

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

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

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# Acknowledgements

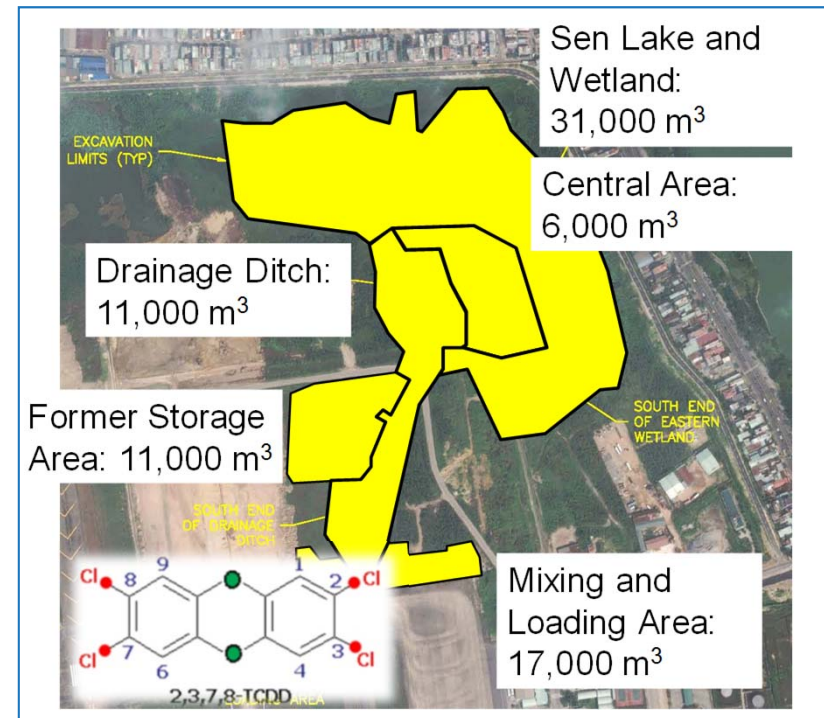
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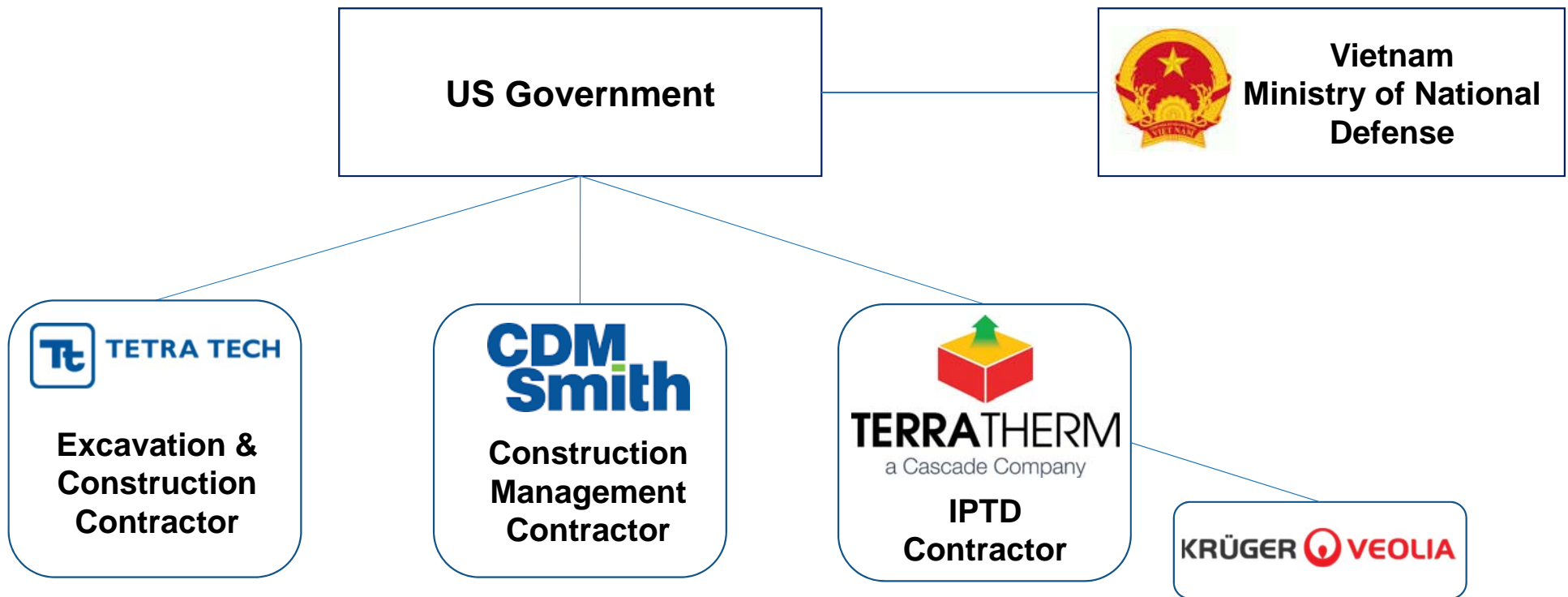
The Danang Airbase project was funded by USAID and USAID has approved TerraTherm's use of project data for this presentation



