Appendix E – WindSentinel Buoy Technical Details, WHOI Modelling Summary Results, and Engineering Drawings

Report Contains Confidential Information – Not for Public Distribution

WindSentinel Buoy Technical Details

AXYS TECHNOLOGIES INC.

WindSentinel™

Wind Resource Assessment Buoy

Technical Proposal for

Dominion VOWTAP

April 17, 2014

AXYS OCEAN Renewables

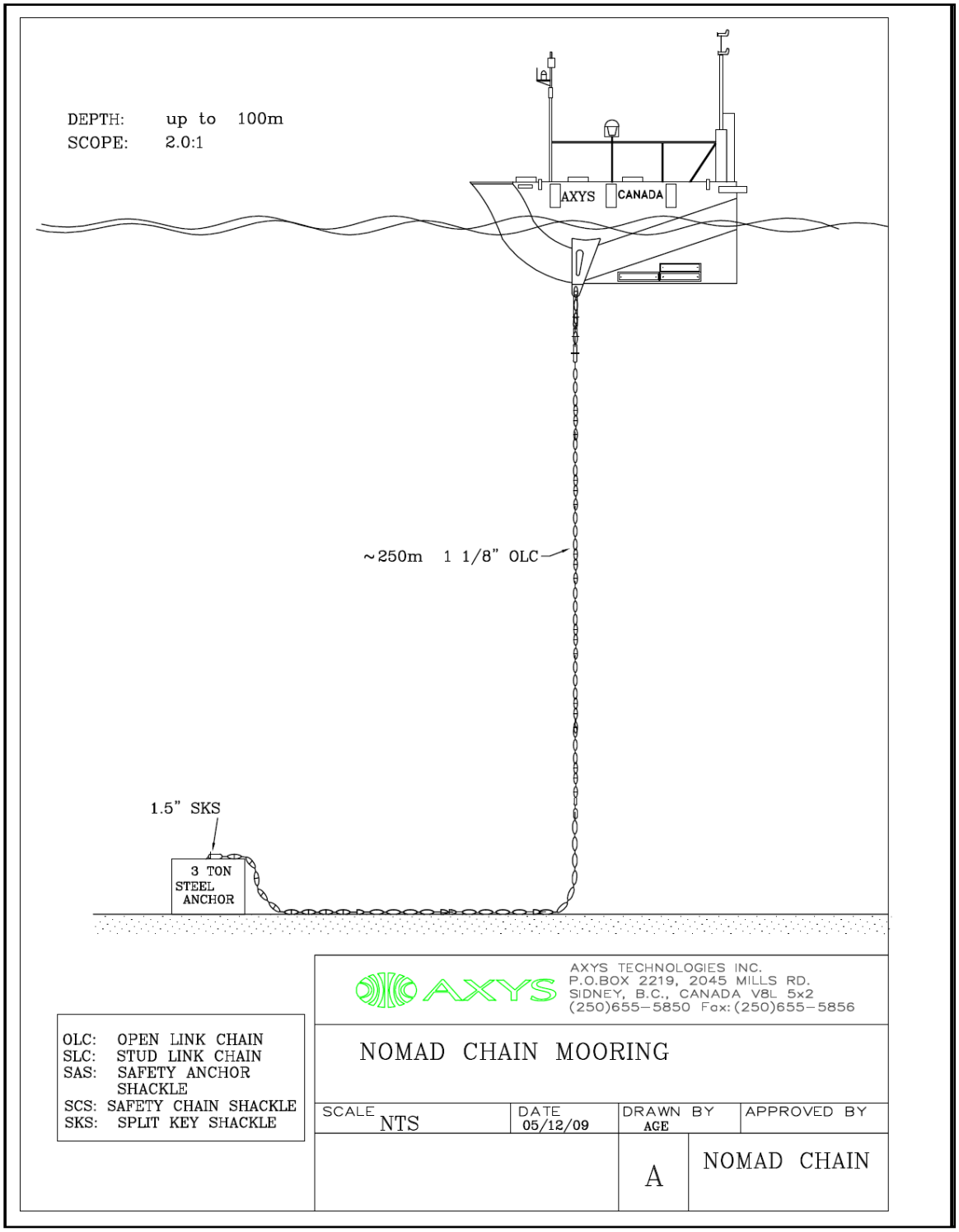
Prepared by

AXYS Technologies Inc.
2045 Mills Road
Sidney, BC
V8L 5X2, Canada
www.axystechnologies.com

Contact

Graham Howe
International Business Development
Renewable Energy
T: 250 655 5861
C: 250 415 2343
ghowe@axys.com

Table of Contents



1. Training

Training typically takes place on-site at the client's facility at time of commissioning.

Topics covered in the training include:

- WatchMan500™ Operation - Basic
- Telemetry/Data Logging
- WatchMan500™ Maintenance – Advanced
- AXYS Data Management System Software Suite
- WindSentinel™ basic operations and maintenance

Field reassembly of the system after shipment is carried out with the clients' technical staff.

Once assembly is complete the system will become powered and the WatchMan500™ system will be set up for its measurement functions. A 48-hour test period begins and the performance of all system components is monitored during this period to verify their correct operation. Training takes place during this phase.

Following a successful 48-hour test, the system is ready for deployment and training for buoy handling procedures will take place.

2. WindSentinel Commissioning

Commissioning of the WindSentinel™ includes:

- Reassembly of the system
- Testing of the reassembled system to ensure compliance with factory standards
- Preparation for deployment

Commissioning requires 4 AXYS personnel for a period of 5 working days plus travel time and expenses.

The client is expected to provide:

- Commissioning facility (including ladders, covered areas, washroom facilities etc.)
- Power – AC (110/220V)
- Buoy transportation / moving equipment (including cranes if necessary)
- Fuel supply

AXYS field technicians are available to deploy each WindSentinel™ system anywhere in the world. The AXYS Services division has 35 years of experience deploying buoys in more than 30 countries and in a wide range of environmental conditions.

3. WindSentinel Deployment

Deployment of the WindSentinel™ includes:

- Delivery of the system to its operating location
- Deployment of the mooring
- Final deployment checks of system once installed

Deployment requires up to 2 AXYS personnel (depending on client support) for a period of 3 working days plus travel time and expenses.

The client is expected to supply:

- Shore logistics for loading, moving of buoy
- Deployment vessel
- Vessel crew, equipment operators
- Regulatory approval, permits etc.
- Safety equipment

A standard WindSentinel™ has a lift weight of approximately 8 tonnes.

To deploy the WindSentinel™, a crane or davit is required that can hold 10 Tonnes and also has the horizontal and vertical coverage to safety place the buoy in the water.

Every client has unique infrastructure and access to different vessels and equipment. Prior to deployment the AXYS Services division will consult with the client and determine the best method and schedule to deploy the WindSentinel™. Deployment typically takes one day with acceptable weather conditions. A full day allows for testing of the WindSentinel™ while at the deployment location.

For pictures of a typical WindSentinel™ deployment, please refer to Appendix-9

4. WindSentinel Servicing

For the initial year of deployment AXYS recommends a planned service interval of three months. This schedule can be amended once operating parameters for the buoy have been established by the client.

In a typical year it is anticipated that there will be:

- One in water service which includes:
    - Replacement of consumables such as washer fluid and generator fuel.
    - Service of met ocean sensors
    - Retrieval of data from flash card
    - Cleaning including solar panels, wind turbine
- One out of water service which includes:

- Service as per in water service
- Cleaning of bio-fouling from buoy
- Review / maintenance of mooring

5. Shipping

The WindSentinel™ is provided EX Works Sidney BC. The client takes ownership of the unit at time of shipment and is legally accountable for the system from then on, including accountability for all customs duties.

The customs tariff code for the WindSentinel™ is 9015.80.00 and the code for parts is 9015.90.00.

When shipping to the United States, the WindSentinel™ is typically shipped by 48 foot double drop (low boy) – crane.

When shipping to Europe or Asia, the WindSentinel™ is typically shipped by break bulk load via ocean. The NOMAD hull ships as one piece with a 10' container for components, giving two pieces. Transit time to Europe is 6-8 weeks and Asia is 2 – 6 weeks, depending on destination port and space availability.

6. Limited Warranty

AXYS TECHNOLOGIES INC ("AXYS") warrants that manufactured Product shall conform to specifications and shall remain free from defects in materials and workmanship for a period of twelve (12) months from the date of final invoice (the "Warranty Period"); provided, however, that the product is applied, installed, operated and used substantially in accordance with the specifications. This warranty is not applicable for customer supplied Product.

Note: A Product is defined as any equipment, sub-assembly, or integrated system assembled, integrated and tested at AXYS.

AXYS shall, at its own expense, replace or repair any Product within such warranty period, provided:

1) AXYS receives written notice of any non-conformance or defect within the Warranty Period;
2) AXYS provides an RMA (Return Material Authorization);
3) the Product is returned to AXYS ' factory of origin or to an Authorized AXYS Distributor with all freight charges prepaid;
4) AXYS determines the Product to have a non-conformance or defect covered under this warranty.
5) Any billable repair work performed by an Authorized AXYS Distributor or 3rd party service provider is authorized by AXYS prior to work to commence.

Any replacement Product shall be warranted for a further period that expires on the later occurrence of six (6) months from the date of shipment or the expiration of the original warranty period.

LIMITATION OF LIABILITY

AXYS does not grant any further representations or warranties on the Product other than as expressly set forth above and expressly disclaims all other warranties, expressed or implied, including any warranties that the Product shall be merchantable, suitable or fit for any purpose other than expressly stated. Notwithstanding any other term of this Agreement, in no event shall AXYS be liable to the Customer, its officers, employees, agents or contractors for any lost or anticipated profits, for any incidental, consequential, exemplary or special damages whether or not AXYS was advised of such claim, or for damages and loss due to personal injury. In any event, AXYS' liability shall not exceed the purchase price of the Product.

WARRANTY OF AUTHORITY

AXYS represents and warrants that it has full and complete power and authority, corporate, legal and otherwise, to enter into and do all things required to be performed under this Agreement; that no litigation or other proceeding is pending or threatened against it, and that no order, judgment or ruling has been made which might adversely affect AXYS ' right to enter into, and do all things required to be done under this Agreement.

The Customer shall give prompt notice to AXYS of any claim, suit or proceeding involving the Customer in which such infringement is alleged or asserted.

WARRANTY SERVICE

To obtain service under the warranty during the warranty period:

1) Write, fax, email (info@axys.com) or call the Customer Service staff (250-655-5850) during working hours (Mon-Fri 8a-4p).
2) Describe precisely and completely the nature of the problem (contact info, product serial number, problem description);
3) Carry out any minor adjustments or service as instructed by AXYS technical personnel;
4) If proper operation is still not achieved, obtain an RMA (Return Material Authorization) number from AXYS and return the instrument, freight prepaid, to the factory or to an authorized Service Centre.

Note: Returned items will not be accepted by AXYS without an RMA.

NON-WARRANTY PRODUCT

The process for returning Product not covered under warranty is the same as described in the above section. Technical inquiries can be made by phone or email during normal working hours (Mon-Fri 8a-4p). Remote technical assistance (commissioning, training) or tech support required outside normal working hours is available with a service contract.

As with Warranty Service, if the return of the Product is necessary, an RMA number must be obtained from AXYS prior to shipping. The instrument must be returned to the Company freight prepaid. Once the instrument is received at the factory, a firm estimate of the repair cost will be provided.

PRODUCT UPGRADES

Enhancements to the Product will be made from time to time. Whenever possible, earlier versions of the Product may be upgraded at a reasonable cost to provide new additional features and extend the useful life of the product. Product enhancements will be promulgated through the AXYS Academy webinars, newsletters, tradeshows and marketing campaigns.

RH sensors in marine applications are not covered by the standard AXYS warranty

Appendix 1: WindSentinel™ Specifications

SPECIFICATIONS

NOMAD BUOY SPECIFICATIONS

HULL CONSTRUCTION	Welded Aluminum. Four water tight compartments for electronics, power and sensors. Aluminum superstructure and stainless steel substructure.
FINISH	Marine grade epoxy (yellow paint, or as specified by client)
WEIGHT	6500 kg (not including ballast or mooring)
DIMENSIONS	6m (L) x 3.1m (W) x 9m (H) with masts installed
MOORING	Inverse catenary, chain, semi-taught, or false bottom. 5 ton anchor.
NAVIGATION LIGHT	IALA standard lamp and automatic multiple bulb changer
POWER	Primary batteries, solar & turbine supplemented with onboard generator.
POSITION	GPS package indicates whether buoy is on-station

AVAILABLE TELEMETRY

Globalstar	Cellular (CDMA, GPRS, 3G, etc.)
Iridium	Inmarsat
VHF/UHF	GOES
ARGOS	

LASER ANEMOMETER SPECIFICATIONS

GENERAL SPECIFICATIONS

OPERATING TEMPERATURE	-40°C to 55°C
OPERATION	Unattended, 24/7
REMOTE SUPPORT	Remote Access for Maintenance and Configuration

FUNCTIONAL SPECIFICATIONS

WIND SPEED RANGE	0-90 m/s
SENSING RANGE	30 to 150 meters vertically, or up to 250m with special order
NUMBER OF RANGE GATES	6
DATA AVAILABILITY	1 Hz motion corrected wind speed & direction
RANGE GATE DEPTH	± 20 meters
WIND SPEED ACCURACY	0.1 m/s @ 1 Hz data rate
VECTOR ORIENTATION	0-360°
RELATIVE ANGULAR ACCURACY	±0.5° @ 8 m/s speed, 1 Hz
EYE-SAFETY	Class 1 Eye-Safe

SYSTEM CERTIFICATION ISO 9001:2008 SGS

Appendix 2: Data Set 1 – Race Rocks Trial

Introduction

The WindSentinel™ was deployed for a one month period for validation testing prior to its commercial launch. The validation tests are designed to compare wind data collected by a laser wind sensor on the moving buoy to wind data collected from a second, stationary laser wind sensor, on Race Rocks Island 0.5 kilometers away. The trial was undertaken to look at to what degree buoy motion interfered with or influenced readings of wind speed taken from a laser wind sensor mounted on the buoy's deck. The test site at Race Rocks Island was specifically chosen to thoroughly test the buoy's capabilities. The waters surrounding Race Rocks see currents of 5 to 6 knots, waves from 2 to 4 meters and winds up to 50 knots.

Sensor Equipment Used

- Onshore land station with Air Temperature Humidity, Barometric Pressure and one RM Young Anemometer
- Onshore LIDAR
- Offshore LIDAR, Air Temperature Humidity, Barometric Pressure, Ocean Temp, Ocean Depth, Wave motion statistics and two RM Young anemometers

Available Data

1. **Ten Minute Winds**
   - 10 minute average Vindicator Wind speeds and directions
   - 10 minute average Anemometer data (2 RM Young onboard Wind Sentinel, 1 on Land Station)
   - 10 minute average Air Temp Humidity
   - 10 minute average Pressure
   - Ocean Temp, Depth
2. **One Second Wind Data**
   - 1 second wind data for two Vindicators with PNI Accelerometer Sensor and AIRMAR Depth sensor
   - 1 file for each day of the trial
3. **Wave Statistics**
   - Summary wave statistics for 2 TRIAXYS Wave Sensors running with a ten minute offset
   - 1 file for the duration of the trial
4. **One Second Wave Data**
   - One second Heave Northing and Easting data for each TRIAXYS Wave Sensor

The data from the trial has been analyzed by GL-Garrad-Hassan and the full paper is available from Dan Jaynes of GL-Garrad-Hassan at dan.jaynes@garradhassan.com

Appendix 3: Build Quality Briefing Note

The AXYS WindSentinel™ has been specifically designed as a remote sensing buoy for the harsh and unforgiving marine environment found in a typical offshore wind farm site.

