

# *Bringing State-of-the-Art Technology to a Developing Country:*

## *A Capacity Building and Knowledge Transfer Success Story*

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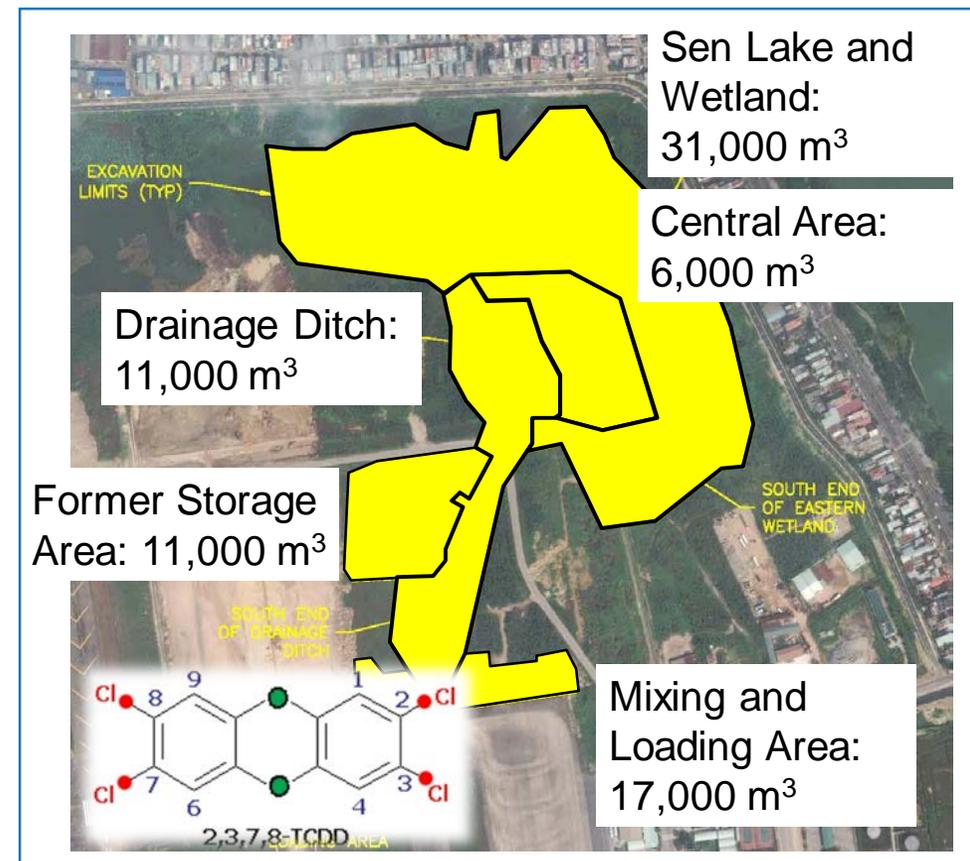
# Acknowledgements

