

api standard 521

api standard 521 is a critical guideline developed by the American Petroleum Institute that focuses on pressure-relieving and depressuring systems. This standard plays a fundamental role in ensuring the safety, reliability, and efficiency of equipment used in the oil and gas industry, chemical plants, refineries, and other industrial processes where pressure control is vital. It provides comprehensive requirements and recommendations for the design, installation, operation, and maintenance of pressure relief devices. Understanding the scope and technical specifications of API Standard 521 is essential for engineers, safety professionals, and plant operators to comply with regulatory demands and mitigate the risks associated with overpressure scenarios. This article offers an in-depth exploration of API Standard 521, covering its purpose, key components, design methodologies, and practical applications across industry sectors. The following sections will present a detailed breakdown for easy navigation.

- Overview of API Standard 521
- Key Components and Definitions
- Design and Engineering Considerations
- Pressure Relief Devices Covered by API Standard 521
- Installation and Maintenance Requirements
- Applications and Industry Impact

Overview of API Standard 521

API Standard 521 is titled "Pressure-relieving and Depressuring Systems" and serves as a fundamental reference for the engineering and safety community within the petroleum and chemical industries. This standard outlines the requirements for the design, sizing, selection, installation, and maintenance of pressure relief systems to protect equipment from potentially dangerous overpressure conditions. It addresses various scenarios including fire exposure, blocked outlet, thermal expansion, and other causes of pressure increase that might lead to catastrophic failures if not properly managed.

The scope of API Standard 521 extends to pressure relief valves, rupture discs, and other pressure protection devices. The document is harmonized with other API standards and international codes, ensuring its relevance and applicability worldwide. It is regularly updated to incorporate technological advancements and lessons learned from industry incidents.

Key Components and Definitions

Understanding the terminology and components defined in API Standard 521 is crucial for proper implementation. The standard provides clear definitions and classifications for various elements involved in pressure relief systems.

Pressure Relief Devices

These are mechanical devices designed to open at predetermined set pressures to protect equipment from excessive pressure buildup. Common types include spring-loaded safety valves, pilot-operated relief valves, and rupture discs.

Overpressure and Accumulation

Overpressure refers to the pressure increase above the maximum allowable working pressure (MAWP) of equipment, while accumulation is the pressure increase over the set pressure of the relief device during discharge. API 521 specifies acceptable limits for both parameters to ensure safety margins.

Relief Scenarios

The standard classifies potential causes of overpressure such as blocked outlet, fire exposure, thermal expansion, and external fire to guide the design and sizing of relief devices accordingly.

Design and Engineering Considerations

API Standard 521 emphasizes a systematic approach toward the design and engineering of pressure relief systems. The standard provides formulas, calculation methods, and design criteria to ensure devices are adequately sized and selected for specific process conditions.

Design Pressure and Temperature

Design pressure is the maximum pressure used for the design of equipment and relief systems, typically set higher than normal operating pressure to account for transient conditions. Design temperature is the maximum temperature for which the equipment is rated. Both parameters influence the selection and sizing of relief devices.

Relief Device Sizing

The sizing of relief devices must consider the maximum expected flow rate during relief scenarios. API 521 provides detailed methodologies to calculate flow rates resulting from process upsets, fire exposure, and thermal expansions. The standard ensures that relief devices can handle discharge without exceeding allowable overpressure limits.

Discharge Piping and Venting

Proper design of discharge piping is crucial to avoid back pressure that could affect relief device performance. API 521 outlines requirements for venting systems, including material compatibility, sizing, and routing to safely release relieved fluids.

Pressure Relief Devices Covered by API Standard 521

API Standard 521 covers a range of pressure relief devices utilized in industrial settings to maintain safe pressure levels.

Spring-Loaded Safety Valves

These valves open automatically when the set pressure is reached and close once normal conditions resume. They are widely used due to their reliability and quick response.

Rupture Discs

Rupture discs provide a non-reclosing pressure relief mechanism that bursts at a predetermined pressure, often used in conjunction with safety valves to provide additional protection or isolation.

Pilot-Operated Relief Valves

These devices use a pilot valve to control the main valve, offering precise pressure control and are suitable for higher set pressures and larger relief capacities.