# 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?

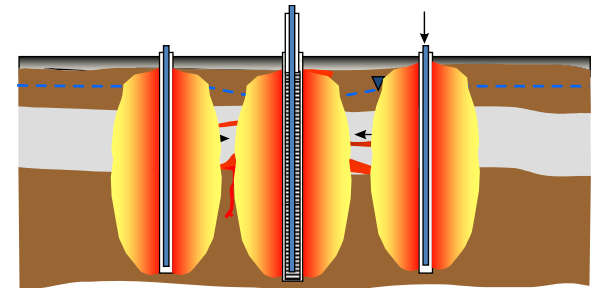
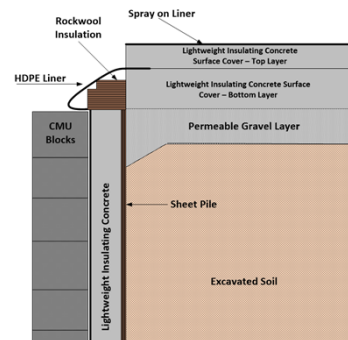
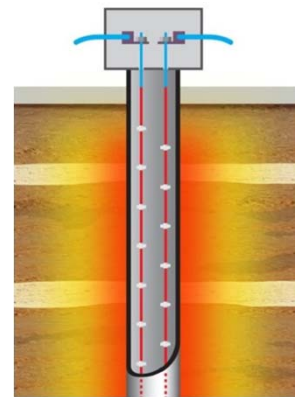
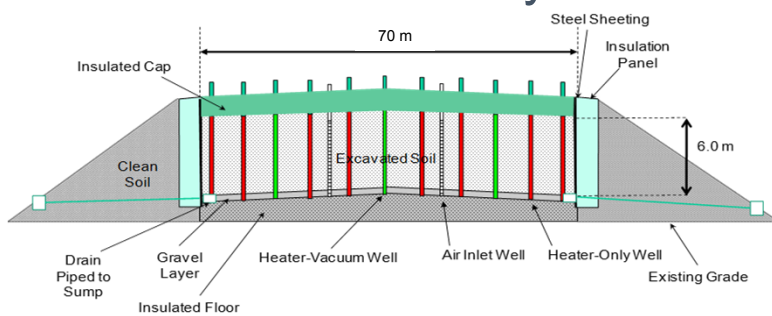
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- Implemented first-of-its-kind remediation system supported by local Vietnamese contractors & employees
- Trained local Vietnamese workers to international safety standards; Worked >400,000 hours without lost time incident
- Treated >87,000 m<sup>3</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