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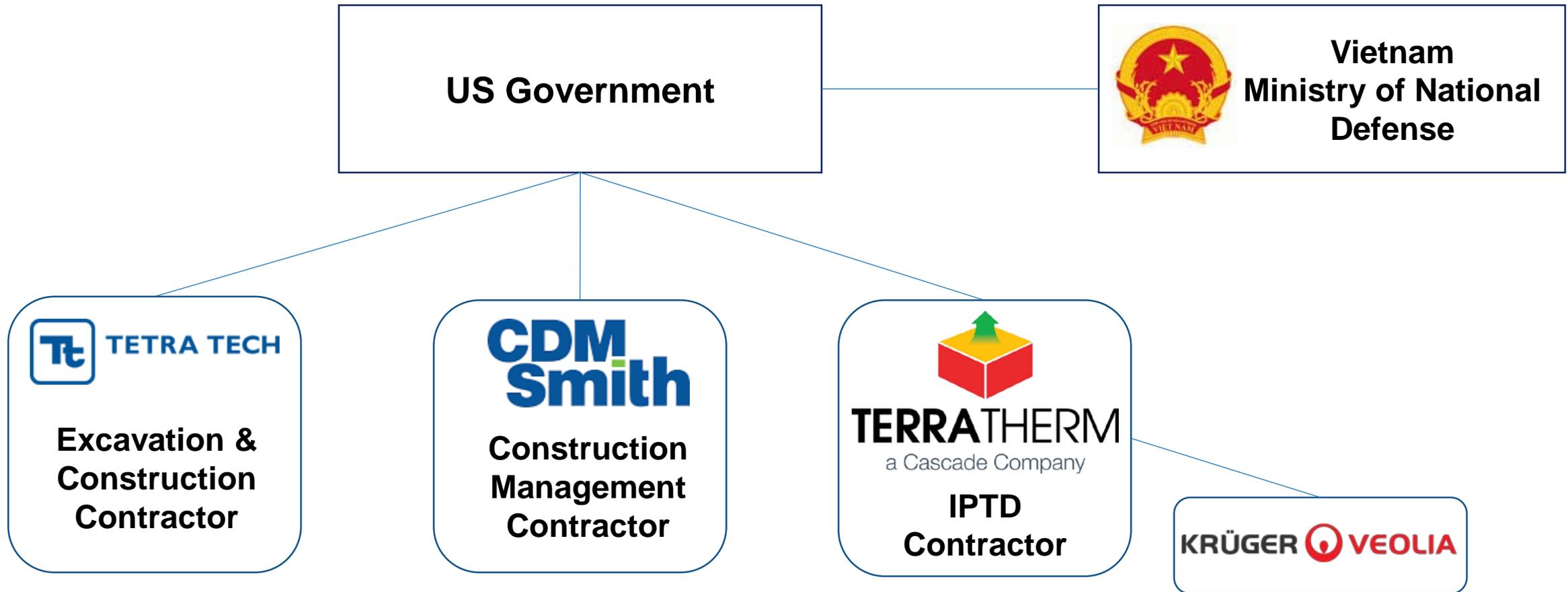


The Danang Airbase project was funded by USAID and USAID has approved TerraTherm's use of project data for this presentation

# Dioxin Contamination at Danang Airbase



# Danang Project Team



# Supporting the Mission

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- Delivering “Aid from the American People”
  - End extreme poverty
  - Promote development of free, peaceful and self-reliant societies
  - Help people and governments in developing nations build human capital
- Critical objective for Danang Project: **Capacity Building**
  - Teach, train, transfer knowledge