AXYS Technologies has over 30 years of experience in the design, deployment, servicing and maintenance of marine environmental monitoring systems. With more than 400 successful buoy systems in use in over 30 countries around the world, AXYS are world leaders in buoy based systems for data acquisition in a variety of challenging environments. This knowledge and experience has been used extensively in the design and development of the WindSentinel™: the world's first offshore wind resource assessment buoy.

Key features of the WindSentinel™ system include:

The Sensor: The Vindicator® Laser Wind Sensor (LWS), supplied by Catch the Wind, Inc., is a rugged, all fiber optic, fully motion compensated, next generation laser wind sensor that measures a volume of air simultaneously at various measurement ranges up to 150 meters. The underlying technology of the Vindicator® LiDARderives from aerospace application and has been designed to withstand the heavy vibration and motion experienced by military helicopters in rugged, dusty and salt water environments and extreme temperature regimes. Catch the Wind is a spin-off from Optical Air Data Systems, LLC (OADS), which has been developing laser sensors since 1990 for use in commercial avionics and military applications, including its LandSafe® Aircraft Survivability System.

The Buoy: The NOMAD (Navy Oceanographic Meteorological Automatic Device) 6m hull was originally designed for the U.S. Navy's offshore data collection program. The AXYS NOMAD, used as the platform for the WindSentinel™, is a modified version of this well-proven original design, and the result of AXYS' more than 30 years' experience with Canada's deep ocean stations. NOMADs moored off the Canadian coast commonly experience winter storms with maximum wave heights approaching 20m. The National Oceanic and Atmospheric Administration's (NOAA) National Data Buoy Center report that there have been no known capsizings of 6-meter NOMAD hulls. The Vindicator® laser wind sensor is mounted on a mast design that has been in use for over 25 years, and updated by AXYS' engineers to support this specific sensor unit at a height of over 7 feet above water, and further protected by a custom wave deflecting shroud.

Testing

The WindSentinel™ system was deployed in 45 metres of water off of Vancouver Island's West Coast in British Columbia, Canada. During the 30-day trial, the WindSentinel™ worked flawlessly and sustained no damage while experiencing wind speeds greater than 80km/hr and wave heights over 4 metres.

Conclusion

The WindSentinel™ is the faster, less expensive, and more accurate way to gather offshore wind data across multiple locations. The WindSentinel™ has been engineered to ensure that users consistently receive their data despite operating in some of the most hostile environmental conditions found in the offshore wind power industry.

Appendix 4: Vindicator® LiDARSystem & WindSentinel™ Service Requirements

In any remote sensing deployment, the system uptime is critical to the value of the wind resource assessment. Earlier LIDAR deployments suffered from system function issues as the result of their large number of moving vital components. The Vindicator® Laser Wind Sensor (LWS) does not suffer from these same problems, and the WindSentinel™ Offshore Wind Resource Assessment system supports proactive service maintenance of the platform.

Vindicator® LiDARSystem Mean Time Between Failures

The Vindicator® Laser Wind Sensor (LWS), supplied by Catch the Wind, Inc., is a rugged, all fiber optic, fully motion compensated, next generation laser wind sensor that measures a volume of air simultaneously at various measurement ranges up to 150 meters. The underlying technology of the Vindicator® LiDARderives from aerospace application and has been designed to withstand the heavy vibration and motion experienced by military helicopters in rugged, dusty and salt water environments and extreme temperature regimes. Catch the Wind is a spin-off of Optical Air Data systems, LLC, a world wide leading developer of fiber optic laser sensors, including its LandSafe® Aircraft Survivability System.

The Vindicator® LiDARhas shown a significant improvement in system performance over earlier model LIDARs. Based on the data collected from field units, the Vindicator® LiDARhas accumulated 79,146 device hours without failure as of March 15, 2011. Using this data, an estimate at a 60% confidence level (based on MIL-STD-690D) supports a MTBF of 86,000 hours. At a 90% confidence level, the MTBF is 20,000 hours. At a 99% confidence level, the MTBF is 9,000 hours.

WindSentinel™ Service Requirements

AXYS recommends a 3 month servicing of the WindSentinel™ buoy at initial deployment. A standard diagnostics test provides information on the parts that require repair or replacement in order to prepare service technicians for the field trip. The software can also be configured to automatically send out alerts for specific data thresholds, so you will be notified immediately if there is a problem.

The AXYS Service Team employs senior Field Specialists that know the AXYS products intimately and have over 60 years of combined oceanographic and operational buoy experience. These specialists are capable of board level diagnostics/repair in the field, and individual electronic component level diagnostics/repair in the lab. We can co-ordinate the installation or service logistics required to ensure the repair of WindSentinel™ systems. Annual service contracts can be quoted and for emergency repair service, AXYS' service engineers can identify and repair your problem quickly to allow for short station down times.

Appendix 5: NOMAD Buoy Platform Survivability

The NOMAD is designed for survivability in extreme marine conditions. Fig.1 and Fig.2 below show historical wind and wave survivability data for a NOMAD deployed in the North pacific in over 2500 meters of water.

Fig. 1 – Significant and Maximum Wave Heights Experienced by NOMAD 46184

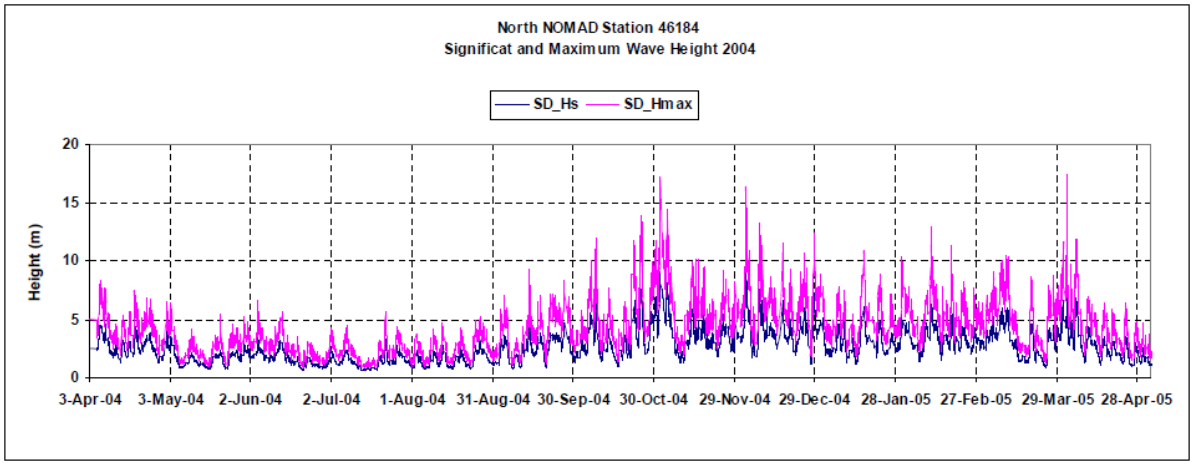
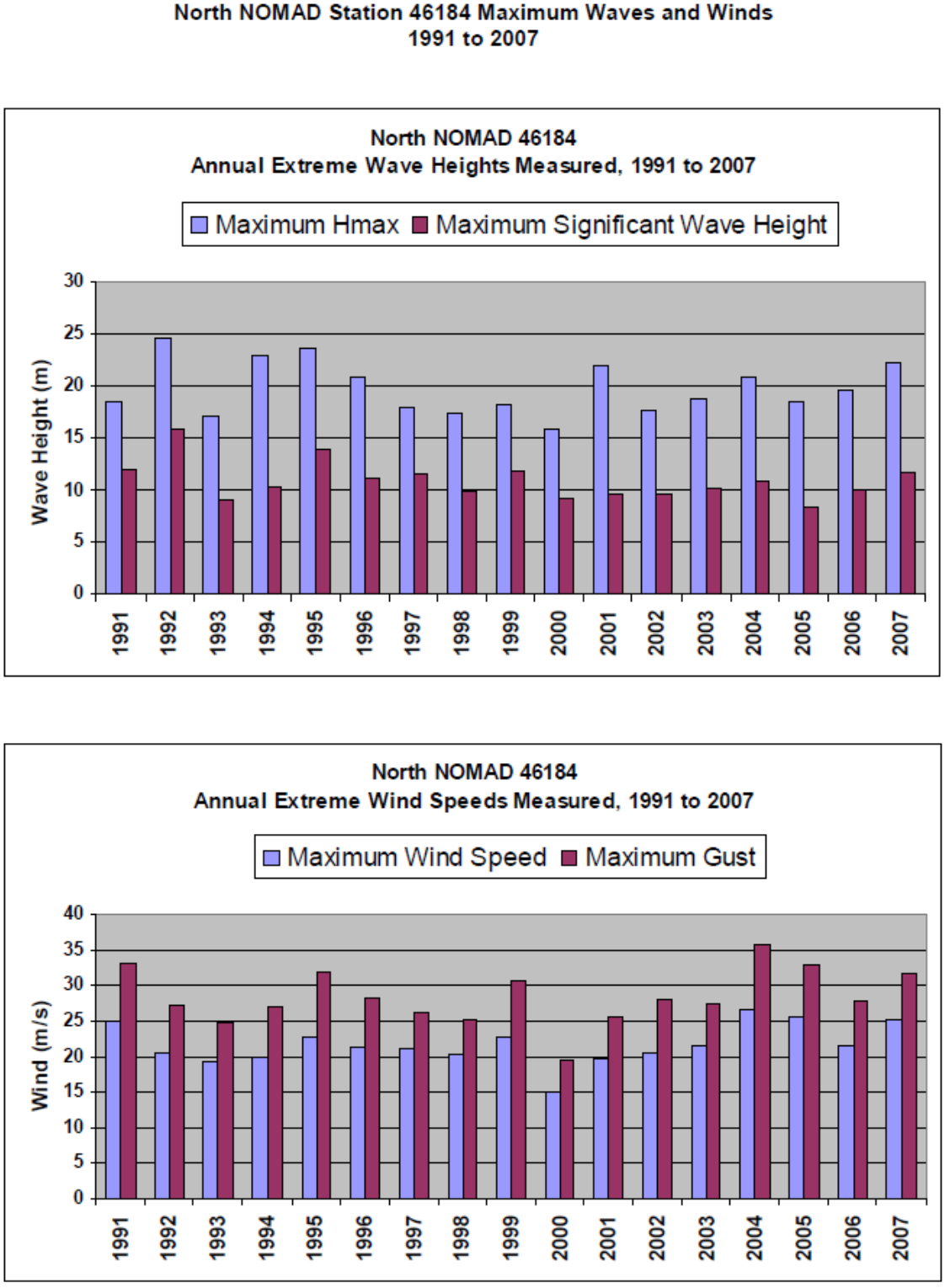
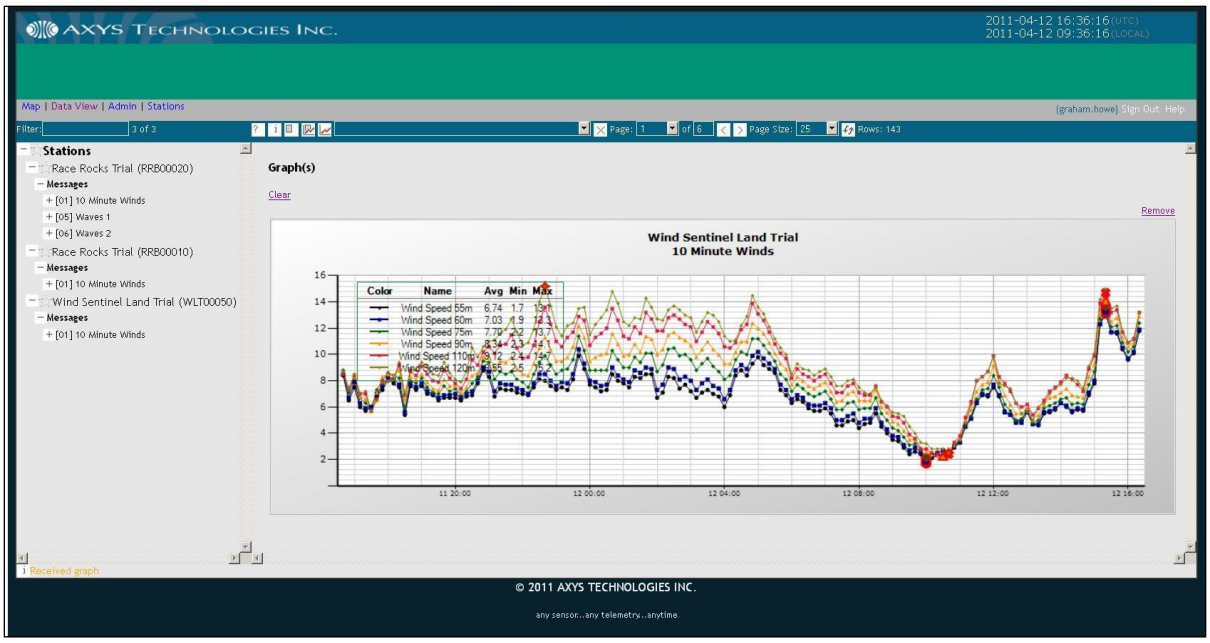
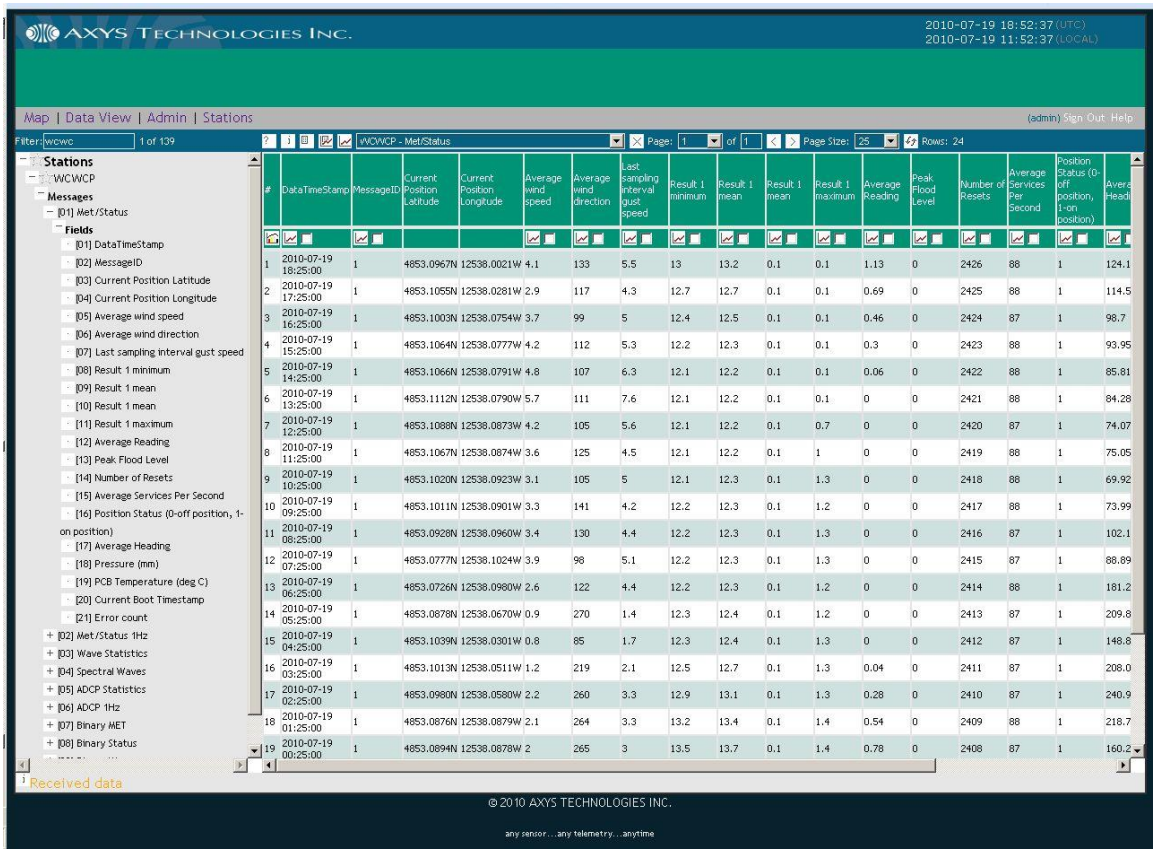


