\ \text{Strain} &= \frac{\Delta L}{L} = \frac{62.5 \text{ inches} - 59.7 \text{ inches}}{59.7 \text{ inches}} \cong 4.7\% \end{aligned}$$

² Andersland, O.B. & Ladanyi, B. (2004). *Frozen Ground Engineering*. Hoboken, NJ: John Wiley & Sons, Inc., p. 7.

Paul Vickers (President of US Flood Control) stated that the water in the tubes can freeze and subsequently expand with no durability issues to the tubes, as shown in field usage in other areas (Winnipeg). Furthermore, Wenck's knowledge of membrane materials indicates that this expansion is acceptable for one or two loadings. However, it is not known if the material will behave elastically or plastically after multiple loadings/uses. Therefore, the allowable expansion over multiple loadings should be reviewed.

5. **Long-Term Response to UV:** It is not fully understood how the tubes will perform considering UV protection with respect to re-use for many years. Paul Vickers stated that UV protection could be an issue over the long-term, but the tubes are quite durable in the short-term. Even though the documentation provided by US Flood Control states that the tubes are UV stable, this should be reviewed with respect to long-term use. However, for short-term use (i.e., 1 week to 3 week flood events), damage of the tubing due to UV effects is not likely a concern.
6. **Horizontal Wall Forces and Anchor Capacity:** Considering a protection height of 1-foot, 5 feet, and 10 feet, the forces acting upon the upstream face of the wall are shown in Table 1 below. The information in this table is used to determine the anchor capacity.

Table 1. Summary of forces acting against the upstream wall face for three scenarios

Scenario	Force of Water per foot of wall
1-foot protection height	31.2 pounds per foot of wall
5-foot protection height	780 pounds per foot of wall
10-foot protection height	3,120 pounds per foot of wall

Engineers from Wenck Associates performed testing of the vertical and lateral capacities of screw anchors on Wednesday, March 10, 2010 and Monday, March 15, 2010 in Fargo, North Dakota. The testing was completed by placing various sized anchors, supplied by US Flood Control, into ground representative of that where the Tiger Dam system will be placed during flood control operations in the Fargo area.

The anchors were installed and loaded individually using a front end loader and load cell system so as to measure the actual capacity of each anchor. Furthermore, the anchors were tested in both a vertical and horizontal orientation in order to 1) measure the undrained shear strength of the soil (vertical orientation) and 2) estimate the capacity of the anchors in the most representative mode of use (horizontal orientation). A summary of the testing is provided below in Table 2 and discussed in the paragraphs following this table. Note that this table provides the test number and date of test, the anchor length and diameter, the anchor material, the measured capacity of the anchor in either a vertical or horizontal orientation, and notes specifically related to each test.

Table 2 provides testing on two different dates, March 10 and March 15, 2010. During the March 10 testing, the four anchors fractured. In response, US Flood Control quickly delivered new anchors for additional testing which was completed on March 15.

Table 2. Summary of anchor test data

Date of Test and Test ID	Anchor Length / Diameter (inches)	Anchor Material	Measured Capacity (pounds)		Back-Calculated Undrained Shear Strength (psf)	Notes
			Vertical	Horizontal		
Testing completed on March 10, 2010						
Test 1	22 / 2.5	Cast aluminum	1,870	--	1,558 ^{see Note 1}	Partially frozen ground – anchor fractured ^{see Note 2}
Test 2			2,460	--	2,050 ^{see Note 1}	Partially frozen ground – anchor fractured ^{see Note 2}
Test 3			--	960	--	Partially frozen ground – anchor fractured ^{see Note 2}
Test 4			--	650	--	Partially frozen ground – anchor fractured ^{see Note 2}
Testing completed on March 15, 2010						
Test 1	22 / 2.5	Steel	990	--	825	Thawed ground
Test 2			1,000	--	833	Thawed ground
Test 3			--	1,470	--	Thawed ground
Test 4			--	3,710	--	Frozen ground, cable broke ^{see Note 3}
Test 5			--	6,680	--	Frozen ground ^{see Note 3}
Test 6	22 / 3.0	Steel	--	1,200	--	Thawed ground
Test 7			910	--	632	Thawed ground
Test 8			4,930	--	3,424 ^{see Note 1}	Frozen ground ^{see Note 3}
Test 9	22 / 4.0	Steel	--	2,680	--	Thawed ground
Test 10			1,370	--	714	Thawed ground
Test 11			1,420	--	740 ^{see Note 1}	Frozen ground ^{see Note 3}

- Note 1:** This value is not representative of the actual soil undrained shear strength because of the presence of the frozen soil.
- Note 2:** At the time of anchor installation, the ground was thawed to a depth of approximately 6 inches.
- Note 3:** An exact measurement of the distance to frozen ground was not taken, but it is inferred from measurements on March 10 that this depth is at least 6 inches.

