

Via email: <u>kimberley.maher@alaska.gov</u>

April 18, 2019

15586.7EXT 19-032

State of Alaska Department of Natural Resources Division of Mining, Land, and Water 3700 Airport Way Fairbanks, AK 99709-4699

Attn: Kimberley Maher

Application for Land Use Permit

Dear Ms. Maher:

ASRC Energy Services Alaska, Inc. (AES Alaska) submits the attached application (Attachment 1: Land Use Permit Application) for the use of gravel pads located on State of Alaska uplands from the Colville to the Canning Rivers on the North Slope of Alaska to conduct commercial activities. The initial proposed work will include installation and maintenance of a Distributed Temperature Sensor (DTS) Data Delivery System operating in a connex in support of the Alaska Methane Hydrate Project.

The initial permit issuance will include the placement of a pre-manufactured connex container, activities related to data collection, operating the DTS Data Delivery System, and site maintenance. No additional infrastructure is proposed because the site is on the road system and the pad on which it operates has already been already constructed (Attachment 2: Figures 1 & 2). Additional information regarding the proposed activities can also be found in Attachment 2.

We respectfully request review of our attached application. Please contact me at (907) 339-5472 or by email at ahenry@asrcenergy.com if you have any questions.

Sincerely, ASRC Energy Services Alaska, Inc.

Amanda Henry C

Senior Project Manager Regulatory and Technical Services Division

Enclosures: Attachment 1: ADNR Land Use Application Attachment 2: DTS Operations Plan

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES DIVISION OF MINING, LAND AND WATER

LAND USE PERMIT APPLICATION

AS 38.05.850

Receipt Types: 7A – Application for Authorization, except

RR – Application for Authorization on Recreational Rivers System

Applicants must complete all sections of this application. In addition, applicants proposing:

- the use of the uplands and non marine waters must also complete the Supplemental Questionnaire for Use of Uplands and Non Marine Waters accompanying this application;
- off-road travel must also complete the Supplemental Questionnaire for Off-Road Travel accompanying this application; and/or
- the use of tide and submerged lands must also complete the Supplemental Questionnaire for Use of Marine Waters accompanying this application.

Other items that must accompany the completed application are:

- <u>a (non-refundable) application fee;</u> see current Director's Fee Order for applicable fees;
- a 1:250,000 or 1:63,360 scale USGS map showing the location of the proposed activity;
- additional items identified and required in any supplemental questionnaire(s) to this application; and
- additional pages if more space is necessary to answer the questions completely.

Completed Land Use Permit Applications should be mailed to one of the following offices:

Public Information Center 550 W. 7th Ave, Suite 1360 Anchorage, AK 99501 (907) 269-8400 Public Information Center 3700 Airport Way Fairbanks, AK 99709 (907) 451-2705 MLW Information Office 400 Willoughby, #400 P.O. Box 111020 Juneau, AK 99811-1020 (907) 465-3400

	I	AS	#
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Applicant Name			Date of Bir
Doing Business As		Contact Person	EIN
Mailing Address with City	State and Zip		Email Address
()	(907)339-5472	(907 <u>,</u> 351-4662	()
Home Phone	Work Phone	Cell Phone	FAX
If you are applying fo	r a corporation, give the following i	information:	
	and of incomportion:		
Name, address and pl			
Name, address and pl	ace of incorporation.		
Name, address and pl	alified to do business in Alaska? V	es [X] No [] If yes provide pa	ne address and phone number of
Name, address and pl	alified to do business in Alaska? Y	es [X] No []. If yes, provide nar	ne, address and phone number of
Name, address and pl Is the corporation qu residen <u>t agent</u> :	alified to do business in Alaska? Y	es [X] No []. If yes, provide nar	ne, address and phone number of
Name, address and pl Is the corporation qu residen <u>t agent:</u>	alified to do business in Alaska? Y	fes [X] No []. If yes, provide nar	ne, address and phone number of
Name, address and pl Is the corporation qu residen <u>t agent:</u> Type of User, Select	alified to do business in Alaska? Y t one: [] Private <u>non</u> -commercial	[es [X] No []. If yes , provide nar (personal use)	ne, address and phone number of [] Commercial Recreation or Touris

Duration of Project: The proposed activity will require the use of state land for: (Check one)							
[] a single term of less than one year. Beginning month: Ending month:							
[X] a multi year term for up to 5 years. Beginning year: Ending year:							
If multi year and sease	onal, circle months of use in e	each year. Jan., Feb.,	Mar., Apr., May, Jun., Jul., Aug., Sep	ot., Oct., Nov., Dec.			
Project Location							
Latitude/Longitude (or UTM:		or				
Section: (The spaces below ar	, Township: e to be used if the boundaries	, Range: s of the proposed proje	, Meridian: ct cross section lines.)				
Section:	, Township:	, Range:	, Meridian:				
Section:	, Township:	, Range:	, Meridian:				
Proposed project will	require the use of up to	acres.	(Add additional sheets as	necessary)			
Proposed project will require the use of up toacres. (Add additional sheets as necessary) Project Description - Describe in detail your intended use of state land. (State land also includes all tide and submerged lands beneath coastal waters and all shorelands beneath other navigable water bodies of the state.) Discuss development and activities. (Attach additional pages as necessary.)							

<u>Site Description</u> - Briefly describe the current condition of the proposed site of use, noting any trash, garbage, debris or signs of possible site contamination (If significant, we recommend you provide pictures to establish initial conditions):

Are there improvements or materials on the site now? Yes [X No [] If yes, briefly describe the improvements, their approximate value, and who owns them (We recommend you provide pictures of improvements):

<u>Site Description continued</u> - Describe the natural vegetation --- ground cover, trees, shrubs --- and any proposed changes. Describe the location of any estuarine, riparian, or wetlands and any noticeable animal use of area.

Site Access - Describe how you plan to access the site, and your mode of transportation.

If your access is by aircraft, specify the type and size of aircraft:

To access the site, the aircraft is equipped with floats [] wheels [] skis [].

Number of people

1. Indicate the number of employees and supervisors who will be working on the site.

2. Indicate the number of customers who will be using the site per year or season.

3. Indicate the number of days the site will be used per year or season. Approximately 56 days/year (1 day/week)

Environmental Risk / Hazardous Substances - In the course of your proposed activity will you generate, use, store, transport, dispose of, or otherwise come in contact with toxic and/or hazardous materials, and/or hydrocarbons? Yes[XNo[] . If yes , please describe:
The types and volumes of fuel or other hazardous substances present or proposed:
The specific storage location(s):
The spill plan and prevention methods:
Environmental Risk/Hazardous Substances (continued) - If you plan to use either above or below ground storage containers (like tanks, drums, or other containers) for hazardous material storage, answer the following questions for each container:
Where will the container be located?

What will be stored in the container?

What will be the container's size in gallons?

Give a description of any secondary containment structure, including volume in gallons, the type of lining material, and configuration:

Will the container be tested for leaks? Yes[] No[]

Will the container be equipped with leak detection devices? Yes[] No[]. If no, describe:

Do you have any reason to suspect, or do you know if the site may have been previously contaminated? Yes[] No[X If yes, please explain:

Date Stamp:

Senior Project Manager

Signature of Applicant or Authorized Representative

Title

AS 38.05.035(a) authorizes the director to decide what information is needed to process an application for the sale or use of state land and resources. This information is made a part of the state public land records and becomes public information under AS 40.25.120 (unless the information qualifies for confidentiality under AS 38.05.035(a)(8) and confidentiality is requested, AS 43.05.230, or AS 45.48). Public information is open to inspection by you or any member of the public. A person who is the subject of the information may challenge its accuracy or completeness under AS 44.99.310, by giving a written description of the challenged information, the changes needed to correct it, and a name and address where the person can be reached. False statements made in an application for a benefit are punishable under AS 11.56.210. In submitting this form, the applicant agrees with the Department to use "electronic" means to conduct "transactions" (as those terms are used in the Uniform Electronic Transactions Act, AS 09.80.010 - AS 09.80.195) that relate to this form and that the Department need not retain the original paper form of this record: the department may retain this record as an electronic record and destroy the original.

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES DIVISION OF MINING, LAND AND WATER

Contract Administration
 550 W 7th Ave., Suite 640
 Anchorage, AK 99501-3576
 (907) 269-8594

- Northern Region
 3700 Airport Way
 Fairbanks, AK 99709
 (907) 451-2740
- Southcentral Region
 550 W 7th Ave., Suite 900C
 Anchorage, AK 99501-3577
 (907) 269-8552
- Southeast Region 400 Willoughby, Suite #400 P.O. Box 111020 Juneau, AK 99801 (907) 465-3400

APPLICANT ENVIRONMENTAL RISK QUESTIONNAIRE

The purpose of this questionnaire is to help clarify the types of activities you propose to undertake. The questions are meant to help identify the level of environmental risk that may be associated with the proposed activity. The Division of Mining, Land and Water's evaluation of environmental risk for the proposed activity does not imply that the parcel or the proposed activity is an environmental risk from the presence or use of hazardous substances.

Through this analysis, you may become aware of environmental risks that you did not know about. If so, you may want to consult with an environmental engineer or an attorney.

Applicant's Name		Doing	g Business As		
Address			City	State	Zip
()	() Work Bhopo	E Moil	Contact Domon		
message Phone	WORK PHONE		Contact Person		
Describe the propos	ed activity:				
In the course of you toxic and/or hazardo	r proposed activity will ous materials, and/or hy	you generate, use, s ⁄drocarbons? Yes [store, transport, dispose of, or	otherwise come	e in contact with
If yes, please list the	substances and the as	ssociated quantities.	Use a separate sheet of paper	r, if necessary.	

If the proposed activities involve any storage tanks, either above or below ground, address the following questions for each tank. Please use a separate sheet of paper, if necessary, and, where appropriate, include maps or plats:

a. Where will the tank be located?
b. What will be stored in the tank?
c. What will be the tank's size in gallons?
d. What will the tank be used for? (Commercial or residential purposes?)
e. Will the tank be tested for leaks?
f. Will the tank be equipped with leak detection devices? Yes 🗌 No 🗌. If yes, describe:
Do you know or have any reason to suspect that the site may have been previously contaminated? Yes 🗌 No 🗌.
If yes, please explain:

I certify that due diligence has been exercised and proper inquiries made in completing this questionnaire, and that the foregoing is true and correct to the best of my knowledge.

Applicant

Date

AS 38.05.035(a) authorizes the director to decide what information is needed to process an application for the sale or use of state land and resources. This information is made a part of the state public land records and becomes public information under AS 40.25.110 and 40.25.120 (unless the information qualifies for confidentiality under AS 38.05.035(a)(9) and confidentiality is requested). Public information is open to inspection by you or any member of the public. A person who is the subject of the information may challenge its accuracy or completeness under AS 44.99.310, by giving a written description of the challenged information, the changes needed to correct it, and a name and address where the person can be reached. False statements made in an application for a benefit are punishable under AS 11.56.210.

Land Use Permit Application Supplemental Questionnaire for: <u>Use of Uplands and Non Marine Waters</u>

To be completed to provide more detailed information about projects or activities requiring the use of state owned uplands and non marine waters. All site development details identified in this section must be represented graphically in the scaled drawings on Page 4 of the supplement.

<u>**Temporary Structures**</u> – 1) Describe all temporary improvements (including buildings, tent platforms, out-buildings, docks, floats, and floating facilities), including their dimensions and building materials. 2) Label improvements to be maintained on a year round basis as year round. **Note:** Seasonal improvements must be completely dismantled and removed or stored on or before the end of authorized terms of use.

Distance structures including pit privies will be located from the ordinary highwater mark of the nearest freshwater body (lake, stream, river, etc), or the mean high water mark of a saltwater body: <u>There are</u> 2 waterbodies adjacent to the

pad <u>Harvest of Non-Timber Related Forest Products</u> – Please list the type and quantity of each non-timber related forest product (berries, ferns, willow, mushrooms, birch bark, etc.) to be harvested for commercial use:

Contact the DNR Division of Forestry to obtain authorizations for the harvest of small trees.

<u>Motorized Equipment</u> - List mechanized/motorized equipment to be used, including type, size, purpose, and number of each.

Storage and Parking - If you plan to store items or park boats, vehicles and/or heavy equipment on the site, describe complete the following:

Describe and give dimensions of long term and short term parking and or storage areas.

Is parking or storage planned to take place on filled tidelands. Yes[] No[]

Does storage involve structures or materials floating in a waterbody? Yes[] No[X If yes, describe.