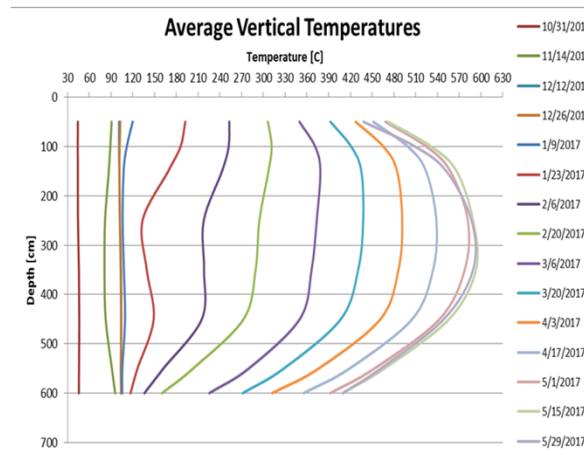
## Phase 1 (2014/2015)

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

## Phase 2 (2016/2017)

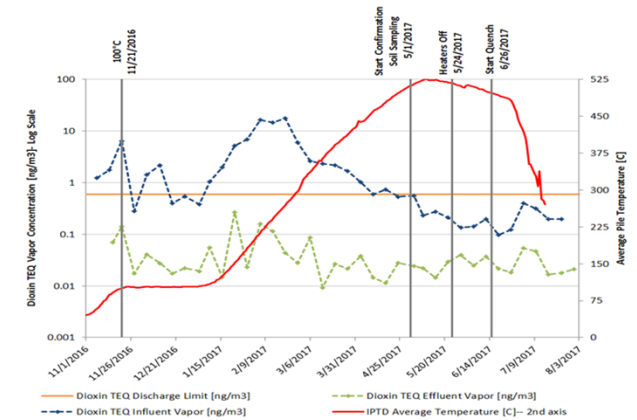
- 43,747 m<sup>3</sup>
- Heated 205 days
- **Mean Post-treatment: 0.199 ppt TEQ Dioxin**
- >99.99% DRE

Temperature Monitoring



Plant Effluent Monitoring

Vapor Dioxin TEQ Concentration vs. Average Pile Temperature



# Capacity Building: How?

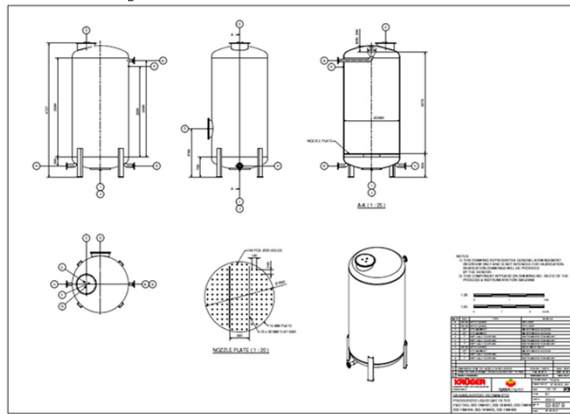
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- Identify & pre-qualify local partners and suppliers
- Communicate standards and expectations
- Provide training
- Work together to achieve goals
- Collaborate & communicate with Government officials
- Provide learning opportunities for Government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

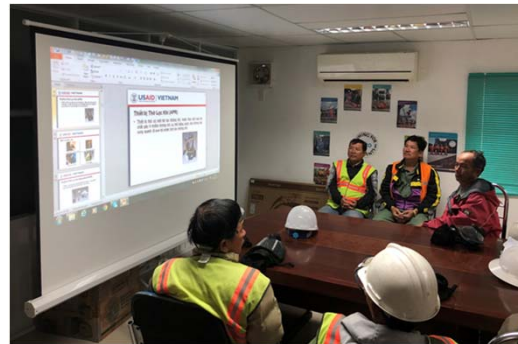
Tick if required Đánh dấu nếu yêu cầu	Description of documents Mô tả tài liệu	Issuer Người phát hành	Quantity Số lượng	Language Ngôn ngữ	Time for submission Thời gian giao
<b>Technical Documents / Các tài liệu cần có</b>					
x	Purchase order acknowledgement copy / Xác nhận đặt hàng	EVNCEMC	1	English	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 NHIỄM BỤI BÀN			
Mức độ bụi bẩn	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 Hợp chất đơn lẻ (EL Mix, mg/m <sup>3</sup> )
Dioxin (tetra)	2.00E-07	0,366	.14
			Sum
			Mức độ phơi nhiễm bụi bản 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 chuyên khử nhiễm độc
- Sự khác biệt chính so với cấp độ C là thiết bị thở độc lập (SCBA)



