

Guidelines for Tie-downs on Offshore Production Facilities for Hurricane Season

API BULLETIN 2TD
FIRST EDITION, JUNE 2006



Guidelines for Tie-downs on Offshore Production Facilities for Hurricane Season

Upstream Segment

API BULLETIN 2TD
FIRST EDITION, JUNE 2006



SPECIAL NOTES

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

All rights reserved. No part of this work may be reproduced, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 1220 L Street, N.W., Washington, D.C. 20005.

FOREWORD

This bulletin is under the jurisdiction of the API Subcommittee on Standardization of Offshore Structures.

The purpose of this bulletin is to raise the awareness of the need to evaluate the tie-downs in use on offshore production facilities for drilling rigs, permanent equipment, and facilities such as quarters, helidecks, etc. The information contained herein is presented as recommendations that a platform owner/operator or drilling rig owner/operator may choose to undertake in the short-term (i.e., the 2006 hurricane season) and intermediate term (i.e., prior to the 2007 hurricane season) in an effort to improve tie-down performance during hurricanes.

Long-term plans include evaluating the need for detailed design requirements for rig and permanent equipment on floating and fixed offshore platforms and, if needed, how to best include that information in the suite of API standards.

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

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, 1220 L Street, N.W., Washington, D.C. 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the Director.

Classified areas may vary depending on the location, conditions, equipment, and substances involved in any given situation. Users of this bulletin should consult with the appropriate authorities having jurisdiction.

Users of this bulletin should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

Where applicable, authorities having jurisdiction should be consulted.

Work sites and equipment operations may differ. Users are solely responsible for assessing their specific equipment and premises in determining the appropriateness of applying the instructions. At all times users should employ sound business, scientific, engineering, and judgment safety when using this bulletin.

API is not undertaking to meet the duties of employers, manufacturers, or suppliers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations to comply with authorities having jurisdiction.

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 and updated regularly by API, 1220 L Street, N.W., Washington, D.C. 20005, www.api.org/cat.

Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

CONTENTS

	Page
1 DRILLING AND WORKOVER DRILLING UNITS.....	1
1.1 Background	1
1.2 Philosophy	1
1.3 Short-Term Recommendations	1
1.4 Intermediate-Term Recommendations	2
2 PERMANENT EQUIPMENT AND FACILITIES	2
2.1 Background	2
2.2 Philosophy/Design Conditions	2
2.3 Short-Term-Recommendations	3
2.4 Intermediate-Term Recommendations	3

Guidelines for Tie-downs on Offshore Production Facilities for Hurricane Season

1 Drilling and Workover Drilling Units

1.1 BACKGROUND

The oil and gas industry has experienced rig failures and movement of rig components during recent hurricanes in the Gulf of Mexico. Some, if not all, of the failures are attributable to the tie-down components. Occurrences on both fixed and floating platforms have resulted in significant platform damage as well as lost and/or deferred production. Recent experience shows that enhancements to current industry practice can improve tie-down performance during hurricanes.

1.2 PHILOSOPHY

1.2.1 Applicability

This document addresses situations where failure of a drilling or workover rig would result in significant damage to the platform or adjacent infrastructure. Generally, this would include any facility designated as having a high or medium consequence of failure as defined by API RP2A. In other situations, a risk-based operational decision process should be followed. Situations that might allow deviation from the recommendations below include drilling operations in the non-hurricane season or the use of light-weight workover masts on shallow water platforms.

1.2.2 Design Conditions

Drilling rig tie-downs to the platform and between drilling components are critical structural components and should have the same, or higher, level of design, material traceability, quality assurance, maintenance, and documentation as other critical structural components.

Primary rig and substructure tie-downs should be designed or assessed for location-specific loading conditions (environmental and dynamic) consistent with those utilized in the facility structural design and should be approved by an engineer experienced and qualified in offshore structural engineering.

For the same design environment, wind gust and height factors appropriate for the derrick and substructure may be higher than those used for designing the topside as a whole, and the short-term extremes will be much higher than the average loadings used in combination with wave forces for jacket or mooring design. Guidance in wind codes supports the use of 5-to 15-second gust factors for the design of such components.

Dynamic accelerations and tilting of the platform topside should also be considered, again at the extreme (not RMS) level. Rigid body (quasi-static) analysis of the rig packages themselves may be used as a first approximation.

1.3 SHORT-TERM RECOMMENDATIONS

The following items should be considered for implementation as appropriate by the platform operator and/or rig owner in the short-term timeframe:

- Visually inspect all tie-downs to confirm that they are in good condition and are constructed per the design drawings.
 - Verify that all tie-downs can be properly installed and that no obstructions exist that might prevent installation (e.g. stiffeners on plate girders).
 - For bolted tie-downs:
 - Verify by visual inspection that the bolts are in good physical condition.
 - Verify that bolts meet the required material specifications and the specifications are suitable for this application.
- Note: ASTM 325 or 490 high strength bolts are not recommended, since retorquing of these bolts is not permitted per AISC specifications.
- Verify that the number of bolt torquing cycles does not exceed the design allowable.
 - Verify required bolt torque is defined and required equipment/tools are available to achieve the required torque.
 - New bolts should be installed if the above items cannot be verified.
 - For mechanical/hydraulic tie-downs:
 - Verify that the tie-down system is in good working condition.
 - Verify that operating personnel are familiar with the operating procedures of the equipment.