Storage and Parking (continued)

Number of disassembled tent frames _____

Number of tent platforms _____

List and describe items that are large and difficult to transport. Include dimensions:

Will barrel(s) or an equivalent type of storage container be used? Yes[] No[X] If using something other than barrels for storage containers, describe the alternative container.

Describe any measures you plan to take to minimize drips or spills from leaking vehicles or equipment.

Water / Wastewater

Water Supply – Describe the water supply and proposed use.

Wastewater – Describe the wastewater type and quantity and proposed method of wastewater disposal: (for the marine environment, also describe the proposed gray and black water systems or out fall pipeline.

Waste – Describe the types of waste that will be generated on-site, including solid waste, the source of the waste, and the method of waste disposal, i.e. pit privy, or self-contained system, or outfall line; indicate distance from the nearest waterbody.

Animal Use

Will there be any use of animals (horses, llamas, dogs, etc.)? Yes[] No[X

Will there be commercial use of the animals (horseback rides, packing, dog sled rides, etc.)? Yes[] No[X If yes, please explain:

Dismantle, Removal, Restoration Plan – Provide a plan for dismantling and removing temporary structures. Include method and timeline for total site restoration:

SHORT TERM (PORTABLE) COMMERCIAL RECREATION CAMPS: Identify commercial recreation activity/activities for which short term (portable) camps **will be** established to accommodate employees and clients, and provide a general description of the location(s) (e.g. guide use area, game management sub-unit, river, stream, lake, etc.) where the recreational activity/activities and short term (portable) camp use will occur.

___ Big Game Guiding: (List up to 3 Guide Use Areas.)

_ Sportfishing (List river corridors, lakes, etc.)

_ Boating/Rafting/Kayaking: (List river corridors, lakes, etc.)

Other Recreation: (Type and general geographic description.)

- Identify any State of Alaska Refuge, Sanctuary and/or Critical Habitat Area where short term (portable) camps will be used.

Will activities include "day use" of state land managed under the Haines State Forest Management Plan? Yes ____ No ____



Operations Plan Preparation and Maintenance of DTS Data Delivery System Alaska Methane Hydrate Project

April 2019

Prepared for

TOYO Engineering Corporation 8-1, Akanehama 2chome, Energy Business Unit, Energy Project Division Narashino-shi, Chiba, Japan 275-0024

Prepared by



3900 C Street, Suite 700 Anchorage, Alaska 99503

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Appendix A	DTS Data Delivery System Drawings
Appendix B	Alaska Safety Handbook*
Appendix C	AES Alaska Field Handbook
Appendix D	Field Forms
Appendix E	Silixa DTS Interrogator Manual

Distribution

ABBREVIATIONS

А	Amp(s)
AC	alternating current
AES Alaska	ASRC Energy Services Alaska, Inc.
AH	amp-hour
ASH	Alaska Safety Handbook
BPXA	BP Exploration Alaska, Inc.
DOE	US Department of Energy
DTS	distributed temperature sensor
°F	degrees Fahrenheit
GTW	geodata test well
Н	hour
HSET	Health, safety, and environment, and training
JOGMEC	Japan Oil, Gas and Metals National Corporation
NETL	National Energy Technology Laboratory
NSTC	North Slope Training Cooperative
Project	Alaska Methane Hydrate Project
PBU	Prudhoe Bay Unit
PTW	production test well
RMC	rigid metal conduit
STW	stratigraphic test well
ΤΟΥΟ	TOYO Engineering Corporation
V	volt(s)
VAC	volts alternating current
VDC	volts direct current
W	watt(s)

1.0 Introduction

1.1 Purpose of Plan

This Operations Plan was prepared by ASRC Energy Services Alaska, Inc. (AES Alaska) for TOYO Engineering Corporation (TOYO) in support of the Alaska Methane Hydrate Project. This plan provides a description of the distributed temperature sensor (DTS) data delivery system, and the procedures for operating and maintaining the system. The DTS data delivery system will be installed and operated at the Kuparuk State 7-11-12 Pad in the Prudhoe Bay Unit (PBU) on Alaska's North Slope. The site location is shown on Figures 1 and 2.

1.2 Background

Japan Oil, Gas, and Metals National Corporation (JOGMEC), in partnership with the U.S. Department of Energy, National Energy Technology Laboratory (DOE-NETL) is conducting methane hydrate research on the North Slope of Alaska. The research involves drilling a stratigraphic test well (STW), a geo-data test well (GTW), and a production test well (PTW), followed by a long-term methane production test.

The STW was spudded December 10, 2018, and drilling was completed in early January. The GTW and PTW are scheduled for drilling during the winter of 2020/2021, followed by the long-term methane production test through 2021 or 2022.

The DTS cable was installed in the STW during well completion, and excess cable for future connection to monitoring equipment was left coiled in the well house that shelters the well tree.

2.0 Description of System

The DTS data delivery system is comprised of a DTS and Interrogator with a battery bank for power, a small wind turbine for battery charging, a voltmeter to monitor the state of charge of the batteries, and a battery charger to connect to a generator any time the wind turbine cannot maintain battery charging.

All of this is installed in an insulated Connex container with the intent to heat the space with the heat dissipated from the operating equipment. The wind turbine charge controller includes a 200 watt dump load which will operate when the batteries are fully charged.

2.1 Insulated Connex Container

The Connex container is a pre-manufactured metal shipping container with approximate dimensions of 8 feet (ft) wide by 8 ft tall by 20 ft long. The Connex will be installed at the 7-11-2 Pad several feet east of the well house, with the long axis oriented approximately east/west, as shown in Appendix A. A portion of the connex is partitioned off with interior walls and is insulated to provide a smaller volume to warm from the heat dissipated from the DTS, battery charging, wind turbine dump load, and any other heat source present in the enclosure.

2.2 Battery Bank

To provide power for the DTS interrogator, eight each Rolls S6-460AGM (AGM VRLA Deep Cycle 6 volt) batteries will be configured as two parallel 24 volt banks. Each bank is rated at 460 amp-hour (AH) at a 100 Hour discharge rate to provide 920 AH capacity at 100 AH discharge rate. The discharge rate,

with the DTS, is 1.75 amps (A) which is well below the 100 H discharge rate of 4.6 A to validate the use of the 100AH capacity. Battery capacity at 5 degrees Fahrenheit (°F) is 65% of capacity at 77°F or 624 AH which is more than sufficient for the 294 AH required for 7 days of data acquisition.

Figure 1 Project Area



Figure 2 PBU Kuparuk State 7-11-12



2.3 Distributed Temperature Sensor

The Silixa DTS is electronic equipment used to measure a temperature profile over a length of fiber optic cable. For the Methane Hydrate project, the fiber is installed downhole in a well (STW), in which the fiber is sealed into the well casing so hydrocarbons are unable to migrate up the well casing and fiber.

A short pulse of light is launched into the fiber and the DTS measures the difference in amplitude of the forward propagating light and the backscattered light from along the length of the fiber optic cable. The data is retrieved from the DTS and processed to calculate the temperatures at each point along the fiber. One sample takes 30 minutes to acquire and store. It is intended that 48 samples per day be acquired which results in the DTS operating continuously.

2.4 Wind Turbine

A Midnight Solar Chinook 200-24M 200 watt, 24 volts direct current (VDC) wind turbine is included to help maintain sufficient charge on the batteries to allow the DTS Interrogator to operate for a full week between data downloads. The wind turbine has a 200 watt dump load which will continue to provide heat within the insulated enclosure even if the battery is fully charged, as long as the wind is blowing.

The wind turbine will be mounted on a single 10 ft-long by 1-1/2 inch-diameter rigid metal conduit. A 1-1/2" LB conduit fitting with conduit nipple will be installed at the bottom end of the conduit. The LB and conduit nipple will permit entry of the conductors from the turbine into the insulated shelter for connection to the batteries.

The wind turbine accessories include: a shutdown switch which will short the ends of the turbine conductors together to cause the turbine to stall when winds are too strong, or to perform maintenance of the turbine; and circuit breakers to allow isolation and overcurrent protection. This Shutdown switch will also disconnect the turbine conductors from the batteries so the short will not appear across the batteries.

Unistrut metal framing mounted to the side of the connex will be used to secure the conduit (Turbine tower) in both a shipping configuration and an operating configuration. A 1.75 inch-diameter hole is to be drilled into the connex wall and through the insulated wall at about 3 ft above the connex floor at a location along the connex wall that will be convenient to mounting of the Shutdown switch, Circuit breakers and Battery Buss connections.

To install the turbine tower the 1-1/2 inch nipple (fastened to the LB) is passed through the 1.75 inch hole and fixed in place with a 1-1/2 inch locknut. The tower can be rotated around this point. A pull string shall be installed in the conduit (tower) once it connected to the connex to allow the conductors to be pulled into the conduit after the connex is located to the operating site and in preparation for Wind Turbine operation.

2.5 120V AC Converter

A Go Power 24 VDC input sine wave inverter is provided for use with any portable electronic equipment that may be brought to site. The unit selected is 300 watt and will be sufficient to power laptop computers and other electronic test equipment. Heavy loads (greater than 2.5A alternating current [AC]) should not be connected to this inverter.

2.6 Mobile Generator

A mobile generator will be used to recharge batteries on site whenever the wind turbine does not provide sufficient charge. It shall be capable of providing a single phase120V AC 20A circuit.

2.7 Battery Charger

A battery charger is provided to allow charging prior to deployment from connection to AC power at a building or by connection to an AC mobile generator. The AC power source shall be 120 volt single phase 20A minimum.

3.0 System Operations and Maintenance

3.1 Health, Safety, Environment, and Training

Employees must comply with all health, safety, and environment rules, policies, and procedures described in the Alaska Safety Handbook 2018 and the AES Alaska Field Handbook contained in Appendices B and C, respectively. Employees must also support a zero-incident safety culture and assume personal accountability and responsibility for safe work practices in all projects, activities, and operations.

Employees are required to successfully complete and show proof of the following training:

- ASH Handbook
- North Slope Training Cooperative (NSTC)
- Polar Bear Awareness Training
- Site Specific Training
- Security badging (necessary for access to BP Exploration Alaska, Inc. [BPXA] sites)

Employees will be required to perform the following duties during each site visit:

- Complete job safety analysis form prior to starting work (Appendix D)
- Complete site monitoring checklist (Appendix D)

Each completed forms is to be sent to <u>kworley@asrcenergy.com</u> following each visit to the site.

If an incident occurs, BPXA and AES Alaska should be immediately notified; the AES Initial Report of Incident form in Appendix D should be completed and emailed as quickly as possible to <u>kworley@asrcenergy.com</u>. Notification numbers for AES Alaska are included in Section 5.0 below.

3.2 Data Monitoring

Data monitoring will be automated using the Silixa DTS and Interrogator. Appendix E provides a manual containing detailed information for the Silixa equipment.

DTS data will be downloaded from the Interrogator once per week to a laptop computer or a thumb drive. From Deadhorse, the data will then be uploaded to a Cloud address provided by TOYO.

3.3 Site Maintenance

Site maintenance will be performed on a weekly basis in accordance with other duties necessary to the maintenance and monitoring of the DTS system. During Phase 2 and Phase 3 weather conditions, the site will not be visited until North Slope security has determined roads and pads are safe to travel on. Once travel has been deemed safe, employee will travel to the site and assess conditions. Work areas will be cleared and inspections of the equipment can begin.

Note: More frequent maintenance may be necessary depending on weather conditions or DTS system requirements.

Guidelines for routine maintenance to be performed on each site visit include:

- All walking areas, work areas, handrails, equipment, tools, etc., will be kept clean and free of obstructions.
- Good housekeeping is essential to maintain a safe workplace. Tools and equipment will be used according to manufacturer's recommendations and stored in the designated location after each use.
- Hand and power tools will be kept in good condition with guards in place and shall not be modified.
- Defective tools and equipment will be repaired by qualified repair persons or replaced.

Employees specific duties will include but are not limited to:

- Snow removal in and around the doorways and walking surfaces of the connex, wellhouse shelter. Note: Snow removal by equipment of the 7-11-12 Pad will be provided routinely by BPXA's Roads and Pads Maintenance Contractor to within 3 ft of buildings and structures.
- Prevention of and removal of ice buildup on ladders, equipment, cables, connections, etc. Special attention shall be given to ensuring the wind generator is free of ice and snow buildup.
- Maintaining and ensuring all means of access and egress between structures and parking areas are clean and free of obstructions.
- Ensuring slick or snowpacked walking surfaces have nutplug or similar traction sand spread to decrease the risk of slips, trips or falls.
- Inspecting the site in its entirety to ensure conditions and equipment have not changed or been disturbed since the last inspection. All disturbances and changes shall be immediately documented and reported to the appropriate parties.
- Ensuring doors are closed and secured on both connex and wellhouse prior to exiting the site.