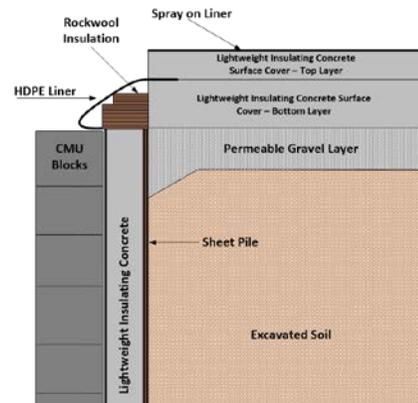
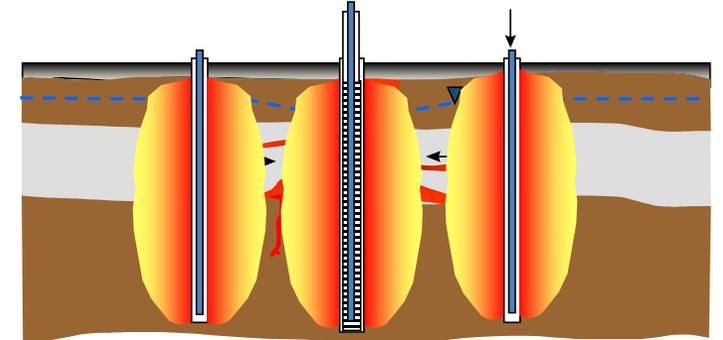
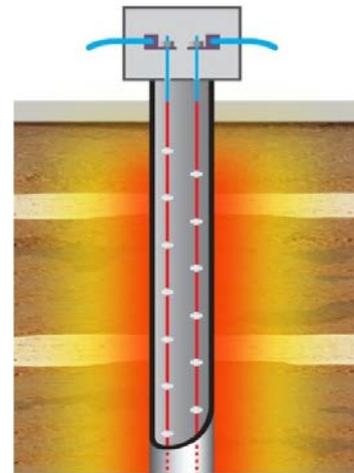
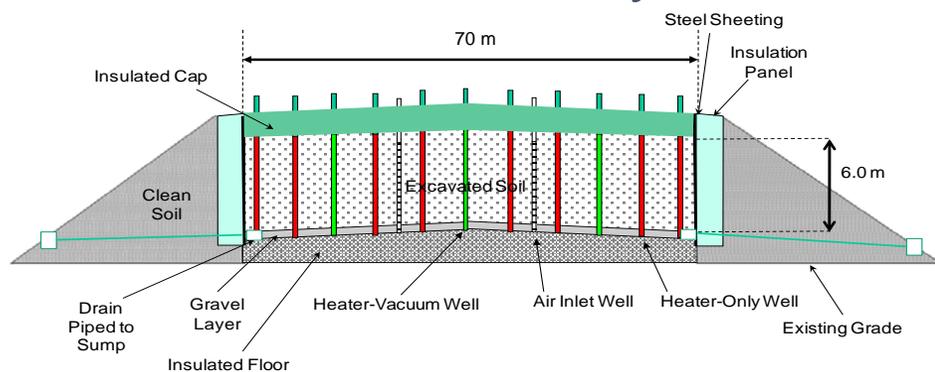
# What Was Accomplished?

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- Implemented first-of-its-kind remediation system supported by local Vietnamese contractors & employees
- Trained local Vietnamese workers to international safety standards; Worked >400,000 hours without lost time incident
- Treated >87,000 m<sup>3</sup> soil/sediment
  - Starting with high levels of dioxin (mean 56,000 ppt)
  - Treated to <150 parts per trillion (ppt); Most treated below <1 ppt.
- *Significantly reduced the risk of dioxin exposure to the people and environment of Vietnam for an improved quality of life*

# IPTD<sup>®</sup> Technology

- Thermal Conduction Heating (TCH)
- IPTD<sup>®</sup> = Aboveground TCH
- Treatment Goal:
  - Soil & sediment: <150 ppt
  - 325°C for ~21 days



# IPTD<sup>®</sup> System Construction

IPTD<sup>®</sup> pile construction & filling



Heater can installation



Insulating cover



Heater installation



Vapor & liquid treatment plant construction



Completed surface – Phase 2



# IPTD<sup>®</sup> System in Operation



# Local Weather Challenges



# IPTD<sup>®</sup> System Operation

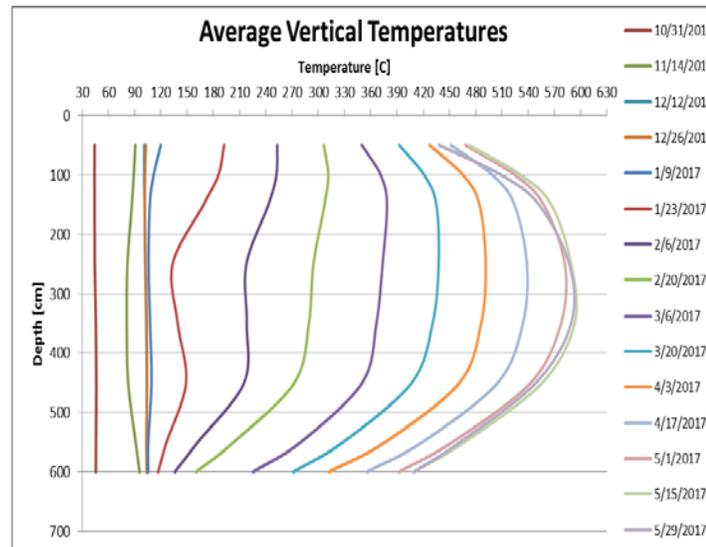
## Phase 1 (2014/2015)