The following two subsections discuss the back-calculation of the undrained shear strength and lateral load capacity of the soil and anchor, respectively, in the vicinity of the anchor testing.

Back-Calculation of Undrained Shear Strength

The undrained shear strength of the soil was back-calculated as shown in the equation below in order to compare it to values considered representative for soils in the Fargo area, to see if the results obtained are reasonable. This sample calculation specifically back-calculates the undrained shear strength for the soil tested on March 15, Test 1 which is comprised of a 22 inch long, 2.5 inch diameter steel anchor placed in thawed ground. The test produced a vertical capacity of 990 pounds and resulted in a back-calculated undrained shear strength value of approximately 825 psf.

Other back-calculated shear strengths are provided in Table 2 with an average value of about 750 psf for testing completed in thawed ground (Tests 1, 2, 7, and 10 completed on March 15).

$$\text{Undrained Shear Strength} = \frac{\text{Measured Vertical Anchor Capacity}}{\text{Surface Area of Anchor}}$$

$$\text{Undrained Shear Strength} = \frac{\text{Measured Vertical Anchor Capacity}}{\pi \times \text{Anchor Diameter} \times \text{Anchor Length}}$$

$$\text{Vertical Capacity} = \frac{990 \text{ pounds}}{\pi \times \frac{2.5 \text{ inches}}{12 \text{ inches/foot}} \times \frac{22 \text{ inches}}{12 \text{ inches/foot}}}$$

$$\text{Vertical Capacity} \cong 825 \text{ psf}$$

It is noted that the surface area of the anchor is calculated based on the outside diameter of the helices, because the area between the anchor helices was visually observed to be plugged with soil after the anchors were pulled out of the ground. This is consistent behavior for anchors placed in soft soil and is therefore reasonable for soil in the Fargo area.

In Fargo, the upper 8 to 12 feet of soil is often composed of the Sherack Formation which has an undrained shear strength of approximately 1,100 psf. Below this is the Brenna Formation which has an undrained shear strength of about 650 psf. The back-calculated shear strength value of approximately 750 psf is reasonably close to the strengths typically used in the Fargo area. This is important to understand because it allows anchor capacities to be estimated in the future if larger anchors are used (either length or diameter). If differing anchors are used, the vertical capacity can be reasonably estimated based on the following equation.

$$\text{Vertical Capacity} = \frac{\text{Surface area of anchor} \times \text{Undrained Shear Strength of Sherack}}{\text{Factor of Safety}}$$

$$\text{Vertical Capacity} = \frac{(\text{Circumference} \times \text{Anchor Length}) \times \text{Undrained Shear Strength of Sherack}}{\text{Factor of Safety}}$$

$$\text{Vertical Capacity} = \frac{(\pi \times \text{Anchor Diameter} \times \text{Anchor Length}) \times \text{Undrained Shear Strength of Sherack}}{\text{Factor of Safety}}$$

Discussion of Lateral Capacity

According to test results provided in Table 2, the ultimate lateral capacity values ranged from 1,200 pounds to 2,680 pounds for the three tests completed on March 15 in thawed ground (Test 3 equaled 1,470 pounds for a 2.5-inch diameter anchor, Test 6 equaled 1,200 pounds for a 3.0-inch diameter anchor, and Test 9 equaled 2,680 pounds for a 4.0-inch diameter anchor). It is noted that the values were higher for testing completed in frozen or partially frozen ground. Based on the values of anticipated lateral forces provided in Table 1, an anchor system could be designed considering individual site conditions.

In order to estimate the lateral capacity of the anchors for other sites in the Fargo, ND area, the Broms method was used. This method is a simplistic method, but provides reasonable results based on limited data and assumptions of short piling (or anchors). It is carefully noted that this is an empirical correlation, therefore it should be verified with site-specific testing data.

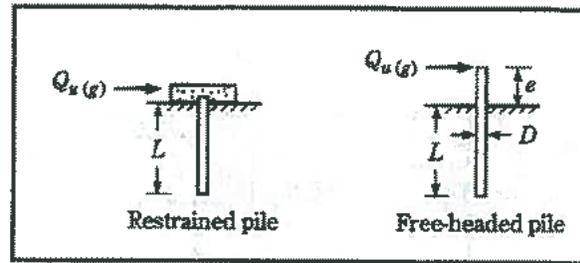


Figure 2. Broms method restraint assumptions

The Broms method relies on a few variables as shown in Figures 2 and 3. For this specific situation, the anchors will act in a restrained pile method (at least initially), therefore the values of Q (capacity) and L (length) are required. Additionally, the values of undrained shear strength (c) and anchor diameter (D) are required. Use of this information allows a ratio to be calculated which directly compares the values of Q/cD^2 (the ultimate lateral resistance) and L/D (the embedment length). For this project, these ratios are provided in Table 3.

