

# Offshore moorings

# An annotated bibliography

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#### INTRODUCTION

This list was originally intended as a list of relevant literature for the use by students in the Offshore Moorings Course (x3CT2). It has been compiled by combining three sources of materials:

- Literature found using the AUBID catalog of the Library of the Delft University of Technology,
- Selected items found via a literature search in the
- Compendex Plus computer data base,
- The personal library of the author.

In spite of its length, the list has been selected. 'Sales pitch' articles, commonly found in the more 'news-type' periodicals have been rather rigorously avoided.

Additionally, rapid development in the field of mooring design is going on continually. One of the most obvious development areas involves mooring line materials; developments in hydrodynamic interaction, anchor soil mechanics, or mooring system analysis methods are no less rapid however. A consequence of this is that literature soon becomes outdated. For this reason, choices have been made progressively more selectively as the items became older. In general, items published before 1980 are included only for a specific reason such as:

- This is the latest published information,
- This piece is a classic,
- A historical perspective is enriched by this.

An additional selection criteria when reviewing the Compendex-Plus search was the liklihood of availability of the reference cited. More proprietary technical reports have been avoided -- especially if a published article by the same authors seemed to cover the topic as well.

Items are listed by first author and then in ascending order of publication. While a certain consistency of presentation has been attempted, not all entries are equally complete or in exactly the same format; the primary objective of this report is to provide information than to achieve bibliographic excellence from a library science point of view.

Four common abbreviations are used in this list:

ASCE	American	Society	of	Civil Engi	neers	
ASME	American	Society	of	Mechanical	Engineers	
OMAE	Proceedi	ore of	the	Offebore	Mechanice	and

- OMAE Proceedings of the Offshore Mechanics and Arctic Engineerig Symposium
- OTC Preprints of the Offshore Technology Conference

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Andreadis, A. & Harvey, R.C. (1981): A Design Procedure for Embedded Anchors: Applied Ocean Research, 1981, vol. 3 no. 4.

- \* This paper gives a convenient evaluation procedure for upliftresisting anchors based upon the Brinch-Hansen soil parameters.
- \* Personal collection W.W. Massie.

Anonymous (undated; probably about 1960): (no title): N.V. Verenigde Touwfabriken.

- \* A book giving details -- with many photos -- of steel wire rope fabrication and testing. It also includes photos of the effect of improper cable handling, etc.
- \* Personal collection W.W. Massie.
- Anonymous (1966): Ropes Made From Man-Made Fibres: British Ropes Limited.
  - \* This report includes a lot of data about the properties and characteristics of cordages made from man-made fibres. Modern developments have forced it out of date, however.
  - \* Personal collection W.W. Massie.
- Anonymous (1979): Proceeding of a Conference on Mooring Large Ships Over 150 000 tons.
  - \* Available at the main library # 1635 1504

Anonymous (1982): Anchoring Systems: A Society of Underwater Technolgy Symposium.

- \* Personal notes made at the symposium have been included with the abstracts distributed at the meeting.
- \* Personal collection W.W. Massie.

Anonymous (1982): Proceeding of a Conference on Offshore Moorings

- \* A collection of papers giving the state of the art about 10 years ago.
  - \* Available as follows:
    - Main library # 1720 5233
    - Personal collection W.W. Massie.

Anonymous (1983): A Method for Predicting Drag Anchor Holding Capacity: U.S. Naval Civil Engineering Lab, report CR 83.036.

- \* This report provides a very simlified means of predicting the holding capacity of an anchor based on the shear strength of the soil.
- \* Personal collection W.W. Massie.

Anonymous (1983): Anchor Technical Data Sheets (various): U.S. Navy Civil Engineering Lab.

- \* Several anchor types are described along with typical test results. A number of such techical data sheets have been bound together, here.
- \* Personal collection W.W. Massie.

Anonymous (1986): (Untitled): Published by United Ropeworks The Netherlands.

- \* The book illustrates proper and improper ways to work with and utilize steel cable.
- \* Personal collection W.W. Massie.

2

Anonymous (1988): Single Point Mooring Equipment: Published by the Oil Companies International Marine Forum.

