ACI ITG-9R-16

Report on Design of Concrete Wind Turbine Towers

Reported by ACI Innovation Task Group 9

American Concrete Institute
Always advancing

American Concrete Institute
Always advancing

First Printing
October 2016
ISBN: 978-1-945487-35-4

Report on Design of Concrete Wind Turbine Towers

The technical committees responsible for ACI committee reports and standards strive to avoid ambiguities, omissions, and errors in these documents. In spite of these efforts, the users of ACI documents occasionally find information or requirements that may be subject to more than one interpretation or may be incomplete or incorrect. Users who have suggestions for the improvement of ACI documents are requested to contact ACI via the errata website at http://concrete.org/Publications/DocumentErrata.aspx. Proper use of this document includes periodically checking for errata for the most up-to-date revisions.

ACI committee documents are intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the material it contains. Individuals who use this publication in any way assume all risk and accept total responsibility for the application and use of this information.

All information in this publication is provided "as is" without warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose or non-infringement.

ACI and its members disclaim liability for damages of any kind, including any special, indirect, incidental, or consequential damages, including without limitation, lost revenues or lost profits, which may result from the use of this publication.

It is the responsibility of the user of this document to establish health and safety practices appropriate to the specific circumstances involved with its use. ACI does not make any representations with regard to health and safety issues and the use of this document. The user must determine the applicability of all regulatory limitations before applying the document and must comply with all applicable laws and regulations, including but not limited to, United States Occupational Safety and Health Administration (OSHA) health and safety standards.

Participation by governmental representatives in the work of the American Concrete Institute and in the development of Institute standards does not constitute governmental endorsement of ACI or the standards that it develops.

Order information: ACI documents are available in print, by download, on CD-ROM, through electronic subscription, or reprint and may be obtained by contacting ACI.

Most ACI standards and committee reports are gathered together in the annually revised ACI Manual of Concrete Practice (MCP).

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331
Phone: +1.248.848.3700
Fax: +1.248.848.3701

www.concrete.org

ACI ITG-9R-16

Report on Design of Concrete Wind Turbine Towers

Reported by ACI Innovation Task Group 9

Charles S. Hanskat, Chair

Roger J. Becker
Rick Damiani
Charles W. Dolan*
Neil M. Hawkins
Kevin L. Kirkley
Gary J. Klein
Nina Kristeva
Dan A. Kuchma*
James D. Lockwood
Kirk B. Morgan*
Markus Wernli

*Principal authors.

This report examines the benefits of the design of concrete towers for land-based wind turbines with heights in excess of 325 ft (100 m), in comparison to those of round steel tubular towers. These benefits include reduced cost, increased stiffness, and superior service life performance. Construction alternatives, design criteria, design methodologies, and guidance for preliminary design of concrete towers are presented.

The report recognizes that final tower design requires close coordination with the turbine supplier. The report is intended for those involved in developing preliminary tower designs. Concrete towers designed for maximum wind forces can be satisfactory for preliminary design, but the final design requires checking for all loads, especially fatigue and dynamic effects from wind and turbine operations. Design of connections and their proportions require an understanding of fatigue requirements during preliminary design for the connection design to remain valid during final checks.

Keywords: concrete tower; full-height tower; hybrid tower; precast elements; prestressing; slipformed; spread footings; turbine; wind; wind farm.

CONTENTS

ACI ITG-9R-16 was adopted and published October 2016.