3.4 **Power System Monitoring and Maintenance**

The turbine Shutoff Switch (see drawings in Appendix A) shall be closed when handling the Wind Turbine. The blades are sharp so proper gloves and clothing should be worn when working with the turbine. The Shutoff Switch will prevent the Wind turbine from spinning as long as the switch is closed. All personnel must be clear of the turbine blades and make certain there is no equipment in the way of the turbine blades before the shutoff switch is opened. The Turbine must be in its final installed location before opening this switch.

A DC Voltmeter is provided across the batteries to monitor the state of charge of the batteries. The battery voltage is nominally 24 volts, but can range from 22.4 volts (totally discharged) to 27.2 volts (charging). When the voltage discharges to 24 volts the battery is at about 50% capacity and should be recharged at that time. If the battery is allowed to discharge too deeply, too many times, its life is shortened considerably.

When the battery voltage is near 24 volts, the mobile generator will be connected to the Charger and the batteries will be charged for at least 8 hours. The voltage will be noted on the Site Monitoring Checklist at the end of the charge period.

When the wind turbine is operating, the voltage for the batteries will be observed to see if the batteries are maintaining charge well above the 24 volt nominal value. A voltage in the 25 to 26 volt range is good.

The temperature inside the insulated enclosure will be observed and recorded on the Site Monitoring Checklist. Under normal circumstances, the temperature inside the heated space should remain above freezing when the system is operating. At 5° F the batteries are at 65% capacity.

4.0 **Project Contacts List**

On the following page, Table 1 provides a list of contacts for the project.

Table 1. List of Project Contacts

Name	Affiliation	Title or Role	Phone	Email
Chris Warner	AES	Senior Director HSET	O: 907-339-7601 M: 907-394-1226	chrwarner@asrcenergy.com
Paul Ramert	AES	Project Manager	O: 907-339-6341 M: 907-441-4988	pramert@asrcenergy.com
Kody Worley	AES	Task Manager	O: 907-339-6316 M: 907-351-5337	kworley@asrcenergy.com
Bob Seitz	AES	Electrical Engineer	O: 907-339-2360 M: 907-632-7498	rseitz@asrcenergy.com
Amanda Henry	AES	Senior Project Manager	O: 907-339-5472 M: 907-351-4662	ahenry@asrcenergy.com
Kyojiro Kawaguchi	ΤΟΥΟ	Facility Engineer, Energy Supply Chain Division	+81-47-454-1906	kyojiro.kawaguchi@toyo-eng.com
Teck Kean Lim	ΤΟΥΟ	Principal Geoscientist, Energy Project Division	+81-47-413-7638	teckkean.lim@toyo-eng.com
Michael Mondanos	Silixa	VP – Industrial Applications	+44-(0)-208-327-4210	

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Appendix A DTS Data Delivery System Drawings

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	• 07			SI	RC a, Ind	ENE	RGY	SEI	RVICES	
	TITLE ALASKA METHANE HYDRATE PROJECT PBU KUPARUK STATE 7-11-12 PAD CIRCUIT BREAKER PANEL									
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CLIENT	JOB# E15586	DATE 12/28/1	8 SCALE NT	S	DWG. NO.				EI-MH-002	А



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Appendix B Alaska Safety Handbook*

*Due to size of Alaska Safety Handbook, it is being included as an attachment rather than being inserted into this document. File name is *Appendix B* - *ASH Handbook (2018 North Slope)*

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Appendix C AES Alaska Field Handbook
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Health, Safety, and Environment AES-RTS Field Handbook

June 2015

Prepared by



3900 C Street, Suite 700 Anchorage, Alaska 99503

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ACRONYMS AND ABBREVIATIONS

AES	ASRC Energy Services Alaska, Inc.
AES-RTS	AES-Regulatory and Technical Services
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATV	all-terrain vehicle
COV	Company-Owned Vehicle
FRMP	Fatigue Risk Management Plan
ft	foot/feet
HSE	Health, Safety, and Environment
JHA	Job Hazard Analysis
JMP	Journey Management Plan
JSA	Job Safety Analysis
MOC	Management of Change
MSDS	Material Safety Data Sheets
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PADS	Physical Agent Data Sheets
PFD	personal flotation device
POV	Personally-Owned Vehicle
PPE	personal protective equipment
РТО	Paid Time Off
QHSE	Quality, Health, Safety & Environmental
R&R	Rest and Recuperation
SDS	Safety Data Sheet
SSE	Short-Service Employee
USCG	U.S. Coast Guard
VP	Vice President
WPP	Work Permit Process

1.0 INTRODUCTION

ASRC Energy Services Alaska, Inc. (AES) is committed to a safe workplace, the protection of the environment, and the health of all employees. However, your help will be needed to accomplish these objectives. AES believes that Health, Safety, and Environment (HSE) is a team effort and is the responsibility of all.

This HSE Field Handbook was developed for use by AES-Regulatory and Technical Services (AES-RTS) personnel as a guide to your responsibilities on the job while on AES premises or Jobsite (company premises). This handbook outlines the minimum requirements with which you will comply while working on company premises. Company policies and procedures are continually revised as necessary and all employees are responsible for reviewing and complying with the most current versions. The full AES Policy or Procedure Manuals will be the controlling and referenced document in the event of a conflict with this handbook, including any amendments to the full policies or procedures which may not be reflected in this handbook. A copy of the complete AES Health and Safety Management and QHSE Policy may be found at http://office.asrcenergy.com/aesic/default.aspx?did=2, and a copy of the complete AES Employee Handbook may be found at http://office.asrcenergy.com/aesic/default.aspx. Good judgment and clear thinking are required to supplement any rules. HSE is a core value in all work performed for AES. If you are in doubt at any time about whether the HSE aspect of the operation at hand is being properly managed, stop work and consult with your supervisor or an HSE Manager/Designee. It is your duty to report conditions that could lead to an HSE incident and to stop the operation immediately until conditions are fixed or safeguarded. In addition, you are required to report all HSE incidents, including accidents and injuries, as soon as possible per Incident Reporting (HSM-02)-062 to your supervisor or an HSE Manager/Designee.

1.1 *Employee HSE Responsibilities*

All employees are responsible for the following:

- Perform work to prevent HSE incidents by following AES HSE policies and procedures, as well as federal, state, and local HSE rules, regulations, and ordinances.
- Notify your supervisor or an HSE Manager/Designee immediately of any HSE incidents (including spills and near misses), even if no injury occurs. Provide the HSE Manager/Designee with a written report within 24 hours.
- Perform a Job Safety Analysis (JSA) that addresses specific hazards of a job prior to beginning all work.
- Use stop work authority to immediately stop any work for which HSE is not being properly managed.
- Wear required personal protective equipment (PPE) at all times.

1.2 Manager and Supervisor HSE Responsibilities

All managers and supervisors are responsible for the following:

- Undertake proactive HSE efforts. AES managers and supervisors are expected to have programs in place that proactively assist in improving HSE performance. These efforts include, but are not limited to, observing the behaviors of employees to positively reinforce behaviors that prevent HSE incidents and to correct behaviors that do not. HSE performance will be monitored and documented. Contractor management will be accountable for HSE performance, as well.
- Communicate HSE policies and procedures. Monitor to be sure that the appropriate HSE policies and procedures are communicated to all personnel, including contractor employees.
- Adhere to the Short-Service Employee (SSE) Program. The SSE Program is described in Section 4.0 of this handbook and effectively manages SSEs through training, mentoring, etc.
- Check tool and equipment usage. Monitor to be sure employees are trained in proper use of tools and equipment.
- Fix unsafe conditions. Promptly fix or safeguard conditions and correct behaviors deemed to be an HSE risk.
- Develop an HSE culture. Create an atmosphere in which HSE issues are reported, discussed, and resolved and one in which everyone feels it is their duty to stop an operation immediately if conditions or behaviors present an HSE risk.

2.0 REFERENCES

Employee Handbook (HRM-01)

Quality, Health, Safety, and Environmental Policy (QHSE-01)

Health and Safety Management (HSM-02)

3.0 INCIDENT REPORTING (HSM-02)-062

All employees will immediately report any near loss, injury, accident, or incident in which they are involved or have observed to ensure immediate attention and management of all situations. If an employee seeks medical attention as a result and has not been contacted by the AES HSE Loss Prevention Manager/Designee, the Supervisor or Field Lead will contact the AES HSE Loss Prevention Manager/Designee directly to ensure notification has been made. All employees will contact the next higher level of management if attempts to contact the appropriate level fail.

Incidents should be immediately reported to AES Senior Director of HSET, Chris Warner at 907-339-7601 (office), 907-394-1226 (cell), or <u>chrwarner@asrcenergy.com</u>.

4.0 SHORT-SERVICE EMPLOYEE PROGRAM (HSM-02)-066

Requirements of the SSE Program are described below:

- For the purpose of this program, SSE are employees (a) whose length of service is less than six (6) months from the date of initial employment with the Company or (b) who transfer to a new Job Site and have less than six (6) months experience on such Job Site in the last twelve (12) months. Personnel who have previously been employed by the Company, but have separated from the Company for more than 90 days are subject to the requirements of this program. Each SSE will be assigned one or more mentors (typically an experienced employee) to assist the employee during his/her "SSE" period. In this role the mentor will be available to answer questions, offer guidance and advice, and provide general support to the SSE.
- Each SSE will be distinguished from experienced employees. The color orange will serve to identify SSE. SSE will wear hi-visibility orange hardhats while on duty at the Job Site, unless the customer requires an additional method of identifying a SSE or a different color hardhat. If a hardhat is not required PPE for the job or task an alternative solution would be a hi-visibility vest of a differing color than non-SSE personnel. All Job Site personnel will be informed about the meaning of the color orange or alternative vest as an identification of Company employees who have less than six (6) months employment experience or transfer to the Job Site. Color coding to identify SSE may vary between different Job Sites and customers. Deviations from using the color orange or required crew size on Company projects require a written deviation request with appropriate level of approval or sign off in accordance with the SSE Program Completion. Refer to the Deviations (QHSE-01) policy.
- To be removed from SSE status, an employee will demonstrate that he/she has worked safely and adhered to the Company and Job Site safety requirements for six (6) months. In the event that a Mentor/Trainer and Foreman/Supervisor believe the SSE has met the requirements for this program prior to the six (6)-month time period, the Mentor/Trainer and Foreman/Supervisor will complete the *Short-Service Employee Program Completion* form and include the justification for the deviation from the program.

5.0 WORKPLACE PRINCIPLES AND POLICIES

5.1 Code of Conduct (HRM-01)-13

For the protection of its property, business, and employees, Company and subsidiary companies have established reasonable rules of conduct for their employees. All employees are expected to comply with these rules and others that Company may establish from time to time. Violating any rule of conduct may result in serious loss to the Company as well as harm or injury to other persons.

Violation of the following rules of conduct will result in disciplinary action, up to and including termination. This list is not intended to be all-inclusive. Other actions that negatively impact the Company's operation or other employees may also result in discipline up to and including termination.

- Negligent damage to the property of fellow employees, Company, or customers, including equipment on loan or lease from any entity with which the Company conducts business.
- Possessing firearms, ammunition, explosives, or flammable materials on Company or customer premise without authorization.
- Creating fire, safety, or health hazards.
- Failure to follow proper safety procedures, such as wearing PPE.
- Violating the Company's Drug and Alcohol policy while on Company premises, including possession, use, distribution, purchase or sale; or being under the influence of drugs, alcohol, or other intoxicants that have a mind-altering effect. Violation of the policy also includes possession of drug paraphernalia, failure to consent to search, or drug and alcohol testing as set forth in the Company's Drug and Alcohol policy. The term Company premises will include customer properties and any conveyance, which may be provided for transportation purposes.
- All forms of harassment that create an offensive working environment are forbidden, including, but not limited to, insulting, intimidating or discourteous conduct, as well as derogatory jokes or comments relating to age, national origin, religion, race, sex, disability, or sexual orientation.
- Release of confidential or proprietary information to third parties without authorization.
- Smoking in undesignated areas.
- Unethical conduct or activities that employees take part in that exert influence or in any transaction in which their own interests may conflict with the best interests of the Company.