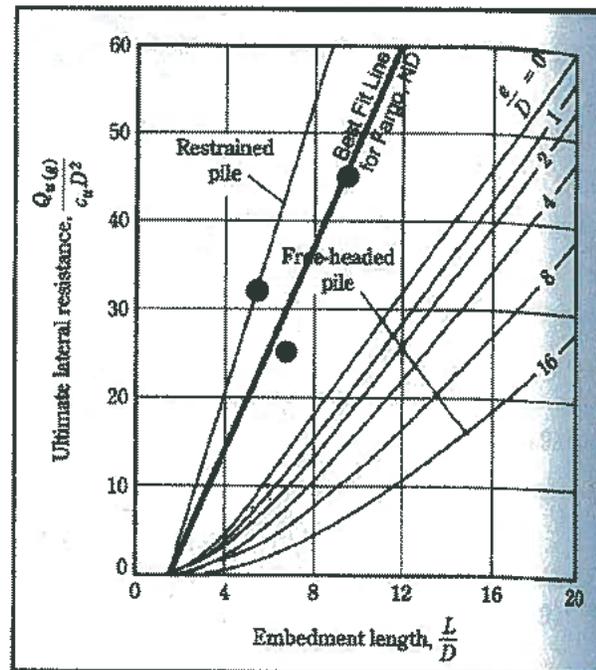


Figure 3. Empirical lateral capacity solution for Broms method in Fargo, ND clay assuming a restrained pile concept

The values of Q , D , and L in Table 3 are the same values provided in Table 2. The value of the undrained shear strength (c) is the average value as discussed in the preceding paragraphs. Using these values, the ratios of Q/cD^2 and L/D were calculated and plotted as three points on Figure 3. Also shown on this figure is an approximate "best-fit" line, labeled specifically as "Best Fit Line for Fargo, ND."

It appears that the lateral (horizontal) load testing performed on the anchors is reasonable in terms of other empirical data (i.e., the data used by Broms to create the original lateral capacity figure). Use of this "best-fit" line can be used to approximate the ultimate capacity of anchors in the Fargo area.

It is noted that the Broms method is not a perfect method because it is an empirical method and also assumes that the anchors are perfectly rigid. But it is a reasonable approximation. It is also noted that this "best-fit" line predicts the ultimate capacity of the anchors based on the soil and anchor testing in Fargo, ND.

Table 3. Summary of lateral load capacity variables

Test	Q (pounds)	C (psf)	D (inches)	L (inches)	Q/cD ²	L/D
March 15						
Test 3	1,470	750	2.5	22	45.1	8.8
Test 6	1,200	750	3.0	22	25.6	7.3
Test 9	2,680	750	4.0	22	32.1	5.5

7. **Strapping Capacity:** According to documentation provided by US Flood Control, the 2-inch wide polyester strapping has a maximum capacity of about 10,000 pounds. It is noted that Wenck did not test the strapping material.