- 43,348 m<sup>3</sup>
- Heated 413 days
- **Mean Post-treatment: 8.9 ppt TEQ Dioxin**
- ~90% - 97% DRE

## Phase 2 (2016/2017)

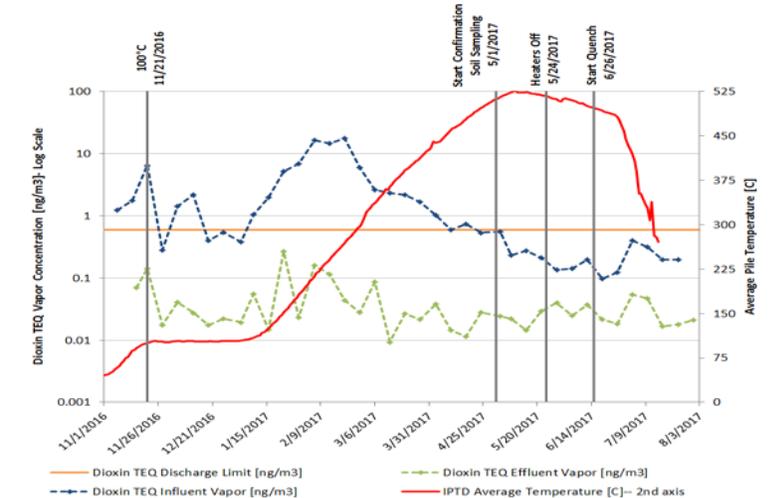
- 43,747 m<sup>3</sup>
- Heated 205 days
- **Mean Post-treatment: 0.199 ppt TEQ Dioxin**
- >99.99% DRE

### Temperature Monitoring



### Plant Effluent Monitoring

#### Vapor Dioxin TEQ Concentration vs. Average Pile Temperature



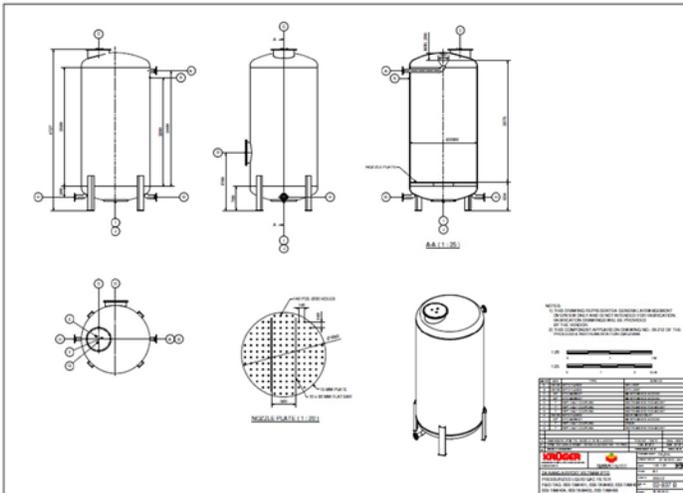
# Capacity Building: How?

