

**APPENDIX 10.1**  
**NOISE MONITOR IN-SITU**

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## APPENDIX 10.2

### WIND SPEED CALCULATIONS FOR HUB HEIGHT

A GOOD PRACTICE GUIDE TO THE APPLICATION OF ETSU-R-97 FOR THE  
ASSESSMENT AND RATING OF WIND TURBINE NOISE


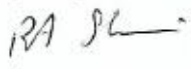
Institute of  
Acoustics

#### 4.5 Wind Shear Corrections

- 4.5.1 Basing the predictions on sound power data tested in accordance with the IEC 61400-11 standard (or equivalent) should mean that the wind reference used corresponds to hub height wind speeds, standardised to 10 m height using a fixed correction (see **Annex A**). These predictions can then be compared to background levels and/or associated noise limits derived using an equivalent wind speed reference, which will have wind shear taken into account directly.
- 4.5.2 When this is not the case, for example when considering background data measured against direct wind speed measurements at 10 m height, it is necessary to apply corrections to account for this. Any such corrections should be clearly outlined and detailed in any noise assessment so that they can be reviewed by any assessor. The assessment should be made using the most detailed information available.
- 4.5.3 Examples of methods which can be used to correct predictions to account for wind shear effects, when only using a 10 m mast, are included in **Supplementary Guidance Note 4** (wind shear). This note presents methods to calculate corrections on the basis of long-term data measured at different heights, but as such data may not be available for a specific site, typical shear values are also presented. Alternatively, similarly derived corrections representing typical (average) shear values can be applied to the wind speed reference used for the derived typical background noise levels.
- 4.5.4 The following simplified method is proposed for ease of use: applying a fixed correction by subtracting the following factors from the wind speed reference used in the turbine predictions: 1 m/s for turbine hub heights of up to 30 m, 2 m/s for hub heights of up to 60 m and 3 m/s for hub heights of more than 60 m. Such a generic approach would be suitable in the context of a study made using a 10 m mast to limit costs, in the absence of site-specific data.
- 4.5.5 If it can be demonstrated that the predicted levels are below the applicable lower fixed limits regardless of wind speed, it can be seen that wind shear would not have an effect on the assessment and this may form the basis of a suitable planning condition.

**APPENDIX 10.3  
CALIBRATION CERTIFICATES OF NOISE INSTRUMENT**

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	<p align="center"><b>MTS Calibration Ltd,</b> The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England Telephone: 01642 876 410</p>																																																																				
<p><b>CERTIFICATE OF CALIBRATION</b></p>																																																																					
<p>Page 1 of 11 pages</p>																																																																					
<p>Issued by: <b>MTS Calibration Ltd</b></p>																																																																					
<p>Approved Signatory:  Tony Sherris</p>																																																																					
<p>Date of Issue: 13 July 2021      Certificate Number: 36055</p>																																																																					
<p><b>Sound Level Meter</b></p>																																																																					
<p><b>Sound Level Meter Periodic Tests to EN 61672-3: 2013 Class 1</b></p>																																																																					
<p><b>Client:</b> Environmental Measurements Unit 12, Tallaght Business Centre Whitestown Business Park Co.Dublin 24, Ireland</p>	<p><b>Instrument Make:</b> Larson Davis <b>Instrument Model:</b> LXT1L <b>Serial Number:</b> 0005896</p>																																																																				
<p><b>Associated Equipment</b></p>	<p><b>Make</b>      <b>Model</b>      <b>Serial number</b></p>																																																																				
Pre-amplifier	Larson Davis      PRMLxT1L      069930																																																																				
Microphone	PCB      377B02      305497																																																																				
Calibrator	Brüel & Kjaer      4231      2343068																																																																				
Calibrator supplied by	MTS for this calibration																																																																				
<p><b>Test results summary, detailed results are shown on subsequent pages.</b></p>																																																																					
<p>Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 Class 1</p>																																																																					
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<p>The instrument was within the above specification as received - no modifications were made</p>																																																																					
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<p>This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.</p>																																																																					

