

## List of Rules and Regulations applicable for Offshore Wind Turbines

### Part1: Regulations forming a basis for the development of new standards and recommendations on structural safety.

- **Offshore Wind turbines Regulations**
  1. Germanischer Lloyd, Rules and Regulations, IV Non Marine Technology, Part 2 Regulations for the Certification of Offshore Wind Energy Conversion Systems, Edition 1999.
  2. Rekommandation for Teknisk Godkendelse af Vinmoller pa Havet, 2. Energistyresens, December 2001.
- **Offshore Structure Regulations**
  - a) **International Standards (ISO TC 67)**
    3. ISO 13819-1, Petroleum and natural gas industries -- Offshore structures -- Part 1: General requirements, 1995-12, 1st edition. To be replaced , ISO TC 67. (ISO 19900, Petroleum and natural gas industries — General requirements for offshore structures) (ISO 19900)
    4. ISO/CD 19901-1/-2/-3/-4 Petroleum and natural gas industries — Specific requirements for offshore structures — Part 1: Metocean design and operating conditions, — Part 2: Seismic design procedures and criteria, — Part 3: Topsides structure, , — Part 4: Geotechnical and foundation design considerations
    5. ISO 13819-2 Petroleum and Natural Gas Industries – Offshore Structures – Part 2: Fixed steel structures, 1995. To be replaced , ISO TC 67. ISO/CD 19902 - Petroleum and Natural Gas Industries — Fixed Steel Offshore Structures
    6. ISO 19903 (Draft), Offshore Structures – Fixed concrete structures.
- **Wind Turbine specific Regulations**
  7. IEC 61400-1, ed. 2, Wind Turbine Generator Systems, Part1 – Safety Requirements, Feb. 1999.
  8. IEC 61400-22, Wind Turbine Generator Systems, Wind Turbine Certification

### Part 2: Existing wind and offshore regulations having potential additional information regarding development of new standards and recommendations.

- **Offshore Regulations regarding Structural Safety**
  - a) **Industry**
    1. American Petroleum Institute, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design, API Recommended Practice 2A-WSD, 21<sup>st</sup> Edition 2000.
    2. American Petroleum Institute (API), Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms –Load and Resistance Factor Design, 1993, (suppl. 1997), RP 2A-LRFD
    3. American Petroleum Institute, Recommended Practice for Planning, Designing and Constructing Structures and Pipelines for Arctic conditions, API Recommended Practice 2N, 2nd Edition 1995.
    4. Norwegian Technology Center (NTC), NORSOK Standard N-001, Structural Design, Rev. 3, Aug. 2000.
  - b) **Governemental, National**
    5. Department of Energy, (now Health and Safety Executive) 1990: Offshore installations: guidance on design, construction and certification (fourth edition) HMSO 1990 ISBN 011 4129614, replaced.
  - c) **Classification societies**

6. Det Norske Veritas, Rules for classification of fixed offshore installations 1998.
7. Germanischer Lloyd, Rules for Classification and Construction, III Offshore Technology, 2 Offshore Installations, Edition 1999.
- **Offshore Mobile Platforms**
  8. Det Norske Veritas, Rules for classification of mobile offshore installations.
  9. Germanischer Lloyd, Rules for Classification and Construction, III Offshore Technology, 2 Offshore Installations, Guidelines for the Construction/Certification of Floating Production, Storage and Off-Loading Units, Edition 1999.
  10. IMO, MODU-Code, Code for the construction and equipment of mobile offshore drilling units, 1989.
  11. ISO 19904 (Draft), Offshore Structures – Floating systems.
- **Wind Turbine specific Regulations**
  12. Deutsches Institut für Bautechnik (DIBt), Richtlinie für Windkraftanlagen, Einwirkungen und Standsicherheitsnachweise für Turm und Gründung, Juni 1993.
  13. DS 472, Loads and Safety of Wind Turbine Construction, 1<sup>st</sup> edition May 1992.
  14. Germanischer Lloyd, Rules and Regulations, IV Non Marine Technology, Part 1 Regulations for the Certification of Wind Energy Conversion Systems, Edition 1999.
  15. IEC 61400-12; Wind Turbine Generator Systems, Part 12 – Wind Turbine Power Performance Testing, 1<sup>st</sup> edition 1998-02.
  16. IEC 61400-13, Wind Turbine Generator Systems, Part 13 – Measurement of Mechanical Loads.
  17. NVN 11400-0, Wind Turbines – Part 0: Criteria for Type-Certification – Technical Criteria, 1<sup>st</sup> edition April 1999.
- **Wind Loading**
  18. ISO 4354, Wind actions on structures, 1<sup>st</sup> edition 1997.