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- Identify & pre-qualify local partners and suppliers
- Communicate standards and expectations
- Provide training
- Work together to achieve goals
- Collaborate & communicate with Government officials
- Provide learning opportunities for Government officials & public

# Capacity Building: Partners & Suppliers

- Identify Partners & Suppliers
- Communicate standards and expectations



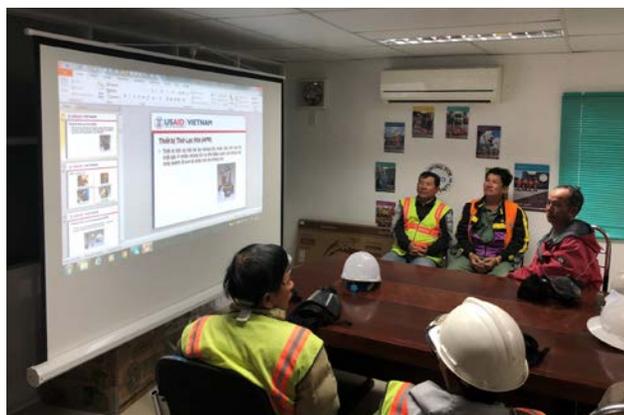
4-1: The Supplier shall supply the documentation as listed here below within the period specified / Bên bán phải cung cấp các tài liệu trong danh sách bên dưới trong thời gian cụ thể.

Tick if required Đánh dấu nếu yêu cầu	Description of documents Mô tả tài liệu	Issuer Người phát hành	Quantity Số lượng	Language Ngôn ngữ	Time for submission Thời gian giao
<b>Technical Documents / Các tài liệu cần có</b>					
x	Purchase order acknowledgement copy / Xác nhận đặt hàng	EVNCEMC	1	English	After signing PO
x	Detail programme of manufacture and delivery / Kế hoạch chi tiết việc sản xuất và giao hàng	EVNCEMC	1	English	After approving design
	Document submission schedule / Kế hoạch bàn giao tài liệu				
x	QA/QC Plan / Kế hoạch Quản lý Chất lượng	EVNCEMC	1	English	After approving design
x	Drawing / Equipment layout / Technical documents Bản vẽ / Sơ đồ thiết bị / Tài liệu kỹ thuật	EVNCEMC	1	English	After signing PO
x	Testing and inspection plan / Kế hoạch nghiệm thu và thử nghiệm	EVNCEMC	1	English	Before delivery
	Cleaning procedure / Quy trình làm sạch				
	Surface treatment procedure / Quy trình xử lý bề mặt				
x	Welding procedures / Các quy trình hàn	EVNCEMC	1	English	After approving design
x	Welder's certificates / Các chứng chỉ đường hàn	EVNCEMC	1	English	Before delivery
	Catalogues / Ca ta lô				
	Operation & maintenance manuals / Hướng dẫn vận hành và bảo trì				
	Installation manuals / Hướng dẫn lắp đặt				
	Handling and storage instructions / Chỉ dẫn giao hàng và lưu kho				
x	Supplier to provide painting reference / Người bán cung cấp việc tham khảo sơn	EVNCEMC	1	English	After approving design
x	Mill and/or material certificates / Chứng nhận vật tư / xuất xưởng	EVNCEMC	1	English	Before delivery
x	Factory acceptance test report / Báo cáo kiểm tra trước khi xuất xưởng	EVNCEMC	1	English	Before delivery
	As built certified drawings / Các bản vẽ hoàn công				
x	Quality compliance certificate / Chứng chỉ Chất lượng	EVNCEMC	1	English	Before delivery
	Motor test certificate / Kiểm tra nghiệm thu mô tơ				
x	Leakage test report / Kiểm tra nghiệm thu rò rỉ	EVNCEMC	1	English	Before delivery
	Spark test survey report / Kiểm tra nghiệm thu rò điện				
	Hydraulic test report / Kiểm tra nghiệm thu nước				
	Performance testing / Kiểm tra hoạt động				
	Calibration certificate / Chứng nhận hiệu chỉnh				
	FDA certificate / Chứng nhận FDA				
x	Packing List / Danh mục hàng hóa	EVNCEMC	1	English	Before delivery
x	Weight certificate / Chứng nhận khối lượng	EVNCEMC	1	English	Before delivery



# Capacity Building: Training

- Construction safety
- Health & safety
- Quality standards
- “Train-the-Trainers”



## Các độc tố trên công trường

Được tính toán trong tình huống xấu nhất Giới hạn phơi nhiễm là  $137 \mu\text{g}/\text{m}^3$