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- \* This booklet lists the reccommendations for the type and dimensions of chaffing chains and chain stoppers etc. to be placed on large tankers.
- \* Available at the main library # 2030 1121
- Ansari, K. A.; Khan, N. U. (1986): Effect of Cable Dynamics on the Station-Keeping Response of a Moored Offshore Vessel: 5th OMAE vol. 3. p 514-521. Also in: Journal of Energy Resources Technology, Transactions of the ASME vol. 108 no. 1 Mar p 52-58.
- Ayers, R. R.; Voormolen, R. (1985): Pipelay Vessel Mooring in Deep Water: 4th OMAE vol. 1. p 490-498.
- Bascom W.; Bascom M. (1970): Tension-Leg Bridge could span Strait of Gibralter: Undersea Technology vol. 11 no. 6 June p 22-24.
- Berteaux, H.O. (1976): Buoy Engineering.
  - \* An excellent complete but compact book aimed primarily at the design of single, flexible leg moorings as used for oceanographic instrumentation purposes.
  - \* Available at the main library # 1140 6279
- Bitting, Kenneth R. (1985): Dynamic Modeling of Nylon and Polyester Double Braid Line: Ocean Engineering and the Environment -Conference Record p 1344-1353.
- de Boer, C.T. & Olthof, J. (1979): Steel Wire Rope Properties: Thesis, Civil Engineering, Delft University of Technology. \* Personal collection W.W. Massie.
- Bosman, A.R.H. (1971): Single Point Mooring Design and Anchoring (Dutch language) : Thesis, Civil Engineering, Delft University of Technology.
  - \* A simple (by today's standards) analysis of a single buoy mooring and tanker as a two mass spring system. Dift forces are estimated using then-current technology. Pile anchors are dimensioned.
  - \* Personal collection W.W. Massie.
- Brady, S.; Bulter, A. Y.; Reed, D. C.; Vasser, F. G. III (1982): Electric Power Slip Ring Assembly for Marine Riser Systems: 14th OTC vol. 3 p 673-679.
- Bratteland, Eivind (1988): Proceedings of the NATO Advanced Study Institute on the Berthing and Mooring of Ships, Trondheim, Norway.
  - \* Most papers are related to berthing and mooring along a quay or similar rigid structure.

Brouwer, J.A.H. (1978); Natural & Synthetic Ropes Tests: Thesis, Civil Engineering, Delft University of Technology.

- \* Report of testing of manilla and synthetic ropes to determine their elastic characteristics.
- \* Personal collection W.W. Massie.

- Bruce, Peter (1990): The Bruce Anchor: Publications by Bruce Anchors Ltd.
  - \* Description of Bruce Anchors with a note on anchor chasing.

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- \* Personal collection W.W. Massie.
- Buckle, A. K. (1974): Anchoring and Mooring Equipment of Ships \* Available at the library of Mechanical Engineering and Marine Technology # WbMT 43A 160.
- Canada, R. H. Jr.; May, D. R. (1985): Mooring Developments and Design Philosophy at the National Data Buoy Center: Ocean Engineering and the Environment - Conference Record, p 1336-1343.

Chapman, Rob (1858): A Treatise on Ropemaking.

- \* This book has not been reviewed, but could be very revealing about the history of rope-making methods.
- \* Main Library # 0647 6056

Chhabra, N.K. (1973): Mooring Mechanics volume I.

- \* This is restricted to static analysis and to a large extent to single, flexible leg moorings such as are used in oceanography. The book does contain computer program listings in FORTRAN.
- \* Available at the main library # 1614 1410

Chhabra, N.K. (1976: Mooring Mechanics volume II.

- \* This book continues on to handle dynamic problems. It also includes FORTRAN coded programs.
- \* Available at the main library # 1600 2183.
- Collier, M. Lowell; Myers, Robert E.; Olive, John C. (1984): Deep Sea Mooring Design - Some History and New Techniques: Oceans '84 Conference & Exposition, p 679-684.
- Collipp, Borgman & Miller (1960): A Method For Analyzing Mooring-Line Catenaries.
  - \* This report give a description of a frequently used method in which static catenaries are put into dimensionless form using the water depth and the computations are reduced to a series of table look-ups.
  - \* Personal collection W.W. Massie.

Costello, George A. (1990): Theory of Wire Rope.

- \* A very good book, but a bit too specialized for many users.
- \* Main library # 2269 3308.

Degenkamp, G.; Dutta, A. (1989): Soil resistances to embedded anchor chain in firm clay: OMAE vol. I p 581-588.

- Dekker, A.K. (1989): Synthetic Ropes for Hoisting: Thesis, Civil Engineering, Delft University of Technology in cooperation with Matech.
  - \* Results of a study guided by Dr. L. Wiek of the fatigue behavior of synthetic cables suitable for running over sheaves for offshore hoisting.
  - \* Personal collection W.W. Massie.