Combination Devices

API 521 also addresses devices that combine different relief mechanisms, such as safety valve and rupture disc assemblies, to enhance safety and operational flexibility.

Installation and Maintenance Requirements

Proper installation and ongoing maintenance are essential to ensure the continued effectiveness of pressure relief systems as outlined by API Standard 521.

Installation Guidelines

The standard recommends careful attention to device orientation, piping connections, and accessibility for inspection and testing. It also advises on minimizing dead legs and avoiding excessive back pressure.

Inspection and Testing

Regular inspection, testing, and calibration are mandated to verify that relief devices function correctly under actual operating conditions. API 521 provides guidance on inspection intervals, testing procedures, and record-keeping.

Maintenance Practices

Routine maintenance including cleaning, part replacement, and operational checks are vital to prevent device failure. The standard recommends following manufacturer instructions along with industry best practices.

Applications and Industry Impact

API Standard 521 is extensively applied across the oil and gas, petrochemical, refining, and chemical processing industries. Its influence extends to equipment design, regulatory compliance, and safety management systems.

Risk Mitigation in Hazardous Environments

By implementing the guidance in API 521, facilities reduce the risk of catastrophic equipment failure, fires, explosions, and environmental releases, thereby protecting personnel, assets, and the environment.

Compliance and Regulatory Alignment

Many regulatory agencies and industry organizations reference API Standard 521 in their codes and standards, making adherence a key factor in achieving legal and insurance compliance.

Technological Advancements

As technology evolves, API 521 adapts to include new materials, improved device designs, and modern engineering approaches, ensuring continued relevance and effectiveness in pressure relief system design.

Benefits of API Standard 521 Implementation

- Enhanced safety and risk reduction
- Improved equipment reliability and lifespan
- Compliance with industry and governmental regulations
- Optimized system performance and operational efficiency
- Standardized engineering practices across the industry

Frequently Asked Questions

What is API Standard 521?

API Standard 521 is a set of guidelines published by the American Petroleum Institute that covers the design and installation of pressure-relieving and depressuring systems for equipment and piping in the petroleum and chemical industries.

What industries commonly use API Standard 521?

API Standard 521 is commonly used in the oil and gas, petrochemical, chemical processing, and refining industries to ensure safe pressure relief system design.

What are the main topics covered in API Standard 521?

The standard covers pressure relief system design, sizing of relief devices, selection of relief valves, discharge piping, and depressuring methods to prevent equipment overpressure.

How does API Standard 521 relate to API Standard 520?

API Standard 521 complements API Standard 520; while API 520 focuses on sizing and selection of

pressure-relieving devices, API 521 provides detailed guidelines on the overall design and installation of pressure relief and depressuring systems.

Why is compliance with API Standard 521 important?

Compliance with API Standard 521 is important for safety, regulatory adherence, and to prevent equipment failure or catastrophic events caused by overpressure.

Does API Standard 521 address emergency depressuring systems?

Yes, API Standard 521 provides guidelines for emergency depressuring systems, including design considerations to safely reduce pressure in emergency situations.

How often is API Standard 521 updated?

API periodically reviews and updates Standard 521 to reflect technological advances and industry best practices; updates typically occur every few years.

Can API Standard 521 be used internationally?

Yes, while developed by the American Petroleum Institute, API Standard 521 is widely recognized and used internationally in industries requiring pressure relief system design.

Additional Resources

1. API Standard 521: Pressure-relieving and Depressuring Systems

This book provides a comprehensive overview of API Standard 521, focusing on the design and implementation of pressure-relieving and depressuring systems in the oil and gas industry. It explains the key principles and requirements for safety valve sizing, relief device selection, and system design. Engineers will find detailed guidance on compliance and practical application to ensure plant safety and regulatory adherence.

2. Pressure Relief Device Engineering: Applying API Standard 521

A practical guide for engineers and safety professionals, this book delves into the engineering aspects of pressure relief devices as outlined in API Standard 521. It covers design methodologies, calculation procedures, and case studies illustrating effective pressure relief system designs. The book emphasizes real-world applications to help avoid overpressure incidents.

