



TRANSNET SOC LTD

**DCT BERTHS 203 TO 205 - RECONSTRUCTION, DEEPENING AND
LENGTHENING**

PORT OF DURBAN

SPECIFICATION – WEATHER STATION FOR WEATHER DATA RECORDING

1785-CO-000-C-SPC-0013 Rev T-00

26 JULY 2019



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1.0 SCOPE

1.1 Project

This specification is a project specific technical specification for the DCT Berths 203 to 205 Reconstruction, Deepening and Lengthening Project in the Port of Durban.

1.2 Scope

The scope of this specification covers the *Employer's* requirements for the provision, maintenance and operation of a weather station for Environmental Monitoring during the entire contract period as well as for the recording and presentation of the data recorded.

The specification details requirements of Materials, Equipment and Procedures to be adopted by the *Contractor* to supply and maintain a fully automatic remote mounted weather station.

2.0 NORMATIVE REFERENCES

2.1 Reference Documents

The following *Employer* and industry standardised specifications are referenced in this specification and form part of the Works Information. Standard specifications referenced within the specifications listed below also form part of the Works Information.

The *works* shall be carried out as specified in the following documents:

- a) This Specification
- b) Industry Codes, Standards and Specifications as listed in Section 2.2
- c) *Employer's* Project Specific Technical Specifications as listed in Section 2.3
- d) Method statement prepared by the *Contractor*, as described in Section 4.1

2.2 Standard Specifications

The *Contractor* shall provide and maintain current copies of all the standard specifications referred to herein below on the site for reference by both parties.

The provision, maintenance and operation of a weather station for Environmental Monitoring shall comply with the following standard specification:

- a) DNV RP C205 – Environmental Conditions and Environmental Loads, April 2014

2.3 *Employer's* Project Specific Specifications and Standards

The provision, maintenance and operation of a weather station for Environmental Monitoring shall comply with the following Project Specific Specifications and Standards.

- a) Project Environmental Specifications (PES) as contained in the Works Information and annexures

3.0 DEFINITIONS

All definitions of responsibilities shall be in accordance with the NEC Engineering and Construction Contract (ECC) for the construction of the Works.

Where the standard specifications referenced in this specification refer the “Engineer”, replace this term with the term “Supervisor”.

For the purpose of this specification, the following definitions shall apply:

3.1 Chart Datum Port

Chart Datum Port refers to the reference level used in the Port of Durban, which is 0,900 m below Mean Sea Level. All levels referred to in this document are relative to Chart Datum Port (CDP).

3.2 Co-ordinate System

The co-ordinate system to be used for all setting out and survey shall be World Geodetic System 1984 (WGS84), L031, referred to as WG31.

3.3 Tidal Levels

The Astronomical Tide Predictions as defined by the SA Navy Hydrographer and Chart SAN 2006 are as follows:

Table 3.1 – Tide Data

Tide	Abbreviation	Level m, Chart Datum Port
Highest Astronomical Tide	HAT	2.287
Mean High Water Springs	MHWS	1.997
Mean Level	ML	1.097
Mean Low Water Springs	MLWS	0.197
Lowest Astronomical Tide	LAT	-0.013

3.4 Method Statements

Method statements shall be compiled by the *Contractor* for all activities. The method statements shall be submitted to the *Supervisor* for acceptance three weeks in advance of the particular activity being undertaken. Full details of all proposed Equipment (including temporary works) and methods shall be provided for acceptance by the *Supervisor*.

No activity shall commence until the method statement has been accepted by the *Supervisor*.

Further details of the requirements of particular method statements are provided in Section 4.

4.0 REQUIREMENTS

4.1 Method Statement

The *Contractor* shall prepare method statements that shall include, *inter alia*:

- a) Provision of a fully automatic remote mounted weather station, with GSM wireless modem and dedicated computer and software.
- b) Provision of complete and operable packages in full accordance with all the applicable Industry Codes and Standards, Government Regulations and Contractor Technical Requirements.
- c) Installation, calibration and maintenance of the systems during the construction of the facilities.
- d) Preparation and submission of complete Operating and Maintenance Manuals.
- e) Proof of training of operator's personnel.
- f) Provision of daily seven day forecasts of weather conditions, in particular those that may affect the contract works.
- g) Provision of weekly summary reports to the *Supervisor* of forecasts and the acquired data.
- h) Removal of all equipment after completion of the Project.

4.2 Location

A mast mounted system is required and to maintain continuity it is proposed that it should be located on the roof of the existing ablution block on Berth 202 which is not to be demolished.