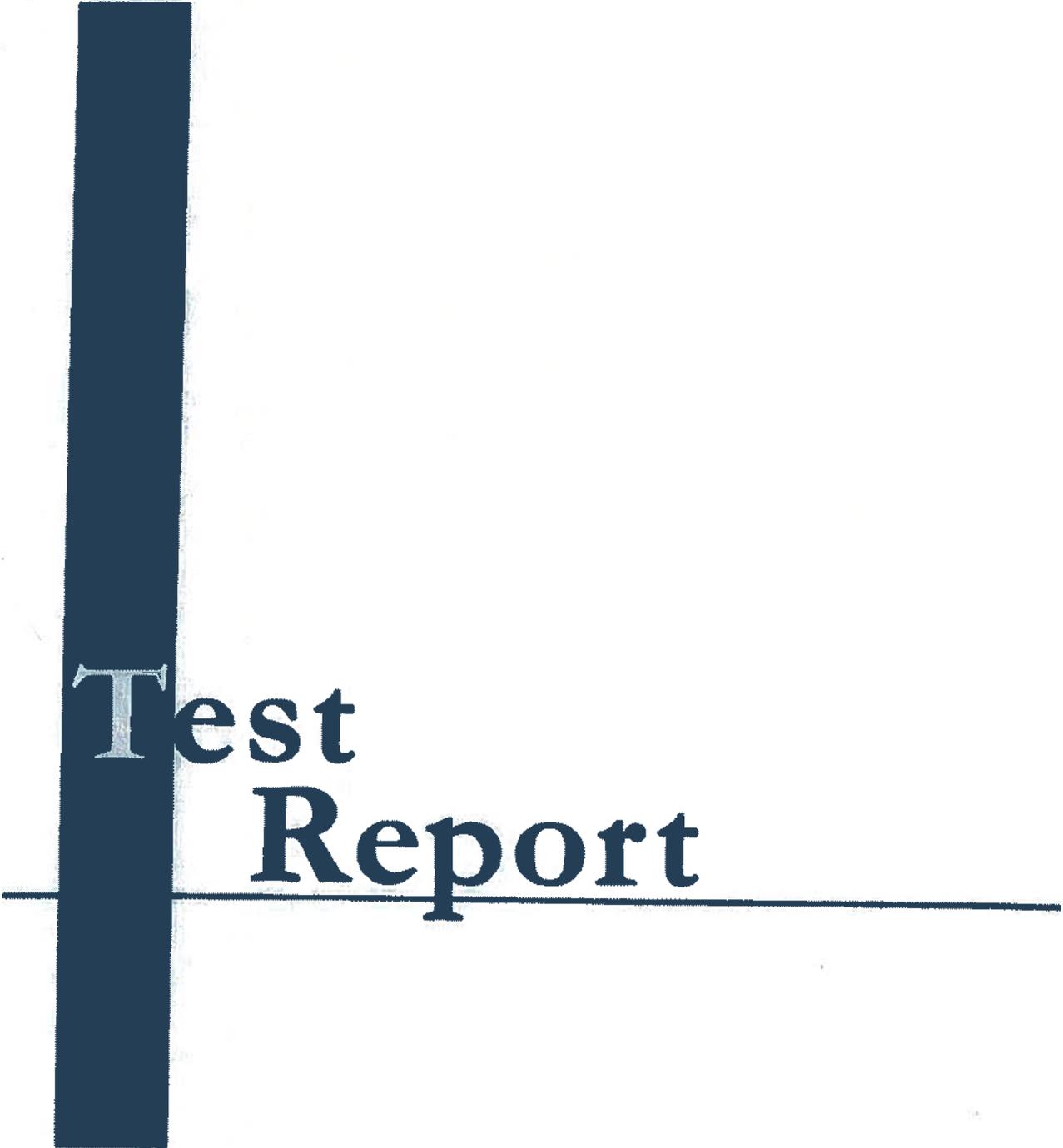
Section 3. Summary and Recommendations

In summary, Wenck reviewed seven (7) items in preparation of this technical memo (product length and weight, product size, internal burst pressure and maximum stacking height, long-term response to UV, anchor capacity, and strapping capacity). These items presented information available to date about the product. We then applied our specific knowledge about the Fargo area where the product is proposed for use.

Testing was completed on a number of anchors supplied by US Flood Control on March 10 and 15, 2010. This testing allowed back-calculations of the undrained shear strength in the vicinity of the testing and also allowed an empirical relationship between the embedment depth ratio and ultimate lateral resistance ratio to be created. Results of this anchor testing indicated that the soil in the vicinity of the testing was very soft and exhibited an undrained shear strength equal to about 750 psf providing an ultimate lateral capacity ranging from 1,200 pounds to 2,680 pounds (depending on the anchor diameter).

A few of the non-technical benefits for the Tiger Dam system include the speed at which it can be installed and the minimal damage to property during placement and removal. Additionally, the product appears to be reusable and have relatively easy storage capabilities versus many traditional systems.

Based on results provided in this technical memorandum, an anchor system could be designed to resist about 5 feet of water in the Fargo, ND area. The resisting anchors should be spaced according to the actual site conditions while also accounting for factors of safety incorporating items such as potential for monitoring and level of damage due to breach potential. It is noted, based on test data shown in Table 2, the use of cast aluminum should be avoided because of the observed low capacity values and brittle failure mechanism.



Test Report



Intertek Testing Services
ETL SEMKO



Intertek Testing Services ETL SEMKO

March 14, 2003

U.S. Flood Control Corp.
402 North Division Street
Carson City, Nevada 89703

Attention: Paul Vickers

CONCLUSIONS AND EXECUTIVE SUMMARY – Project No. 3034172

A test series was conducted by Intertek Testing Services NA Ltd./Warnock Hersey on the US Flood Control Corp. portable, inflatable dam system. The test series was to demonstrate the performance of the dam, its ability to hold back water, to resist puncture, and to determine the maximum internal pressure that the tubes can withstand.