3. Designing Pressure-Relief Systems: Meeting API 521 Standards

This text focuses on the step-by-step design process for pressure-relief systems that comply with API Standard 521. It includes detailed chapters on relief valve selection, sizing techniques, and system integration. Readers will benefit from examples and best practices aimed at optimizing safety and

operational efficiency.

4. Safety Relief Valves and API 521 Compliance

This book targets the selection, testing, and maintenance of safety relief valves within the framework of API Standard 521. It discusses valve types, performance criteria, and inspection protocols necessary to maintain compliance. Maintenance personnel and engineers alike will gain insights into prolonging valve life and ensuring reliable protection.

5. Pressure Relief Systems in Petrochemical Plants: API 521 Applications

Focusing on petrochemical plants, this book explores how API Standard 521 is applied to manage pressure relief and depressuring systems. It highlights unique challenges in petrochemical environments and provides solutions for system design and emergency response planning. The text is rich with industry case studies and troubleshooting techniques.

6. API 521 and Pressure Safety: A Practical Approach

This publication offers a practical approach to understanding and implementing API Standard 521 for pressure safety management. It integrates theory with practical engineering, addressing risk assessment, sizing calculations, and system testing. The book is suitable for professionals responsible for plant safety and regulatory compliance.

7. Comprehensive Guide to Pressure Relief and Depressuring Systems

Covering both pressure relief and depressuring systems, this guide explains the technical requirements and design considerations of API Standard 521. It provides in-depth analysis of emergency depressuring methods and relief device coordination. Engineers will find this resource valuable for designing safer and more effective pressure management systems.

8. API Standards for Pressure Relief: Focus on Standard 521

This book reviews various API standards related to pressure relief, with a special focus on API Standard 521. It compares standards, clarifies terminology, and explains their interrelationships to help engineers navigate complex regulatory landscapes. The text is ideal for those seeking a broad understanding of API pressure relief standards.

9. Advanced Pressure Relief Valve Technology and API 521

Highlighting recent technological advances, this book examines modern pressure relief valve designs and their compliance with API Standard 521. It discusses innovations such as smart valves, materials improvements, and testing technologies. Readers gain insight into how technology enhances safety and efficiency in pressure relief systems.

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API Standard 521: A Comprehensive Guide to Protecting Against Pipeline Corrosion

API Standard 521, "Recommended Practice for Gathering and Transmission Pipeline Systems," is a crucial document for the oil and gas industry, detailing best practices for managing pipeline corrosion and protecting against catastrophic failures. Understanding its intricacies is vital for ensuring operational safety, environmental protection, and regulatory compliance. This ebook provides a deep dive into API 521, focusing on its key aspects and practical implications, with particular attention to SEO optimization for improved online discoverability.

Ebook Title: Mastering API Standard 521: A Practical Guide to Pipeline Integrity Management

Outline:

Introduction: What is API Standard 521 and why is it important?

Chapter 1: Understanding Pipeline Corrosion Mechanisms: Exploring various types of corrosion and their impact.

Chapter 2: Risk Assessment and Mitigation Strategies: Detailing methodologies for identifying and reducing corrosion risks.

Chapter 3: Inspection and Monitoring Techniques: Examining various inspection technologies and data analysis.

Chapter 4: Repair and Remediation Methods: Discussing effective strategies for repairing damaged pipelines.

Chapter 5: Regulatory Compliance and Best Practices: Navigating relevant regulations and industry best practices.

Chapter 6: Case Studies and Real-World Examples: Illustrating practical applications of API 521 principles.

Chapter 7: The Future of Pipeline Integrity Management: Exploring emerging technologies and trends.

Conclusion: Key takeaways and recommendations for implementing API 521 effectively.

Detailed Explanation of Outline Points:

Introduction: This section will define API Standard 521, explaining its purpose, scope, and significance within the oil and gas industry. It will also briefly introduce the importance of pipeline integrity management for safety and environmental protection.

Chapter 1: Understanding Pipeline Corrosion Mechanisms: This chapter delves into the science behind pipeline corrosion, covering various types such as uniform corrosion, pitting, stress corrosion cracking, and microbiologically influenced corrosion (MIC). It will explain the factors influencing corrosion rates and their impact on pipeline lifespan.