### **Part 3: Standards and regulations to be considered in design and construction of offshore wind turbines.**

- **Electrical Equipment**
  19. American Petroleum Institute, Recommended Practice for design and installation of electrical systems for Offshore.
  20. IEC 60092-xxx (2000-02) Electrical installations in ships
  21. IEC 60533 (1999-11) Electrical and electronic installations in ships - Electromagnetic compatibility
  22. IEC 60654-2 (1979-01) Operating conditions for industrial-process measurement and control equipment. Part 2: Power
  23. IEC 60654-4 (1987-07) Operating conditions for industrial-process measurement and control equipment. Part 4: Corrosive and erosive influences
  24. IEC 61363-1 (1998-02) Electrical installations of ships and mobile and fixed offshore units - Part 1: Procedures for calculating short-circuit currents in three-phase a.c
  25. IEC 61892-3 (1999-02) Mobile and fixed offshore units - Electrical installations - Part 3: Equipment
  26. IEC 61892-6 (1999-02) Mobile and fixed offshore units - Electrical installations - Part 6: Installation
- **Materials and Corrosion**
  27. DIN EN 12495, Cathodic protection for fixed steel offshore structures, 2000.
  28. DIN EN 10225, Weldable structural steels for fixed steel offshore structures, 1994.
  29. Det Norske Veritas, R.P. B401, Cathodic Protection Design, 1993
  30. Germanischer Lloyd, Rules and Regulations, II Materials and Welding, Part 1, Metallic Materials, Edition 1998.

31. Germanischer Lloyd, Rules and Regulations, II Materials and Welding, Part 1, Non-metallic Materials, Edition 2000.

- **Special Topics**

32. IMO, Safety of Life at Sea Convention (SOLAS)

33. Marine pollution , MARPOL

34. International Association of Sea-Mark Administrators (AISM/IALA)

Recommendations for the marking of offshore structures, Nov. 1984 /suppl. 1987).

**Part 4: Additional regulations, standards and other sources of information.**

- **Helicopter Platforms**

1. Cap 437, Offshore Helicopter Landing Areas.

2. American Petroleum Institute, Recommended Practice for Planning, Designing and Constructing Heliports for Fixed Offshore Platforms, API Recommended Practice 2L, 4<sup>th</sup> Edition 1996.

- **Offshore Cranes**

3. American Petroleum Institute, Specification for Offshore Cranes, API Spec 2C, 5<sup>th</sup> Edition 1995.

4. DIN EN 13852, Cranes – Offshore Cranes – Part 1: General purpose offshore cranes, 2000

- **External conditions**

- a) **Offshore Installations: Guidance Notes**

5. Department of Energy, 1990 Metocean parameters - wave parameters. Supporting document to 'Offshore installations: guidance on design, construction and certification - environmental considerations'. Department of Energy, 1990, Offshore Technology Report OTH 89 300. 116pp. HMSO

6. Department of Energy, 1990 Metocean parameters - parameters other than waves. Supporting document to 'Offshore installations: guidance on design, construction and certification - environmental considerations'. Department of Energy, Offshore Technology Report OTH 89 299. 151pp. HMSO

- b) **Tides and Currents, Atlases and Charts**

7. Howarth, M.J. 1990, Atlas of tidal elevations and currents around the British Isles. Department of Energy, Offshore Technology Report, OTH 89 293, 16pp., appendix and charts, HMSO, ISBN 011 41 307 44

8. Global Sea Level Cotidal Charts, Schwiderski, E.W. Atlas of Tidal Charts and Maps Global Ocean Tides - part 2 Global Sea Level Cotidal Charts

9. Atlas of the Seas Around the British Isles, Ministry of Agriculture Fisheries and Food, 1981, ISBN 0 907545 00 9

10. Atlas der Gezeitenströme für die Nordsee, den Kanal und die britischen Gewässer, Bundesamt für Seefahrt und Hydrographie 2345, 1963

11. Atlas der Gezeitenströme in der Deutschen Bucht, Bundesamt für Seefahrt und Hydrographie 2346, 1983

- c) **Temperature, Temperature and Salinity**

12. 'Mean Monthly Temperature and Salinity of the Surface Layer of the North Sea and Adjacent Waters from 1905-1954' 1962, ICES

13. North Sea temperatures (sea temperatures for each degree of latitude) Tomczak, G. & Goedecke, E. 1964

14. Die Thermische Schichtung der Nordsee auf Grund des mittleren Jahresganges der Temperatur in 1/2 deg und 1 deg Feldern, Deutsches Hydrographisches Institut, Hamburg, Ergänzungsheft Reihe International Young Fish Survey (IYFS)

15. Temperature and Salinity Charts for February 1970-1989 International Council for the Exploration of the Seas (ICES), Palaegade 2-4 DK - 1261 Copenhagen K Denmark.