# Capacity Building: Training

- Provided 1,396 individual trainings
- Over 6,300 hrs of training to VN staff



### Fall Protection Options

Personal Fall Arrest System (PFAS)

Guardrails

Safety Net



ACTIVITY HAZARD ANALYSIS

Date: March 23, 2014  
 Project: USGS Dabang Implementation  
 Activity: Line Drilling/Drill Opening Activities During Operations  
 Activity Location: To Be Determined  
 Prepared By:

Risk	Risk Assessment Code Matrix				
	Frequent	Likely	Occasional	Seldom	Unlikely
Extremely High Risk	5	4	3	2	1
High Risk	4	3	2	1	0
Medium Risk	3	2	1	0	0
Low Risk	2	1	0	0	0
Very Low Risk	1	0	0	0	0

Overall Risk Assessment Code (RAC): H  
 Involved Personnel: Southem and Subcontractor

JOB Steps	Hazards	Actions to Eliminate or Mitigate Hazards	RAC
Minimum Required Personal Protective Equipment (PPE): Modified Level D - E80 rated steel toe boots, ANSI Z87 safety glasses, hard hat, and splash protective equipment (i.e., chemical protection splash overalls, apron, gloves, boots, respirator (or Level B respiratory protection (as indicated))			
Prepare for Movement Activities Requiring Lifting		<ul style="list-style-type: none"> <li>Discuss tasks to be performed, including the task length, objectives, appropriate PPE, etc. with the professional and assign responsibilities</li> <li>Verify that potentially affected parties of activities to be performed</li> <li>Ensure tasks will not be performed until equipment is inspected and ready for specified use or beginning preparation for entry into area of task</li> <li>Clearly identify those points and activities where required safety (i.e., fall, head, or otherwise) other PPE is required</li> <li>Use weight, balance, leverage, or otherwise prepare for the control of hazardous energy (electrical, fluid, vapor, heat, etc.) when equipment to be worked on</li> <li>Ensure emergency procedures, communication, location of emergency equipment (shower/eyewash), having appropriate emergency personnel (if necessary), evacuation procedures, hazard emergency, and any specific first aid measures</li> <li>Discuss hazard communication of chemicals that may be present or that personnel are in danger of coming into contact with during task accomplishment</li> <li>Ensure that all appropriate PPE</li> </ul>	
Line Drilling or Drill Opening		<ul style="list-style-type: none"> <li>All personnel potentially coming into contact with potential chemical or other physical hazard associated with the task shall wear appropriate PPE and equipment protection</li> <li>Ensure that all times and areas to be encountered in task performance could be under pressure or that substances may not be anticipated and avoid from the potential for dangerous hazardous energy (gas, liquid, vapor, chemical, electrical, etc.)</li> <li>Ensure that the drill or other opening was from the end of the column (i.e., include column shut down, withdrawal, shoring, etc.)</li> <li>Ensure that all shut-in or other opening and existing capabilities are present at the site that the opening or other opening task will take place</li> <li>Block adequately - approach with caution - remove caps, bolts, furlings, damaged equipment with care and attention</li> </ul>	

