API/EI Research report

Verification of lightning protection requirements for above ground hydrocarbon storage tanks

API/EI RESEARCH REPORT

VERIFICATION OF LIGHTNING PROTECTION REQUIREMENTS FOR ABOVE GROUND HYDROCARBON STORAGE TANKS

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FOREWORD

This publication has been produced at the request of the API RP 545 Task Force and the EI Electrical Committee.

It collates a number of research reports produced by Culham Electromagnetics and Lightning Limited (Culham) who were commissioned to investigate the lightning phenomena and the adequacy of lightning protection measures on above ground hydrocarbon storage tanks.

Currently international, British and United States standards contain requirements relating to lighting protection; however, these have not been verified through practical, scientific testing. As a result of the work commissioned by the API and EI, a new Recommended Practice (RP) is being developed which will incorporate the results of this investigation.

Suggested revisions are invited and should be submitted to the director of standards, API, 1220 L Street, N.W., Washington, D.C. 20005 or The Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR.

API/EI RESEARCH REPORT

VERIFICATION OF LIGHTNING PROTECTION REQUIREMENTS FOR ABOVE GROUND HYDROCARBON STORAGE TANKS

PHASE 1

ACKNOWLEDGEMENTS

This suite of reports has been produced by Culham Electromagnetics and Lightning Limited (Culham) at the request of the American Petroleum Institute (API) and the Energy Institute (EI). The API and EI gratefully acknowledge the input into these reports from:

B J C Burrows	Consultant
S J Haigh	
C J Hardwick	

Resource Protection International (RPI) was contracted to co-ordinate the Technical Peer Review of these reports. This work was undertaken by:

Paul Watkins

The API and EI gratefully acknowledge the assistance received from refinery employees for valuable discussions, practical help, samples, etc.

The API RP 545 Task Force and EI's Electrical Committee provided technical direction to the project, and reviewed and commented upon drafts of the reports.

At the time of publication, the API RP 545 Task force comprised:

Louis Barrios	Shell Global Solutions (US) Inc.
Chip Breitweiser	HMT Inc.
Mark Goodman	Jacobs Engineering Group Inc.
Paul S. Hamer	Chevron Products Company
Bruce Kaiser	Lightning Master Corporation
Joe Lanzoni	Lightning Eliminators & Consultants, Inc.
Victor Minak	ExxonMobil Research & Engineering
Rick Mondler	ConocoPhillips
George L. Morovich	TEMCOR
Philip E. Myers	Chevron Corporation
Art Neubauer	Arseal Technologies LLC
Gordon Robertson	API
Marilyn Shores	Explorer Pipeline Company
Richard J. Virgilio	Foster Wheeler USA Corporation

At the time of publication, the EI's Electrical Committee comprised:

Phil Carpenter	Chevron Limited
Mel Cockerill	Total
Duncan Crichton	BP
Robert Denham	Health and Safety Executive
Jeff McQueen	Shell U.K. Oil Products Limited
Geoff Fulcher	F.E.S. (Ex) Limited
Kevin Hailes	BP
Terry Hedgeland	Consultant
Darren Hughes	Petroplus Refining and Marketing Limited
Tom Ramsey (Chair)	ExxonMobil
Paul Taylor	British Pipeline Agency Limited
Stephen Wilkinson	ConocoPhillips

Project coordination was carried out by, in order of involvment:

Alia Alavi (EI)
Mark Scanlon (EI)
Sonia Quintanilla (EI)
Andrew Sykes (EI)

Technical editing was carried out by Andrew Sykes (EI).

CUL/LT-0234

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API/EI RESEARCH REPORT

VERIFICATION OF LIGHTNING PROTECTION REQUIREMENTS FOR ABOVE GROUND HYDROCARBON STORAGE TANKS

PHASE 2

ACKNOWLEDGEMENTS

This suite of reports has been produced by Culham Electromagnetics and Lightning (Culham) at the request of the American Petroleum Institute (API) and Energy Institute (EI). API and EI gratefully acknowledge the input into these reports during their development.

Tests contained in these reports were conducted by:
Chris Chessum
Stephen J Haigh
Philip G Leichauer

Inductances and resistances were put together with assistance from Brian J C Burrows as consultant to Culham.

The first series of tests were carried out over two days in February 2007. On the second day tests were witnessed by Mark Scanlon (EI) and Sonia Quintanilla (EI). The second series of tests were carried out over two days in August 2007.

The API RP 545 Task Force and EI's Electrical Committee provided technical direction to the project, and reviewed and commented upon drafts of the reports.

At the time of publication, the API RP 545 Task force comprised:

Louis Barrios	Shell Global Solutions (US) Inc.
Chip Breitweiser	HMT Inc.
MarkGoodman	Jacobs Engineering Group Inc.
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Bruce Kaiser	Lightning Master Corporation
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Gordon Robertson	API
Marilyn Shores	Explorer Pipeline Company
Richard J. Virgilio	Foster Wheeler USA Corporation

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Robert Denham	Health and Safety Executive
Jeff McQueen	Shell U.K. Oil Products Limited
Geoff Fulcher	F.E.S. (Ex) Limited
Kevin Hailes	BP
Terry Hedgeland	Consultant
Darren Hughes	Petroplus Refining and Marketing Limited
Tom Ramsey (Chair)	ExxonMobil
Paul Taylor	British Pipeline Agency Limited
Stephen Wilkinson	ConocoPhillips

Project coordination was carried out by, in order of involvement:
Mark Scanlon (EI)
Sonia Quintanilla (EI)
Andrew Sykes (EI)

Technical editing was carried out by Andrew Sykes (EI).

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