Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design

API RECOMMENDED PRACTICE 2A-WSD
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Foreword

This document contains engineering design principles and good practices that have evolved during the development of offshore oil resources. Good practice is based on good engineering; therefore, this recommended practice consists essentially of good engineering recommendations. In no case is any specific recommendation included that could not be accomplished by presently available techniques and equipment. Consideration is given in all cases to the safety of personnel, compliance with existing regulations, and antipollution of water bodies. U.S. customary (USC) conversions of primary metric (SI) units are provided throughout the text of this publication in parentheses, for example, 150 mm (6 in.). Most of the converted values have been rounded for most practical usefulness; however, precise conversions have been used where safety and technical considerations dictate. In case of dispute, the SI units should govern.

Offshore technology continues to evolve. In those areas where the committee felt that adequate data were available, specific and detailed recommendations are given. In other areas, general statements are used to indicate that consideration should be given to those particular points. Designers are encouraged to utilize all research advances available to them. As offshore knowledge continues to grow, this recommended practice will be revised. It is hoped that the general statements contained herein will gradually be replaced by detailed recommendations.

Reference in this document is made to the 1989 edition of the AISC *Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design*. The use of later editions of AISC specifications is specifically not recommended for design of offshore platforms. The load and resistance factors in these specifications are based on calibration with building design practices and may not be applicable to offshore platforms. Research work is now in progress to incorporate the strength provisions of the new AISC code into offshore design practices.

In this document, reference is made to AWS D1.1/D1.1M:2010, *Structural Welding Code—Steel*. While use of this edition is endorsed, the primary intent is that the AWS code be followed for the welding and fabrication of fixed offshore platforms. However, where specific guidance is given in this API document, this guidance should take precedence.

This edition supersedes the 21st Edition dated December 2000, as well as Errata and Supplement 1 dated December 2002, Errata and Supplement 2 dated September 2005, and Errata and Supplement 3 dated October 2007. Revision bars are not used for this edition for clarity because of the extensive document reorganization outlined in the Introduction.

The verbal forms used to express the provisions in this recommended practice are as follows:

— the term “shall” denotes a minimum requirement in order to conform to the recommended practice,

— the term “should” denotes a recommendation or that which is advised but not required in order to conform to the recommended practice,

— the term “may” is used to express permission or a provision that is optional,

— the term “can” is used to express possibility or capability.

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This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

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This publication serves as a guide for those who are concerned with the design and construction of new fixed offshore platforms and for the relocation of existing platforms used for the drilling, development, production, and storage of hydrocarbons in offshore areas.

In addition, these guidelines are used in conjunction with API 2SIM for the assessment of existing platforms in the event that it becomes necessary to make a determination of the “fitness for purpose” of the structure.

This recommended practice is organized around the framework of the API 2A-WSD, 21st Edition, with the following sections:

— Section 1: Scope;

— Section 2: Normative References;

— Section 3: Terms, Definitions, Acronyms, and Abbreviations;

— Section 4: Planning (API 2A-WSD, 21st Edition, Section 1);

— Section 5: Design Criteria and Procedures (API 2A-WSD, 21st Edition, Section 2);

— Section 6: Structural Steel Design (API 2A-WSD, 21st Edition, Section 3);

— Section 7: Strength of Tubular Joints (API 2A-WSD, 21st Edition, Section 4);

— Section 8: Fatigue (API 2A-WSD, 21st Edition, Section 5);

— Section 9: Foundation Design (API 2A-WSD, 21st Edition, Section 6);

— Section 10: Other Structural Components and Systems (API 2A-WSD, 21st Edition, Section 7);

— Section 11: Material (API 2A-WSD, 21st Edition, Section 8);

— Section 12: Drawings and Specifications (API 2A-WSD, 21st Edition, Section 9);

— Section 13: Welding (API 2A-WSD, 21st Edition, Section 10);

— Section 14: Fabrication (API 2A-WSD, 21st Edition, Section 11);

— Section 15: Installation (API 2A-WSD, 21st Edition, Section 12);

— Section 16: Inspection (API 2A-WSD, 21st Edition, Section 13);

— Section 17: Accidental Loading (API 2A-WSD, 21st Edition, Section 18);

— Section 18: Reuse (API 2A-WSD, 21st Edition, Section 15);

— Section 19: Minimum and Special Structures (API 2A-WSD, 21st Edition, Section 16);

— Annex A: Listing of figures, tables, and equations;

— Annex B: Commentary;

— Bibliography.

The following additional changes to the content of API 2A-WSD not previously noted above have been made:

— API 2A-WSD, 21st Edition, Section 14 (Surveys) and Section 17 (Assessment of Existing Platforms) have been removed in their entirety and now reside in API 2SIM;

— with the publication of API 2FB, the new Section 17 contains only the accidental loading portion of API 2A-WSD, 21st Edition, Section 18;

— Annex A provides a listing of API 2A-WSD, 21st Edition tables, figures, and equations with corresponding 22nd Edition numbers;

— Annex B contains any commentary for the sections;

— Bibliography contains references for all sections.

Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design

1 Scope

This recommended practice is based on global industry best practices and serves as a guide for those who are concerned with the design and construction of new fixed offshore platforms and for the relocation of existing platforms used for the drilling, development, production, and storage of hydrocarbons in offshore areas.

NOTE 1 Specific guidance for hurricane conditions in the Gulf of Mexico and other U.S. offshore areas, previously provided in API 2A-WSD, 21st Edition, Section 2, is now provided in API 2MET.

NOTE 2 Specific guidance for earthquake loading in U.S. offshore areas, previously provided in the API 2A-WSD, 21st Edition, Section 2, is now provided in API 2EQ.

NOTE 3 Specific guidance for soil and foundation considerations in offshore areas, previously provided in API 2A-WSD, 21st Edition, Section 6, is now provided in API 2GEO.

NOTE 4 Specific guidance for the evaluation of structural damage, above and below water structural inspection, fitness-for-purpose assessment, risk reduction and mitigation planning, plus the process of decommissioning has been removed and is now provided in API 2SIM.

NOTE 5 Specific guidance for fire and blast loading, previously provided in the 2A-WSD, 21st Edition, Section 18, is now provided in API 2FB [3].

NOTE 6 Specific guidance for marine operations, supplementing the guidance provided in this document, is now provided in API 2MOP [6]. The provisions in API 2A-WSD shall govern if there are any conflicts.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies (including any addenda/errata).

API Specification 2B, *Fabrication of Structural Steel Pipe*

API Specification 2C, *Specification for Offshore Pedestal-mounted Cranes*

API Recommended Practice 2EQ, *Seismic Design Procedures and Criteria for Offshore Structures*

API Recommended Practice 2GEO, *Geotechnical and Foundation Design Considerations*

API Recommended Practice 2MET, *Derivation of Metocean Design and Operation Conditions*

API Recommended Practice 2N, *Planning, Designing, and Constructing Structures and Pipelines for Arctic Conditions*

API Recommended Practice 2SIM, *Structural Integrity Management of Fixed Offshore Structures*

API Bulletin 2TD, *Guidelines for Tie-downs on Offshore Production Facilities for Hurricane Season*