Chapter 2: Risk Assessment and Mitigation Strategies: This chapter focuses on the process of identifying and evaluating corrosion risks within a pipeline system. It will cover methodologies like hazard identification, risk analysis, and the development of mitigation strategies based on risk prioritization. This includes exploring the use of corrosion inhibitors, coatings, and cathodic protection.

Chapter 3: Inspection and Monitoring Techniques: This section details various non-destructive testing (NDT) methods used for pipeline inspection, such as in-line inspection (ILI), magnetic flux leakage (MFL), and ultrasonic testing (UT). It also covers data analysis techniques to interpret inspection results and predict future corrosion behavior.

Chapter 4: Repair and Remediation Methods: This chapter explains different methods for repairing corroded pipelines, including weld repairs, pipe replacement, and the use of composite materials. It will consider the selection criteria for appropriate repair techniques based on the severity and type of damage.

Chapter 5: Regulatory Compliance and Best Practices: This section covers the legal and regulatory aspects of pipeline integrity management, including compliance with relevant standards (e.g., OSHA, PHMSA) and best practices outlined in API 521. It will explain the importance of documentation and record-keeping.

Chapter 6: Case Studies and Real-World Examples: This chapter will present real-world examples of pipeline corrosion incidents and successful mitigation strategies. These case studies will illustrate the practical application of API 521 principles and demonstrate the consequences of inadequate corrosion management.

Chapter 7: The Future of Pipeline Integrity Management: This chapter will explore emerging technologies and trends in pipeline integrity management, including the use of advanced sensors, machine learning, and data analytics for improved corrosion prediction and risk assessment.

Conclusion: This concluding section will summarize the key takeaways from the ebook, reinforcing the importance of adhering to API Standard 521 for safe and efficient pipeline operation. It will offer recommendations for implementing a comprehensive pipeline integrity management program.

Keywords: API Standard 521, Pipeline Corrosion, Integrity Management, Oil and Gas Industry, Corrosion Prevention, Risk Assessment, Inspection Techniques, Repair Methods, Regulatory Compliance, Cathodic Protection, In-line Inspection (ILI), Non-Destructive Testing (NDT), Pipeline Safety, Environmental Protection, Pipeline Integrity, Pipeline Maintenance

(The following sections would be further expanded upon in the full ebook, incorporating relevant

research, detailed explanations, visuals, and practical examples.)

Frequently Asked Questions (FAQs)

1. What is the purpose of API Standard 521? API Standard 521 provides recommended practices for managing the integrity of gathering and transmission pipeline systems, focusing on the prevention and mitigation of corrosion.
2. Who should use API Standard 521? This standard is relevant to anyone involved in the operation, maintenance, or regulation of oil and gas pipelines, including pipeline operators, engineers, inspectors, and regulatory agencies.
3. How often should pipeline inspections be conducted according to API 521? Inspection frequency varies depending on factors like pipeline age, material, operating conditions, and risk assessment. API 521 outlines guidelines for determining appropriate inspection intervals.
4. What are the key elements of a successful pipeline integrity management program? A comprehensive program includes risk assessment, regular inspections, effective repair strategies, and adherence to regulatory requirements.
5. What are the consequences of neglecting pipeline corrosion management? Neglecting corrosion management can lead to pipeline failures, resulting in environmental damage, economic losses, and potential injury or fatalities.
6. What role does cathodic protection play in corrosion prevention? Cathodic protection is a widely used technique that applies an electrical current to the pipeline to prevent corrosion.
7. How does API 521 address the challenges of microbiologically influenced corrosion (MIC)? API 521 emphasizes the importance of identifying and managing MIC through appropriate inspection techniques and mitigation strategies.
8. What are some emerging technologies impacting pipeline integrity management? Advanced sensor technologies, machine learning, and data analytics are transforming pipeline integrity management, enabling more proactive and efficient corrosion monitoring and management.
9. Where can I find the latest version of API Standard 521? The latest version of API Standard 521 can be purchased directly from the American Petroleum Institute (API) website.

Related Articles:

1. Pipeline Integrity Management: A Holistic Approach: This article explores the broader context of pipeline integrity management, outlining key principles and best practices beyond API 521.