### APPENDIX 10.4 CANDIDATE TURBINE MANUFACTURER'S NOISE EMISSION DATA

Frequency	Hub height wind speeds [m/s]																	
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s	16 m/s	17 m/s	18 m/s	19 m/s	20 m/s
6.3 Hz	17.2	16.1	14.6	17.7	21.3	24.7	25.4	25.8	26.3	27.2	28.2	28.7	29.0	29.0	28.9	28.7	28.4	28.4
8 Hz	23.3	22.6	21.6	24.7	28.4	31.7	32.4	32.8	33.2	33.9	34.6	34.9	35.0	34.9	34.7	34.5	34.1	33.8
10 Hz	28.7	28.4	27.9	31.0	34.6	37.9	38.7	39.0	39.3	39.8	40.3	40.5	40.4	40.2	39.9	39.6	39.1	38.8
12.5 Hz	33.8	33.9	33.8	36.9	40.5	43.8	44.7	44.9	45.1	45.5	45.7	45.7	45.5	45.2	44.8	44.5	44.0	43.6
16 Hz	39.2	39.7	40.0	43.0	46.6	49.9	50.9	51.0	51.1	51.3	51.4	51.2	50.8	50.5	50.0	49.6	49.1	48.6
20 Hz	43.8	44.5	45.2	48.2	51.8	55.1	56.1	56.2	56.2	56.3	56.2	55.9	55.4	55.0	54.5	54.0	53.4	53.0
25 Hz	48.1	49.1	50.1	53.1	56.7	59.9	61.0	61.0	61.0	61.0	60.7	60.3	59.7	59.3	58.7	58.2	57.6	57.1
31.5 Hz	52.4	53.5	54.8	57.8	61.4	64.6	65.7	65.7	65.7	65.5	65.0	64.6	63.9	63.4	62.8	62.3	61.6	61.1
40 Hz	56.4	57.8	59.3	62.3	65.8	69.1	70.2	70.2	70.1	69.8	69.2	68.7	68.0	67.4	66.8	66.2	65.5	65.0
50 Hz	59.9	61.5	63.1	66.1	69.7	72.9	74.1	74.0	73.9	73.5	72.9	72.2	71.5	70.9	70.2	69.7	69.0	68.4
63 Hz	63.3	64.9	66.7	69.8	73.3	76.5	77.8	77.6	77.5	77.1	76.3	75.7	74.9	74.3	73.6	73.0	72.3	71.8
80 Hz	66.5	68.2	70.1	73.1	76.7	79.9	81.1	81.0	80.8	80.4	79.6	78.9	78.1	77.4	76.8	76.2	75.5	75.0
100 Hz	69.2	70.9	72.9	76.0	79.5	82.7	84.0	83.8	83.6	83.1	82.3	81.6	80.8	80.2	79.5	78.9	78.2	77.7
125 Hz	71.6	73.4	75.4	78.4	82.0	85.2	86.5	86.3	86.1	85.6	84.8	84.1	83.3	82.6	82.0	81.4	80.8	80.2
160 Hz	74.0	75.7	77.7	80.8	84.3	87.5	88.8	88.7	88.4	88.0	87.1	86.5	85.7	85.1	84.4	83.9	83.3	82.8
200 Hz	75.9	77.5	79.5	82.6	86.1	89.3	90.6	90.4	90.2	89.8	89.0	88.3	87.6	87.1	86.4	85.9	85.3	84.9
250 Hz	77.5	79.1	81.0	84.0	87.6	90.8	92.0	91.9	91.7	91.3	90.6	90.0	89.3	88.8	88.2	87.7	87.1	86.7
315 Hz	78.9	80.3	82.1	85.2	88.7	92.0	93.2	93.1	92.9	92.5	91.9	91.4	90.8	90.3	89.7	89.3	88.8	88.4
400 Hz	80.1	81.3	82.9	86.0	89.5	92.8	94.0	93.9	93.8	93.5	92.9	92.5	92.0	91.5	91.1	90.7	90.2	89.9
500 Hz	80.9	81.9	83.3	86.4	90.0	93.2	94.4	94.3	94.2	94.0	93.6	93.3	92.8	92.5	92.1	91.8	91.4	91.1
630 Hz	81.4	82.2	83.4	86.5	90.0	93.3	94.5	94.4	94.4	94.3	94.0	93.8	93.5	93.2	92.9	92.6	92.3	92.0
800 Hz	81.7	82.2	83.0	86.2	89.8	93.1	94.2	94.2	94.2	94.2	94.1	94.0	93.8	93.7	93.4	93.3	93.0	92.8
1 kHz	81.7	81.8	82.4	85.5	89.2	92.5	93.5	93.6	93.7	93.8	93.9	93.9	93.9	93.8	93.7	93.6	93.4	93.3
1.25 kHz	81.4	81.2	81.4	84.6	88.2	91.6	92.5	92.7	92.8	93.1	93.4	93.6	93.7	93.8	93.7	93.7	93.6	93.6
1.6 kHz	80.8	80.2	80.0	83.1	86.8	90.2	91.1	91.3	91.5	92.0	92.6	92.9	93.2	93.4	93.5	93.6	93.6	93.6
2 kHz	80.0	78.9	78.3	81.5	85.2	88.6	89.4	89.7	90.0	90.6	91.5	92.0	92.5	92.8	93.0	93.2	93.3	93.4
2.5 kHz	78.9	77.4	76.3	79.5	83.2	86.7	87.4	87.7	88.2	89.0	90.1	90.9	91.5	91.9	92.3	92.6	92.8	93.0
3.15 kHz	77.5	75.5	73.9	77.1	80.8	84.3	85.0	85.4	85.9	87.0	88.4	89.3	90.2	90.8	91.3	91.7	92.1	92.3
4 kHz	75.8	73.2	71.0	74.2	78.0	81.5	82.1	82.6	83.2	84.5	86.3	87.5	88.6	89.4	90.0	90.5	91.1	91.4
5 kHz	73.9	70.7	67.9	71.2	75.0	78.6	79.0	79.6	80.4	81.9	84.0	85.5	86.8	87.7	88.6	89.2	89.9	90.3
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10 kHz	66.3	61.2	56.4	59.7	63.6	67.3	67.4	68.4	69.6	71.9	75.2	77.5	79.7	81.2	82.6	83.6	84.7	85.5
A-wgt	91.7	91.9	92.8	95.9	99.5	102.8	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9	103.9

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