Fig. 2 –Maximum Waves and Winds Experienced by NOMAD 46184 (1991 to 2007)



Appendix 6: AXYS SmartWeb™ Data Display Software





Appendix 7: Factory Acceptance Testing

AXYS uses the following Factory Acceptance Test:

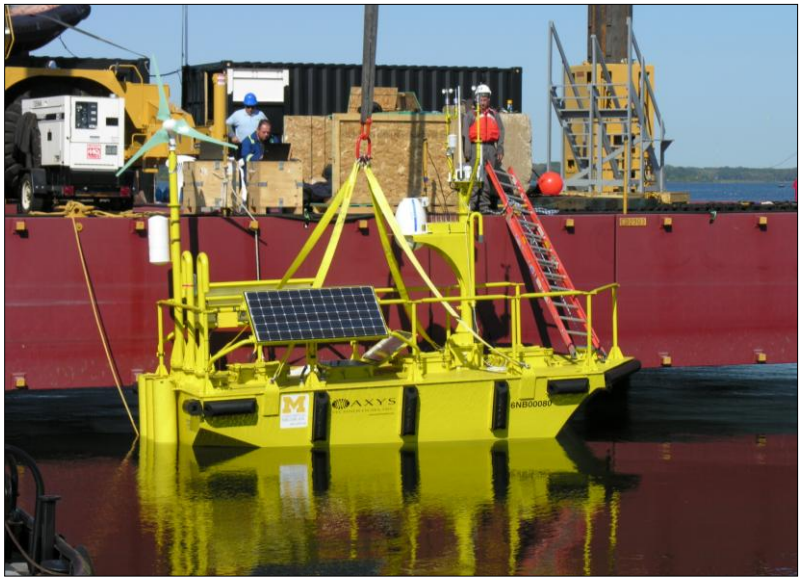
- A 60-hour, hands-off burn in test on land. Successful transmission of 90% of the hourly messages is required to accept the product or the entire test must be repeated.
- Over the same 60-hour period the successful transmission of 90% of the data transmitted within those messages is also required.
- Calibration of any wave module on the calibration facility at AXYS (1m radius “Ferris” wheel at five frequencies).
- Once AXYS has demonstrated that the data is being received by the Base Station then the buoy systems will be available for shipping.

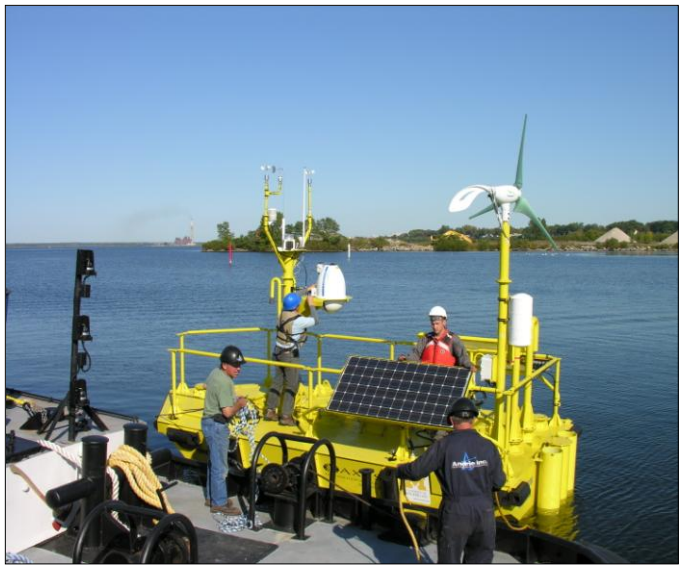
Appendix 8: Manuals and Documentation

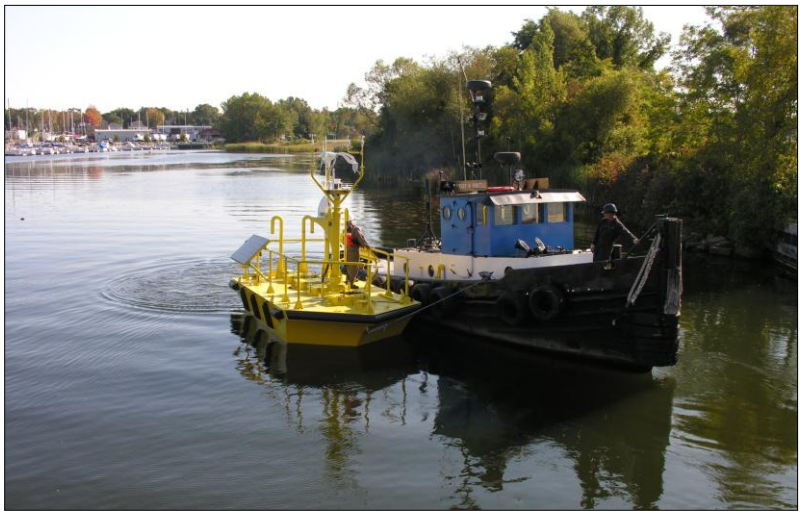
AXYS will supply comprehensive WindSentinel™ manuals that cover all aspects of equipment covered in the customer training program and recommended maintenance program. The following quantities of manuals and other documentation shall be provided:

- Set of Operation & Maintenance Manuals, including equipment catalogues
- 2 original & 2 copies of Manufacturer's Certificate of Quality
- 2 original & 2 copies of Manufacturer's Certificate of Warranty for 12 months from the date of delivery

Appendix 9: WindSentinel™ Deployment Supporting Pictures







Appendix 10: AXYS Customer List

WindSentinel™

Private/Public Companies	Country	Application
Fishermen's Energy	USA	Wind assessment
Grand Valley State University	USA	Wind assessment

Marine Systems

Private/Public Companies	Country	Application
Telecom Italia	Italy	Wave climate studies
Baird & Associates	USA, Ghana	Wave climate studies
BC Hydro	Canada	Wave climate studies
Somagec	Morocco	Wave climate studies
Mobil Oil	Canada	Sea-state monitoring
Dunlop Beaufort Safety Systems	USA	Sea-state monitoring
Royal Dutch Shell (Lease)	Kazakstan	Sea-state monitoring
Aqua Energy Group (Lease)	USA	Sea-state monitoring
Rio Tinto Zinc Iron & Titanium	Madagascar	Coastal Engineering
Monterey Bay Aquarium Research Inst.	USA	Sea-state monitoring
British Petroleum	UK	Wave climate studies
America's Cup Syndicate	NZ	Sea-state monitoring
Muir Matheson	UK	Wave climate studies
HR Wallingford	UK	Wave climate studies
AMEC	Canada	Sea-state monitoring
Somague Engenharia Marrocos	Portugal/Morocco	Sea-state monitoring
Innova	Spain	Sea-state monitoring
SRP	New Caledonia	Sea-state monitoring
DNT Gore	China	Sea-state monitoring
Maersk Oil	Mid East	Sea-state monitoring
Petrobras	Brazil	Sea-state monitoring
Evans Hamilton	USA	Wave climate studies
Metocean Services Inc	South Africa	Wave climate studies
Government Agencies		
Environment Canada	Canada	Weather monitoring
UK Met Office	UK	Wave climate
Defense Research Establishment	Canada	Sea-state monitoring
United States Navy	USA	Sea-state monitoring
Chilean Navy	Chile	Wave climate studies
Canadian Coast Guard	Canada	Wave climate studies
Proudman Oceanographic Laboratory	UK	Wave climate studies
Environment Agency	UK	Sea-state monitoring
NOAA - NOS	USA	Sea-state monitoring
NOAA - NDBC	USA	Sea-state monitoring
United States Navy (Panama City, FL)	USA	Sea-state monitoring
United States Navy (Port Hueneme, CA)	USA	Sea-state monitoring
SHOA	Chile	Wave climate studies
CETMEF	France	Wave climate studies
Servizio Idrographico E Mareographico	Italy	Wave climate studies
DSTO	Australia	Sea-state monitoring

ENVBOP	New Zealand	Sea-state monitoring
Meteo France	France	Sea-state monitoring
APAT	Italy	Sea-state monitoring
NIOT	India	Sea-state monitoring
DIMAR	Colombia	Sea-state monitoring
Research Agencies		
Johns Hopkins University (Lease)	United States	Sea-state monitoring
University of Washington (Lease)	United States	Wave climate studies
Han Dong University	Korea	Wave Climate studies
Pennsylvania State University	United States	Wave climate studies
University of Bordeaux	France	Wave climate studies
University of Pau	France	Wave climate studies
Coastal Research Station	Germany	Wave climate studies
University of Connecticut	USA	Sea-state monitoring
University of Victoria	Canada	Sea-state monitoring
MBARI	USA	Wave Climate studies
Florida Atlantic University	USA	Wave Climate studies
Port Authorities		
Associated British Ports	United Kingdom	Sea-state monitoring
Port of Napier	New Zealand	Wave climate studies
Port of Melbourne	Australia	Sea-state monitoring
Puertos del Estado	Spain	Sea-state monitoring
Port of Lisbon	Portugal	Sea-state monitoring
Port of Le Havre	France	Sea-state monitoring
Port of Casablanca	Morocco	Sea-state monitoring
Northport	New Zealand	Sea-state monitoring
Port of Nelson	New Zealand	Sea-state monitoring
Port of Melbourne	Australia	Sea-state monitoring
Leasing Agencies		
Coastal Leasing Incorporated	United States	Rental fleet
Coastal Ocean Associates	Canada	Rental fleet
Geophysical Survey Equipment (GSE)	United Kingdom	Rental fleet

More than 400 AXYS buoys have been deployed around the world.

Appendix 11: Sample Commissioning Work Plan

AXYS Technologies Inc.

2045 Mills Road
Sydney BC
250.655.5850
www.axystechnologies.com

Service Trip Work Plan

PROJECT: WindSentinel Deployment

DATES:

AXYS Personnel:

Name	email	Cell phone	Dates	Flight Itinerary
Nick Gubby				
Yanis Gryshan				
Andrew Mclean				
James Adams				
Reo Phillips				

Trip Details

Client:
Sales Order:
Work Order:
Project Number:

Work Plan

Svc day	Task no	Time	Task Details	Staff Required	Tech Lead	Location	Logistics Notes
	22-1	All day	**Travel**	AXYS			Nick, Yanis, Andrew, James - Air travel, Car rental, hotel check-in
			Assembly				
	23-1	All day	Mast assembly: Structure and cabling. *** New cabling required for the wind turbine ***	AXYS	Nick		- CTW field tech needed - Use crane as buoy emergency lift (if needed) - Tarp cover and heater required or Hangar - Max 6 pers on buoy at all time - Ladder for access - Safety equipment required. -AC shore power (desirable) **- Buoy purging procedure in effect**
	23-2	All day	Sensors Install: Vindicator, wind sensor, antennas, etc…	AXYS, CTW	Nick		
	23-3	All day	Diesel Generator checks	AXYS	James		
	23-4	PM	Contact Ken & Craig at AXYS to confirm data is viewable	AXYS	Nick		
	23-5	All night	Leave system operating overnight	AXYS	Nick		
			Commissioning				
	24-1	AM	Data QC Check	AXYS	Nick		- CTW field tech needed - Use crane as buoy emergency lift (if needed) - Max 6 pers on buoy at all time -AC shore power (desirable) - Ladder for access - Safety equipment required. **- Buoy purging procedure in effect**
	24-2	AM	Watchman500 checks	AXYS	Nick		
	24-3	AM	Sensor checks (check sheets)	AXYS	Nick		
	24-4	AM	Telemetry checks (GPRS and INMARSAT D+)	AXYS	Nick		
	24-5	AM	Diesel Generator checks	AXYS	James		
	24-6	AM	Mechanical checks	AXYS	James		
	24-7	PM	Crane Operation: Trim assessment - install extra ingots if necessary	AXYS/FE	Nick/Stephen		- Crane and forklift operators needed - Use 1 shot of chain for added weight on the buoy
	24-8	PM	Fuelling operation: 240 gal of diesel	FE	Stephen		No RF transmission, fuelling barge/truck needed
Svc day	**Task no**	**Time**	**Task Details**	**Staff Required**	**Tech Lead**	**Location**	**Logistics Notes**

	24-9	PM	Swing test: Compass calibration	AXYS	Nick		Tug boat needed
	24-10	PM	Crane operation: move from water to dock (at your discretion)	AXYS/FE	Stephen		Crane operator and rigger needed
	24-11	PM	Leave system operating overnight (complete test)	AXYS	Nick		
			Training				
	25-1	AM	W500/DMS training	AXYS	Nick		- Projector and internet access - Access to the buoy - Confirm attendance
	25-2	PM	Wind Sentinel Training	AXYS	Nick		
	25-3	PM	Power system and Engine training	AXYS	James		
	25-4	All night	Leave system operating overnight (complete test)	AXYS	Nick		
	25-6		**Travel (TBC)**				-
Thu 26			**Pre-Deployment**				
	26-1	All day	Verify environment data collection	AXYS	Nick		
	26-2	All day	Verify data transmission	AXYS	Nick		
	26-3	All day	Final pre-deployment checks	AXYS	Nick		
	26-4	All night	Leave system operating overnight (complete test)	AXYS	Nick		
Fri 27			**Deployment**				- Boat and crane needed - Crane with operator and rigger - Safety equipment required. **- Buoy purging procedure in effect**
	27-1	AM	Mooring checks	AXYS/ FE	Reo		
	27-2	AM	Crane Operation: Move buoy on water; Mooring and anchor on tug boat	FE	Stephen		
	27-3	All day	Towing operation: Buoy towed to location	FE	Stephen		
	27-4	PM	Crane operation: Deployment on water (mooring, anchor)	FE	Stephen		