BẢNG TÍNH PHƠI NIỄM BỤI BÀN			
Mức độ bụi bàn	Chỉ số an toàn cho công trường này= 4		
Hóa học	Giới hạn Phơi nhiễm (mg/m <sup>3</sup> )	Hàm lượng đất tối đa (mg/kg)	Giới hạn phơi nhiễm Dưa trên Hộp chất đơn lẻ (EL Mix, mg/m <sup>3</sup> )
Dioxin (tetra)	2.00E-07	0.365	.14
			Sum
			Mức độ phơi nhiễm bụi bàn ở hỗn hợp PEL = 0.137

Hãy tìm số đó trong bài giảng quan trắc không khí

## Bảo hộ cấp độ B

- Bảo hộ cấp độ B bao gồm
  - Bộ trang phục không kín
  - Mặt nạ khí
  - Nếu được sử dụng để đi vào, người mặc phải ở cấp độ Kỹ thuật viên
  - Có thể được sử dụng cho dây chuyền khử nhiễm độc
- Sự khác biệt chính so với cấp độ C là thiết bị thở độc lập (SCBA)





# Capacity Building: Quality Standards

- International quality standards
  - Manufacturing
  - Construction
- On-site quality control inspections



# Capacity Building: Quality Standards

- International quality standards
  - Manufacturing
  - Construction
- Manufacturer QC Documentation

PO no.	Description	Issued date	Received date	Issued by	Remark
PO-043	Fabrication and Installation of Vapor Manifold - LILAMA7	19-Jul-13			
1	Technical Review Card -COOC of plate steel and shaped steel -Test report of plate steel and shaped steel -Mill certificate of Welding rod -CO of Pipe	7-Feb-14	7-Feb-14	LIUZHOU IRON/ RINHAO	OK
2	Technical Review Card -Certificate of Origin, Seamless Steel Pipes, Fittings -MSI Test Certificate, Seamless Steel Pipes, Fittings	2-Oct-13	2-Oct-13	HEBEI SHANTIAN	OK
3	Procedure of Fabrication -For Structure -For Piping	14-Sep-13	02-Oct-13	Ulama 7	OK
4	Procedure of fabrication and installation	14-Sep-13	02-Oct-13	Ulama 7	OK
5	Procedure of Painting	7-Oct-13	7-Oct-13	Ulama 7	OK
6	Daily Report of Fabrication	5-Nov-13	5-Nov-13	Ulama 7	OK
7	Heating/rooming quality control sheets -For support of piping	10-Oct-13	10-Oct-13	Ulama 7	OK
8	Fabrication completion inspection report	09-13	09-13	Ulama 7	OK
9	Welder certificate	5-Nov-13	5-Nov-13	Ulama 7	OK
10	Fabricated support type 1	20-Nov-13	20-Nov-13	Ulama 7	OK
11	Fabricated support type 2	20-Nov-13	20-Nov-13	Ulama 7	OK
12	Fabricated support type 3	20-Nov-13	20-Nov-13	Ulama 7	OK
13	Inspection sheet for Fabricated Pipe spool & Compensator	26-Nov-13	26-Nov-13	Ulama 7	OK
14	Inspection sheet for Fabricated Pipe spool of air extraction pipe vapor manifold line 1 PD-43	26-Nov-13	26-Nov-13	Ulama 7	OK
15	Inspection sheet for Fabricated Pipe spool of air extraction pipe vapor manifold line 2 PD-43	26-Nov-13	26-Nov-13	Ulama 7	OK
16	Inspection sheet for Fabricated Pipe spool of air extraction pipe vapor manifold line 3 PD-43	26-Nov-13	26-Nov-13	Ulama 7	OK
17	Inspection sheet for Fabricated Pipe spool of air extraction pipe vapor manifold line 4 PD-43	26-Nov-13	26-Nov-13	Ulama 7	OK
18	Inspection sheet 1: Inlet support for pipe of Vapor Manifold	3-MAR-14	3-MAR-14	Ulama 7	OK
19	Inspection sheet 2: Inlet compensator of Vapor Manifold	3-MAR-14	3-MAR-14	Ulama 7	OK
20	Inspection sheet 3: Inlet piping of Vapor Manifold	3-MAR-14	3-MAR-14	Ulama 7	OK
21	System flushing certificate PD-043	15-Mar-14	15-Mar-14	Ulama 7	OK
22	Inspection sheet for Pipe Spool & Pipe Dimensions	26-Feb-14	17-Feb-14	Ulama 7	OK
23	Pipe spool test certificate	26-Feb-14	26-Feb-14	Ulama 7	OK