5.2 Cell Phones and Electronic Devices (HRM-01)-12

While operating a Company-Owned Vehicle (COV) or operating a Personally-Owned Vehicle (POV) on Company business, the use, including hands free use, of Electronic Devices is prohibited. Employees may use Electronic Devices once the vehicle or mobile equipment is brought to a full stop in a safe location and it is otherwise safe to do so.

While operating a POV, the use, including hands free use, of any Company Device or any Personal Device for Company business is prohibited. Employees may use such Electronic Devices once the vehicle or mobile equipment is brought to a full stop in a safe location and it is otherwise safe to do so. Employees are encouraged not to use Personal Devices while operating a POV.

Notwithstanding the above restrictions, employees may use Electronic Devices as navigational aids so long as the device is set up to act as such before the vehicle is in motion and it does not involve any hands on interaction while the vehicle is being operated and such use can be done safely.

Notwithstanding the above, employees may not use any Company Device or Personal Device on Company business in a manner which would violate any applicable law or regulation (please note that these laws vary from jurisdiction to jurisdiction). Violation of this policy may result in loss of Company driving privileges, loss of the use of Company Devices or other disciplinary action, up to and including, termination.

5.3 Anti-Harassment (HRM-01)-06

While on company premises, all employees will conduct themselves in a professional manner. Any form of offensive treatment or behavior, which to a reasonable person creates an intimidating, hostile, or abusive work environment is not allowed. This includes any form of workplace harassment which may be based on an individual's race, color, religion, sex, national origin, disability, age gender information and/or sexual orientation. It may encompass other forms of hostile, intimidating, threatening humiliating, or even violent behavior.

5.4 Drug, Alcohol, and Controlled Substances (HRM-01)-25

The use, possession, transportation, promotion, or sale of illegal drugs, controlled substances, drug paraphernalia, and alcohol while on company premises and/or job sites is absolutely prohibited. Marijuana use is prohibited. Use of prescription or over-the-counter medications that may impair your ability to work safely will be discussed with your supervisor before you begin work.

AES reserves the right to search the person, the vehicle, and other property of individuals while they are on company premises. These searches may be conducted without prior announcement and at such times and locations as deemed appropriate.

5.5 Housekeeping (HSM-02)-13

All walking areas, work areas, handrails, equipment, tools, firefighting, and life-saving equipment, etc., will be kept clean and free of obstructions. Good housekeeping is essential so that work may proceed in a safe and orderly manner. Tools and equipment will be used appropriately and will be promptly put away after use to prevent a job hazard. Hand and power tools will be kept in good condition with guards in place and will not be modified. Defective tools and equipment will be repaired by qualified repair persons or replaced. When grease is being cleaned from equipment and tools, detergents and water or steam are preferable to solvents. When solvents are necessary, only company-approved solvents will be used, and gasoline and diesel are not allowed for cleaning. Always refer to the Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS)/Physical Agent Data Sheets (PADS) before handling any chemical.

5.6 Security

Employees and contractors will not bring unauthorized individuals (i.e., friends, relatives, or observers) onto AES and customer premises. AES and contractor employees will observe landowner requirements for site security (e.g., close/lock doors and gates).

6.0 FATIGUE RISK MANAGEMENT (HSM-02)-065

A Fatigue Risk Management Plan (FRMP) is required for work arrangements of employees in Quality, Health, Safety, Environmental (QHSE) critical positions that involve shift work greater

than 12 hours in a 24-hour period, overtime resulting in work hours exceeding 12 hours more than once a month, or call-outs resulting in more than 16 working hours in one calendar day, shift or call-outs between 22:00 and 06:00, day-to-day shift hour changes of more than 3 hours to start time, or more than 21 days of consecutive work. The FRMP will identify, monitor, and manage fatigue risk, with the goal of ensuring employees are performing with adequate level of alertness. The plan will include an assessment of work activities and identify control measures to reduce risk and fatigue including assignment of additional resources and work-rest schedules.

Unless an Extended Work Shift Exception or exceptions due to emergencies, logistical adversity, or shutdown activities has been approved by the Business Unit Manager/Designee, employees will not be permitted to work for more than two consecutive 18-hour days or work for more than 21 consecutive days at a worksite without 7 consecutive days away from the worksite. Employees will not be permitted to work for more than 42 consecutive days at a worksite and will require a minimum of 7 consecutive days away from the worksite unless an exception has been approved by the Vice President (VP) of QHSE/Designee.

Employees are required to assess and monitor their own level of fatigue and inform their supervisor if they believe they are too fatigued to safely perform their work. When a supervisor becomes aware of the possibility of excessive fatigue, they must take appropriate action to mitigate the fatigue or the safety risk of the fatigue including breaks, shifting work or utilizing a buddy system.

7.0 FIRE PREVENTION (HSM-02)-008

Smoking, including the use of e-cigarettes, is only allowed in designated smoking areas.

Explosion-proof equipment approved by Underwriters Laboratories will be used at all offshore locations and at any other locations where flammable mixtures may be present. Smoking, open flames, or electric arcs are prohibited when flammable materials are being handled. All combustion engines should be shut down before fueling except when the refueling location is at a sufficient distance from the engine. Extreme caution should be followed in areas where flammable vapors are present or suspected.

Combustible materials such as rags, paper, and trash will be disposed of in proper containers, and the containers will be labeled. Flammable liquids such as gasoline, kerosene, fuel oil, etc., will be transported and stored only in approved metal containers, and the containers will be labeled.

Firefighting equipment will not be altered, tampered with, or blocked. All employees are expected to be familiar with the Emergency Response Plan, know the locations of the portable fire extinguishers and fire alarms, and participate in fire drills.

8.0 EMERGENCY ACTION PLAN (HSM-02)-034

All locations will develop action plans and train personnel for emergency response to fire, explosion, serious personal injury, hazardous material release, and natural disaster.

All personnel will secure their work sites and execute the appropriate emergency response

measures. The Project Manager or his/her designee will be responsible for maintaining current listings of all personnel on the job site and ensuring that all personnel are accounted for and that emergency action plans are followed.

All personnel will be indoctrinated as to the emergency contacts, site layout, building layouts, and escape routes as noted on the site and building maps. Company employees and contractors will be familiar with the Emergency Response Plan and emergency notification process for their location and will participate in emergency drills for their location.

HSE in the office is as important as HSE in the field. Each office will have an emergency evacuation plan and will conduct an evacuation drill annually. AES employees will be familiar with emergency evacuation procedures, evacuation routes, and specific responsibilities. Office doors will be closed but left unlocked during an emergency evacuation. Elevators will not be used. Handrails will be used when ascending or descending stairs. Hallways, entrances, offices, cubicles, and exits will be kept free of obstructions.

9.0 PERSONAL PROTECTIVE EQUIPMENT (HSM-02)-042

All employees will wear appropriate PPE. It is the responsibility of each person to wear PPE that is suitable for the specific task being performed, the potential hazards that person will be exposed to, and the specifics of the job site. The PPE requirements provided on the MSDS for the material being handled will be strictly adhered to. In addition, all employees working on site will wear a shirt and long pants at all times. Tank tops, sleeveless shirts, and short pants or cutoffs are not permitted. Loose or floppy clothing is prohibited around rotating or moving equipment. Rings, neck chains, or loose jewelry will be removed while employees are engaging in manual labor.

9.1 Head Protection

An approved American National Standards Institute (ANSI) Z89.1-2014 Class E (plastic) hardhat will be worn by all employees working in field operations when an overhead danger exists.

Employees are required to maintain their headgear in a sanitary, safe condition and replace per manufacturers recommendation. Hardhats may not be altered in any way that will downgrade their efficiency.

9.2 Eye Protection

Safety glasses with side shields will be worn by all employees working in field operations at all times, except while in living quarters, offices, and control rooms. All eye protection must comply with ANSI Z87.1-2010. During nighttime operations, only clear or amber-colored safety glasses will be worn. Contact lenses and unapproved prescription glasses may be worn; however, safety glasses with side shields are required. Safety glasses are required while driving or riding in a vehicle on unpaved roads.

When performing work for which safety glasses do not provide adequate protection, such as using a high-pressure washer, handling chemicals, etc., other appropriate eye protection, such as goggles, will be worn. Hardhats with full-face shields are required for all buffing and

grinding operations.

The employee is responsible for the proper care and maintenance of issued eye protection equipment.

9.3 Foot Protection

Employees will ensure that they are wearing the appropriate footwear for the activity being performed. Sturdy hiking boots or waders free of leaks are to be worn by field crews.

Safety-toed or nonconductive-safety-toed shoes or boots with nonskid soles will be worn by all employees working in field operations where required such as some locations on the North Slope. When required, these shoes or boots will be worn at all times, except when the employees are in vehicles, living quarters, offices, and control rooms or when weather conditions will not permit. All safety-toed footwear must comply with American Society for Testing and Materials (ASTM) F-2412-2005 and ASTM F-2413-2005. Visitors who are not performing work on company property may not be required to wear steel-toed shoes in certain areas if escorted by a designated employee.

9.4 Hand Protection

Appropriate gloves will be worn when the hands are exposed to hazards such as cuts, punctures, or abrasions (cloth, leather, or leather-palmed gloves); when chemicals or hazardous materials are being handled and absorption is a concern (rubber gloves); and when electrical work is being performed (gloves certified for electrical work). The type of glove necessary for the task must be listed within the daily JSA.

9.5 Hearing Protection

Hearing protection will be worn in all high-noise areas or wherever a high-noise warning sign is posted.

9.6 Protective Clothing

Special protective clothing will be worn when chemicals are being handled or in other hazardous situations as specified by the MSDS/SDS/PADS.

During field operations, all personnel will wear high-visibility work vests, preferably fluorescent orange in color.

9.7 Fall Protection (HSM-02)-31

Fall protection equipment will be worn when employees are working or climbing more than 6 feet (ft) above an established working surface (ground, deck, or water level); when specified on a warning sign; or when an immediate danger exists below the working surface, regardless of height, and no guardrails are present. All components of the fall protection system must comply with ANSI Z359.0-2012.

9.7.1 Care and Inspection of Fall Protection Equipment

Fall protection devices such as full-body harnesses, lanyards, static lines with cablegrabbing devices, inertia reels, etc., will be inspected before each use and replaced if necessary. Fall protection equipment that has been involved in a fall will be replaced.

Only approved cleaning products for full-body harnesses and lanyards will be used in order to avoid diminishing the rated capacity of the devices.

9.7.2 Ladders (HSM-02)-16

A ladder will always be used for access to objects or areas that are not within an employee's easy reach. Some specific requirements for the use of ladders follow:

- All ladders will be inspected before use. Any damaged or unsafe ladders will be tagged and taken out of service. Stationary ladders with missing, broken, or loose steps will be taken out of service until repaired.
- Both hands will be kept free for climbing, descending from, and performing work on a ladder. Employees will not rush while climbing or descending from a ladder and will only take one step at a time.
- Only one person at a time will be on a ladder.
- Portable ladders will have anti-slip safety feet and be secured at the top before work begins to prevent shifting. A second employee will hold the ladder until the climber can secure it at the top. In addition, portable ladders will be set at the correct angle (1 ft out at the bottom for every 4 ft of ladder height) to provide stability.



9.8 Respiratory Protection (HSM-02)-043

Respiratory protection will be worn by employees working in areas where respiratory hazards exist and are not controllable by other means. Respirator protection must comply with ANSI Z88.2-1992 and in the United States, be certified by National Institute of Occupational Safety and Health (NIOSH).

The following requirements must be met by employees who will be using respiratory protection:

- The employee will meet medical requirements for using this equipment.
- The employee will receive training on the proper use, fit, and maintenance of this equipment.
- The employee will not have facial hair that will interfere with the seal of the face piece.
- The employee will not wear eyeglasses that interfere with the seal of the face piece.
- The employee will not wear contact lenses while using a respirator.

9.9 Personal Flotation Devices (HSM-02)-056

Approved personal flotation devices (PFDs), such as life jackets or flotation suits, will be worn

and properly secured at all times by personnel working over or near the water. This includes, but is not limited to, employees who make vessel-to-vessel transfers or vessel-to-platform transfers, and employees who work in areas outside of the cabin of any vessel or boat.

Each PFD should be carefully examined prior to use to assure proper working condition. Don't alter the PFD. If it does not fit an employee, obtain one that does. Clean and store PFD's per manufacturers recommendations.