Svc day	Task no	Time	Task Details	Staff Required	Tech Lead	Location	Logistics Notes
	27-5	PM	System Final Checks – set WatchCircle	AXYS	Nick		
Sat 28	28	All day	**Travel**	AXYS			-Hotel check out, Car rental return, Air travel

Trip Details:

1. Travel:
    a. As per flight itinerary
2. Accommodations:
3. Local Transport:
    a. Car Rental
4. Equipment and Tool List Prepared:
    a. Safety equipment needed:
        i. AXYS supplied: hats, toe caps, harness, gas detection, overall, lifejackets
        ii. Client supplied: lifejackets, extraction ropes, ladder (brow), gas extraction fans, tarp cover, heaters (or hangar)
    b. Tools:
        i. AXYS Supplied

Tools:
allen key set (metric and imperial) with IMPORTANT x/64 bit for RLU.
Torx allen key set
crescent wrench x 3 (one up to 2”)
bullnose pliers
Needle-nose pliers
adj. pliers
side cutters large & small
wire strippers
large flathead screwdriver & Phillips & 2 x Robertson
small wm500 electronics screwdrivers
Robertson head screwdriver w/ bits
Torque Wrench
Bottle Jack
Rubber Mallet
CTW softjaw pliers
Socket/wrench set – extra 7/16” wrench
Measuring tape
Dorn wrench
Enclosure keys
Electric drill
Drill Pump
Fluke scopemeter
Fasteners:
Zip ties, large & small
Black Tape rolls
Misc Supplies:
Silicone - #4
Silicone - 732 Silicone
Vulcanizing tape
Antiseize
Teflon Tape
Oil absorbent Pads (10) and Towels (Bunch)
Brake Clean x3 Cans
String and Nut on Don’s Desk
1/8” Thk Rubber 1ft x 1ft

Misc Equipment:
12VDC power supply
fiber cleaner kit w/ swaps & wipes
spare bulgin to db-9
USB to serial adapter
Multimeter
spare CF card 8GB
Null serial to DB-9 connector
DB-9 serial cable
10pin IDC to DB-9
thumbdrives x 2 with manuals and software install (with license keys)
Laptop with power supply
Soldering Iron (field kit)
Spare Watchman500 node
Spare Compact Flash card
Fluid Extractor or spong
Lifting slings
Gas detector
Manual Engine start switch
Infrared temperature gun (measurement tool)
Hand held met station (pressure, wind speed, temp, RH etc)
Cell phone /Smart phone

ii. Client supplied hammers, electrical cords,

5. Client Contact Information:

Name	**Role**	**Email**	**Office**	**Cell**

6. Special Logistics Required: (i.e. Helicopters, charter vessels)
    a. Crane (10 ton min)
    b. Boat
    c. Forklift
    d. Tarp and heaters for bad weather (or hangar)

7. Shipping
8. Special Guest

AXYS WindSentinel™ Training Attendance List

Name	Company	Position

Appendix 12: WindSentinel™ Training Curriculum

WindSentinel™

Training Curriculum

Date: Jan 2012

Manufactured by

AXYS TECHNOLOGIES INC.

2045 Mills Road, Sidney, British Columbia Canada V8L 5X2
Phone: +1 (250) 655-5850 Fax: +1 (250) 655-5856

E-mail: customerservice@axys.com Website: www.axystechnologies.com

Date:
Location:
Clients:

Trainers: Nick Gubby
Yanis Gryshan
Adam Matthews

The AXYS Technologies WindSentinel™ training program is structured to give a good overview of the system operation, monitoring, maintenance, and troubleshooting /diagnostic procedures. Access to a fully operational WindSentinel™ system is recommended for effective hands-on learning.

Where applicable reference the appropriate manual in the course of discussion.

Training Agenda Overview	Completed
System Overview	
Documentation Overview	
WM500	
Software	
Networking	
Buoy Assembly	
Deployment Checks and Troubleshooting	
Mooring	

System Hardware	Completed
System Overview	
Telemetry	
Power	
Enclosure layout and wiring	
Accessories	
Configuration and operations overview	

Documentation and References	Completed
Manuals	
Schematics	
Cable diagrams	

Buoy Assembly	Completed
Battery Installation, Testing, Connections	
Payload Installation	
Power Distribution Module Connections	
Dessicant, Deoxo Packs	
Gasket Preparations and Checks	
Solar Panel Assembly and Dome Installation	
Confined Space Entry Procedure	

Generic WM500 Details	Completed
Device Handlers and Slots	
Menu System	
Configuration	
▪ Device Handlers	
▪ Messages	
▪ Hardware Mapping	
Data Loggers: Internal and External	

Software Suite	Completed
Software Suite Overview:	
▪ DMS	
▪ SmartWeb, SmartView	
▪ DMS Config	
Communications	
▪ Input/Output window	
▪ Communications logging	
Configure Menu	
▪ WM500 Configuration	
Data Log Retrieval	
Synchronization	
▪ Import/Export	
Operational Mode	
Message Broadcasting, Relay	

Networking	Completed

Database architecture	
SQL Server	
PC and network requirements	
DMS Install Check Sheet	

Day 2 (0900-1600hrs)

Device Handlers	Completed
System-Specific Device Handlers	
▪ Configuration parameters	
▪ Message parameters	
Other Device Handlers	
▪ Action Script Utility Handlers	
▪ Math Handlers	

Operational Setup and Checkout	Completed
Sleep/Wake cycle (testing:always on, normal runmode:sleep/wake)	
BlueTooth operation	
Deployment checksheet	
Disabling servicing (Ctrl-S, Ctrl-R)	
Firmware menu and configuration management/backup	
Duplicating configurations	

Monitoring and Troubleshooting	Completed
System data –DMS	
Raw logs	
Diagnostic level and filtering	
Realtime Data menu	
Pipeline to Device	

Mooring	Completed
Design	
Assembly	
Checks	
Deployment Procedure	

WHOI Modelling Summary Results

Mooring Simulations for a NOMAD Buoy deployed at
36°53'3" North Latitude by 75°29'19" West Longitude
off the coast of Virgina, USA in a water depth of 26.4 metres

Mooring simulations were carried out for a 6m NOMAD Buoy to be deployed in 26.4 metres lower low water depth off the coast of Virgina, USA at 36.8843 degrees North Latitude by 75.4886 degrees West Longitude (WGS84). The proposed moorings was designed by Axys Technologies Inc. and consists of a NOMAD Buoy connected to 2.5 shots (64 meters) of 1-1/2" Open and Stud Link Chain which is then connected to an anchor. The mooring design is the Axys Technologies Inc. type 7235. See Figure 1. The WHOI Cable version 2.0 program was used for the mooring simulations.

The solutions were a 2 Dimensional dynamic simulation with input currents and waves propagation in the same direction. The simulation uses the input wave height and period and then uses a Bretschneider spectrum to output the wave height time series. Wave heights used for input are Significant Wave Height and Wave Periods are Peak Periods. The water depth for the simulation was for a worst case condition at an approximate high tide level of 29.1 metres above bottom.

The ocean currents used for this simulation were derived from the Metocean Design Assessment for the proposed Virginia Offshore Wind Technology Advancement Project prepared for Dominion. The primary simulation was for a 1000 year conditions with Significant Wave (Hs) height of 9.9 meters with a Peak Period (Tp) of 14.1 seconds. Ocean currents used are with 1.1 m/s at the surface tapering to 0.3 m/s at the bottom.

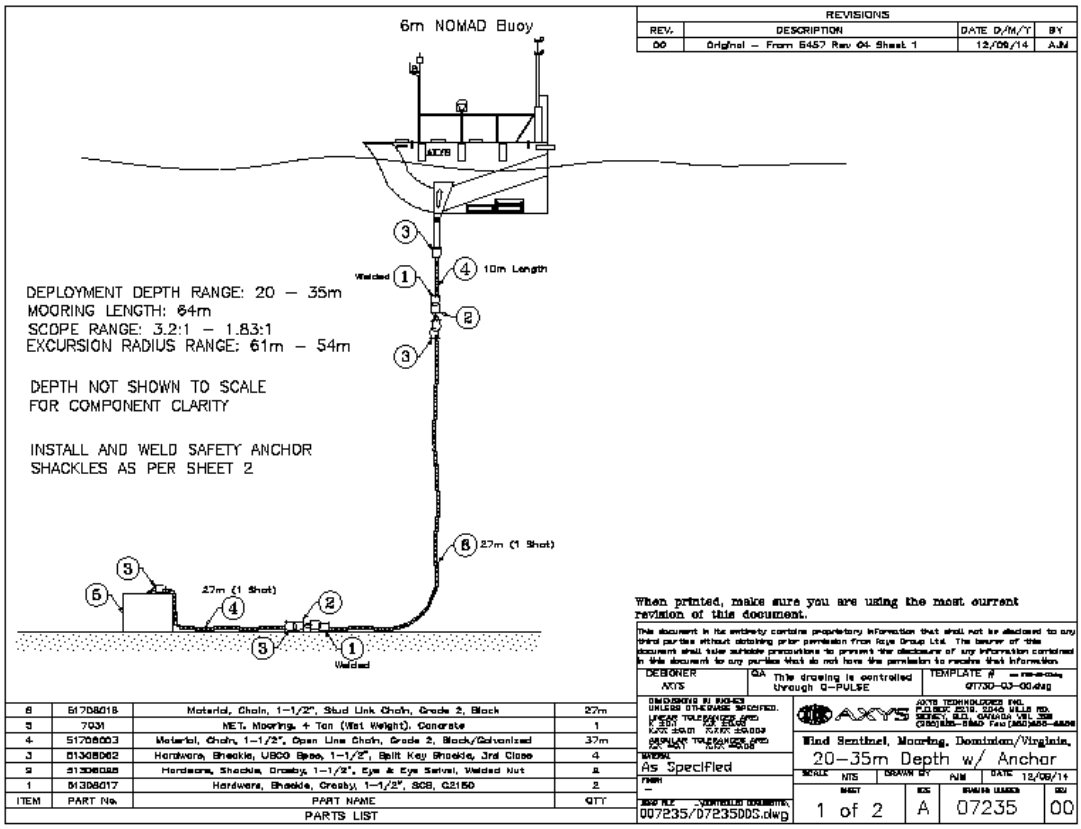
Given below are the Nomad buoy Specifications:

Weight 5200 Kg hull
ballast: 1360 Kg keel
up to 2720 Kg Lead internal
plus payload of electronics and batteries.

Typical Total Weight: 6560 to 9000 Kg

Total Displacement: 19044 Kg
minus 9000 Kg = 10044 Kg Reserve Buoyancy = 22137 lbs

Figure 1. Axys 7235 all chain mooring



ITEM	PART No.	PART NAME	QTY
6	51708018	Material, Chain, 1–1/2", Stud Link Chain, Grade 2, Black	27m
5	7031	NET, Mooring, 4 Ton (Wet Weight), Concrete	1
4	51708003	Material, Chain, 1–1/2", Open Link Chain, Grade 2, Black/Galvanized	37m
3	51308062	Hardware, Shackle, UBCO Bose, 1–1/2", Bolt Key Shackle, 3rd Class	4
2	51308025	Hardware, Shackle, Crosby, 1–1/2", Eye & Eye Swivel, Welded Nut	2
1	51308017	Hardware, Shackle, Crosby, 1–1/2", SCS, G2150	2

Case 1: 9.9 meter Significant wave height, 12.5 meter Maximum Wave Height with 14,1 second peak period.
Ocean Current Velocity Profile: 1.1 m/s tapering to 0.3 m/s at the bottom

Results:
Maximum Tension at Anchor: 8092 lbs (3671 Kg)
Maximum Tension at Buoy: 6863 lbs (3113 Kg)
Reserve Buoyancy after Maximum Tension at Buoy: 15273 lbs (6930 Kg)

Conclusions:
Tensions on NOMAD are well below reserve buoyancy.

WHOI Cable Mooring Simulation:
Hs: 9.9 m, Hmax: 12.5 m, Tp: 14.1 s, 1.1 m/s to 0.3 m/s at bottom Current Profile.

Figure 2. Hs:9.9m, Tp: 14.1s ,Wave Height (Heave) Time Series for simulation

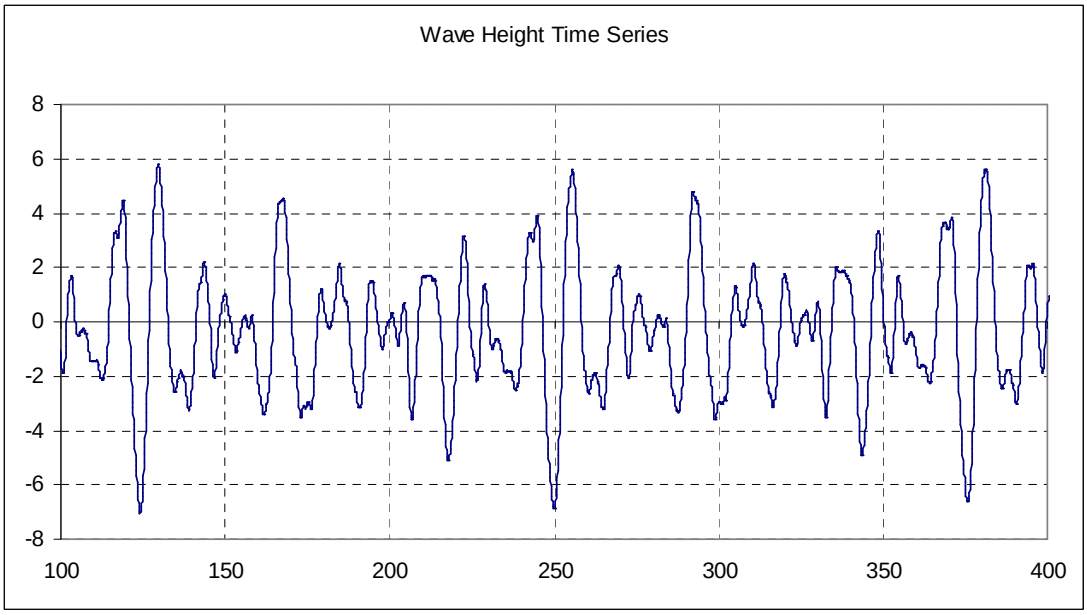


Figure 3. Hs:9.9m, Tp: 14.1s Tensions at Anchor during Dynamic Mooring Simulation