**d) Sea levels**

16. Bottomley, M., Folland, C.K., Hsiung, J., Newell, R.E., and Parker, D.E. Global Ocean Surface Temperature Atlas (GOSTA) Joint UK Met Office/ US MIT publication

**e) Waves**

17. ANEP II-I, Allied Naval Engineering Publication: Standardized wave and wind environments for NATO operational areas, April 1983

18. Draper, L. 1991 Wave climate atlas of the British Isles. Offshore Technology Report OTH 89 303, 11pp. & plates. HMSO

19. Fortnum, B.C.H. 1982 Waves recorded off the Eddystone Lighthouse, Data for September 1978 to August 1981 at position 50,10N04,15W. Summary analysis and interpretation report. Institute of Oceanographic Sciences, Report No 132, 113pp.

20. Fortnum, B.C.H. & Tann, H. M. 1977 Waves at Seven Stones light vessel (50,04N, 06,04W). Institute of Oceanographic Sciences, Report No 39, 50pp.

21. Bacon, S. 1987 Waves recorded west of the Scilly Isles 1979-1986 Institute of Oceanographic Sciences, Deacon Laboratory, Report No 246, 64pp.

22. Bacon, S. & Carter, D.J.T. 1989 Waves recorded at Seven Stones Light Vessel 1962-86 Institute of Oceanographic Sciences, Deacon Laboratory, Report No 268, 94pp.

23. Tucker, M.J. 1991 Waves in ocean engineering: measurement, analysis, interpretation. New York: Ellis Horwood. 431pp.

24. Estimating Wave Climate Parameters for Engineering Applications Report prepared by DJT Carter, Pg Challenor, Ja Ewing, Eg Pitt, Ma Srokosz & Mj Tucker, Ios Wormley for DoE, OTH 86 228

25. Ian Young and Greg Holland, Atlas Of The Oceans: Wind And Wave Climate, Elsevier Science ISBN:008042434.

26. C.G. Korevaar, „Climatological data of the Netherlands lightvessels over the period 1949-1980“, scientific report WR 87-9, KNMI 1987.

27. C.G. Korevaar, „Climatological data for the North Sea based on observations by voluntary observing ships over the period 1961-1980“, scientific report WR 89-2, KNMI 1989.

28. Hasselmann K. et al, “Measurements of wind-wave growth and swell decay during the Joint North Sea Wave Project (JONSWAP)” Deutsche hydrographische Zeitschrift, Reihe A(12), Ergänzungsheft.

29. Hogben N., Lumb F.E., “Ocean Wave Statistics”, HMSO 1967.

**f) Wind**

30. Barthelemie, R.J. et al, Offshore Wind Speeds, Annales Geophysicae vol. 9, 1991.

31. Matthies et al, „Study of Offshore Wind Energy in the EC, Final Report Joule I (JOUR 0072), Verlag Natürliche Energie 1995.

32. Bitner-Gregersen, E.M., Hagen O., “Aspects of Joint Distribution for Metocean Phenomena at the Norwegian Continental Shelf“, Proceedings of ETCE/OMAE2000, ASME 2000.

33. Myrhaug D. Slaattelid O.H., „Wind Stress over Waves: Effects of Sea roughness and atmospheric Stability“, Proceedings of ETCE/OMAE2000, ASME 2000.

34. Borresen J.A., „Wind Atlas for the North Sea and the Norwegian Sea“, Norwegian University Press 1987.

35. Matthies et al, „Offshore Windkrafanlagen: Kombination der Lasten von Wind und Wellen“, TU Braunschweig 2000.

36. Myrhaug D. Slaattelid O.H., „Wind Stress over Waves: Effects of Sea roughness and atmospheric Stability“, Proceedings of ETCE/OMAE2000, ASME 2000.

**g) Ice.**

37. Timco G.W., et al, „The NRC Ice Load Catalogue“, Proceedings of 15<sup>th</sup> Int. Conference on Port and Ocean Engineering under Arctic Conditions, POAC'99, Vol I, pp 444-453, Helsinki Finland.