TERRATHERM

SAFETY TRAINING RECORD

PROJECT TITLE: \_\_\_\_\_ DATE: 11 July 2014

TRAINING NAME: \_\_\_\_\_ INSTRUCTOR: \_\_\_\_\_ LOCATION OF TRAINING: \_\_\_\_\_

PRESENTEE NAME	COMPANY	SIGNATURE
1) Cao Van Thien	VNCS	[Signature]
2) Cao Van Thien	VNCS	[Signature]
3) Cao Van Thien	VNCS	[Signature]
4) Cao Van Thien	VNCS	[Signature]
5) Cao Van Thien	VNCS	[Signature]
6) Cao Van Thien	VNCS	[Signature]
7) Cao Van Thien	VNCS	[Signature]
8) Cao Van Thien	VNCS	[Signature]
9) Cao Van Thien	VNCS	[Signature]
10) Cao Van Thien	VNCS	[Signature]
11) Cao Van Thien	VNCS	[Signature]
12) Cao Van Thien	VNCS	[Signature]
13) Cao Van Thien	VNCS	[Signature]
14) Cao Van Thien	VNCS	[Signature]
15) Cao Van Thien	VNCS	[Signature]
16) Cao Van Thien	VNCS	[Signature]

Construction Management and Oversight of the Environmental Remediation at Da Nang Airport

Contract No. 40/2011/Đ-ĐB (02/2011-ĐB) (Đ-ĐB) (Đ-ĐB)

Project: Environmental Remediation at Da Nang Airport

EVACUATION TRAINING

Contractor: TERRATHERM

Date: 6 June 2014

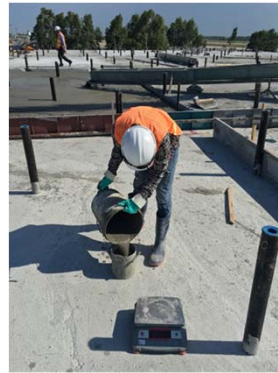
Time (in/Out)	Time (in/Out)	Name / Title	Company / City by	Purpose of Visit / City by
08:30	09:00	Van Van Thien	VNCS	Site
09:00	09:30	Van Van Thien	VNCS	Site
09:30	10:00	Van Van Thien	VNCS	Site
10:00	10:30	Van Van Thien	VNCS	Site
10:30	11:00	Van Van Thien	VNCS	Site
11:00	11:30	Van Van Thien	VNCS	Site
11:30	12:00	Van Van Thien	VNCS	Site
12:00	12:30	Van Van Thien	VNCS	Site
12:30	13:00	Van Van Thien	VNCS	Site
13:00	13:30	Van Van Thien	VNCS	Site
13:30	14:00	Van Van Thien	VNCS	Site
14:00	14:30	Van Van Thien	VNCS	Site
14:30	15:00	Van Van Thien	VNCS	Site
15:00	15:30	Van Van Thien	VNCS	Site
15:30	16:00	Van Van Thien	VNCS	Site
16:00	16:30	Van Van Thien	VNCS	Site
16:30	17:00	Van Van Thien	VNCS	Site
17:00	17:30	Van Van Thien	VNCS	Site
17:30	18:00	Van Van Thien	VNCS	Site
18:00	18:30	Van Van Thien	VNCS	Site
18:30	19:00	Van Van Thien	VNCS	Site
19:00	19:30	Van Van Thien	VNCS	Site
19:30	20:00	Van Van Thien	VNCS	Site
20:00	20:30	Van Van Thien	VNCS	Site
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21:00	21:30	Van Van Thien	VNCS	Site
21:30	22:00	Van Van Thien	VNCS	Site
22:00	22:30	Van Van Thien	VNCS	Site
22:30	23:00	Van Van Thien	VNCS	Site
23:00	23:30	Van Van Thien	VNCS	Site
23:30	24:00	Van Van Thien	VNCS	Site