2. **Advanced NDT Techniques for Pipeline Inspection:** This article focuses on the latest advancements in non-destructive testing methods used for detecting pipeline corrosion and other defects.
3. **The Economics of Pipeline Corrosion: Costs and Benefits of Prevention:** This article analyzes the economic impact of pipeline corrosion, highlighting the cost-effectiveness of proactive corrosion management.
4. **Regulatory Landscape for Pipeline Safety: A Global Overview:** This article provides a comprehensive overview of the various regulations and standards governing pipeline safety worldwide.
5. **Case Studies in Pipeline Failure Analysis: Lessons Learned:** This article presents detailed case studies analyzing pipeline failures, identifying root causes, and drawing lessons for future prevention.
6. **The Role of Data Analytics in Pipeline Integrity Management:** This article discusses the use of data analytics to improve corrosion prediction, risk assessment, and maintenance scheduling.
7. **Effective Corrosion Mitigation Strategies for Different Pipeline Environments:** This article addresses the specific challenges of corrosion management in various environmental conditions.
8. **Developing a Comprehensive Pipeline Integrity Management Plan:** This article provides a step-by-step guide for developing and implementing a comprehensive pipeline integrity management plan.
9. **The Future of Pipeline Technology: Innovations in Corrosion Control:** This article explores emerging technologies and innovations aimed at improving corrosion control and enhancing pipeline safety.

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complexity of key contested terms in a series of mini-essays - References relevant codes and standards

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These important developments coupled with a global concern on green house gas emissions provide a fresh impetus to engage in new and more focused research activities aimed at mitigating or resolving the challenges facing the industry. Academic researchers and plant engineers in the gas processing industry will benefit from the state of the art papers published in this collection that cover natural gas utilization, sustainability and excellence in gas processing. - Provides state-of-the-art contributions in the area of gas processing - Covers solutions to technical and environmental problems - Input from academia and industry

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heaters, heat exchangers, effluent water treatment systems, and flares. It is noted that the documents and articles included in this book will surely be of assistance and value to the readers and specifically to engineers in the Oil & Gas field.

api standard 521: *Lees' Loss Prevention in the Process Industries* Frank Lees, 2005-01-10 Over the last three decades the process industries have grown very rapidly, with corresponding increases in the quantities of hazardous materials in process, storage or transport. Plants have become larger and are often situated in or close to densely populated areas. Increased hazard of loss of life or property is continually highlighted with incidents such as Flixborough, Bhopal, Chernobyl, Three Mile Island, the Phillips 66 incident, and Piper Alpha to name but a few. The field of Loss Prevention is, and continues to, be of supreme importance to countless companies, municipalities and governments around the world, because of the trend for processing plants to become larger and often be situated in or close to densely populated areas, thus increasing the hazard of loss of life or property. This book is a detailed guidebook to defending against these, and many other, hazards. It could without exaggeration be referred to as the bible for the process industries. This is THE standard reference work for chemical and process engineering safety professionals. For years, it has been the most complete collection of information on the theory, practice, design elements, equipment, regulations and laws covering the field of process safety. An entire library of alternative books (and cross-referencing systems) would be needed to replace or improve upon it, but everything of importance to safety professionals, engineers and managers can be found in this all-encompassing reference instead. Frank Lees' world renowned work has been fully revised and expanded by a team of leading chemical and process engineers working under the guidance of one of the world's chief experts in this field. Sam Mannan is professor of chemical engineering at Texas A&M University, and heads the Mary Kay O'Connor Process Safety Center at Texas A&M. He received his MS and Ph.D. in chemical engineering from the University of Oklahoma, and joined the chemical engineering department at Texas A&M University as a professor in 1997. He has over 20 years of experience as an engineer, working both in industry and academia. New detail is added to chapters on fire safety, engineering, explosion hazards, analysis and suppression, and new appendices feature more recent disasters. The many thousands of references have been updated along with standards and codes of practice issued by authorities in the US, UK/Europe and internationally. In addition to all this, more regulatory relevance and case studies have been included in this edition. Written in a clear and concise style, *Loss Prevention in the Process Industries* covers traditional areas of personal safety as well as the more technological aspects and thus provides balanced and in-depth coverage of the whole field of safety and loss prevention. * A must-have standard reference for chemical and process engineering safety professionals * The most complete collection of information on the theory, practice, design elements, equipment and laws that pertain to process safety * Only single work to provide everything; principles, practice, codes, standards, data and references needed by those practicing in the field