PFDs come in a variety of styles and types. Occupational Safety and Health Administration (OSHA) and U.S. Coast Guard (USCG) regulations are specific in the types that are required for various work activities and locations. Assure that the PFDs purchased are appropriate for intended use and regulatory requirements.

10.0 TRANSPORTATION

10.1 Journey Management (HSM-02)-064

Travel should only be taken when necessary. Employees should plan their work to try to complete multiple tasks in single trips to reduce the amount of travel for improved safety and efficiency.

A Journey Management Plan (JMP) is to be completed by each traveler, providing trip details, PPE packing list and personal emergency contacts, and will be reviewed and signed by traveler, Operations Manager, Supervisor, and Project Manager. The JMP provides the traveler with contact information for HSE Lead, Journey Manager, Operations Manager, Project Manager, and local emergency numbers and provides AES with traveler's emergency contact information.

In addition to the JMP, for all field crew deployments and multi-location/multi-personnel project travel, a Project HSE Execution Plan is required. This plan is to be completed by Project Manager or designated Crew Lead. This plan is required to be reviewed and signed by all crew members or travelers and requires approval by Project Manager and Operations Manager prior to travel. The Project HSE Execution Plan includes work scope description and timeline, crew list, travel itineraries, project safety and journey management communications plan, incident reporting procedures and contacts, project specific training, and PPE requirements.

When adverse weather conditions present a potential risk to HSE, AES expects good judgment to be used and action taken, if necessary, up to and including shutting down the job. Before leaving, ensure the weather conditions are safe for travel. When travel by vehicle is necessary the driver is responsible for ensuring that the vehicle being used is adequate for weather conditions and that emergency supplies are in the vehicle and there is a reliable communication device available in case of emergency. Travel to be completed during daylight hours, whenever practicable.

10.2 Vehicles (HRM-01)-014

A Company Driver is an employee who is authorized to operate a Company-owned, leased, rented vehicle or equipment or a personally-owned vehicle while in the course of conducting Company business. Authorized Company Drivers will have a valid driver's license and current defensive-driving training.

Use of a COV or a POV while conducting Company business, will be an acknowledgement that the employee has read and agreed to abide by all of the terms and conditions of Company Vehicles and Vehicle Usage policy HRM-01-014. This includes annual review of driving record and reporting of tickets or violations, including parking tickets, received while operating a COV or a POV used for Company business purposes to his/her supervisor immediately. If off shift (e.g. Rest and Recuperation [R&R] or Paid Time Off [PTO]), report must be made within 10 business days or within eight hours upon returning to work from R&R or PTO.

Seat belts will be worn by all vehicle occupants, and all traffic regulations will be obeyed when driving. Driving while under the influence of alcohol or other drugs is prohibited. While on site, vehicles will be parked in a safe designated area. Also, when possible, vehicles will be parked so the drivers can exit by driving forward.

First-aid kits will be located in every COV used to transport personnel and will be readily available at all worksites. The contents of the first-aid kit will be checked before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.

10.3 Equipment Fueling (HSM-02)-009

Vehicles engine must be turned off for fueling. Use appropriate fuel for vehicle i.e. diesel in diesel powered equipment, gasoline in gasoline powered equipment. Monitoring the fueling process to ensure there are no drips from the hoses or vehicles. Smoking is prohibited while fueling or in proximity to fueling activities.

10.4 All-terrain vehicle (ATV) and Snow Machines

To the extent practical and when available, employees should receive model specific vehicle operation and familiarization training from renting party or owner prior to operating ATV or snow machine. The operator must inspect the equipment and deem it in good mechanical condition before departure.

ATV or snow machine approved helmet with enclosed face shield, long pants and sleeved shirt, boots, gloves, and other weather appropriate clothing will be worn at all times while operating vehicle.

Adequate preparation to ensure the vehicle has adequate fuel, tools, and emergency supplies for the intended use.

For remote travel, operator will submit a JMP with AES Supervisor or Project Manager. Prior to departure the AES Supervisor or Project Manager will be notified. At time of departure, the AES Supervisor or Project Manager authorizing the trip will record the time of departure and direction of travel. Operator will notify the AES Supervisor or Project Manager upon arrival at destination. Regular radio contact must be maintained with the operator's base.

10.4.1 Cold Weather Operations

In cold weather, the snow machines should not be operated at speeds greater than required to maintain flotation on snow. Snow machines should not be used in temperatures below -20° F. Operation of snow machines at lower temperatures require

approval of On-Site Lead Manager prior to travel. Use of snow machines in extreme situations where visibility may be hampered by weather or conditions, and may be hazardous to personnel, must be approved by senior management. When traveling to/from remote areas, or during inclement/questionable weather conditions, the requirement is for two people to travel together, on separate snow machines, unless On-Site Lead Manager has granted approval for a person to travel alone.

Ice can always be dangerous because of changing conditions and inconsistencies in thickness, particularly when there is running water beneath it. Never venture onto water bodies unless you are absolutely certain of a safe route across the frozen surface.

Operators must be aware of ice and avoid waterways, if possible. If an alternative travel route is not available or traveling on ice is necessary to complete the job, it needs to be included in the JMP and JSA to identify hazards associated with the travel and measures to be taken to ensure safety of personnel.

10.5 Vessels (HSM-02)-056

Employees will follow the instructions of the vessel master. Vessel master/boat captain will be in complete control of the vessel and will supervise all passenger procedures, cargo, and vessel operations while on the water. All passengers will walk (not run) on the deck, keep one hand free for support, and wear a PFD when transferring on or off the vessel. All vessels operating for AES will meet USCG regulations.

All personnel who work offshore must attend annual training on Marine Trash and Debris Awareness, and be certified in Cold Water Survival.

10.5.1 Small Water Craft and Boats

Employees will operate all watercraft in a safe and prudent manner in accordance with local and state laws, and USCG regulations. All occupants will wear a PFD at all times.

10.6 Aviation (HSM-02)-003

Employees will listen to and understand the information presented during the Pilot's preflight briefing, including crash position and restraint, basic airframe escape signals, and pyrotechnic devices and electronic aids to search and rescue on board the aircraft. Specifically,

- Use restraints or seat belts when the aircraft is in motion.
- Properly secure baggage and loose objects in designated storage areas.
- Keep all means of access and egress clear of baggage or other stored items.
- Ensure all hazardous materials and firearms are properly prepared, packaged, labeled, and approved for flight.
- Smoke only in designated areas and not aboard the aircraft.
- Follow the Pilot's instructions during emergency landing or evacuation.
- Cell phone use is not permitted, unless otherwise specified by the operator. Cell phones

will be turned off and stowed during flight.

10.6.1 Helicopters (HSM-02)-003

Employees will follow the instructions of the dispatcher and helicopter pilot at all times. A helicopter preflight HSE orientation will be conducted. The helicopter will not be approached until a signal is received from the pilot. No hazardous material or firearm will be carried on the helicopter unless the proper paperwork has been completed and the pilot has been notified.

Employees will attend Wilderness Safety for remote field travel or Helicopter Underwater Evacuation Training or equivalent for offshore travel. These courses will address risks associated with helicopter travel and provide training on safe transport and emergency procedures.

Some additional requirements for helicopter use follow:

- Walk (do not run) to or from the helicopter.
- Never walk behind the aft cargo compartment.
- Never walk under the helicopter tail boom.
- Watch carefully and crouch down when under the turning rotors.
- Remain clear of the tail rotor at all times.
- Wear hearing protection.
- Never use the emergency exit from the helicopter unless it is a real emergency.
- Wear a seat belt secured tightly during flight.

HELICOPTER DANGER AREAS



11.0 ENVIRONMENTAL

11.1 Environmental Assessment (QHSE-01)-006

Prior to beginning any work activity, an Environmental Assessment should be completed to determine if adequate barriers are in place to prevent an environmental incident or a permit violation.

The Environmental Assessment will evaluate the following factors:

- Whether activities will generate any new discharges to the air, water, or land;
- Whether activities will require any new permits;
- Whether activities will affect any existing discharges;
- Whether existing discharges exceed the permit limits; and
- Whether activities will lessen the effectiveness of existing barriers that protect the environment from an oil spill or a chemical spill.

11.2 Waste Management (HSM-02)-049

All waste materials will be disposed of properly. Employees are responsible for taking the necessary steps to prevent pollution and minimize the generation of waste.

Waste management will include the following:

- Proper identification of each individual waste stream;
- Segregation of individual waste streams; and
- Proper labeling, marking, manifesting, storage, and shipping of each waste stream.

Offshore Specific - It is unlawful for vessel-based employees to dispose of any liquids, solids, or

other material overboard. Failure to comply with this regulation could result in a substantial regulatory agency penalty.

11.3 Environmental Rules, Regulations, and Guidelines

The company recognizes that protection of natural resources and sound environmental performance are essential. AES conducts its business in compliance with the laws and regulations designed to protect the vital natural resources of clean air, clean water, land, and wildlife.

In order to achieve the environmental goals of supporting sustainable development and minimizing impacts to the environment, the company will continue the following practices:

- Provide adequate resources to implement this environmental policy.
- Comply with all environmental laws, regulations, permit stipulations, and all other environmental requirements, at a minimum.
- Promote environmental awareness among its employees, business units, subsidiaries, and subcontractors through training.
- Listen, consult, and respond openly to any environmental concerns.
- Expect management and supervisors to take ownership of and share responsibility for environmental performance.
- Adopt the philosophy to reduce, reuse, and recycle, while promoting sound waste management principles.
- Correct practices or activities not in compliance with this policy promptly.
- Strive to continually improve on environmental performance.

12.0 INDUSTRIAL HYGIENE PROGRAM (HSM-02)-039

Identify, evaluate (through monitoring, surveys, etc.), and controlling (through engineering, material substitutions, work practices, PPE, etc.) potential workplace hazards so that all employees are assured a safe occupational environment throughout their work for the Company.

Occupational health objectives include the following:

- Protect personnel health.
- Provide a framework for recognizing and managing health hazards.
- Comply with regulatory requirements.

12.1 Hazard Communication Plan (HSM-02)-037

The purpose of the Hazard Communication Plan is to communicate to all employees all known potential hazards of substances used or present in the workplace.

Compliance with this program is achieved through the following activities:

- Providing employees with information and training, including measures that employees should take to protect themselves from these hazards (such as proper work practices, PPE, and emergency procedures);
- Labeling containers and providing information regarding hazards associated with unlabeled containers;
- Maintaining MSDS/SDS/PADS; and
- Maintaining workplace chemical inventory lists.

12.2 Climatic Operations/Heat and Cold Stress (HSM-02)-004

Prior to start of work identify and prepare for potential cold or heat stress exposures. Develop appropriate controls to lessen the effects of cold and heat stress such as work/rest cycles, and provide protective clothing and equipment. Monitor employees for signs of cold or heat stress. Work environment will be evaluated on a case-by-case basis for activities for which exposure to heat or cold stress can occur.

If cold or heat stress occurs take immediate countermeasures to assist employee and seek emergency medical assistance.

12.3 Food Control

Food and drink preparation, and storage and consumption practices will prevent contamination from chemicals, oils, dirt, biological agents, and any foreign matter. Facilities for washing before food preparation and consumption will be available near the workplace. Eating areas that are separate from work areas will be provided wherever practical.

12.4 Human Waste

AES practices "Leave No Trace" fieldwork. Established restrooms or facilities are preferred for human waste disposal; however, human waste disposal in the field may be necessary. AES crew members will take steps to reduce human waste impacts by maintaining a 100 ft setback from lakes, ponds, or streams. All solid wastes generated in the field, such as trash, litter, etc. will be packed out and properly disposed of at approved facilities.

13.0 WORK PERMIT PROCESS (HSM-02)-50

AES utilizes a Work Permit Process (WPP) for non-routine work activities so that hazards and risks associated with these activities are identified and safeguarded against. The WPP is a comprehensive process for analyzing, planning, authorizing, and executing work, with the goal of preventing HSE incidents. The process involves much more than simply issuing permission to conduct certain jobs.

13.1 Scheduled HSE Meetings

Regularly scheduled HSE meetings will be conducted monthly (at a minimum) and attended by all personnel on site. Topics may include HSE issues, regulatory issues, HSE training, HSE trends that have been identified, etc. A record of these meetings will be kept that includes date, location, names/signatures of attendees, and topics covered.