The US Flood Control Corp. portable, inflatable dam is intended to be an easy-to-store, and a quick set-up and removal replacement for conventional sandbag dams. The dams eliminate disposal and removal costs, and are re-usable.

Our test report showed that a 3-tier dam of 88 ft. in length can be set up in a few hours with four men, could withstand water depth equalling the height of the dam (47.5 in.), and that wave action did not affect the dam's performance. The dam also was unaffected when purposely dislodged at one end. The tubes are strong enough to withstand 1 atmosphere of pressure, which equates to 32 ft. of water column. The reinforced vinyl fabric material could withstand 21 lbs. of force of a sharp steel point without creating a hole in the material. When punctured, a small leak was created that did not cause failure of the product.

Yours truly,

INTERTEK TESTING SERVICES NA LTD.
Warnock Hersey

Michael van Geyn, A.Sc.T.
Manager – Fire Testing & Technical Programs

MVG/bjm



Intertek Testing Services NA Ltd.
311 Schoolhouse Street, Coquitlam, BC V3K 4X9 Canada
Telephone 604-826-3321 Fax 604-824-8188 Home Page www.edsemko.com



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**REPORT OF A
PERFORMANCE VERIFICATION PROGRAM
CONDUCTED ON
PORTABLE, INFLATABLE DAM SYSTEM**

CLIENT:

U.S. Flood Control Corp.
402 North Division Street
Carson City, Nevada 89703

Attention: Paul Vickers

REPORTED BY:

**INTERTEK TESTING SERVICES NA LTD.
WARNOCK HERSEY
211 SCHOOLHOUSE STREET
COQUITLAM, B.C.
V3K 4X9**

REPORT NUMBER: 3034172

REPORT DATE: FEBRUARY 19, 2003

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PART A – PERFORMANCE DEMONSTRATION

Introduction

The performance test of the US Flood Control Corp. portable, inflatable dam system was conducted at the wave pool of the Ocean Engineering Test Center of B.C. Research, Inc., located on the endowment lands of the University of British Columbia. The pool measures 88 ft. in width, 100 ft. in length, and 9 ft. in depth. A ramp provides access to the pool floor. A hydraulic wave generator is located along the 88 ft. length of one side of the pool.

Description

The dam system consists of the following components:

Dam Tubes

- 50 ft. long by 20 in. diameter tubes constructed from heavy gauge fiberglass reinforced PVC plastic. The fabric is weld-seamed along its length and at the ends. Two plastic fittings are installed in the tube wall, a vent fitting, and a fire hose connection fill fitting.

Sleeves

- 6 ft. long by 20 in. diameter open-ended tubes made from the same material as the tubes

Drain Tubes

- 20 ft. lengths of 1/2 in. I.D. PVC tubes

Plastic Sheet

- Fiberglass reinforced polyethylene sheet

Tie Straps

- 2 in. wide nylon webbing

Test Installation

The dam was installed by representatives of US Flood Control Corp., in accordance with their installation instructions (See Appendix A).

The first step was the placement of the plastic drain tubes on the floor, perpendicular to the dam orientation, every 15 ft. of dam length. Next, the plastic sheet was placed on the floor and folded in half. The plastic sheet was laid on the floor and extended the length of the dam, and about 40 ft. in width. The plastic tarp was folded back along the tubes in preparation for the laying of the dam tubes, as the tarp is later placed up the side and over the top of the dam tubes.

The dam configuration for the test was a triangular configuration, with three tubes on the bottom, two tubes for the second tier, and one tube for the top tier, for a total of six tubes.

The straps were laid on the floor to secure the tubes together. The tubes were individually laid out and joined with sleeves to form the 88 ft. length of the dam. At the ends, the excess tube length was folded over and secured with an additional sleeve. The three base tubes were inflated with water and tied together with the straps every 5 ft. This process was repeated for the remaining tubes and tiers. Each tier was connected to the previous tier using straps every 10 ft.

The final step was bringing the tarp up over the top of the dam and taping it to the pool sides at each end. See the following page for photographs of the installation sequence.