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processes and equipment. The third edition retains its hallmark features of scope, clarity and practical emphasis, while providing the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards, as well as coverage of the latest aspects of process design, operations, safety, loss prevention, equipment selection, and more. The text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken), and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). - Provides students with a text of unmatched relevance for chemical process and plant design courses and for the final year capstone design course - Written by practicing design engineers with extensive undergraduate teaching experience - Contains more than 100 typical industrial design projects drawn from a diverse range of process industries NEW TO THIS EDITION - Includes new content covering food, pharmaceutical and biological processes and commonly used unit operations - Provides updates on plant and equipment costs, regulations and technical standards - Includes limited online access for students to Cost Engineering's Cleopatra Enterprise cost estimating software

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on North American gas processing and changing gas treating requirements due to shale gas production. It covers the international nature of natural gas trade, LNG, economics, and more. To help nonengineers understand technical issues, the first 5 chapters present an overview of the basic engineering concepts applicable throughout the gas, oil, and chemical industries. The following 15 chapters address natural gas processing, with a focus on gas plant processes and technologies. The book contains 2 appendices. The first contains an updated glossary of gas processing terminology. The second is available only online and contains useful conversion factors and physical properties data. Aimed at students as well as natural gas processing professionals, this edition includes both discussion questions and exercises designed to reinforce important concepts, making this book suitable as a textbook in upper-level or graduate engineering courses.

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management tactics of domino effects, -facilitating prevention - Identifies areas where new research is needed

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process plants and interconnecting piping systems. As a follow up with Smith's best-selling work published in 2007 by Gulf Publishing Company, *The Fundamentals of Piping Design*, this handbook contributes more customized information on the necessary process equipment required for a suitable plant layout, such as pumps, compressors, heat exchangers, tanks, cooling towers and more! While integrating equipment with all critical design considerations, these two volumes together are must-haves for any engineer continuing to learn about piping design and process equipment.

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Chris Jackson, Jason Gooley, Adrian Iliesiu, Ashutosh Malegaonkar, 2020-10-07 This is the eBook edition of the Cisco Certified DevNet Associate DEVASC 200-901 Official Cert Guide. This eBook does not include access to the companion website with practice exam that comes with the print edition. Access to the video mentoring is available through product registration at Cisco Press; or see the instructions in the back pages of your eBook. Trust the best-selling Official Cert Guide series from Cisco Press to help you learn, prepare, and practice for exam success. They are built with the objective of providing assessment, review, and practice to help ensure you are fully prepared for your certification exam. Master Cisco Certified DevNet Associate DEVASC 200-901 exam topics Assess your knowledge with chapter-opening quizzes Review key concepts with exam preparation tasks Learn from more than two hours of video mentoring Cisco Certified DevNet Associate DEVASC 200-901 Official Cert Guide presents you with an organized test preparation routine through the use of proven series elements and techniques. "Do I Know This Already?" quizzes open each chapter and enable you to decide how much time you need to spend on each section. Exam topic lists make referencing easy. Chapter-ending Exam Preparation Tasks help you drill on key concepts you must know thoroughly. Cisco Certified DevNet Associate DEVASC 200-901 Official Cert Guide focuses specifically on the objectives for the Cisco Certified DevNet Associate DEVASC exam. Four leading Cisco technology experts share preparation hints and test-taking tips, helping you identify areas of weakness and improve both your conceptual knowledge and hands-on skills. Material is presented in a concise manner, focusing on increasing your understanding and retention of exam topics. Well regarded for its level of detail, assessment features, comprehensive design scenarios, , this official study guide helps you master the concepts and techniques that will enable you to succeed on the exam the first time. The official study guide helps you master all the topics on the Cisco Certified DevNet Associate DEVASC 200-901 exam, including: Software Development and Design Understanding and Using APIs Cisco Platforms and Development Application Deployment and Security Infrastructure and Automation Network Fundamentals

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industry's fastest-growing segment - Includes numerous new products that have never before been written about in the mainstream literature

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