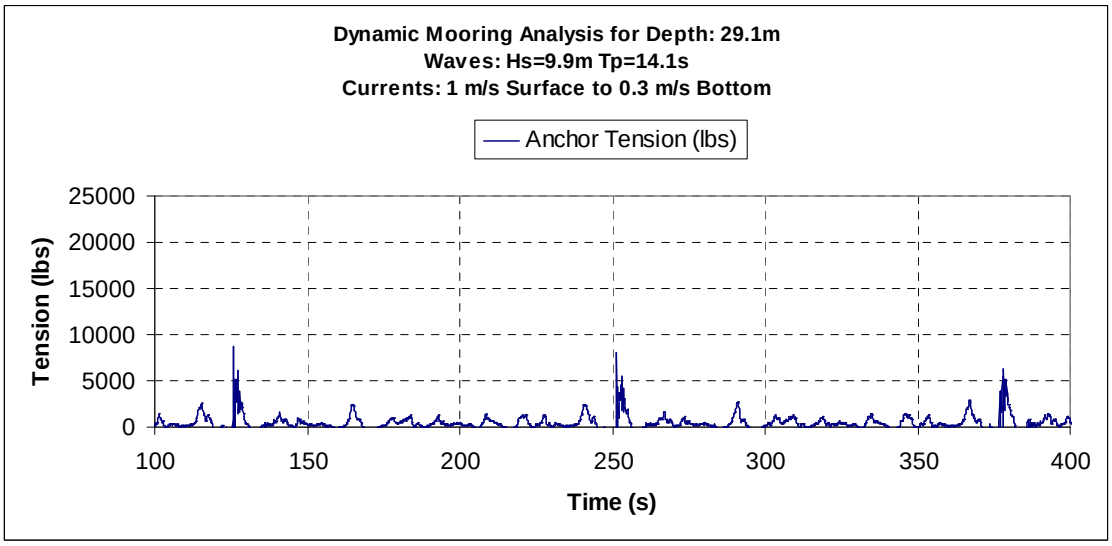


Figure 4. Hs:9.9m, Tp: 14.1s,Tension on NOMAD Buoy during Dynamic Simulation

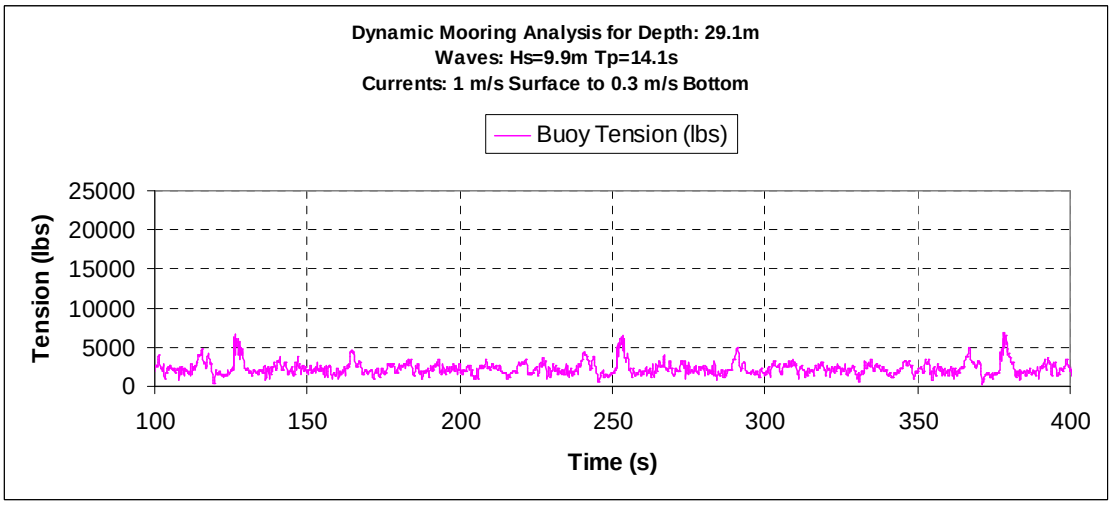
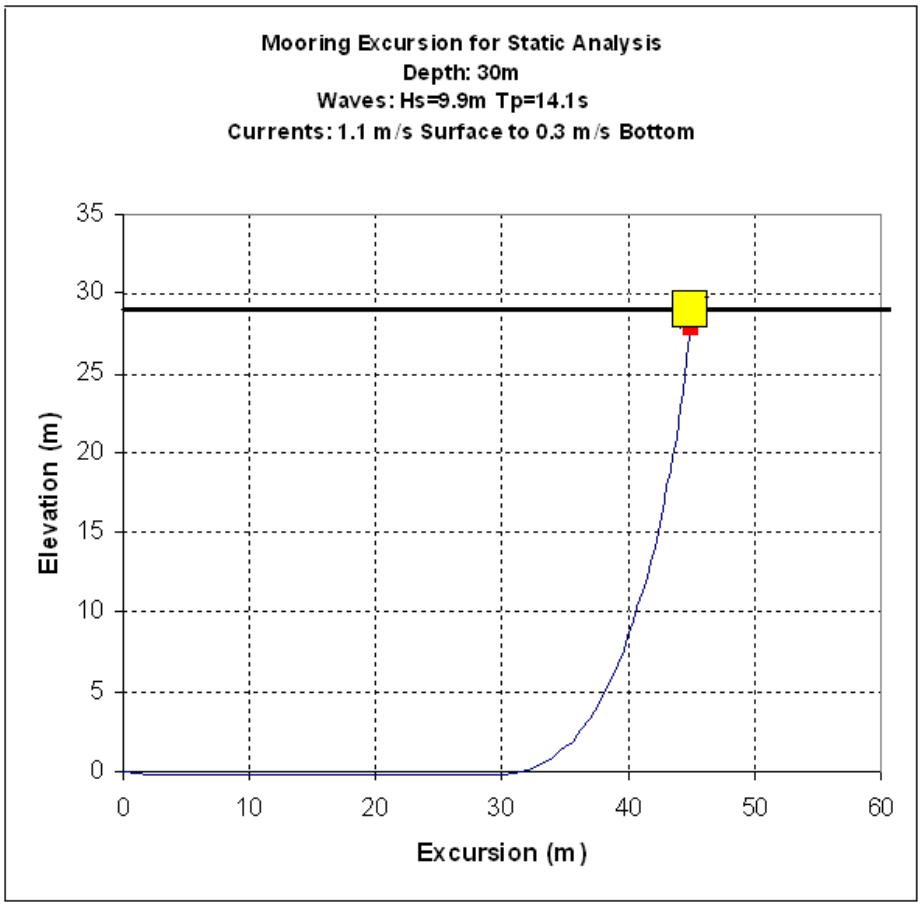


Figure 5. Mooring Excursion for Static Analysis



An additional mooring simulation was done in order to have maximum wave heights exceed 15 meters. The simulation was done with Significant Wave height of 12 meters with a Peak Period of 12.04 seconds. This resulted in a Maximum Wave height of 15.89 meters.

Results:
Maximum Tension at Anchor: 27020 lbs (12260 Kg)
Maximum Tension at Buoy: 13371 lbs (6066 Kg)
Reserve Buoyancy after Maximum Tension at Buoy: 8766 lbs (3977 Kg)

Conclusions:
Tensions on NOMAD are well below reserve buoyancy.

WHOI Cable Mooring Simulation:
Hs: 12 m, Tp: 12.04 s

Figure 6. Hs:12m, Tp: 12.04s, Wave Height (Heave) Time Series for simulation

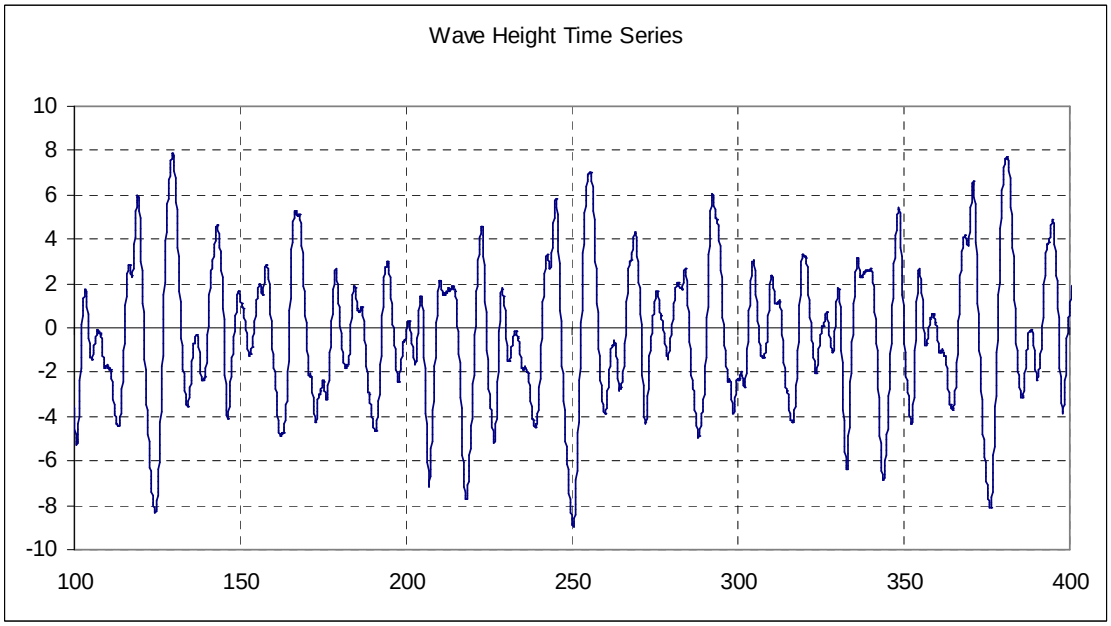


Figure 7.Hs:12m, Tp: 12.04s, Tensions at Anchor during Dynamic Mooring Simulation

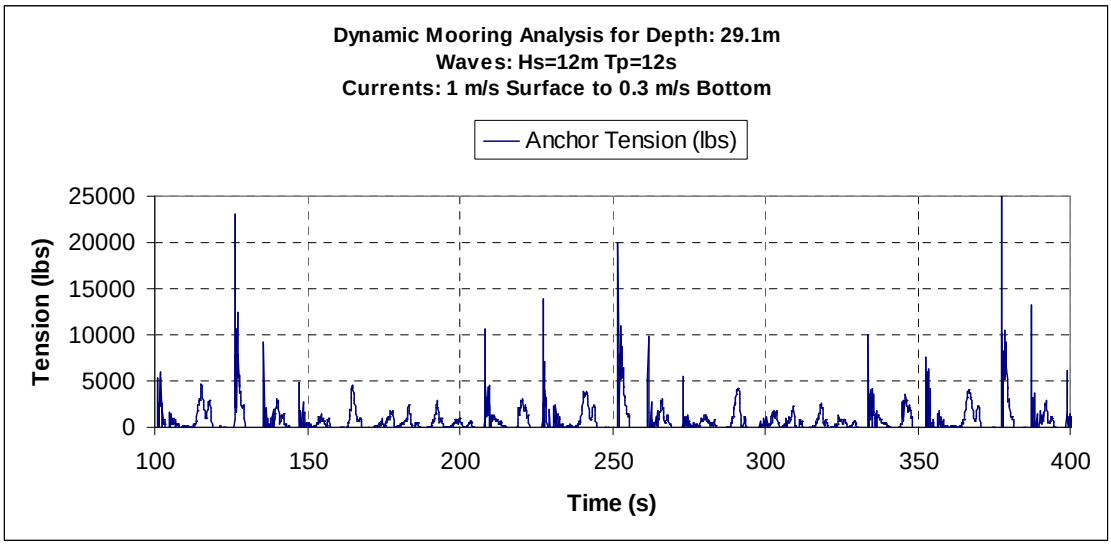
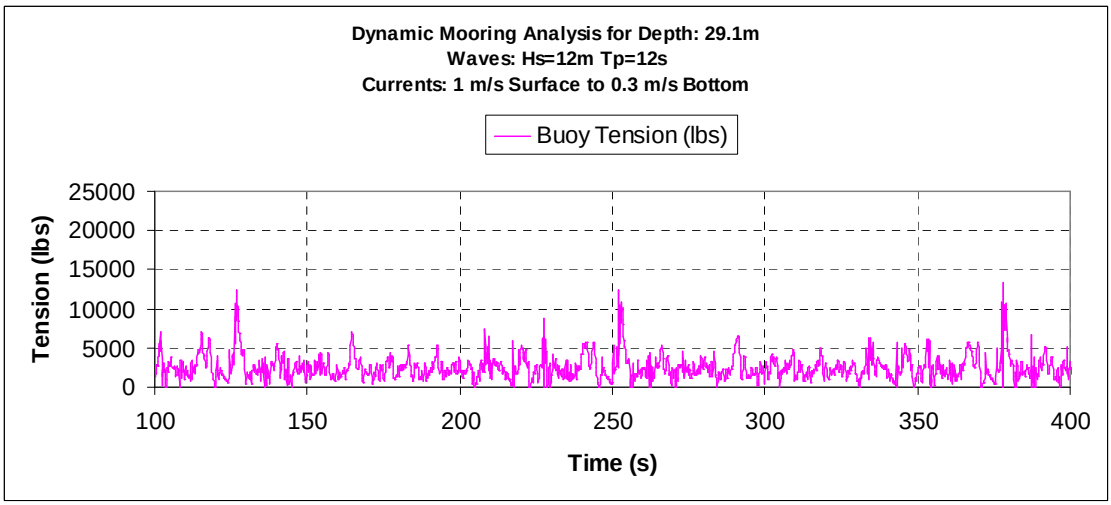
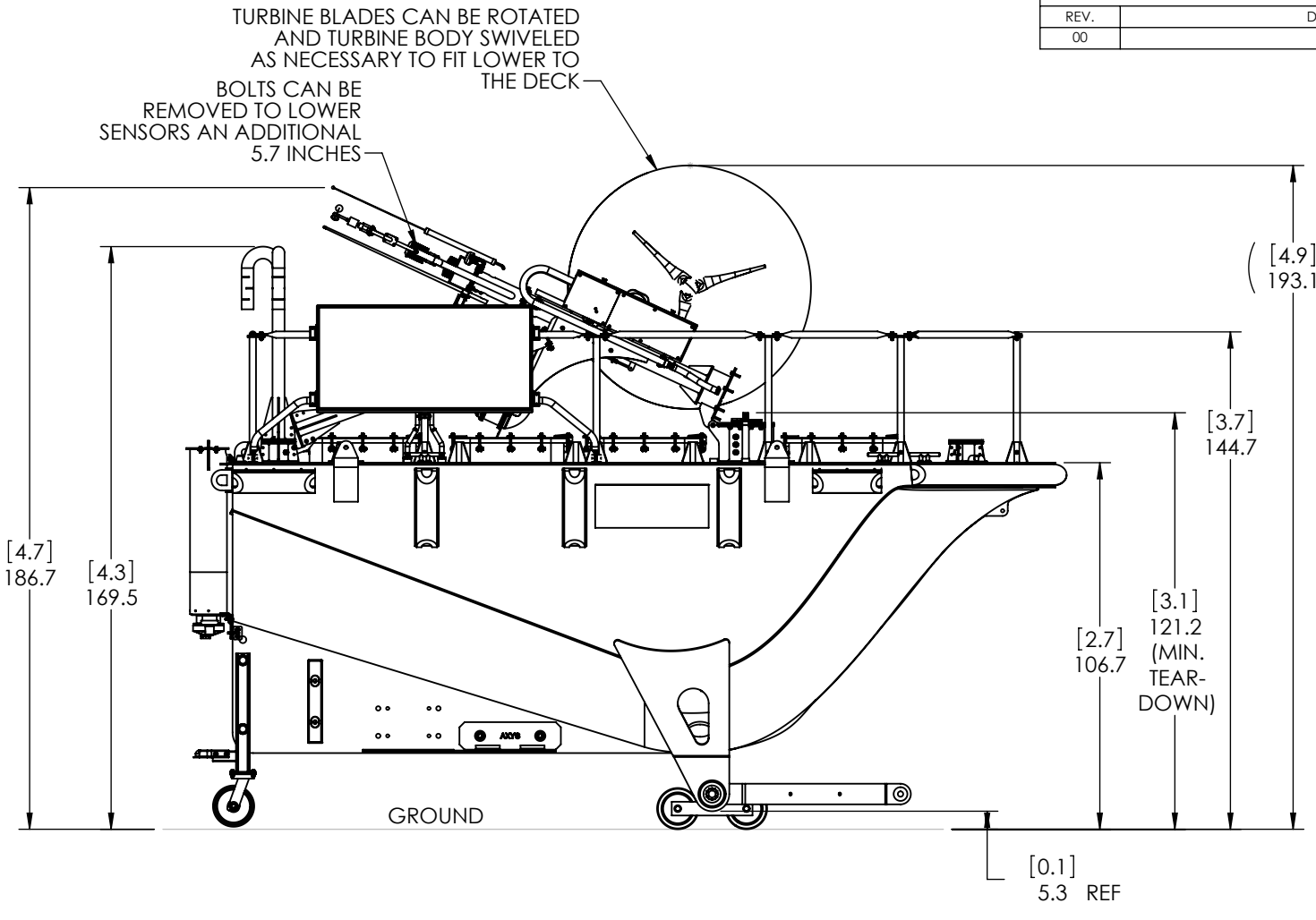