Photographs -- Test Installation

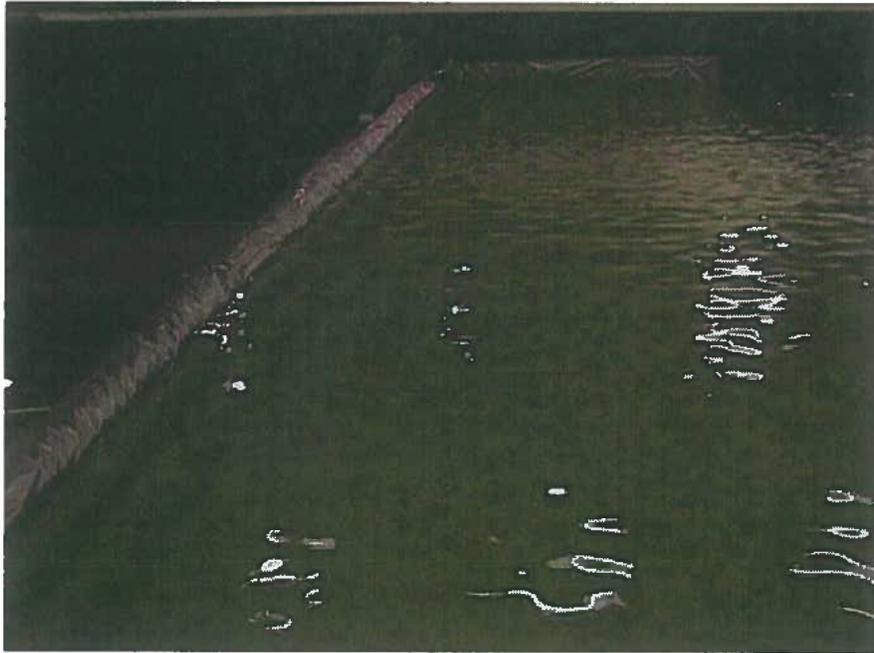


Dam Performance Test

The water main valves were opened and the pool was filled with water. The effect on the dam system was observed as follows:

Time	Water Depth	Observation
5 min.	2 in.	Some water trickling out of 1/2 in. plastic drain tubes
1 hr. 20 min.	15-1/2 in.	Still flow from base tubes, flow rate same as before
1 hr. 30 min.	16 in.	Some steel bars placed on floor behind dam to weigh down plastic sheet edge on pool floor
2 hrs. 20 min.	27 in.	Design depth of 27 in. reached, flow from drain tubes has not increased, no change to dam
3 hrs.	34 in.	No change
3 hrs. 15 min.	37 in.	Slight movement in dam, shift of tubes as they adjust due to pressure
3 hrs. 30 min.	39.5 in.	Water flow from drainage tubes is lessening
3 hrs. 45 min.	42 in.	Second movement in dam, top mbe shifted slightly
4 hrs.	47 in.	Water flowing over top of dam at far end
4 hrs. 15 min.	47 in.	No change in water depth as it has reached dam height, dam is stable and no breach or failure is evident

Photographs – Dam Performance Test



Wave Test Performance

The wave machine was turned on. The waves created a corresponding subtle rocking motion in the top of the dam. No breach or failure is evident.

Photographs – Wave Test Performance



Pull-Out Test Performance

A winch was used to pull-out and dislodge one end of the dam to release the water. The water was allowed to flow out the end. This did not cause failure of the remainder of the dam to perform its function.

The dam was dismantled by opening the drain valves and releasing the water from the tubes. Once empty, the sleeves were removed, the straps were released, and the components were rolled up and carried out.

Photographs – Pull-Out Test Performance



Conclusions

The demonstration showed that US Flood Control Corp. provided a portable, fast set-up and take-down, dam system. In a 3-tier configuration, it was capable of retaining water equal to its own height. The same results will be expected for a 2-tier configuration. The dam system performed its intended function without breach or failure. The system withstood the effects of waves and of being deliberately dislodged at one end.

PART B – PUNCTURE TEST

The puncture test was conducted at the Intertek Testing Services Laboratory in Coquitlam, B.C.