# 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

ID No.	Description	Issued date	Revised date	Issued by	Remark
<b>LIST OF QA/QC DOCUMENTS</b>					
<b>PO-043 Fabrication and Installation of Vapor Manifold - ULAMA7</b>					
1	Technical Review: Cast - CO/CV of pipe steel and shaped steel - Test report of pipe steel and shaped steel - Silt certificate of welding coil - CO of base	7-Feb-14	7-Feb-14	LICHON/BOV/ R2300	OK
2	Technical Review: Cast - Certificate of Origin: Stainless Steel Plate, Fittings, - ASME Test Certificate, Stainless Steel Plate, Fittings, - CO of base	2-Dec-13	2-Dec-13	HERO SHANGHAI	OK
3	Procedure of welding - Pipe Brazing	14-Sep-13	02-Dec-13	Ulama 7	OK
4	Procedure of inspection and installation - Procedure of Brazing	14-Sep-13	02-Dec-13	Ulama 7	OK
5	Test Report of Inspection	2-Dec-13	2-Dec-13	Ulama 7	OK
7	Welding/overseeing quality control sheets - Part aspect of piping	10-Dec-13	10-Dec-13	Ulama 7	OK
8	Finalization completion inspection report - Piping assembly	06-11	06-11	Ulama 7	OK
9	Inspector certificates	5-Nov-13	5-Nov-13	Ulama 7	OK
10	Material inspection form 1	20-Nov-13	20-Nov-13	Ulama 7	OK
11	Material inspection form 2	20-Nov-13	20-Nov-13	Ulama 7	OK
12	Material inspection form 3	20-Nov-13	20-Nov-13	Ulama 7	OK
13	Inspection sheet for Separator Pipe spacer & Compressor - Pipe spacer	26-Nov-13	26-Nov-13	Ulama 7	OK
14	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 1) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
15	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 2) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
16	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 3) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
17	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 4) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
18	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 5) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
19	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 6) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
20	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 7) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
21	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 8) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
22	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 9) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
23	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 10) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
24	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 11) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
25	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 12) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK
26	Inspection sheet for Separator Pipe spacer of an extension joint upper manifold (In 13) PO-43	26-Nov-13	26-Nov-13	Ulama 7	OK

Model Number	EJAX 100-JWGWS-R12ENF1D1				
Serial Number	170700200				
Customer Name	A00000001040				
Date	9/15/2014				
Antenna Temp	22 Deg C				
Immersion Temp	18.5 Deg C				
Customer PO#	3861				
Customer OIC	3861				
Customer UIC	3861				
Customer OPI	3861				
Company Name	DPH Corp				
Company Address	10055401				
Line Number	00001				
Tag Number	000				
Technician	37013				
Technician No	110429				
Inspection Method	R 10 (ASME) Linear				
<b>Inspection Used</b>					
Probe: 100 Standard	NIK				
Probe: 500 Standard	NIK				
Probe: 1000 Standard	NIK				
Probe: 2000 Standard	NIK				
Volume instrument: surface and penetration monitor	DPH 5000 series				
DPH 5000 series					
Target Input	Measurement	Reading %	Desired Voltage	Output Voltage	Output Error %
0.00 (0.00000)	0.00000	1.00000	2.00000	2.00000	-0.000
1778.00 (0.00000)	48.88145	2.75000	2.00000	2.00000	-0.000
1666.00 (0.00000)	95.85445	4.85831	4.00000	4.00000	-0.000
1778.00 (0.00000)	48.88145	2.00000	2.00000	2.00000	-0.000
0.00 (0.00000)	0.00000	1.00000	1.00000	1.00000	-0.000

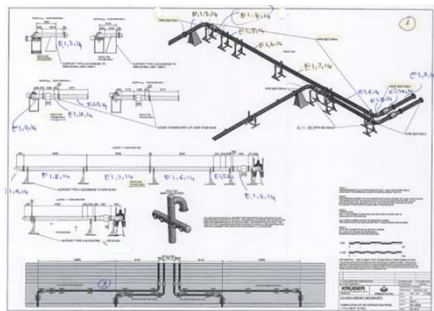
	<b>BÁO CÁO CHỤP ẢNH PHÒNG XẠ RADIOGRAPHIC TESTING REPORT</b>	Đơn vị: NĐE-IN-001
		Report No: RT-004
Ngày: 13/10/2013		Date: 1/1