- Demirbilek, Zeki (1990): Quasi-Static Modeling of Tension Leg Platform Mooring System: Conference Proceedings - Oceans '90 p304-308.
- Demirbilek, Zeki (1991): Hydrodynamics of Deepwater Tension Leg Platforms: ASCE Engineering Mechanics Specialty Conference on Mechanics Computing in 1990's and Beyond p 430-434.
- van der Doef, M. R. & van Dongen, A. J. G. (1986): Anchor Penetration Simulation: Thesis, Civil Engineering, Delft University of Technology in cooperation with KSEPL.
  - \* Report of the computer simulation of the process of anchor embedment in the sea bed. The computer model is used to test for a large number of sensitivities of anchor behavior. While accelerations are not included, the model does include the velocity dependent effect of soil dillatancy in combination with permeability.
  - \* Personal collection W.W. Massie.
- Dove, P.G.S. (1980): Methods in Anchor Handling: reprint from Offshore magazine, March 1980.
  - \* A short description of chaser systems.
  - \* Personal collection W.W. Massie.
- Drisko R.W. (1968): Cathodic Protection of Buoys, Floats, and Mooring Chain in Sea Water: Proceedings of 24th Conference of National Association of Corrosion Engineers, p. 107-110.
- Drisko R.W.: (1970): Cathodically Protecting Mooring Chains in Seawater: Materials Protection Performance vol. 9 no. 7 July p 20-22.
- Feldmann, K. (1988): Experiments on the Dynamic Behavior of Mooring Lines: Thesis, Civil Engineering, Delft University of Technology.
  - \* Report of testing to evaluate the influence of hydrodynamic interaction for shallow catenary moorings. Tests were carried out with a periodically moving chain in air, in still water and in waves. The hydrodynamic influence was found to be small.
  - \* Personal collection W.W. Massie.
- Fjeld, Svein; Wilhelmy, Viktor (1982): Assessment of Deep-Water Anchorings Based on their Dynamic Behavior: 14th OTC vol. 1 p 105-115.
- Flory, John F. (1982): New and Used Strength of Large Marine Hawsers: 14th OTC v 3 p 37-48.
- Flory, J. F.; Goksoy, M.; Hearle, J. W. S. (1988): Yarn-on-yarn Abrasion Testing of Rope Yarns Part I The Test Method: Journal of the Textile Institute vol. 79 no. 3 p 417-431.
- Flory, John; Parsey, Mike; Leech, Chris (1989): Method of Predicting Rope Life and Residual Strength: Proceedings of Oceans '89. Part 5: Diving Safety & Physiology; Ocean Engineering/ Technology, p 1436-1441.

- Foss, I.; Kvalstad, T.; Ridley, T. (1980) Sea Bed Anchorages for Floating Offshore Structures. FIP Commission on Sea
  - Structures, Working Group on Foundations.
  - \* Summary of the state of the art (in 1980) for conventional fluke anchors, embedment plate anchors, gravity anchors, piles and suction anchors.
  - \* Personal collection W.W. Massie.
- Fulkerson, E. F.; Clements, R. J. (1981): Review of Anchoring Requirements for Large Tankers - a Status Report: Proceedings of the Symposium on the Behaviour of Disabled Large Tankers, p 99-108.
- Fylling, I. J.; Ormberg, H. (1985): Extreme Loads in Anchor Systems for Longterm Operation: 4th OMAE vol. 1 p 432-441.
- Fylling, I.J. (1979): Anchor Line Forces: WEGMET Course Paper \* This paper includes the derivation of the static catenary anchor line equations including stretch.
  - \* Personal collection W.W. Massie
- Gault, John A.; Cox, William R. (1974): Method for Predicting Geometry and Load Distribution in an Anchor Chain from a Single Point Mooring Buoy to a Buried Anchorage: 6th OTC vol. 2 paper 2062, p 309-318.
- Goksoy, M.; Hearle, J. W. S. (1988): Yarn-on-yarn Abrasion Testing of Rope Yarns Part III The Influence of Aqueous Environments, Journal of the Textile Institute vol. 79 n 3 p 443-450.
- Goksoy, M.; Hearle, J. W. S. (1988): Yarn-on-yarn Abrasion Testing of Rope Yarns Part II. The Influence of Machine Variables: Journal of the Textile Institute vol. 79 no. 3 p 432-442.
- Grosenbaugh, M.A.; Yoeger, D.R.; Hover, F.S.; Triantafyllou, M.S. (1991): Drag Forces and Flow-Induced Vibrations of a Long Vertical Tow Cable -- Part II: Unsteady Towing Conditions: Journal of Offshore Mechanics and Arctic Engineering, ASME August 1991, pp 199 - 204.
  - \* Report of experiments to determine the actual configuration of a cable towing a remote vehicle at sea under unsteady conditions.
    \* Personal collection W. W. Massie.
- van den Haak, R. (1987): Modern Developments of Vrijhof Anchors:
  - Vrijhof Anchors report 37-87-1594.
  - \* A sales pitch for the more modern improvements to the anchors manufactured by Vrijhof.
  - \* Personal collection W.W. Massie
- van den Haak, R. (1990): Single-Leg Anchor Systems for Deep Water Moorings: Vrijhof Anchors report.
  - \* A description of a system to use a single chain anchor leg between the surface and a tensioning point near the sea bed. The tensioning point is held more or less in place by a spread mooring of drag embedment anchors.
  - \* Personal collection W.W. Massie.