**YOKOGAWA** Factory Calibration Test Report

Model Number: EJ4110E-JM5V0-012ENFU101  
Serial Number: UTP000200

Client Name: DANANG AIRPORT VIETNAM IPTD  
Project: DANANG AIRPORT VIETNAM IPTD

Target Input	Reference Reading %	Desired Voltage	Output Voltage	Output Error %
0.00 mVDC	0.0002	1.0000	0.9999	-0.01
1778.00 mVDC	48.8943	2.9954	2.9911	-0.14
3556.00 mVDC	98.8786	4.9931	4.9859	-0.14
5334.00 mVDC	148.8533	2.9901	2.9856	-0.18
7112.00 mVDC	208.8280	1.0000	1.0003	0.01

Accuracy: 0.05 %      Avg Error: -0.02

**NDE** BẢO CÁO CHỤP ẢNH PHÓNG XẠ RADIOGRAPHIC TESTING REPORT

Đơn dự án/Project: DANANG AIRPORT VIETNAM IPTD  
Hạng mục KT / Item: BỒN BÉ      Khách hàng/Client: CÔNG TY CP CƠ ĐIỆN MIỀN TRUNG - CEMC

Qui trình kiểm tra số: NDE-IN-IPTD-01      Tiêu chuẩn Kỹ thuật: ASME V Article 2      Tiêu chuẩn chấp nhận: ASME VIII Div.1 (Acceptance Standard)

Thông số kỹ thuật: Mối hàn nối tấm      Chu hình kiểm tra: Hai đầu Đáy V      Qui trình hàn: Hàn kim loại trong môi trường khí bảo vệ

Điện áp kiểm tra Test Voltage	Loại dòng điện Arcing Type	Loại ống vát Joint Type
140 KV		Phân người/ Sancer Side
Kích thước ống Pipe Size	2x2 mm	Phân ống/ Sancer Side
Khoảng cách từ đầu Nguồn - Phim MIN Distance from FOCAL TO FILM	700 mm	Xử lý phim Film processing
Khoảng cách phim - Vết MAX DEFECT	Áp sát	Phim đóng/Develop

Hãng sản xuất/Film manufacturer: FUJI      Loại phim/Film type: IX 100

Số lượng phim 1 lần chụp/ Film quantity in one shoot: Phim đóng/Develop

Độ nhạy yêu cầu/ Density required: 0.25

Đặc tính Flaming: SI

THÔNG TIN VẬT LIỆU/MATERIAL INFORMATION

Điều kiện bề mặt: Nguyên dạng đường hàn      Kích thước: N/A      Vị trí: SM-09B-ITS2106      Bản vẽ: DNAPVN IPTD-837

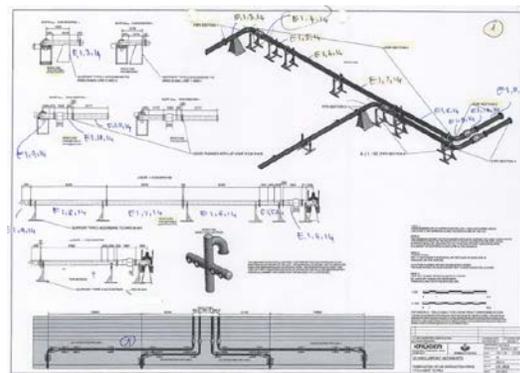
Ngày chụp ảnh/Date: 13/10/2013

**1. Summary**

This specification contains specifications for supply and distribution of gases and fittings for heater gas piping and temperature monitoring piping.