13.2 Pre-Job Safety Meetings

Prior to beginning all work, a pre-job safety meeting will be conducted on site in which the specific hazards pertaining to the job are discussed. Additional meetings may be required that same day if a non-routine job is performed, if a JSA or Work Permit must be reviewed prior to the start of a specific task, or if a change in job scope occurs. Everyone will attend and participate in all HSE meetings unless specifically instructed otherwise. A record of these meetings will be kept that includes date, location, names/signatures of attendees, and topics covered.

Suggested topics for pre-job safety meetings are listed below:

- **Responsibilities** Establish who has the overall responsibility for the job and make sure that each individual understands his/her assignment.
- **Scope of Work** Discuss the task and job steps.
- **Skills** Verify if proper training has been provided or if special job skills are needed for a task. Discuss SSEs and how they will be managed.
- **Equipment** Discuss any special tools that will be needed for a task and the HSE aspects of their usage.
- **Materials** Discuss HSE aspects associated with materials, including proper PPE, and review MSDS/SDS if appropriate.
- **PPE** Discuss what PPE is needed for the job.
- **JSA** Review the JSA.
- **Hazards** Discuss any locations or job hazards not previously discussed during other portions of the meeting.
- **Work Permit** Review the Work Permit if required.
- **Emergency Evacuation** Discuss the rallying point, the evacuation route, nearby hospitals, who the first responders are, etc.
- **Environment** Discuss weather (heat, cold, wind, lightning, etc.) and location hazards, such as bears, insects, uneven walking surfaces, etc.
- **Conflicting Activities** Discuss other activities or simultaneous operations that may affect the operation.

13.3 Job Safety/Task Hazard Analysis and Job Hazard Analysis

Other key tools utilized in the WPP, besides the Work Permit, are the JSA and Job Hazard Analysis (JHA). The JSA and JHA provide appropriate precautions and procedures that, when employed, eliminate or minimize identified HSE hazards and risks for the activities being conducted. The JSA and JHA are processes for discussing and documenting each step of a job, identifying the existing or potential HSE hazards, and then determining the best way to perform the job to reduce or eliminate those hazards. The JSA and JHA are effective tools to be used

for jobs that will take place even if a Work Permit is not required.

14.0 MANAGEMENT OF CHANGE PROCESS (QHSE-01)-007

AES requires that a Management of Change (MOC) process be used for all operations for which major changes are planned, both permanent and temporary, that could have a significant impact on the HSE aspects of a job or an operation. The purpose of the MOC process is to verify that hazards and risks associated with these changes are identified and managed.

Examples of such "changes" include the following:

- Physical changes to equipment;
- Equipment and/or structural additions to a physical asset;
- Changes to software;
- Personnel changes (staff and management);
- Changes in project scope; and
- Procedural changes.

The MOC process provides for appropriate review, approval, implementation, and tracking. Consult an HSE Manager/Designee for those changes that will require use of the MOC process.

15.0 ERGONOMICS PROGRAM (HSM-02)-036

Proper techniques for performing work are required to minimize injury to employees. These techniques include redesigning the job, workstation, tool, or process. The focus of the design changes should be to properly orient the worker to the work done and materials handled.

15.1 Administrative Controls

Highly repetitive work can result in soft-tissue injuries. Educating employees on the proper posture and work station positioning can help to reduce this risk. Supervisors of Employees working in offices should schedule an ergonomic assessment upon hire to ensure workstations are setup correctly to minimize soft tissue injuries to employee while performing work. If a soft-tissue injury or illness is reported, an incident report will be completed and direction will be provided by HSET. A therapeutic follow-up evaluation will be scheduled immediately to re-evaluate workstation and adjust as required.

15.2 Lifting of Loads by Personnel

Back injuries may result from improper lifting techniques. Lifting a load that is too heavy or lifting in the wrong position can cause an injury. Loads over 50 pounds must use mechanical means or assistance.

Guidelines for safe lifting follow:

• Make sure the area is clear of tripping hazards.

- Face the load you intend to lift.
- Bend your knees.
- Keep the load close to your body.
- Keep your back straight.
- Use your legs, not your back, to lift the load.
- Do not twist your body while carrying the load.
- Do not try lifting a load that is too heavy; ask for help.

When lifting a load with another person, communicate with the other person at all stages of the lift, especially before lowering your end of the load.



16.0 Wildlife Avoidance and Protection

As a general rule, all wildlife species, regardless of their perceived threat, are to be avoided at all times by personnel. Wildlife will never be purposely approached, not even for photographs unless specifically required by the scope of work. Personnel will take care to effect no behavior change in any observed animal to the extent practical. Personnel will always be aware of specific site conditions and adjust activities accordingly to avoid wildlife interactions. Regular in-field briefings will be conducted to provide field personnel with the information necessary for their own safety, the safety of others, and the safety of wildlife.

Human activity has the potential to attract wildlife. The most significant factors that contribute to the undesirable attraction of wildlife are food and waste-handling practices. The misuse of food scraps, associated waste by-products, and dumpsters are major attractants for wildlife.

Proper food management and related waste management are critical to prevent wildlife from being conditioned to associate human activity with a food source. Extra care is necessary to

properly store and dispose of food waste to avoid attracting wildlife and to prevent its entry into work areas.

Personnel may encounter bears and other wildlife in the field, where there are few or no safety areas, such as buildings. Therefore, personnel will be trained to avoid problems with bears and to properly protect themselves with a firearm in the event of a bear attack.

Key wildlife avoidance, noninterference, and protection objectives follow:

- Prevent wildlife from associating food with humans and facilities.
- Avoid wildlife-human encounters and interactions.
- Understand the controls needed to prevent encounters and interactions.
- Train personnel in firearm safety and bear attack protection.
- Implement reporting and observation procedures.

16.1 Prevent Wildlife from Associating Food with Humans and Facilities

Wildlife may become problematic when it associates food with people, camps, and facilities. Some species of wildlife are curious about their surroundings and will investigate camps, trucks, and buildings, even in the absence of food waste and other garbage. Personnel will adhere to the following requirements to help eliminate the potential for bears to associate food with humans and facilities:

- Food will be stored in enclosed areas when possible, and food-associated waste will be disposed of or will be kept in dedicated, bear-proof trash containers at each site so these attractants are controlled.
- Employees are prohibited from leaving food in unoccupied vehicles or other unsecured areas.
- Employees are prohibited from directly feeding animals or deliberately leaving food for ground squirrels, foxes, ravens, and bears. Employee violation of this rule is grounds for dismissal.

16.2 Prevent Bear-Human Interaction

There is always the potential for bear-human encounters during field activities even when all precautions have been taken to eliminate attractants. Early detection of bears in the vicinity of project operations is an essential element to prevent bear-human encounters. The goal is to avoid or minimize potential conflict from bear-human interactions.

The following actions will be taken if a bear or bears are in a work area:

- Contact the on-site Project/Field Leader whenever a bear is sighted.
- If a bear is observed, alert all on-site personnel so that work activities can be altered or stopped to avoid interactions. Depending on the distance between the bear and the

activities, this may mean that personnel must retreat to the safety of vehicles, an emergency shelter, temporary buildings, or the rig. Regular in-field briefings will be conducted to provide field personnel with guidance on what distances are determined to be acceptable.

- Do not approach or crowd a bear. Give it plenty of room. Every bear has "personal space"—the distance within which it feels threatened. The more distance between personnel and the bear, the better for conflict avoidance.
- Never feed a bear or any other wildlife.

16.3 Protect Workers and Bears

Worker safety is AES's priority. Personnel will adhere to the following procedures for their own safety when working in areas where they may encounter bears:

- Check behind doors prior to exiting a rig or other facility and also check access areas and under structures to avoid a surprise encounter with a bear. Be aware that bears can hide behind dumpsters, connexes, stacked and stored materials, well houses, etc.
- Maintain exterior illumination during hours of darkness if workers are present.
- Conduct periodic safety sessions to elevate awareness of bear avoidance techniques and activities.
- Employ a "buddy system" to verify that fellow workers are informed about the whereabouts and activities that may bring them in contact with bears.
- Assign a designated bear watcher when a bear is observed, for continuous monitoring of the bear's movements.

16.4 Safety Requirements for Working in Bear Habitat

Personnel will adhere to the following safety requirements when working in bear habitat:

- AES personnel who work in bear habitat must successfully complete an approved Firearms Safety Course with an annual refresher course and Bear Awareness Course every three years. Firearm carriers must complete a Criminal Background check annually. A copy of the complete AES-RTS Firearms Policy can be located at K:\E&T\AES Lynx\HSET\Policy.
- The priority will be that personnel who work in bear habitat will work in groups of two or more. Personnel who must work alone for whatever reason will be equipped with a firearm and a radio capable of maintaining contact with other AES personnel.
- Personnel who work in bear habitat will carry at least two types of nonlethal deterrents within a party to deter bear attacks. At least one of these must be a non-shotgunactivated type of deterrent, such as a fog horn or other noise-making device. However, rubber bullets, bean bags, or cracker shells could be used in shotguns as nonlethal deterrents, if desired.
- Appropriate bear fencing should be considered for use in protecting camp sites and equipment, where feasible.

16.5 Deterrents and Firearms Requirements

AES personnel must adhere to all state, and federal laws regarding the possession, transportation, and use of firearms and ammunition. State law does allow an individual to kill a bear in defense of life or property. However, an individual will most likely be cited by a state or federal agency if the incident was created by the following:

- Harassment or provocation of the animal or an unreasonable invasion of the animal's habitat; or
- Improper disposal of garbage or improper storage of food, biological specimens, or similar bear attractant.

Personnel will adhere to procedures to deter all wildlife species from entering and remaining in project work areas to protect both the safety of personnel and wildlife. Should encounters occur, however, personnel will strive to resolve them through non-lethal means when practicable, while placing the highest priority on human safety.

16.5.1 Non-Lethal Deterrents

Cracker shells, shotgun-launched flares, flare-gun-launched flares, hand-launched flares, rubber or plastic bullets, bean bags, noise makers, and U.S. Environmental Protection Agency-approved pepper sprays are authorized to be used as nonlethal deterrents.

Bear spray chemical repellents (i.e., bear spray or pepper spray), when not being carried in the field, will be stored in a dry, secure area. When traveling by vehicle, personnel will transport bear repellents or purchase bear repellents at their destination. Do not transport repellants in checked or carry-on luggage. When air travel is required, personnel will ship bear repellents via ground transportation or purchase bear repellents at their destination.

When fieldwork is completed, the bear repellant cans will be placed in secure Bear Spray Containers, packaged and shipped back to Anchorage via land transport from field location. Usable Bear Spray Canisters will be stored onsite in a dry, secure area.

Empty and expired Bear Spray Canisters will be taken to the Anchorage Waste Disposal facility to dispose of per Municipality of Anchorage Landfill Hazardous Waste Disposal protocol.

Expired or empty bear repellant will disposed of at the Hazardous Waste Collection Center, located at the Anchorage Regional Landfill. At the time of disposal repellent cans we will be diffused of the remaining contents. Requirements can be found at http://www.muni.org/Departments/SWS/Pages/HazardousWaste.aspx

16.5.2 Firearms Storage and Transport

A locked safe, vault, or other secure storage container approved by AES will be used for long-term storage of firearms and ammunition. Transport of firearms within the AES premises will be performed in accordance with the Firearms Policy and will be performed by authorized personnel only who have the required training certifications. Building Security Supervisor/Designee will escort AES-RTS personnel during AES premises firearm transport.

Firearms will only be stored empty and with the chamber open. Firearms and ammunition will not be kept in the same storage container. When traveling commercially, personnel must transport their firearms in locked, hard-sided containers; must make sure that the firearms are not loaded; and must declare the firearms to the airline at the ticket counter. Firearms may be placed in checked luggage. Ammunition must be placed in a separate checked bag, and it must be stored in its original box or in a container made for the storage of ammunition.

Personnel who are assigned firearms are responsible for cleaning and maintaining them in the field and for cleaning them prior to their return to storage. Project/Field Leaders will verify that adequate cleaning and storage facilities are available in the field.

Project/Field Leaders will adopt issuance procedures to inspect each firearm for damage immediately prior to its issuance and upon its return. In addition, all firearms will be "test fired" on at least an annual basis prior to use in the field. Personnel who are assigned firearms must immediately report damage to or malfunction of the firearms during training, practice, or field use.

Firearms will be loaded only in the field or when it is anticipated that bears may be present during the day's field activities. The safety of a firearm will always be on, except during intentional firing.