- Verify that equipment is fail safe (tie-down force will be maintained in the event of equipment failure).
- For welded tie-downs:
 - Verify that plans, weld size, welding procedures, and inspection procedures are adequate.
- Verify that welded components of tie-downs have been properly inspected.
- Determine if there is a preferred well position for stowing the rig. If so, verify that this is clearly defined in the platform hurricane evacuation procedures.
- Verify that proper tie-down procedures are part of the platform evacuation procedures and that proper tie-down is verified in writing by the Offshore Installation Manager (OIM) or his designate prior to evacuation.
- Verify that other procedures such as setting down of all drill pipe, handling of setback load, emptying of tanks, etc. are clearly defined in the evacuation procedures and have been considered in engineering of the tie-down procedures.
- Verify that all required tie-down tools, equipment, and labor including all required spares will be available as required prior to evacuation. Any new components should be prefabricated for quickness and ease of connection.
- Verify that hurricane evacuation procedures allow time for proper tie-down prior to evacuation.
- Where feasible, an engineered, welded stop should be installed at the end of skid beams to prevent skid packages from skidding off the end of the beams. Welds should be of structural quality and properly inspected. Stops should be sized to withstand shear associated with wind and platform tilt (on floating structures) in combination with a lower bound friction assumption.
- Verify that all rig packages are properly tied down based on risk appropriate environmental and dynamic loads.
- After each hurricane evacuation, the tie-downs should be visually inspected prior to returning the rig to normal service. Any damage found should be evaluated to determine if any design or procedural modifications are required. Inspection results should be documented. Damage that is repeatedly discovered indicates a need for design and/or procedure change, and should result in more frequent inspections until such inspections indicate that the cause(s) of the fault(s) has been resolved.

The above recommendations are considered the minimum required, and any additional inspections or modifications required to prevent movement or failure of rig package tie-downs during design storm conditions should be completed as soon as possible.

1.4 INTERMEDIATE-TERM RECOMMENDATIONS

The following items should be considered for implementation by the platform operator and/or rig owner in the intermediate-term timeframe:

- Review design calculations of all tie-downs with updated site-specific environmental and dynamic loads and document results. Analysis and results should be approved by an engineer experienced and qualified in offshore structures. Clamps should be assessed for all appropriate well positions. Special care should be given to calculations that show either no predicted uplift or only a small uplift when compared to the gravity reaction. In such cases, there may effectively be no reserve against slightly higher wind forces.
- Review fabrication and material records to assure that all tie-down systems are properly documented. Consider replacement of tie-downs if proper documentation is not available. Otherwise, make an assessment based on conservative assumptions of material and weld properties.
- Review derrick or mast and substructure design based on site-specific environmental and dynamic loads and document results. Analysis and results should be approved by an engineer experienced and qualified in this area.

2 Permanent Equipment and Facilities

2.1 BACKGROUND

Permanent equipment, quarters, and helidecks also suffered severe damage due to tie-down failure during the recent Gulf of Mexico hurricanes. This resulted in a significant amount of damage as well as lost and/or deferred production. Recent experience shows that enhancements to current industry practice can improve tie-down performance during hurricanes.

2.2 PHILOSOPHY/DESIGN CONDITIONS

Tie-downs of permanent equipment and facilities to the platform are critical structural components and should have the same, or higher, level of design, quality assurance, maintenance, and documentation as other critical structural components.

Tie-downs should be designed or assessed for location-specific loading conditions (environmental and dynamic) consistent with those utilized in the facility structural design and should be approved by an engineer experienced and qualified in offshore structural engineering.

Wind gust and height factors appropriate for the tie-downs may be higher than those used for designing the topside as a whole, and the short-term extremes will be much higher than the average loadings used in combination with wave forces for jacket or mooring design. Guidance in wind codes supports the use of 5-to 15-second gust factors for the design of such components. Dynamic accelerations and tilting of the platform topside should also be considered, again at the extreme (not RMS) level. Rigid body (quasi-static) analysis of the rig packages themselves may be used as a first approximation.

2.3 SHORT-TERM RECOMMENDATIONS

The following items should be considered for implementation by platform owners in the short-term timeframe:

- Visually inspect all tie-downs to confirm that they are in good condition and are constructed per the design drawings. If any doubts exist, conduct appropriate non-destructive testing (NDT). If no design drawings exist, verify that required tie-down strength exists using appropriate engineering analysis.
- After each hurricane evacuation, the tie-downs should be visually inspected as soon as possible. Any damage found should be evaluated to determine if any design or procedural modifications are required. Inspection results should be documented.

2.4 INTERMEDIATE-TERM RECOMMENDATIONS

The following item should be considered for implementation by platform owners in the intermediate-term time frame:

- Review design calculations of all tie-downs with updated site-specific environmental and dynamic loads and document results. Analysis and results should be approved by an engineer experienced and qualified in offshore structural engineering.

Additional copies are available through IHS

Phone Orders: 1-800-854-7179 (Toll-free in the U.S. and Canada)
303-397-7956 (Local and International)
Fax Orders: 303-397-2740
Online Orders: global.ihs.com

Information about API Publications, Programs and Services
is available on the web at [**www.api.org**](http://www.api.org)



1220 L Street, NW
Washington, DC 20005-4070
USA

202.682.8000

Product No. G2TD01