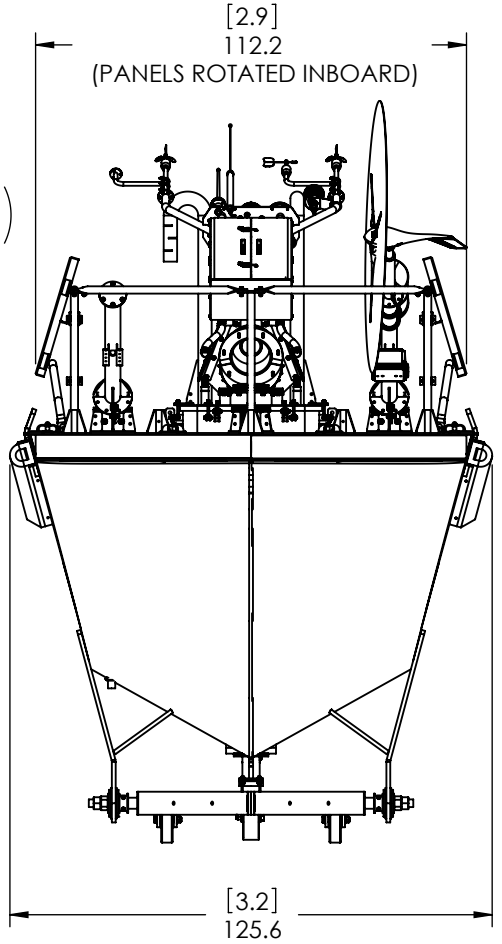
Figure 8.Hs:12m, Tp: 12.04s, Tension on NOMAD Buoy during Dynamic Simulation



Engineering Drawings

REVISIONS			
REV.	DESCRIPTION	DATE D/M/Y	BY
00	Original	28/08/14	AJM





LAYOUT OF COLLAPSED WIND SENTINEL

When printed, make sure you are using the most current revision of this document.

DESIGNER: AXYS Technologies	QA: This drawing is controlled through Q-PULSE	TEMPLATE # (was QT04-05-00.dwg): QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

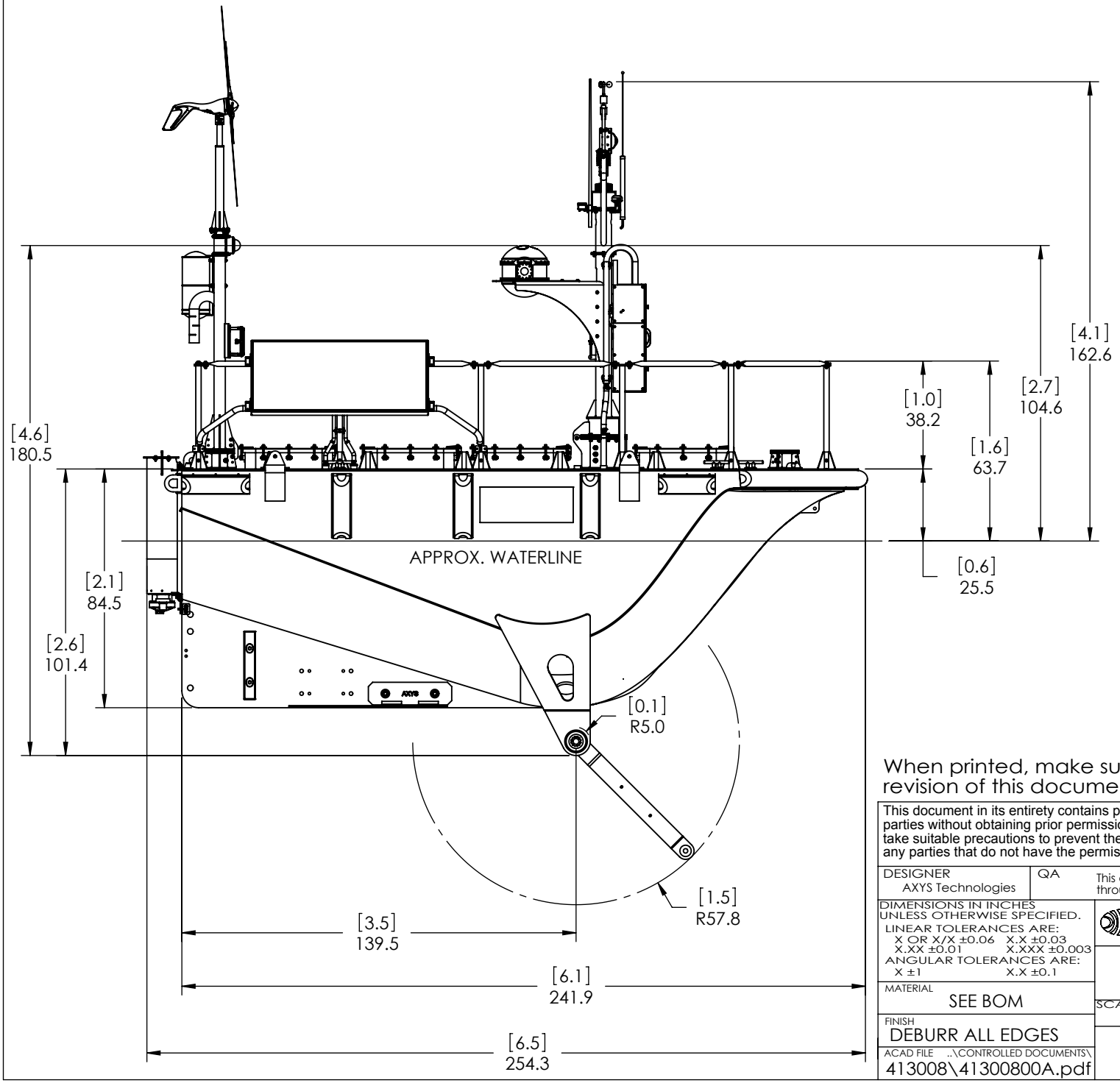
Wind Sentinel, System,
Dominion

MATERIAL	SCALE	DRAWN BY	DATE	SHEET
SEE BOM	1:50	AJM	28/08/14	1 of 5

FINISH	ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
DEBURR ALL EDGES		A	413008	00

ACAD FILE ..\CONTROLLED DOCUMENTS\413008\41300800A.pdf

PRIMARY UNITS IN INCHES, [SECONDARY] UNITS IN METERS



When printed, make sure you are using the most current revision of this document.

DESIGNER: AXYS Technologies	QA: This drawing is controlled through Q-PULSE	TEMPLATE # (was QT04-05-00.dwg): QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

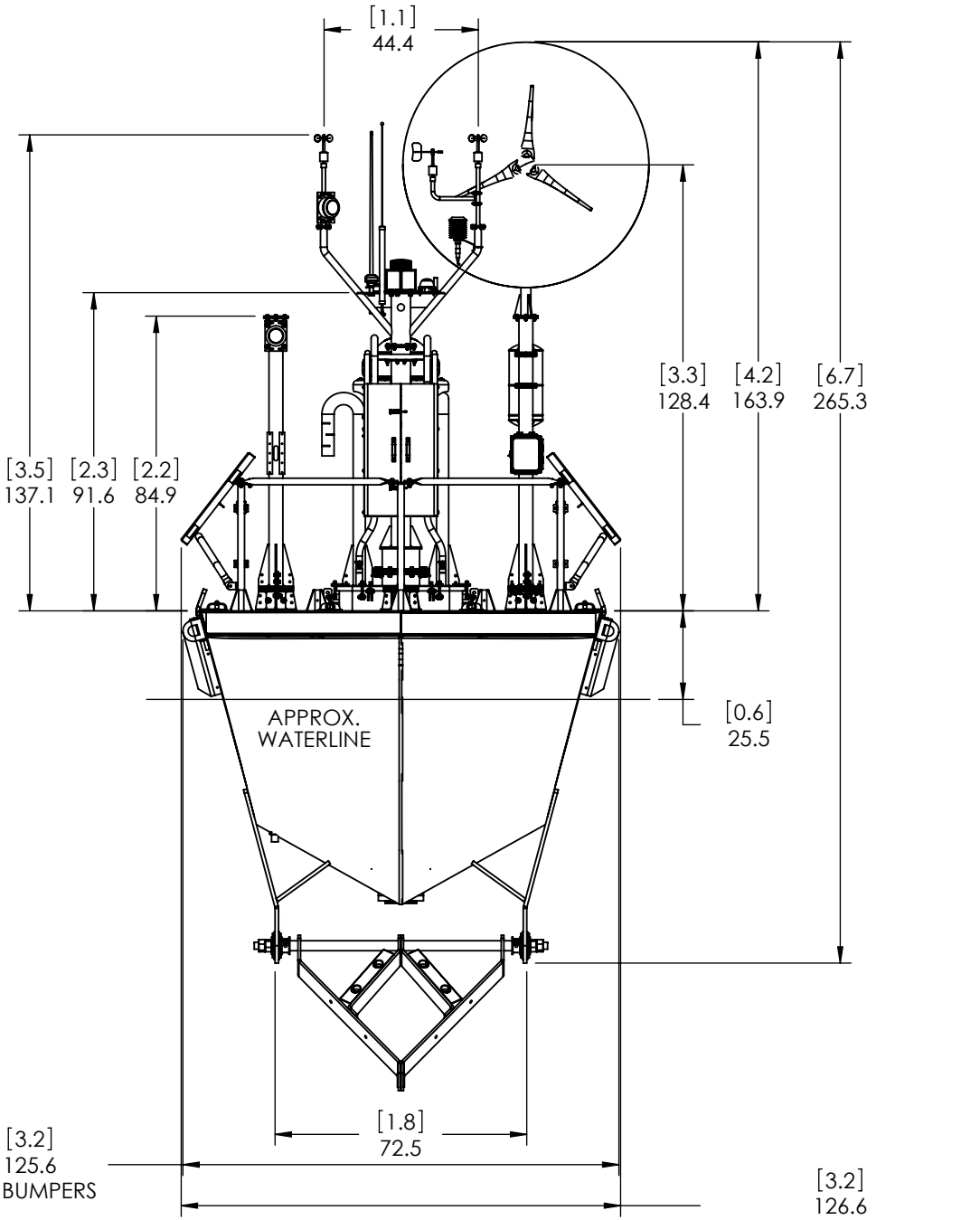
Wind Sentinel, System,

Dominion

MATERIAL	SCALE	DRAWN BY	DATE	SHEET
SEE BOM	1:50	AJM	28/08/14	2 of 5

FINISH	ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
DEBURR ALL EDGES		A	413008	00

ACAD FILE ..\CONTROLLED DOCUMENTS\413008\41300800A.pdf



When printed, make sure you are using the most current revision of this document.

DESIGNER	QA	TEMPLATE # (was QT04-05-00.dwg)
AXYS Technologies	This drawing is controlled through Q-PULSE	QTS2-04-00.dwg

DIMENSIONS IN INCHES
UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

MATERIAL: SEE BOM

FINISH: DEBURR ALL EDGES

ACAD FILE ..\CONTROLLED DOCUMENTS\413008\41300800A.pdf

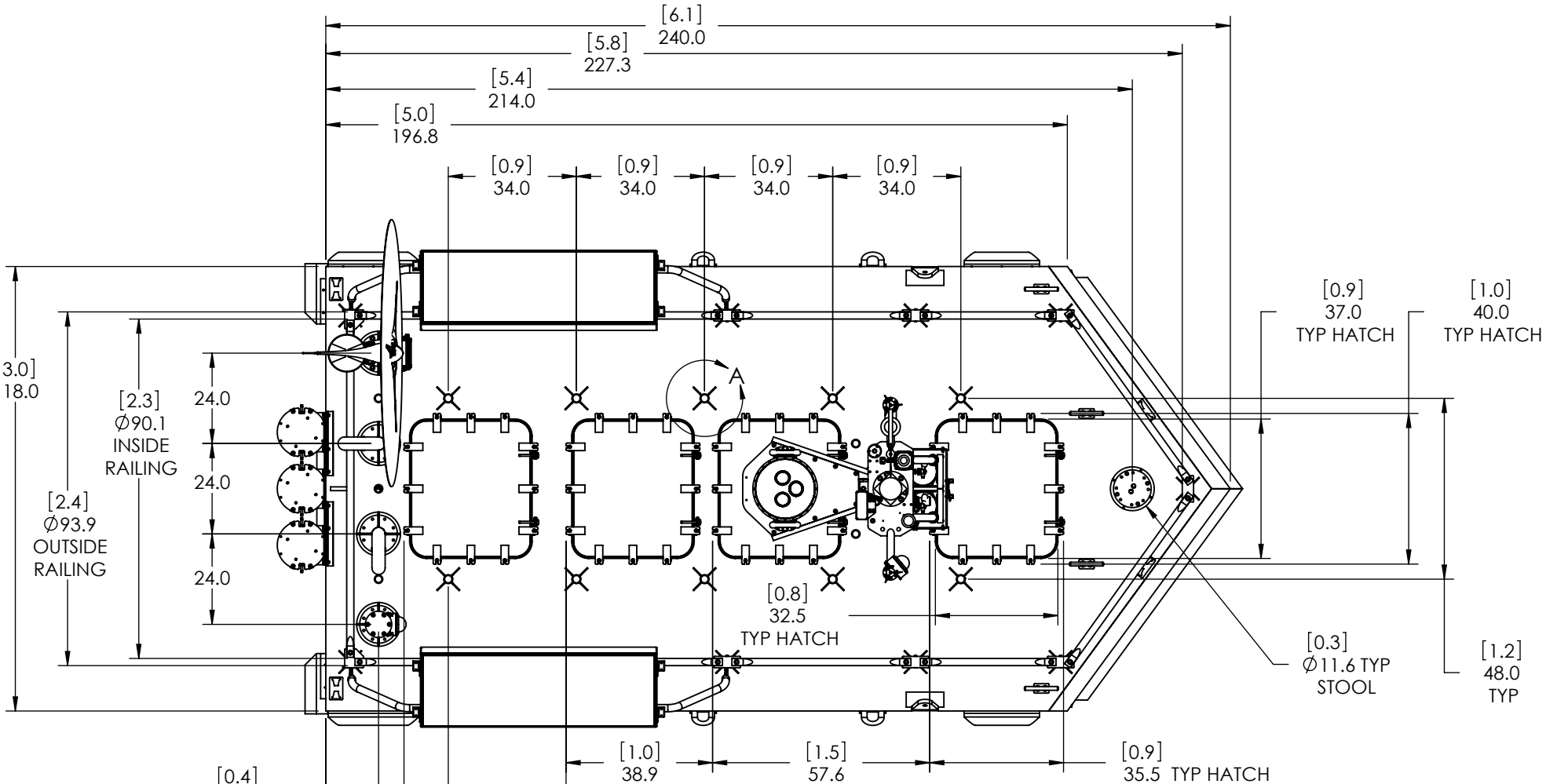
AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

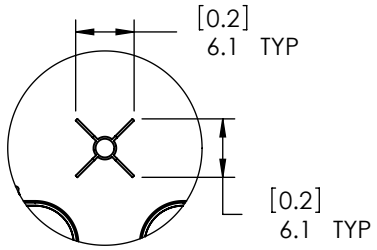
Wind Sentinel, System,

Dominion

SCALE	DRAWN BY	DATE	SHEET
1:50	AJM	28/08/14	3 of 5

ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
	A	413008	00





DETAIL A
SCALE 1 : 20

When printed, make sure you are using the most current revision of this document.