16.6 Reporting Bear and Human Incidents

Personnel who kill a bear during official duty in defense of life or property will notify their supervisor as soon as practical. Personnel must complete a Bear Incident Report Form following each bear incident and forward it to their supervisor and an HSE Manager/Designee. A bear incident would include one or more of the following:

- Take of a bear in defense of life or property;
- Injury to or death of a person or bear;
- Use of nonlethal deterrents;
- Aggressive bear behavior; and
- Destruction of a camp or equipment by bears.

State and federal laws must be followed, including those regarding notification, salvage and disposition of hides, claws, and skulls. Personnel may not treat a take in defense of life or property while on duty as a sport harvest even if they possess a valid hunting license and the take occurs during an open season.

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AES HSE HANDBOOK ACKNOWLEDGMENT

I hereby acknowledge that:

- (1) I have received a copy of, and read, this handbook.
- (2) I understand the handbook.

I understand this is not all inclusive

This is a summary of the full policy and procedure manuals

Signature: _____

Name (Printed):	
· · · · ·	

Date: _____

Contract Company:	
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This form is to be placed on file at the AES local office.

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Appendix D Field Forms
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ASRC Energy Services a subsidiary of Arctic Slope Regional Corporation REGULATORY AND TECHNICAL SERVICES	Jobs Safety Analysis (JSA)	Date : TASK LOCATION:
TASK/ACTIVITY/GENERAL DESCRIPTION:		SAT #:
TASK LEADER/SUPERVISOR NAME:		PLB #:
REQUIRED PERSONAL PROTECTIVE EQUIPMENT FOR ENTIRE JOB	other	other
bug spray / net hard hats sturdy shoes rubber boots / wader survival bag gloves PFD hearing protection proper outerwear	other	other

Basic Steps	Potential Hazards	Controls

I understand & will adhere to the steps, hazards & controls as described in this JSA. I understand that performing steps out of sequence may pose hazards that have not been evaluated, nor authorized. I will contact my supervisor prior to continuing work, if the scope of work changes or new hazards are introduced. I understand I have the authority and responsibility to stop work I believe to be unsafe.

Worker Name (please print)	<u>Signature</u>	<u>Date</u>

I have reviewed the steps, hazards & controls described in this JSA with all workers listed above and authorize them to perform the work. Workers are qualified (i.e. licensed or certified, as appropriate, & in full compliance with SLAC training requirements) to perform this activity.

Task Lead/Supervisor

Signature

Date



7-11-12 PAD SITE INSPECTION CHECKLIST

Preparation and Maintenance of DTS Data Delivery System

Answer: Yes/No/NA, or provide description as noted:

DESCRIBE THE WEATHER CONDITIONS AS PROMPTED BELOW:
Outside Ambient Temperature:
Outside Temperature (Windchill):
Briefly Describe Weather Conditions:
·

DESCRIBE THE PAD CONDITIONS AS PROMPTED BELOW:

☐ Yes	Is there snow buildup requiring removal by equipment? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Is there snow buildup requiring removal by shovel? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Are there slick walking/working surfaces that require the addition of traction material? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Are Connex doors securely closed? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Are Wellhouse doors securely closed? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Is there ice buildup on either door (Connex and Wellhouse) requiring removal? Action Taken:
🗌 Yes 🗌 No 🗌 N/A	Is there ice buildup on the Wind Turbine, cables, etc. requiring removal? Action Taken:



RREIELY DESCRIBE ANY OTHER RELEVANT RAD CONDITIONS:	
BREITET DESCRIDE ANT OTHER RELEVANT FAD CONDITIONS.	
	•

Answer: Yes/No/NA, or provide description as noted:

DESCRIBE THE DTS SYSTEM CONDITIONS AS PROMPTED BELOW:					
Interior Connex Temperatu	Interior Connex Temperature:				
Battery Voltage (Upon Arri	ival):				
Battery Voltage (Upon Dep	parture):				
🗌 Yes 🗌 No 🗌 N/A	Is the Wind Turbine operating? Action Taken:				
🗌 Yes 🗌 No 🗌 N/A	Do indicators on DTS indicate that it is operating properly? Action Taken:				
🗌 Yes 🗌 No 🗌 N/A	Are winds in excess of 60MPH expected? Action Taken:				
🗌 Yes 🗌 No 🗌 N/A	Before departure are Wellhouse and Connex doors securely closed? ActionTaken:				
🗌 Yes 🗌 No 🗌 N/A	Before departure is Turbine SHUTDOWN Switch in "Normal" position? Action Taken:				
Inspection Performed By:	Time: / Date: Arrival Departure				
Inspection Reviewed By:	Date:				



INITIAL REPORT OF INCIDENT

This form must be completed and signed by the employee involved in the incident. Witnesses or third parties are required to complete a separate Initial Report of Incident form. Please print clearly.

Statement Type: Employee: V	Vitness: 🔲 Third-Part	y: 🗌			
Name:	Job:	Time	Shift Began:	AM 🗌 PM 🗌	
Complete Address:			PI	none:	
Date of Occurrence: Time:	AM 🗌 PM 🗌	Supervisor Name	: Pl	none:	
Date Reported: Time:	AM 🗌 PM 🗌	Specific Location:			
Weather Conditions:		Lighting:			
Specific Activity:					
Date Arrived at Work Site:	Next R&R Dat	e:	Shift Rotatio	n:	
Safety Specialist Notified: Date:	Time: AM	1 🗌 PM 📃 🛛 Non-	Contract Employee:	Yes 🗌 No 🗌	
Safety Specialist Signature:					
Incident Type: Personal Illness / Injury	n Injury 🗌 Veł	nicle 🗌 Prope	erty 🗌 Spill 🗌	Near Loss	
I request to be treated at the medical clin	ic at this time: Yes 🗌	No 🗌 NA 🗌			
Describe how the incident occurred (include the activity/task being performed at the time of incident what happened, sequence of events). You are not required to provide personal information.					
Injury / Illness N/A 🗌 Describe injury	& treatment (type of injur	y, body part, positio	on (left/right), and det	Continue on Page 2 ails of treatment):	
				Continue on Page 2	
I agree that if my condition worsens and I exp immediately notify my supervisor. Additionally	erience signs of infection, so y, I will take special care to k	uch as swelling or rec eep the injury clean a	Idening or an increase i and protected from furth	n pain or fever, I will er harm.	
Action taken to prevent reoccurrence:					



Name:				
Has it been determined you should be flown off the slope for further evaluation/treatment? Yes D No NA D				
Vehicle	ehicle Describe damage:			
Incident	Vehicle ID or VIN:	Make/Model/Year: C)wner:	
N/A	Driver's License:	State: Exp Da	te:	
Property D	Damage N/A 🗌	Describe damage: 0	Owner:	
Witnesses	: Yes 🗌 No 🗌 🛛	If yes, please provide name(s):		
Did this in	cident occur due to r	malfunction of any equipment? Yes 🗌 No 🗌 N/A 🗌		
Was incid	ent caused by anoth	er person? Yes 🗌 No 🗌 If yes, name of other person(s) involved:		
Continued	information from Pag	ge 1		
Employee	e / Witness / Third F	Party Signature:	Date:	

Appendix E Silixa DTS Interrogator Manual

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Hardware Manual

Version 1.3



What is XT-DTS[™]?

Silixa's XT-DTS family uniquely provides high performance sensing specifications over a wide operating temperature range. The XT family provides a temperature resolution from 0.01°C, and a sampling resolution from 25cm. The XT operates over an ambient temperature range from -40°C to +65°C.

Detection Principle

The underlying principle of the XT-DTS is Raman based temperature measurement combined with Optical Time-domain Reflectometry (OTDR).

A short pulse of light is launched into the fibre. The forward propagating light generates Raman backscattered light at two new wavelengths, from all points along the fibre. The wavelengths of the Raman backscattered light differ from the forward propagating light, and are named 'Stokes' and 'anti-Stokes'.

The amplitudes of the Stokes and anti-Stokes light are monitored, and the spatial localisation of the backscattered light is determined through knowledge of the propagation speed inside the fibre. The amplitude of the Stokes light is very weakly dependent on temperature, whilst the amplitude of the anti-Stokes light is strongly dependent on temperature.

The temperature profile within the optical fibre is calculated by taking the ratio of the amplitudes of the anti-Stokes and the Stokes detected light.

The XT-DTS is the latest generation of Silixa's range of DTS unit and is designed to operate over extended temperature ranges with low power consumption. These design features make the XT-DTS suitable for remote or portable installation.



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Product Information

Identification Labels



- Serial Number _
- Date of Manufacture
- Do not tamper or attempt to remove this seal. Warranty will be void.
- Laser Wavelength _
- Laser Repetition Rate _
- **Optical Pulse Width** _
- **Optical Output Power** _

Figure 1. Identification of labels on the XT-DTS chassis



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Front Panel

The front panel of the XT-DTS houses all electrical and optical connections.



Figure 2. Identification of the XT-DTS; front panel

Power Switch

This is a momentary switch used to start up/shut-down the unit.

The Green LED indicates the internal power supplies are active and the system is operational.

Power Supply IN

The unit is DC powered and requires the following power input:

Nominal Voltage Range	+12 to +24VDC
Power Rating Measuring	≤47W
Power Rating Idle	15W
Absolute Minimum Voltage	+11VDC
Absolute Maximum Voltage	+36VDC



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When the unit is in the idle state (not measuring), the system will switch to the low power consumption mode.

Power Socket Mating Connector

The power socket uses a MULTICOMP - MC101 508002 - LOCKING PLUG, 5.08MM, 2WAY, R/A Connector.

Manufacturer part number: MC101 508002.

Pin#	Function
1	0V
2	+V



Pt100 #1. and Pt100 #2.

There are two Pt100 temperature reference probe inputs.

These each accept a 4-wire Pt100 sensor and measure a temperature range of -50°C to +250°C



The XT-DTS is supplied with two Pt100 probes with the following specification:

	Specification
Probe Type	Class A, 4-Wire
Mechanical	150mm long 6mm diameter Rigid stainless steel probe 2m cable, terminated to LEMO
Measurement Range	-50°C to +250°C
Accuracy	Better than ±0.1°C

The connector type is LEMO with manufacturer part number FGG.1B.304.CLAD62Z



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The pin-out is:

Pin #	Function
1	A+
2	A-
3	B+
4	B-



RS485

The XT-DTS has a DB9 Male/Plug for RS485 ModBUS communications.



To connect to the XT-DTS, the user will require a DB9 Female/Socket

The pin-out is:

Pin #	Function
1	#Watchdog Disable
2	A
3	Y
4	N/C
5	GND
6	В
7	N/C
8	N/C
9	Z





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Watchdog Timer

The XT-DTS contains a watchdog timer which will reset the power in the event of the system becoming unresponsive.

If the system becomes unresponsive, it will take a maximum of 7 minutes before measurements, or network communications, resume to ensure minimal loss of measurement time if the XT-DTS was previously collecting data.

The XT Client will detect this event and when the XT-DTS is available on the network, it will automatically resume data synchronisation.

Watchdog Timer Override

When the XT-DTS system software undergoes an upgrade, the watchdog timer will require an override which can be enabled by connecting the DB9 dongle provided to the RS485 port on the front panel.

The DB9 dongle contains a wire link between pins 1 and 5 (GND) of the RS485 Port. Pin 5 is not normally used and so has no effect on system operation, other than to inhibit the Watchdog timer.

The DB9 dongle must only be used during a system software upgrade and it must be removed when the upgrade process is complete.







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LAN1

This is an Ethernet connection, requiring standard RJ45 CAT5/CAT6 cabling.

The adapter is Auto MDI, and so does not require a crossover cable to connect directly to a PC/laptop, however, one may be used.

This adapter is 10/100Mbps and is configured for DHCP.

LAN2

This is an Ethernet connection, requiring standard RJ45 CAT5/CAT6 cabling.

The adapter is Auto MDI, and so does not require a crossover cable to connect directly to a PC/laptop, however, one may be used.

This adapter is 10/100/1000Mbps (Gigabit) and is configured for DHCP.

Optical Outputs (1-4)

The XT-DTS has a built-in 4-channel optical switch, and so up to 4 optical fibres can be connected to the unit.

Only angled <u>E2000</u> connectors with <u>multimode 50/125um fibre</u> should be used. Ensure the dust-caps are replaced on any sockets that are not in use.

To maintain optimum performance and to reduce the risk of damage, both the cable connector and E2000/APC socket must be cleaned using the supplied cleaner <u>before</u> connection.