Dự án/Project: DANANG AIRPORT VIET NAM IFTD		Khách hàng/Client: CÔNG TY CP CƠ ĐIỆN MIỀN TRUNG - CEMC	
Hàng hóa: KT / Jaw: BÓN BÈ		Tytu chulu Ky duat: ASME V Article 2	
Code hành kiểm tra: NDE-IN-IFTD-01		Tytu chulu chap nhan: ASME VIII Div 1	
Test Procedure No: PLATE		Category: Pipe Weld	
Thông số kỹ thuật: Mối hàn nối tấm		Cấu hình hàn nối: Hàn nối trên vế	
Code hành kiểm tra: Mối hàn nối tấm		Cấu hình hàn nối: Hàn nối trên vế	
Category: Pipe Weld		Tytu chulu chap nhan: ASME VIII Div 1	
Test Procedure No: PLATE		Category: Pipe Weld	

Điểm số kiểm tra	Test Range	Loại ống/vì
140 KV	140 KV	Loại ống/vì
2.2 mm	Kích thước khe hở	Kích thước khe hở
700 mm	Kích thước trục	Kích thước trục
Ap sát	Kích thước khe hở	Kích thước khe hở

Hàng hóa	Quy trình	Loại quy trình	ASTM IB
Loại phân	VI 100	Vị trí đặt	Phân ngành
Số trong phân 1 lần chụp	Phân số/đơn vị/đơn vị	Số lượng	Phân số
Độ nhạy yêu cầu	0,25	Kỹ thuật chụp	SW 02 DW

<b>1. Summary</b>	
This specification contains specifications for supply and installation of pipe and fittings for boiler gas pipes and turbine steam monitoring pipes.	
All pipes and fittings shall be according to ASME VIII Div 1.	
Supply and installation shall be according to specifications and drawings. All work shall performed in accordance with good engineering practice.	
In case of missing or missing information the contractor must contact the consultant and clarify the work before proceeding with the work.	
<b>2. Scope of supply</b>	
Material	Supply
Supply and installation of pipe and fittings for boiler gas pipes and turbine steam monitoring pipes.	Supply and installation
Supply and installation of pipe and fittings for boiler gas pipes and turbine steam monitoring pipes.	Supply and installation



CONSULTANT	CDM SMITH	
PRIME CONTRACTOR	TERRATHERM	
SUB CONTRACTOR	KRUGER - WWSVN	
IN-PIPE THERMAL DESCRIPTION (PTDS) SERVICES FOR ENVIRONMENTAL REMEDIATION PROJECT AT THE DANANG AIRPORT		
SCOPE FABRICATED INSPECTION RECORD		
Report no: AEM-E-08	Item No: Air Extraction Manifold - Line 1	Description: E. 1.1.14
Result of inspection: Accepted <input checked="" type="checkbox"/> / Not Accepted <input type="checkbox"/> / N/A <input type="checkbox"/>		
Submitted by Vendor	Received by KRUGER WWS/TERRATHERM	Reviewed by CDM/CLIENT

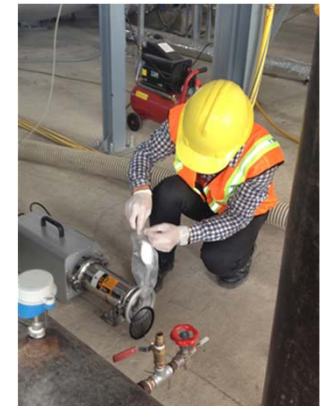
Check Method		Check Result	
Dimension	Design	Actual	Difference
Length	1200	1200	0
Width	300	300	0
Weight	1200	1200	0
Material	A 316 L	A 316 L	0

Đơn vị: NĐE-IN-001			
Report No: RT-004			
Ngày: 13/10/2013			
Date: 1/1			
<b>THÔNG TIN VẬT LIỆU MATERIAL INFORMATION</b>			
Điều kiện môi trường: Nguyễn Đăng Dương	Kích thước: N/A	Vật liệu: SM-008-INS-1016	Biểu vẽ: DNAPVN-IFTD-817
Điều kiện môi trường: Nguyễn Đăng Dương	Dimension: Material	Material	Material
Điều kiện môi trường: Nguyễn Đăng Dương	Dimension: Material	Material	Material



# 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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