4.3 Equipment

The external data acquisition equipment shall be a proprietary system with the following or equal approved characteristics:

- a) Fully weather proof for field mounting with weatherproof IP 65 enclosure.
- b) Built in data logger.
- c) Mains power with battery backup or solar power recharging.
- d) Fitted with RS232 data link for set-up and local download of data.
- e) Fitted with GSM modem communications (transmitter with receiver at the Contractor's offices) with Type Approval Certificate issued by the Independent Communication Authority of South Africa (ICASA).
- f) The sensors shall be mounted on a meteorological mast with base for bolting down.
- g) The meteorological mast shall be corrosion protected to applicable specifications.
- h) The height of the meteorological mast shall be of such that the height of other equipment will not influence any parameter measured or recorded.
- i) Interface electronics shall be housed in an IP68 panel.
- j) A suitable lightning conductor shall be installed which is separate from and higher than the sensor mast.
- k) Interface electronics shall be provided to process the various outputs from the sensors, convert them to engineering units and transmit the data via serial data protocol to the Display Unit.
- l) The software/operating system for this shall be supplied with weather station.
- m) Instrumentation to collect and record the following data in real time. Alternative solid state devices with equal or better performance may be offered by the Contractor.
 - i) Ambient Temperature - Precision thermistor air temperature sensor, with louvered solar radiation shield. Range -20 to +60°C, Error $\pm 0.1^\circ\text{C}$ Cover the whole range. (Alternatively a highly accurate NTC-resistor.)
 - ii) Relative Humidity - Combined Relative humidity with replaceable sensing element (chip) module and Air Temperature sensor in a louvered solar radiation shielded housing. Range 0-100% RH, Error $\pm 2\%$ RH. (Alternatively capacitive humidity sensor.)

- iii) Atmospheric pressure - Barometric pressure sensor for use at low altitude (0-1,500 m), in IP65 weatherproof housing. Range 600 - 1060 hPa (mbar) Error at 20°C ± 0.5 hPa, resolution ± 0.6 hPa. (Alternatively capacitive silicon temperature corrected strain gauge device.)
- iv) Wind direction - Wind vane, based on 358° micro-torque potentiometer. Range 0 to 358°. Resolution and error $0.3^\circ \pm 2^\circ$ in winds > 5 m/s. (Alternatively combined wind direction and speed sensor as below).
- v) Wind speed - Anemometer - high resolution, 3-cup rotor Digital photodiode pulse and Analogue outputs. Range 0.15 – 75 m/s. Error $1\% \pm 0.01$ m/s. (Alternatively an acoustic system with four ultrasound sensors to take cyclical measurements in all directions and calculate the resulting wind speed and direction from the measured run-time sound differential.)
- vi) Rainfall - Tipping bucket rain gauge. Maximum rate of rainfall – 500 mm in 1 hour. Sensitivity 2 mm/tip. (Alternatively precipitation sensor using 24 GHz Doppler radar to measures drop speed and calculate precipitation quantity and type by correlating drop size and speed.)
- vii) Solar radiation - Si photodiode for solar energy measurement. Measuring range 0 to 2 kW/ m². Error $\pm 3\%$ under standard lamp. Spectral response 400-1050 nm. Operating temperature range -10 to +60°C.

4.4 Baseline Data

Data shall be collected by the *Contractor*, either through its own equipment or from other reliable and certified sources, covering as long a period prior to commencement of the contract *works* for comparison with the Contract *works* weather information, but at least monthly records over a period of 6 months.

4.5 Data to be collected

Data shall be collected in real time and collated and presented weekly throughout the duration of the contract *works*.

Wind recording and analysis shall be carried out as follows:

- a) The hourly average, the one minute mean and the maximum 3 second gust velocity in that hour shall be recorded at hourly intervals at 10 m above mean sea level (MSL).
- b) Wind occurrence and exceedance tables shall be produced per month, per season and for full period for 16 direction sectors.

These parameters shall be transferred in real-time to a computer display. All recorded data shall be stored in digital format and backed-up on a monthly basis.

5.0 REPORTING AND DISTRIBUTION

The system shall be capable of providing data recorded with the specified sensors to a central location and provide output in real time. All recorded data shall be stored on suitable digital storage media (to be approved by the *Employer*) and backed-up on a monthly basis.

Data shall be presented to the *Supervisor* weekly in Excel and graphical or similar format with monthly and above data presented on CD.

Trend analyses shall be provided monthly, quarterly, six monthly and annually.

Daily seven day weather forecasts shall be issued to the *Supervisor*.

Early warnings shall be provided to the *Supervisor* of any weather conditions which the *Contractor* deems to be not in accordance with the baseline data or the Contract *works* data provided.

6.0 INSPECTION AND CALIBRATION

6.1 Inspection

All equipment specifications and supporting documentation shall be supplied for approval to the *Employer* prior to ordering and deploying the equipment.

The *Contractor* shall include a detailed description of the full monitoring system, installation procedures and operating systems with the specifications.

6.2 Calibration

Calibration certificates shall be supplied with all equipment. After installation, a full installation and calibration report shall be provided by the *Contractor*.

Routine calibration shall be carried out on 3 monthly intervals and calibration reports supplied to the *Employer*. If the real time data shows that any part of the equipment is malfunctioning, the *Contractor* shall arrange to investigate, replace and recalibrate the malfunctioning equipment at his own cost.

6.3 Tolerances

The *Contractor* shall ensure that cumulative tolerances meet with tolerance requirements as defined within this specification.