DESIGNER: AXYS Technologies	QA: This drawing is controlled through Q-PULSE	TEMPLATE # (was QT04-05-00.dwg): QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

MATERIAL: SEE BOM

FINISH: DEBURR ALL EDGES

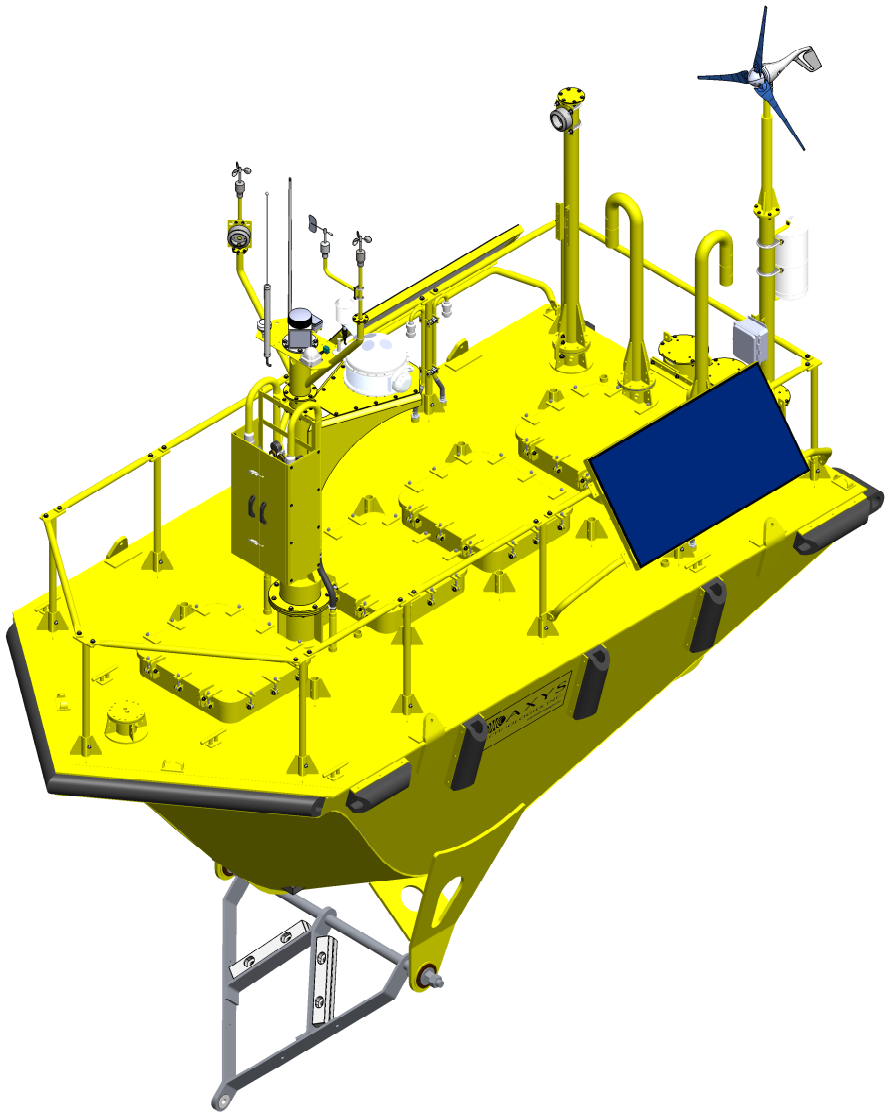
ACAD FILE ..\CONTROLLED DOCUMENTS\413008\41300800A.pdf

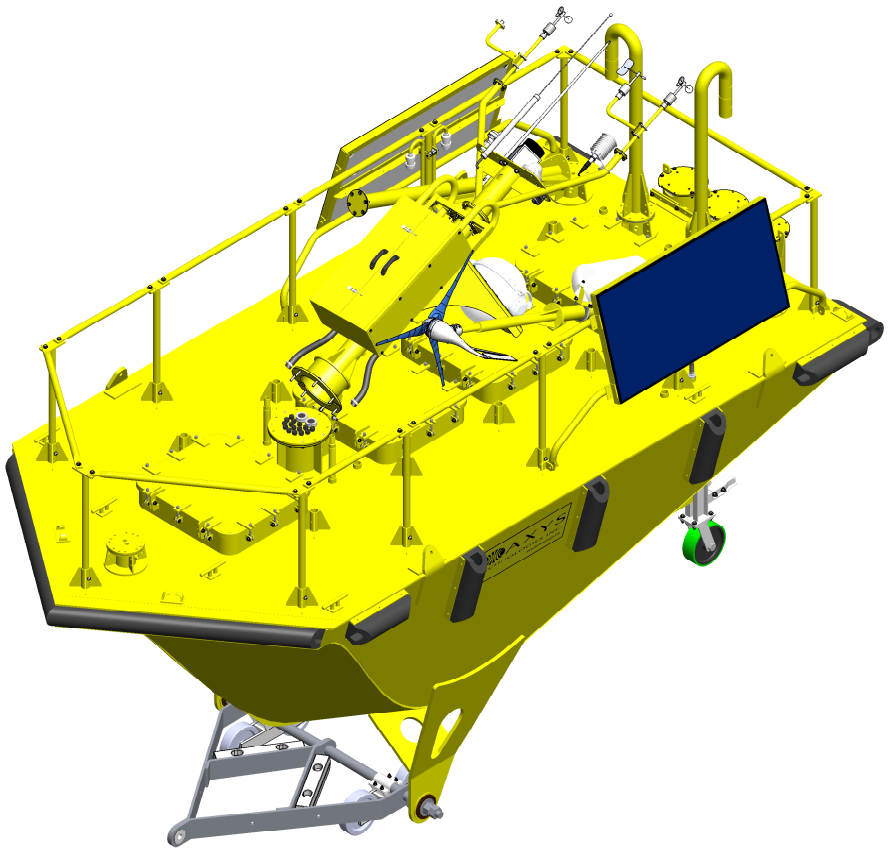
AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

Wind Sentinel, System,
Dominion

SCALE	DRAWN BY	DATE	SHEET
1:40	AJM	28/08/14	4 of 5

ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
	A	413008	00





When printed, make sure you are using the most current revision of this document.

DESIGNER: AXYS Technologies	QA: This drawing is controlled through Q-PULSE	TEMPLATE # (was QT04-05-00.dwg): QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

MATERIAL: SEE BOM

FINISH: DEBURR ALL EDGES

ACAD FILE: ..\CONTROLLED DOCUMENTS\413008\41300800A.pdf

Wind Sentinel, System,

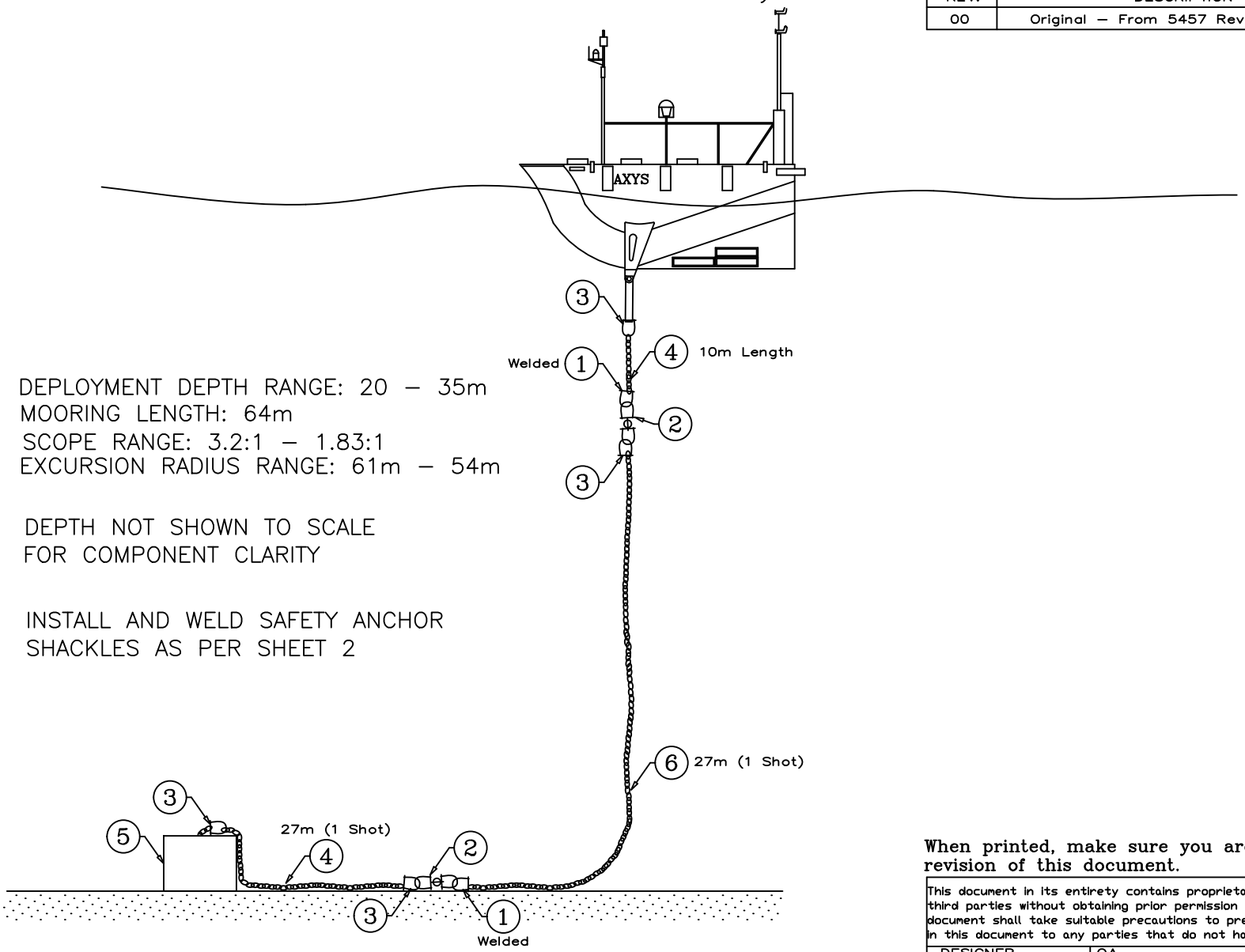
Dominion

SCALE	DRAWN BY	DATE	SHEET
1:50	AJM	28/08/14	5 of 5

ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
	A	413008	00

REVISIONS			
REV.	DESCRIPTION	DATE D/M/Y	BY
00	Original – From 5457 Rev 04 Sheet 1	12/09/14	AJM

6m NOMAD Buoy



DEPLOYMENT DEPTH RANGE: 20 – 35m
MOORING LENGTH: 64m
SCOPE RANGE: 3.2:1 – 1.83:1
EXCURSION RADIUS RANGE: 61m – 54m

DEPTH NOT SHOWN TO SCALE
FOR COMPONENT CLARITY

INSTALL AND WELD SAFETY ANCHOR
SHACKLES AS PER SHEET 2

ITEM	PART No.	PART NAME	QTY
6	51708016	Material, Chain, 1–1/2", Stud Link Chain, Grade 2, Black	27m
5	7031	MET, Mooring, 4 Ton (Wet Weight), Concrete	1
4	51708003	Material, Chain, 1–1/2", Open Line Chain, Grade 2, Black/Galvanized	37m
3	51308052	Hardware, Shackle, USCG Spec, 1–1/2", Split Key Shackle, 3rd Class	4
2	51308026	Hardware, Shackle, Crosby, 1–1/2", Eye & Eye Swivel, Welded Nut	2
1	51308017	Hardware, Shackle, Crosby, 1–1/2", SCS, G2150	2

PARTS LIST

When printed, make sure you are using the most current revision of this document.