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Halliwell, A.R. (1977): Single Point Moorings: Feasability of Computer-Based Design Systems.

- \* This book has not been reviewed; because of its age and topic, it is undoubtedly now somewaht out of date.
- \* Main library # 1998 2164 (apparently stolen some years ago.)
- Hancock, R. (1980): Mooring of Large Wave Power Stations: Proceedings - Symposium on Wave Energy Utilization, Gothenburg, Sweden p 298-326.
- Hanff, J.J. (1989): A Comparison between Various Deep Water Catenary Mooring Systems: Thesis, Mechanical Engineering, Delft University of Technology.
  - \* Comparison of static and dynamic behavior of various types of mooring lines using the DYNFLX software from Shell.
  - \* Personal collection W.W. Massie.
- Harichandran, R.S. & Irvine, H.M. (1982): A Static Analysis Technique for Multi-Leg Cable-Buoy Systems: MIT Sea Grant report 82-13.
  - \* The report details the tangent stiffness method for linearizing the behavior of a cable for computational purposes.
  - \* Personal collection W.W. Massie.
- Hardy, Kevin R.; Kenton, William (1985): Oceanographic Mooring Winch System Utilizing a Horizontal Double-Barreled Capstan: Ocean Engineering and the Environment - Conference Record p 1357-1360.
- Harvey, R. C. (1979): Probabilistic Approach to Anchor Design: Naval Architect no. 4 July p 153-154.
- Hearle, J. W. S.; Parsey, M. R. (1983): Fatigue Failures in Marine Ropes and their Relation to Fibre Fatigue: International Conference - Fatigue in Polymers p 1-16.
- van Helvoirt, L. C. (1982): Static and Fatigue Tests on Chain Links and Chain Connecting Links: 14th OTC vol. 1, p 165-171.
- Himmelfarb, D. (1957) The Technology of Cordage, Fibers and Rope. \* This book has not been reviewed; it obviously cannot contain data on modern synthetic fiber developments which have been so instrumental for offshore applications.
  - \* Main library # 1352 4198
- Hogervorst, J. R. (1980): Field Trails with Large Diameter Suction Piles: 12th OTC vol. 3 paper 3817 p.217-224.
- van Holst, M. (1975): Mooring of Column Stabilized Drilling Units: Institution of Mechanical Engineers.
  - \* Informal presentation of the static mechanics of multiple-leg mooring systems as applied to a semi-submersible rig.
  - \* Personal collection W.W. Massie.

van Holst, M. (1977): Moorings (in Dutch, original title

'Verankeringen'): MARCON internal report 297-04. \* A good description of the theory and a computer program to