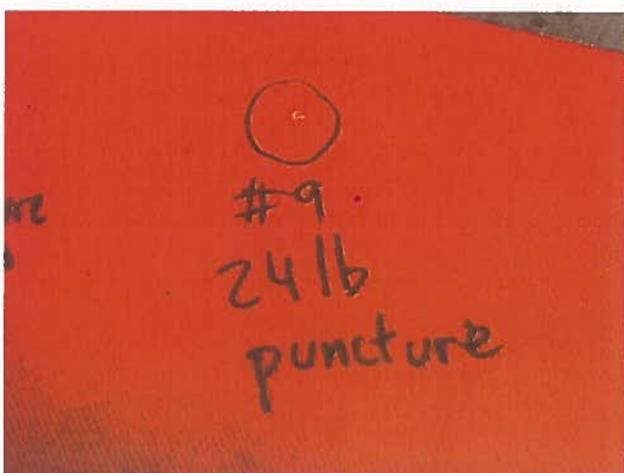
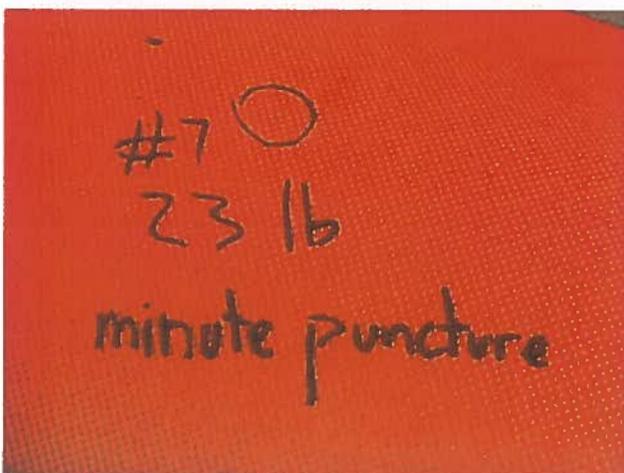
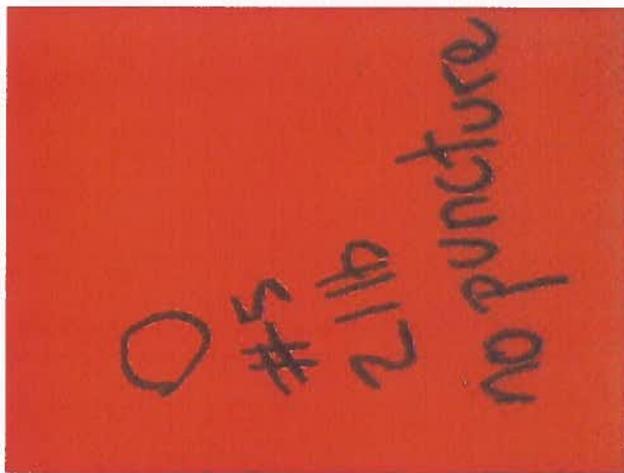
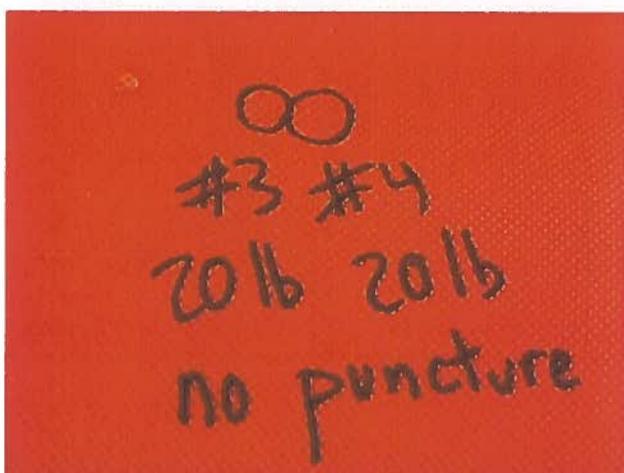
The dam was filled with water on a smooth level surface through the smaller of two water filler/drain caps. Sleeves were slid over the ends of the dam as per the manufacturer's instructions. A pressure gauge was mounted at the filler hose connection. The dam was pressurized to 3 psi to simulate a standard working pressure. A metal cone, as described in CGSB Standard 37-GP-54M, Section 7.2.7, (60° cone penetration needle with 0.5mm radius tip) was pressed onto the surface of the dam with varying degrees of force to determine the force required to puncture the dam membrane.

The following table shows the results of the puncture testing.