DESIGNER	QA	TEMPLATE # (was QT04-05-00.dwg)
AXYS	This drawing is controlled through Q-PULSE	QT730-03-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X ±0.1 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X.X ±0.1 X.XX ±0.05

MATERIAL: As Specified
FINISH: –
ACAD FILE ..\CONTROLLED DOCUMENTS\007235/0723500S.dwg

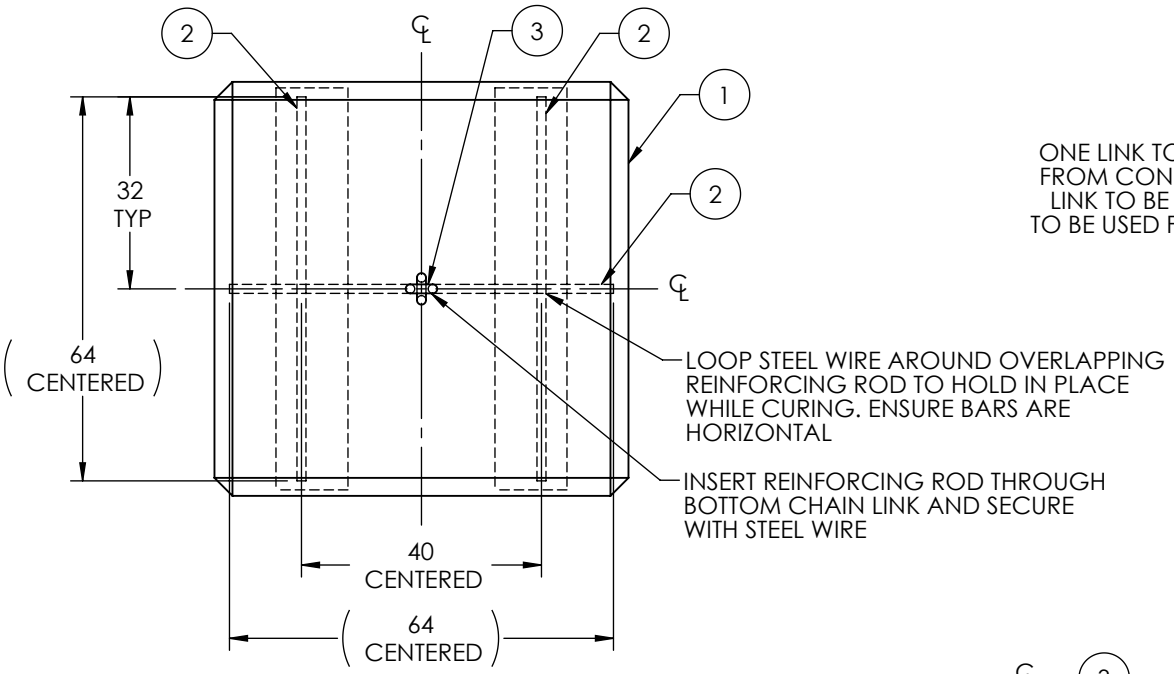
AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

Wind Sentinel, Mooring, Dominion/Virginia,
20–35m Depth w/ Anchor

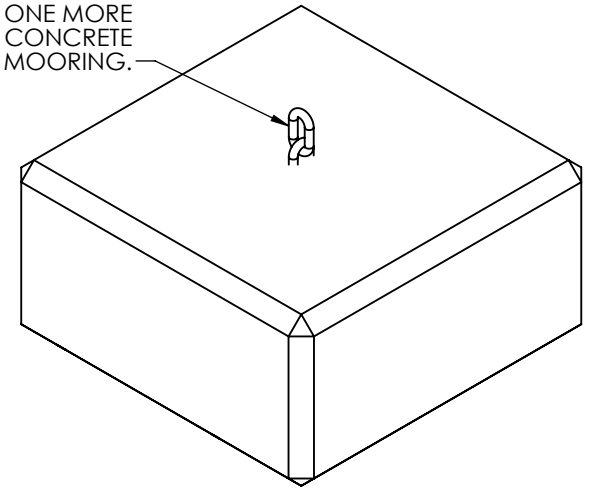
SCALE	DRAWN BY	DATE
NTS	AJM	12/09/14

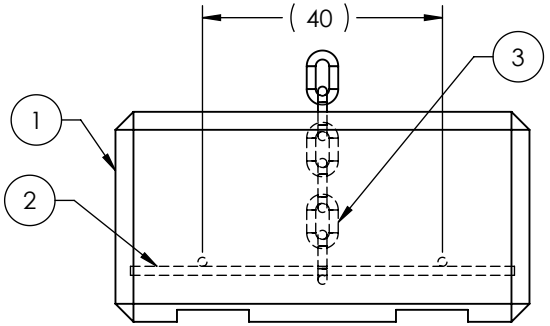
SHEET	SIZE	DRAWING NUMBER	REV
1 of 2	A	07235	00

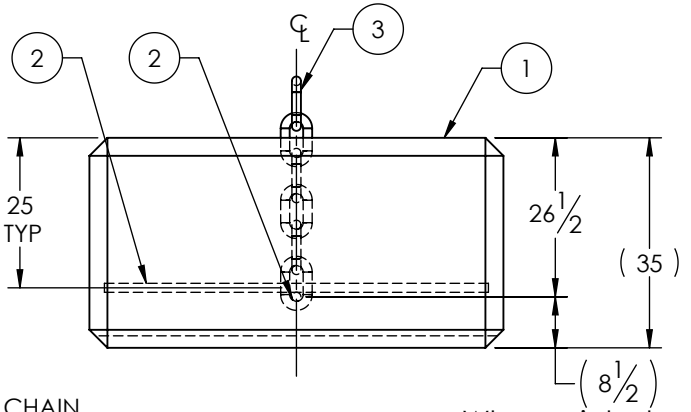
REVISIONS			
REV.	DESCRIPTION	DATE D/M/Y	BY
00	Original	28/03/14	AJM



ONE LINK TO BE HALF PROTRUDING FROM CONCRETE AND ONE MORE LINK TO BE FREE FROM CONCRETE TO BE USED FOR LIFTING MOORING.







NOTES:
1. NO STEEL TO PROTRUDE FROM CONCRETE, EXCEPT FOR CHAIN.
2. ALLOW CONCRETE APPROX. 15 DAYS TO CURE BEFORE ATTEMPTING TO USE OR LIFT EMBEDDED CHAIN.
3. CONCRETE TO BE VIBRATED TO REMOVE AIR.
4. RECOMMENDED CONCRETE MIX SHOULD CONTAIN 400kg OF CEMENT PER CUBIC METER OF CONCRETE.
5. CONCRETE MUST BE RATED FOR MARINE USE.

ANCHOR WEIGHT:
- IN AIR: 6,120 kg, 13,500 lb, 6-3/4 ton
- IN FRESH WATER (998 kg/cubic m): 3,500 kg, 7,700 lb, 3.9 ton
- IN SEA WATER (1,025 kg/cubic m): 3,425 kg, 7,550 lb, 3.8 ton

ITEM NO.	Description	Material	QTY
1	Vibrated Concrete [Air Removed]	Concrete	1
2	Reinforcing Rod	Steel Rebar 1 1/2" Round	3
3	1-1/2" Open Link Buoy Chain, 65,500 lb Proof or Greater	1-1/2" Open Link Mooring Chain	1

PARTS LIST

When printed, make sure you are using the most current revision of this document.

DESIGNER	QA	TEMPLATE #
AJM	This drawing is controlled through Q-PULSE	was QT04-05-00.dwg QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

MATERIAL: SEE BOM

FINISH: DEBURR ALL EDGES

ACAD FILE ..\CONTROLLED DOCUMENTS\07031\0703100S.pdf

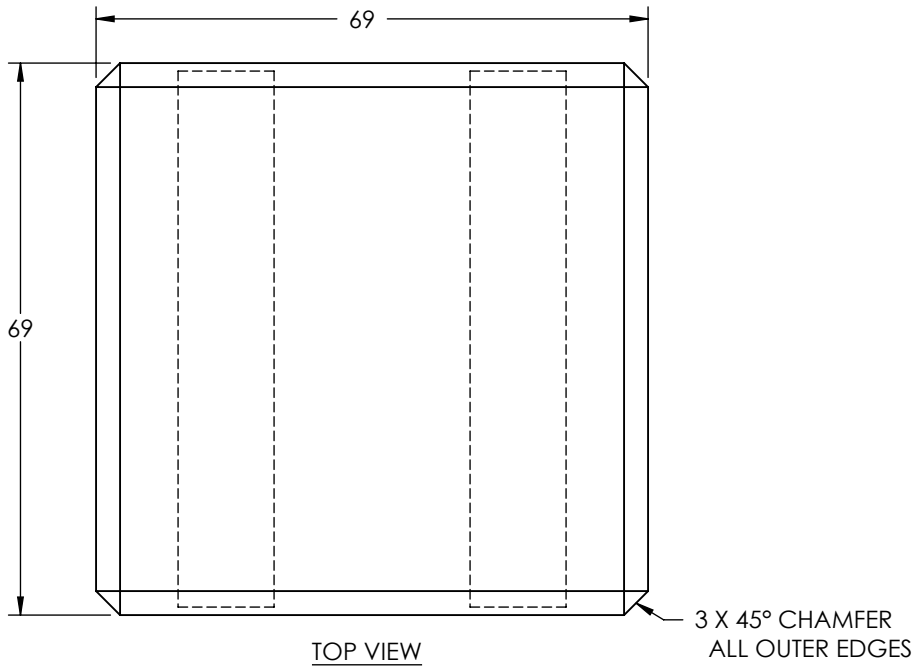
AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

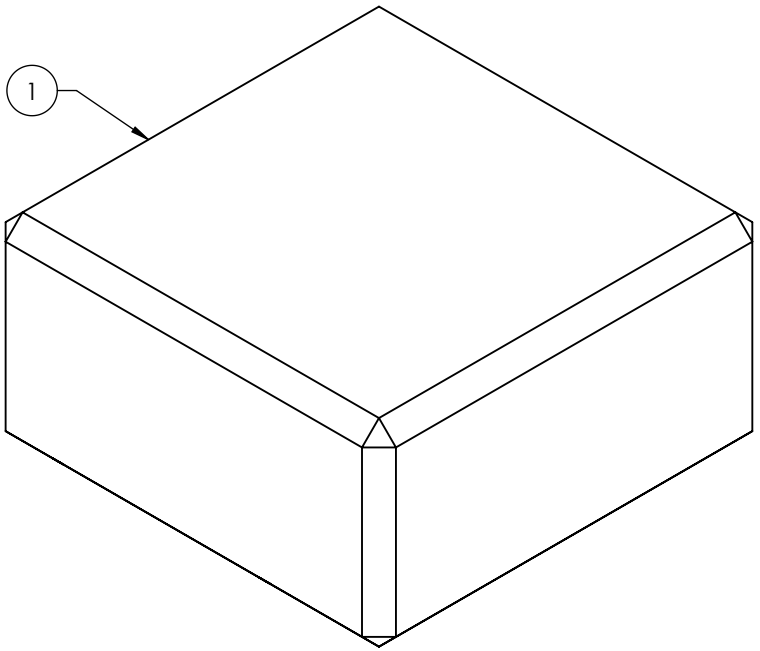
MET, Mooring, Anchor,

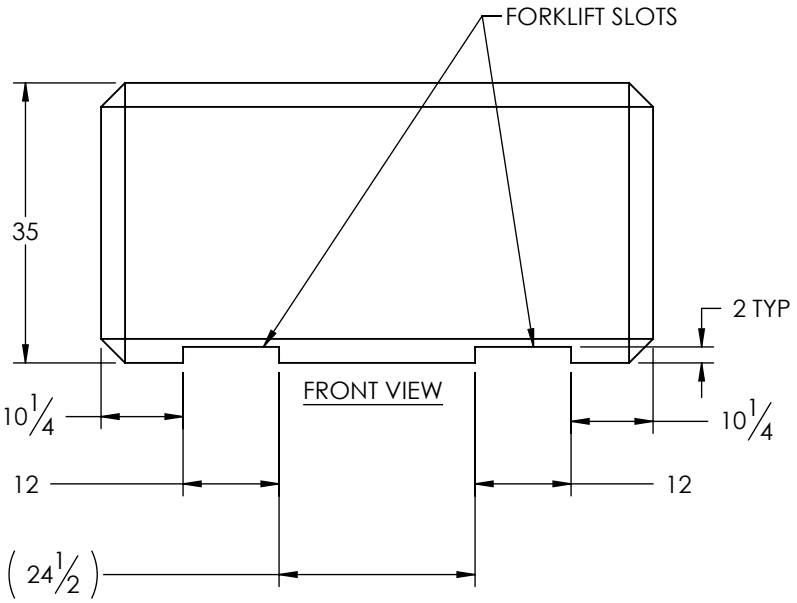
4 Ton (Wet Weight), Concrete

SCALE	DRAWN BY	DATE	SHEET
1:32	AJM	28/03/14	1 of 3

ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
	A	07031	00







When printed, make sure you are using the most current revision of this document.

DESIGNER	QA	TEMPLATE # (was QT04-05-00.dwg)
AJM	This drawing is controlled through Q-PULSE	QTS2-04-00.dwg

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

MET, Mooring, Anchor,

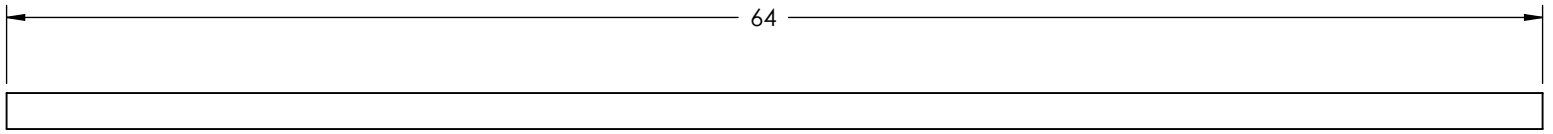
4 Ton (Wet Weight), Concrete

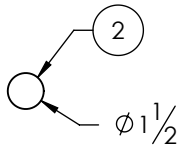
MATERIAL	SCALE	DRAWN BY	DATE	SHEET
SEE BOM	1:32	AJM	28/03/14	2 of 3

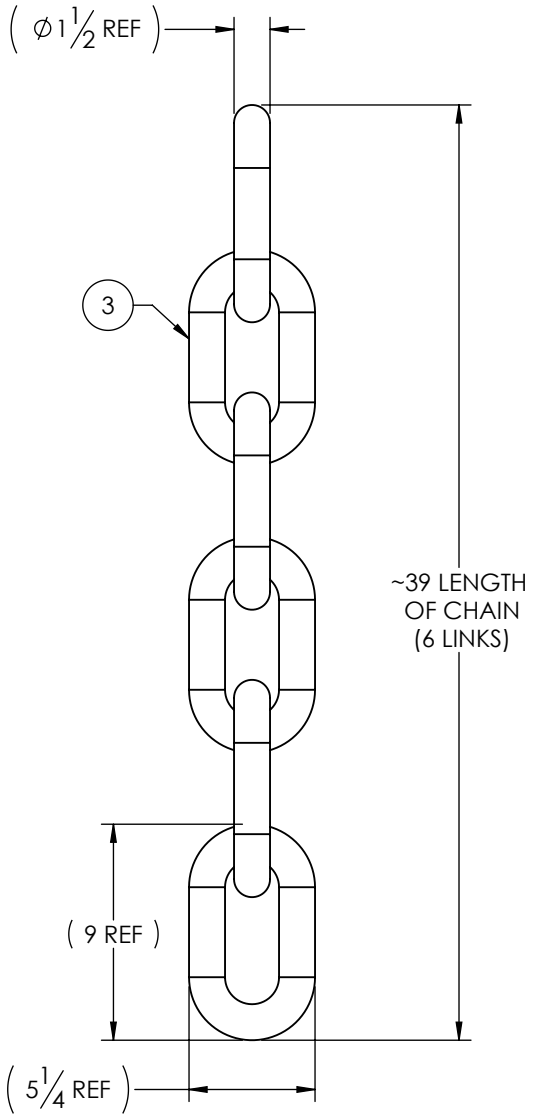
FINISH	ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
DEBURR ALL EDGES		A	07031	00

ACAD FILE ..\CONTROLLED DOCUMENTS\07031\0703100S.pdf

PARTS LIST







When printed, make sure you are using the most current revision of this document.

DESIGNER	QA	TEMPLATE # (was QT04-05-00.dwg)
AJM	This drawing is controlled through Q-PULSE	QTS2-04-00.dwg

DIMENSIONS IN INCHES
UNLESS OTHERWISE SPECIFIED.
LINEAR TOLERANCES ARE:
X OR X/X ±0.06 X.X ±0.03
X.XX ±0.01 X.XXX ±0.003
ANGULAR TOLERANCES ARE:
X ±1 X.X ±0.1

AXYS TECHNOLOGIES INC.
P.O.BOX 2219, 2045 MILLS RD.
SIDNEY, B.C., CANADA V8L 3S8
(250)655-5850 Fax:(250)655-5856

MET, Mooring, Anchor,

4 Ton (Wet Weight), Concrete

MATERIAL	SCALE	DRAWN BY	DATE	SHEET
SEE BOM	1:8	AJM	28/03/14	3 of 3

FINISH	ASSEMBLY DWG	SIZE	DRAWING NUMBER	REV
DEBURR ALL EDGES		A	07031	00

ACAD FILE ..\CONTROLLED DOCUMENTS\
07031\0703100S.pdf

PARTS LIST