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- compute the static characteristics of a spread mooring system. \* Personal collection W.W. Massie.
- Iyengar, R. N.; Rao, G. V. (1988): Free Vibrations and Parametric Instability of a Laterally Loaded Cable: Journal of Sound and Vibration vol. 127 no. 2 Dec 8 p 231-243.
- Jordan, P. A.; Brewerton, R. W. (1982): Offshore Catenary Moorings: Proceedings of Conference on Offshore Moorings, p 95-114.
- Kaplan, Paul (1970): Hydrodynamic Analysis Applied to Mooring and Postioning of Vehicles and Systems in A Seaway. 8th Symposium on Naval Hydrodynamics, Cal. Inst. of Tech.
  - \* A formulation which includes linear wave theory and very straight-forward analysis. It has been superseded by modern developments.
  - \* Personal collection W.W. Massie.
- Kenney, M. C.; Mandell, J. F.; McGarry, F. J. (1985): Fatigue Behaviour of Synthetic Fibres, Yarns, and Ropes: Journal of Materials Science vol. 20 no. 6 Jun p 2045-2059.
- Khan, Najeeb Ullah; Ansari, Khyruddin Akbar (1986): On the Dynamics of a Multicomponent Mooring Line: Computers and Structures vol. 22 no. 3 p 311-334.
- Kiewiet, A. (1982): Uplift Resisting Anchors: Thesis, Civil Engineering, Delft University of Technology.
  - \* Report of testing to determine the resistance of an uplift resisting anchor deeply buried in loose, fine sand.
- Klotz J.A. (1970): Vessel Motion Control Through Anchor-Line' Design: Journal of Petroleum Technology, vol. 22 no. 6 June p 685-692.
- Kohler, Craig A. (1988): Corrosive-wear of buoy chain: Proceedings of Oceans '88 -- A Partnership of Marine Interests, vol. 2. p 582-587.
- Koterayama, W.; Nakamura, M.; Kyozuka, Y.; Ohkusu, M.; Suhara, T. (1988): Motions of OTEC Platform in Waves and Forces on Mooring Chain and Cold Water Pipe: Journal of Offshore Mechanics and Arctic Engineering vol. 110 no. 3 Aug 1988 p 263-271. Also published in: OMAE page 441-448: 1987.

Kroese, G. M. & Nieuwenhuyse, P. (1972): Polyfilene Rope Properties: Thesis, Civil Engineering, Delft University of Technology.
\* Report of the testing of a section of 8 strand braided polypropylene rope to determine its elastic characteristics.

\* Personal collection W.W. Massie.

- Lammes, R. R. & Siemers, R. W. (1988): Soil Mechanics of Drag Embedment Anchors in Sand: Thesis, Civil Engineering, Delft University of Technology in cooperation with Vrijhof Anchors.
  - \* Report of scale model tests of the behavior of various anchors. Special attention has been paid to the influence of soil permeability and dilatancy.
  - \* Personal collection W.W. Massie.
- Langeveld, J. M. (1974): Design Criteria for Single-Point Mooring Terminals: ASCE Journal of Waterways Harbors and Coastal Engineering Div., vol. 100 no. 4 Nov p 305-323.
- Lawrie, S. T. (1981): Engineering of the Towing Connection: Proceedings of the Symposium on the Behaviour of Disabled Large Tankers, p 85-98.
- Leech, C. M. (1986): Theory and Numerical Methods for the Modelling of Synthetic Ropes: Communications in Applied Numerical Methods vol. 3 no. 5 Sep-Oct p 407-413.
- Leeuwen, Joop H. V. (1981): Dynamic Behavior of Synthetic Ropes: 13th OTC v 1, p 453-463.
- Lereim, Jon (1985): Anchor Chain Cables Offshore -- Strength and Reliability: Behaviour of Offshore Structures, Proceedings of the 4th International Conference, Delft, p 807-812.
- Lereim, J. (1987): Stress Analysis of Anchor Chains: OMAE vol. 1. p 221-226.
- Libby, G. Curtis (1983): Dynamic Braking Systems for Offshore Mooring Winches & Windlasses: Sea Technology vol. 24 no. 9 September pages 23, 25.
- Lou, Y.K. (1979): Deepwater Mooring and Drilling published by the ASME Ocean Engineering Division.
  - \* Available at the main library # 2096 2385.
- Mandell, J. F. (1987): Modeling of Marine Rope Fatigue Behavior: Textile Research Journal vol. 57 no. 6 June p 318-330.
- Mandell, J. F.; Steckel, M. G.; Chung, S. -S.; Kenney, M. C. (1987): Fatigue and Environmental Resistance of Polyester and Nylon Fibers: Polymer Engineering and Science vol. 27 no. 15 Aug. p 1121-1127.
- Maari, Roger (1985): Single Point Moorings, Published by Single Buoy Moorings Incorporated, Monaco.
  - \* This book gives a good readable summary of the state of the art as used in offshore single point mooring practice at that time. It includes many photos and diagrams as well.
  - \* Available as follows:
    - Main library: # 2062 1341
    - Faculty of Mechanical Engineering and Marine Technology library: Wb - AB 16 22
    - Personal collection W.W. Massie.