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Тор



Figure 3. Identification of the XT-DTS; top view



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Status Display

The display shows the current operating status of the XT-DTS. A typical display while the XT-DTS is measuring is:



Figure 4. Status display: XT-DTS measuring

When idle (not measuring), a typical display is:

Silixa XT DTS PT100#1 25.31C Idle	S/N:XTnnnnn PT100#2 26.21C
	02:09:32

Figure 5. Status display: XT-DTS idle

When initialising the next measurement:



Figure 6. Status display: XT-DTS initialising the next measurement

The display shows:

- Model name (XT-DTS) and serial number _
- The temperatures currently read by the two Pt100 external temperature probes
- The measurement status:
 - Idle = The XT-DTS is not measuring.
 - Between Measurements = The XT-DTS is initialising the next measurement.
 - \circ Measuring Channel *x* = The XT-DTS is measuring in the indicated optical channel.
- The local time for the XT-DTS in 24hr format





Safety

Safety Information

The XT-DTS is a distributed temperature sensor intended for indoor and outdoor use, when used with an appropriate IP rated enclosure.

The XT-DTS weighs 12kg/26.5lb and care should be taken when lifting or moving.

The XT-DTS should be placed on a suitable stable surface or placed in an industrial enclose using the <u>mounting kit</u>.

Install the XT-DTS in a position where, if required, it can be turned off without difficulty.

This equipment contains hazardous voltages. Do not the open the product or operate where there is obvious damage.

- **Grounding** The XT-DTS does not require a safety ground, but this would be considered good practice on fixed installations. The ground connection can be found on the rear of the XT-DTS Chassis.
- Live electrical and optical circuits Operating personnel and service personnel must not remove protective covers when operating the XT-DTS. Adjustments and service to internal components must be undertaken by Silixa staff only.
- **Part Replacement** Servicing must only be performed by Silixa personnel. There are no user-serviceable parts inside.
- Modification Do not modify any part of the XT-DTS from its original condition. Unsuitable modifications may result in safety hazards, and will invalidate the warranty.

Related Topics: Laser Safety ; Laser Safety Labels and Apertures



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Laser Safety

The XT-DTS is a Class 1 laser product.

The XT-DTS incorporates a Class 4 laser which emits laser radiation that is potentially hazardous if viewed directly by the eye. This radiation is attenuated and coupled into a 50/125 multimode fibre inside the XT-DTS such that the light emitted from the XT-DTS unit is classified as Class 1 (classified under IEC 60825-1:2007).

Ensure that measurements are NOT in progress, or a measurement is due to start, when connecting or disconnecting the front panel optical connectors.

The laser is emitted through an angled E2000/APC connector which, for safety, incorporates a shutter that stops light being emitted when connectors are disconnected.

The XT-DTS should be connected to a 50/125 multimode sensing fibre that is terminated with an angled E2000/APC connector only.

It is best practice to terminate both ends of the optical fibre cable with the recommended connector to prevent accidental exposure to laser emission, which can pose a safety issue.

The XT-DTS emits infrared radiation which is invisible to the eye.



Caution – Do not open the product or interfere with any of the connectors. Invisible infrared radiation may be emitted with risk to eyes.

The optical output will be within the following range:

Output	Range
Wavelength	1064nm
Beam Divergence	10.7° to 12.4° for recommended 50/125 graded index fibre
Pulse Repetition Rate	≤47.5kHz
Maximum Average Power	≤0.8mW

Related Topics: Safety Information ; Laser Safety Labels and Apertures



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Laser Safety Labels and Apertures



Related Topics:

- <u>Warnings</u>
- Safety Information
- Laser Safety



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Installation

Installing XT-DTS

The XT-DTS is designed to operate on a bench or in an industrial enclosure, using the mounting kit.

Before installing the XT-DTS you must ensure the following are considered:

- **Providing Adequate Clearance** _
- **Connecting Safety Ground** _
- **Connecting Power Source** _



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Enclosure Mounting Kit



XT-DTS top view

XT-DTS bottom view

Figure 7. Mounting the XT-DTS enclosure brackets

The XT-DTS system can be vertically mounted in an enclosure using the 4 steel brackets provided (each bracket has 2 pre-mounted spring screws).

Note the orientation of the steel brackets required to mount the XT-DTS vertically in an enclosure.



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Providing Adequate Clearance



The XT-DTS is designed to operate in extreme ambient temperatures; from -40°C to +65°C.

If the air temperature surrounding the XT-DTS is in excess of +65°C, the system will stop measurements and enter a low-power idle state. For this reason, care should be taken in the choice and positioning of any enclosure in which the XT-DTS is to be mounted.

Connecting Safety Ground

To connect the safety ground, complete the following steps:

- 1. Connect a 16 AWG (1.3 mm) wire to the XT-DTS grounding screw using a grounding lug. The wire must have green insulation with a yellow stripe or must be non-insulated (bare).
- 2. Attach the opposite end of the wire to a permanent earth ground using either toothed washers or a toothed lug.



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Optical connections

To connect an optical fibre to one of the connectors on the front panel:

- 1. Clean both fibre end and the connector socket using the supplied fibre cleaner
- 2. Remove the plastic protector from the socket and push the fibre's connector into the socket until it clicks.



Ensure the laser is not emitting before making or breaking a connection.



Ensure that all fibre connectors are thoroughly cleaned before inserting.



If you believe the connectors <u>inside</u> the XT-DTS may be damaged then contact Silixa for support. Do not attempt to repair these connectors without Silixa support.

Ethernet connections

Connect an Ethernet Cable to either LAN1 or LAN2.

LAN1 has a link speed of 10/100 and LAN2 has a link speed of 10/100/1000

The factory default is for both sockets to be set to DHCP.

Connecting the DC power source

The XT-DTS is supplied with a DC power adapter. This provides a stable +24V DC supply to the product from an AC Supply of 100-240VAC.

The power adapter has an IEC320-C14 (IEC) input connector for your local AC Supply.

Note, the power adapter supplied is for indoor use only. The installer should provide a suitable power supply for the environmental conditions at site.

- 1. Connect the power cable to the socket on the front panel.
- 2. Apply power to the system.





- 3. The XT-DTS will automatically power-up. The green LED on the power switch and the power LED on the top of the XT-DTS will illuminate.
- 4. After approximately 2 minutes, the system will be ready to start measuring and the display will show the current status information:





The supplied power adapter is for indoor use only.



The operating temperature range of the supplied power adapter is -20°C to +50°C.



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Specifications



Specifications are subject to change without notice.

This section contains the following specifications for the XT-DTS:

- Performance Specifications -
- **Electrical Specifications** _
- **Operating Environment Specifications** _
- Storage Environment Specifications _
- Safety Specifications _
- **Electromagnetic Compatibility Specifications** -
- **CE** Compliance Specifications _
- **Mechanical Specifications** _



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Performance Specifications

Depending on the model and options chosen, XT-DTS specifications are within the following range:

Parameter	Rating
Sensing Range	Up to 10km
Temperature Resolution	0.01°C for long averages
Sampling Resolution	From 25cm
Spatial Resolution	From 60cm
Measurement Time	From 5s
Number of Channels	4

Electrical Specifications

Parameter	Rating
Nominal Input Voltage Range	+12 to +24V DC
Operating Voltage Range	+11 to +36V DC
Input Frequency	DC Only
Input Current Rating	1 to 2 A (47W)
Over Current Protection	Internal fuse (factory replaceable)

Operating Environment Specifications

Parameter	Rating
Ambient Temperature Range	-40°C to +65°C
Relative Humidity Range	10 to 85% Non-condensing

Storage Environment Specifications

Parameter	Rating
Ambient Temperature Range	-40°C to +85°C
Relative Humidity Range	10 to 85% Non-condensing



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Safety Specifications

This product complies with the requirements of the following standards of safety for electrical equipment for measurement, control and laboratory use and for laser safety.

- EN 60825-1: 2007 Safety of laser products - Part 1: Equipment classification and requirements
- EN 61010-1: 2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

Electromagnetic Compatibility Specifications

This product complies with the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326) Class A emissions; Basic immunity
- EN 61326-1: 2013

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Note: For EMC compliance all external electrical cables should be less than 2 meters in length.

CE Compliance Specifications

This product meets the essential requirements of applicable European Directives as follows:

- 2014/35/EC; Low Voltage Directive (Safety)
- 2014/30/EC; Electromagnetic Compatibility Directive (EMC)



Caution - Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



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Mechanical Specifications

Overall Dimensions - XT-DTS

Parameter	Rating (Imperial)	Rating (Metric)
Height	6.6 in.	168mm
Width	14.4 in.	365mm
Depth	18.5 in.	470mm
Weight	26.5 lb.	12kg

Finish	
Lid and Front	Black Powder Coated
Rear and Side Heatsinks	Black Anodised
Base	Interlox
Handles	Black Powder Coated

Support

If you have any questions about XT-DTS that are not answered by this manual, you can contact Silixa Support:

Silixa Ltd,
230 Centennial Park,
Centennial Avenue,
Elstree, WD6 3SN
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E: <u>support@silixa.com</u>

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Glossary

Name	Description
E2000/APC	Industrial fibre optic connector featuring a locking mechanism to prevent accidental disconnection, an angled polished fibre tip to prevent reflections and an automated shutter for protective purposes.
50/125 Graded Index Fibre	Optical fibre with a core diameter for 50µm and a parabolic transverse profile of the refractive index which minimises the modal dispersion of the travelling light.
Pt100	Type of temperature sensor based on the known dependence of the resistance of platinum over temperature, featuring high accuracy and repeatability. At 0°C, the sensor will have an electrical resistance of 100.00 Ohms.
Sampling Resolution	Distance between consecutive measurement points.



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Addendum

Warnings



DO NOT LOOK AT OR EXAMINE EXPOSED FIBRE OR CONNECTOR ENDS WHENEVER THE XT-DTS IS IN OPERATION.



DO NOT MAKE OR BREAK OPTICAL CONNECTIONS WHENEVER THE XT-DTS IS IN OPERATION.



AVOID EYE EXPOSURE TO THE INVISIBLE LASER RADIATION EMITTED FROM FIBRE CONNECTORS OR EXPOSED FIBRE ENDS.



DO NOT EXAMINE OR INSPECT EXPOSED FIBRE OR CONNECTOR ENDS USING A VIEWING AID SUCH AS AN EYE LOUPE, MAGNIFIER OR MICROSCOPE.



DO NOT UNDERTAKE FUSION SPLICING OR SIMILAR FIBRE JOINTING WHEN THE XT-DTS IS IN OPERATION.



THE XT-DTS CONTAINS NO USER SERVICEABLE PARTS AND THE PROTECTIVE HOUSING FULLY ENCLOSES A CLASS 4 (EMBEDDED) LASER DEVICE. UNDER NO CIRCUMSTANCES SHOULD THE PROTECTIVE HOUSING BE REMOVED.



THE XT-DTS SHOULD ONLY BE INSTALLED AND OPERATED BY QUALIFIED PERSONNEL.



DO NOT OPERATE THE XT-DTS IF THE PROTECTIVE HOUSING IS DAMAGED.

Related topics: Laser Safety Labels and Apertures



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Declaration of Conformity



Declaration

of Confe	ormity	
Manufacturer	Silixa Ltd	
Address	Silixa House, 230 Centennial Park, Elstree, Hertfordshire WD6 3SN, UK	
Product Description	Distributed Fibre Optic Temperature Sensing Instrument	
Product Model	XT DTS	
We hereby declare that the above products meet the essential requirements of the:		
 Electromagnetic Compatibility Directive 2014/30/EU Low Voltage Directive 2014/35/EU 		
based on the comp	liance with the following EU harmonised standards:	
EN61326-1:2013	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	
EN61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	
EN60825-1:2007	Safety of laser products - Part 1: Equipment classification and requirements	
(Tom Parker – Chie (Name, Function, and sign	f Technology Officer) ature of authorized person)	
	X1-D15-D0C-002	
nitoring The Future		

XT-DTS[™]

Monito

Designed and developed by Silixa's world-beating technical team, the XT-DTS family of sensors offers a precision and accuracy unrivalled by any other DTS system.

Silixa offers a full range of services, from the customisation of system engineering and design, to installation, data interpretation software, and hands-on support services. Our team will analyse your requirements and recommend a bespoke system that is tailored to meet your business objectives.





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Electronic Distribution

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QUALITY CONFROL REVIEWER

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