**2. Scope of Supply**

No.	Description	Quantity
1	Supply and manufacturing of heater gas without temperature monitoring pipes	3000
2	Supply and manufacturing of heater gas with temperature monitoring pipe	100
3	Supply and manufacturing of temperature monitoring pipes (stand alone)	50
4	Line marking for heater gas installation	1000
5	Return tank of air preheaters (stand alone)	1000



**IN-PIPE THERMAL DESORPTION (IPTD) SERVICES FOR ENVIRONMENTAL REMEDIATION PROJECT AT THE DANANG AIRPORT**

CONSULTANT: CDM SMITH      PRIME-CONTRACTOR: TERRATHERM      SUB-CONTRACTOR: KRUGER - WSWIN

Report no: AEM-I-1-16      Item No: Air Extraction Manifolds - Line 1      Description: E.I.1.14

Dimension point	Design	Actual	Different
1	6370	6367	-3
2	6370	6365	-5
3	6370	6365	-5
A	3185	3184	-1

Result of inspection: Accepted:  Not Accepted:  N/A:

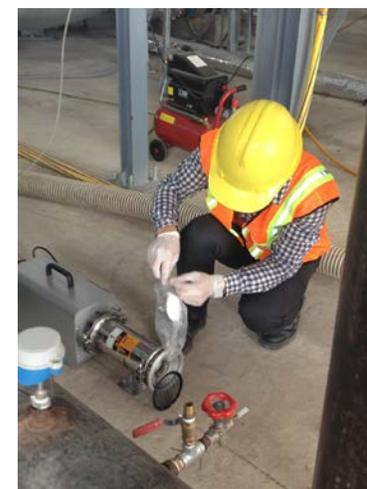
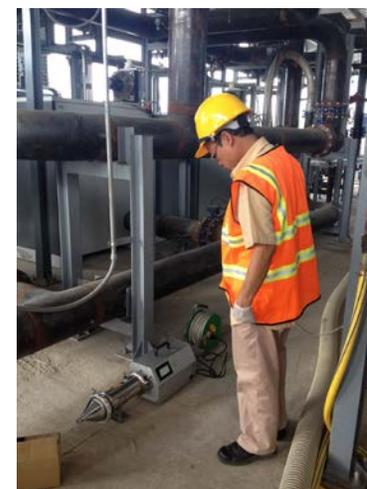
SUBMITTED BY VENDOR: Phan Quang Energy      RECEIVED BY KRUGER-WSWIN/TERRATHERM: Hiep Nguyen      REVIEW BY CDM / CLIENT: [Signature]

**PHIẾU KẾT QUẢ THI NGHIỆM**

Tên mẫu	Loại mẫu	Chỉ số	Đơn vị	Giá trị	Đơn vị														
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

# Capacity Building: Collaboration

- Split samples with GVN scientists
- Data sharing
- GVN scientists conducted parallel sampling & analysis at local VN labs



# Capacity Building: Collaboration

- Coordination meetings with GVN officials
- Technical workshops for scientists & regulators
- Community outreach meetings



# Capacity Building: Results

- Technical success! Project remediated dioxin contamination, improving conditions in the local environment
- Implemented “first-of-its-kind” innovative technology approach with major contributions by local Vietnamese workforce
  - Large Vietnamese workforce trained to international standards for safety & quality
  - Major equipment fabrication and construction activities performed by local Vietnamese contractors
- Enhanced collaboration with Vietnamese scientists & Agency representatives

# Capacity Building Model

## Roles & Benefits



# Câu hỏi?



# Questions?

# Thank you

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