- May, Daniel R. (1986): Deep-Sea Moorings for Data Buoys Prove Resilient: Sea Technology vol. 27 no. 7 Jul p 36.
- McCartney, Bruce L. (1985): Floating Breakwater Design: ASCE Journal of Waterways Port Coastal and Ocean Engineering vol. 111 no. 2 March p 304-318.
- McCaully, C.H.A. (1955): The Chain Tester's Handbook. \* Main library # 1035 6387
- McTernan, L. M.; Crawford, Henry (1983): Cyclic Testing of Continuously Wetted Synthetic Fiber Ropes: 15th OTC vol. 3 paper 4635, p 455-466.
- Mitchell, A. et al (1848): On Submarine Foundations, Particularly The Screw Pile and Moorings.
  - \* This book describes screw anchors and their installation in shallow water using a man-driven capstan from a small, special workboat. The book is obviously only of historical interest.
    \* Available at the main library # 1192 7003.
- Nakajima, Toshio; Motora, Seizo; Fujino, Masataka (1982): On the Dynamic Analysis of Multi-Component Mooring Lines: 14th OTC vol. 3, p 105-120.
- Nakajima, T. (1986): New Three-Dimensional Quasi-Static Solution for the Multi-Component Mooring Systems: OMAE vol. 3. p 487-491.
- Nygaard, I.; Fylling, I. J. (1987): Strategies for Thruster Assisted Mooring Systems: OMAE vol. 1. p 201-212.
- Oppenheim, B. W. (1988): Interactive Design and Operations of Moorings: 7th OMAE p 97-103.
- Ottsen, Henning; Meggitt, Dallas J. (1983): State of the Art in Simulation of Ocean Cable Systems: Proceedings OCEANS '83: Effective Use of the Sea - An Update, p 534-537.
- Peekel, P.J.A. (1981): Deep Water Cable Laying Simulation: Thesis, Civil Engineering, Delft University of Technology.
  - Computer simulation of the quasi-static geometry of the laying of a submarine power cable in deep water in which there is an ocean current perpendicular to the direction of laying. The simulation predicts the lay-barge path needed to locate the cable on a pre-determined route on the sea bed.
    \* Personal collection W. W. Massie.
  - reisonal correction w.w. Massie.
- Pieroni, Charles A.; Clark, Bruce S.; Libby, David O. (1978): High Voltage Power Cable Installation Concept Between Offshore Structures: 10th OTC vol. 4 Paper 3325 p 2377-2384.
- Radwan, A.; Chen, M. C.; Leavitt, C. W. (1986): Design Curves for Chain Mooring Systems: OMAE vol. 3. p 537-542.
- Ramberg, Steven E.; Griffin, Owen M. (1977): Free Vibrations of Taut and Slack Marine Cables: ASCE Journal of the Structural Division vol. 103 no. 11 Nov p 2079-2092.

- Ramzan, F. A.; Mitchell, N. D. (1985): Design Considerations and Behaviour of Moored Offshore Vessels: Proceedings of the 4th International Conference on the Behaviour of Offshore Structures, vol. 2, p 973-983.
- Rankka, W. & Bergdahl, L. (1990) Estimating the Fatigue Life of Mooring Cables: Paper (source unknown) \* Personal collection W. W. Massie.
- Reid, R.O. (1968): Dynamics of Deep Sea Mooring Lines. \* Available at the main library # 1968 2548.

Ridge, Isabel; Potts, Andrew (1989): Bending-Tension Fatigue of Rope: Wire Industry vol. 56 no. 662 Feb p 128-133.

Ridgeway J.J. (1970): Explosive Anchors for Sea Mooring: Undersea Technology vol. 11 no. 12 Dec p 16-17.