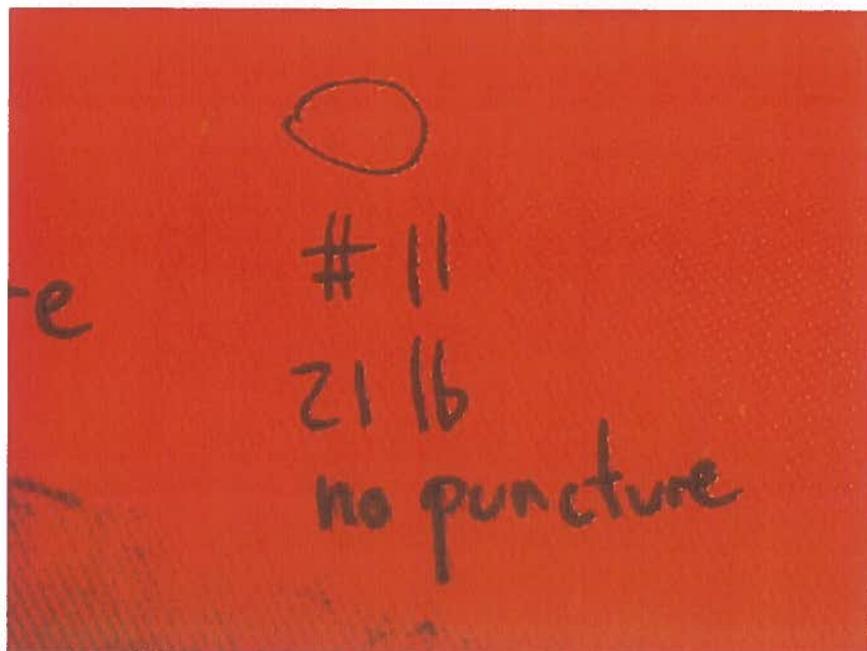
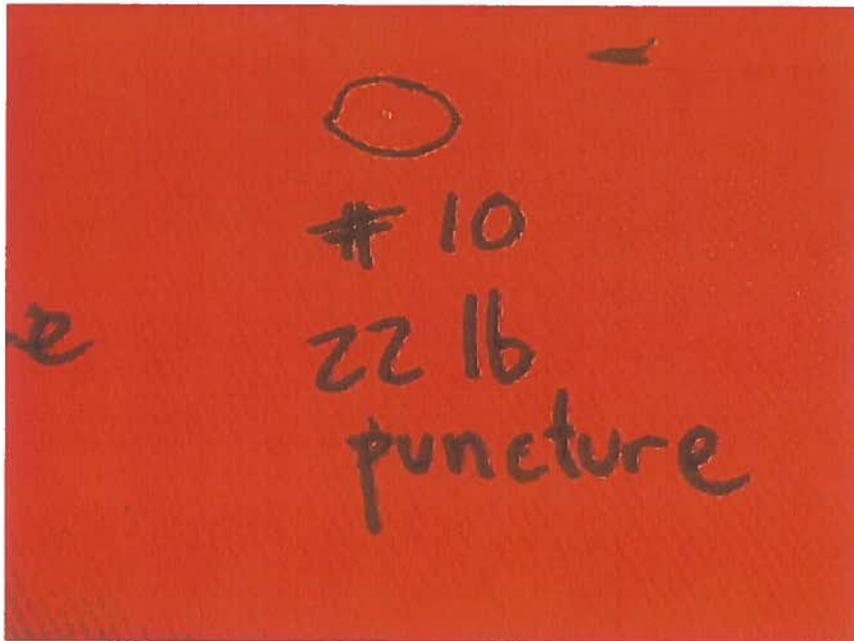
Test No.	Load Applied (lbs.)	Puncture (yes/no/minimal)
1	28	Yes
2	25	Yes
3	20	No
4	20	No
5	21	No
6	22	No
7	23	Minimum
8	24	No
9	24	Yes
10	22	Yes
11	21	No

The results of the puncture testing show that the membrane, when pressurized to 3 psi, will puncture at a load of 22 to 24 lbs of force, applied with a metal cone, as described in CGSB Standard 37-GP-54M, Section 7.2.7. See the following pages for photographs of the puncture test.

Photographs – Puncture Test



Photographs – Puncture Test – *Continued*



PART C – BURST PRESSURE TEST

The burst pressure test was conducted at the Intertek Testing Services Laboratory in Coquitlam, B.C.

The dam consists of a reinforced vinyl fabric tube. It was filled with water on a smooth level surface through the smaller of two water filler/drain caps. Sleeves were slid over the ends of the dam as per the manufacturer's instructions. A pressure gauge was mounted at the filler hose connection. Upon reaching a pressure of 15 pounds per square inch, (103.5 kPa), the larger of the two caps was forced out of the dam.

The mechanism fastening the cap to the fabric of the dam consists of a clamping arrangement which grips the fabric of the dam. The clamping force was not adequate to counter the force of the internal water pressure. The dam fabric was released completely from the cap. No torn dam fabric remained within the clamp of the cap. As soon as the cap was ejected, the opening in the dam fabric tore along the length of the dam approximately 1-1/2 feet in both directions.

A knot was tied into the dam to reseal it, and the dam was re-pressurized. At a pressure of 16 psi, the smaller of the two caps began to leak at the periphery of the cap and dam fabric. At a pressure of 17 psi, the cap was forced out of the dam. As soon as the cap was ejected, the opening in the dam fabric tore along the length of the dam approximately 5 feet in both directions. No torn dam fabric remained within the clamp of the cap.

See the following page for photographs of the burst pressure test.

Photographs – Burst Pressure Test