- Riewald, P. G.; Walden, R. G.; Whitehill, A. S.; Koralek, A. S. (1986): Design and Deployment Parameters Affecting the Survivability of Stranded Aramid Fiber Ropes in the Marine Environment: Oceans 86 - Conference Record, p 284-293.
- Roders, P.H.; Rutgers, A.R. (1988): The use of the Kinematic Element Method for 2-D and 3-D Models of Anchor Capacities in Sand: Thesis, Civil Engineering, Delft University of Technology in cooperation with KSEPL.
  - \* Results of computer simulation of the holding force of fluke anchors using two and three dimensional soil elements.
  - \* Personal collection W.W. Massie.
- Russel, R.C.H. (1973): Proceedings of the NATO Advanced Study Institute on the Berthing and Mooring of Ships, Wallingford, England.
  - \* The papers are primarily aimed at the problems of berthing along quays and other fixed structures. One paper is devoted to the sub-harmonic motion of a submerged floating tunnel.
  - \* Available at the main library # 1803 1695.
- Seo, Moon Hwo (1988): Mechanical Deterioration of Synthetic Rope in The Marine Environment.
  - \* Available from the Faculty of Civil Engineering Library # CT - k2/(52)
- Skop, R. A. (1988): Mooring Systems: A State-of-the-Art Review: Journal of Offshore Mechanics and Arctic Engineering vol. 110 no. 4 Nov p 365-372.
- Sluimer, G. & Visman, G.C. (1987): Suction Anchors on Clay: Thesis, Civil Engineering, Delft University of Technology in cooperation with KSEPL.
  - \* Theoretical and experimental study of the penetration of suction anchors in clays.
  - \* Personal collection W.W. Massie.
- Smith, G. H.; Owen, D. G. (1985): Mooring and Anchoring in Ice-Infested Waters: 4th OMAE vol. 1 p 424-431.

- Smith, T. M.; Chen, M. C.; Radwan, A. M. (1985): Systematic Data for the Preliminary Design of Mooring Systems: 4th OMAE vol. 1 p 403-407.
- Song, K. K.; Rao, G. P.; Childers, Mark A. (1980): Large Wire Rope Mooring Winch Drum Analysis and Design Criteria: Society of Petroleum Engineers, AIME Journal vol. 20 n 2 April p 63-74.
- Song, K. K.; Rao, G. P.; Childers, M. A. (1979): Large Wire Rope Mooring Winch Drum Analysis and Design Criteria: 11th OTC vol. 4 p 2737-2746.
- Suhara, Toshiro; Koterayama, Wataru; Tasai, Fukuzo; Hiyama, Hiromi; Sao, Kunihisa; Watanabe, Kunio (1981): Dynamic Behavior and Tension of Oscillating Mooring Chain: 13th OTC vol. 2, p 415-424.
- Suhara, Toshiro; Koterayama, Wataru; Hiyama, Hiromi; Koga, Yoji (1983): Behavior and Tension of Oscillating Chain in Water (II): Naval Architect Ocean Engineer vol. 21 p 187-198.
- Suhara, Toshiro; Koterayama, Wataru; Hiyama, Hiromi; Koga, Yoji (1984): Behavior and Tension of Oscillating Chain in Water (III): Naval Architect Ocean Engineer vol. 22 p 137-145.
- Takezawa, Seiji; Hirayama, Tsugukiyo; Kazuyuki Morooka, Celso (1985): Practical Calculation Method of A Moored SemI-Submersible Rig Motion in Waves (On The Effects of Moored Water Depth and Mooring Systems): Naval Architecture and Ocean Engineering vol. 23 p 67-82.
- Taylor, R. J. (1980): Conventional Anchor Test Results at San Diego and Indian Island: U.S. Naval Civil Engineering Lab, Technical Note N-1581
  - \* Extensive report of comparative testing -- primarily in mud -of several anchors including the (older) Bruce and Stevfix models.
  - \* Personal collection W.W. Massie.
- Taylor, R. J. & Rocker, K. (1980): Conventional Anchor Test Results at Guam: U.S. Naval Civil Engineering Lab, Technical Note N-1581.
  - \* Extensive report of comparative testing -- in hard soil conditions -- of several anchors including the (older) Bruce and Vrijhof models.
  - \* Personal collection W.W. Massie.

Taylor, R.J. (1981): Performance of Conventional Anchors: U.S.

- Naval Civil Engineering Lab, Technical Memorandum 42-81-02.
  \* This short memo summarizes the results reported in the extensive tests at California and Guam rported in detail in 1980.
- \* Personal collection W.W. Massie.

- Taylor, R.J. (1982): Interaction of Anchors with Soil and Anchor Design: U.S. Naval Civil Engineering Lab, Technical Note N-1627
  - \* A brief summary of a great variety of anchor types -- from deadweight anchors to piles and uplift resisting anchors -- and their interaction with soils.
  - \* Personal collection W.W. Massie.

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