ASME BJRS 2022

Bolted Joint Reliability Symposium

ASME COURSE
OCT. 24–25, 2022

CONFERENCE
OTC.26–27, 2022

Norris Conference Center
CityCentre
Houston, TX

Program

A NEW ERA OF SEALING TECHNOLOGY

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ASME BJRS 2022

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Contents

ASME BJRS2022 TECHNICAL PROGRAM COMMITTEE

Hakim A. Bouzid, Chairman

ASME

Welcome to Houston for the 2022 ASME Bolted Joint Reliability Symposium! The BJRS is an outstanding international technical forum through which participants can exchange opinions and ideas with leading experts from industry and academia, and deepen their knowledge base through exposure to diverse topics of bolted joints. The symposium, built with a pioneering spirit, helps disseminate cutting-edge knowledge on Sealing and Fastening Technologies to our global community of practice.

This international event is the second of a new ASME conference series that will focus exclusively on Bolted Flange Connections. The main objective of this conference is to present in one venue, the advances around the world in the design, component selection, assembly and troubleshooting of Bolted Flange Connections that have been made in the last decade.

The ASME Pressure Vessels and Piping Division is the primary sponsor of this Symposium. This year, under the theme “A New Era in Sealing Technology,” the symposium has attracted 18+ presentations. In addition, the ASME learning department is organizing a special two-days ASME course on Bolted Joints and Gasket Behavior given by Jack Hawkins. The two-days symposium will start with a Plenary Session feature keynote presentation each day by expert speakers Randy Walker and Hakim A. Bouzid.

Technical presentations presented at this symposium are separated into sessions according to their technical areas. Since fewer and fewer computers allow for playing CD-ROMs and many companies discourage the use of USB memory sticks, we chose to make technical presentations available online to preregistered attendees in the link sent to their emails.

On behalf of the ASME staff, the PVP Division Leadership Team, the BJRS organizing committee and myself, the symposium chair, we would like to extend our sincere gratitude to all Contributing presenters, Reviewers, Session Organizers and Session Chairs, our ASME Conference and Events Manager, Kimberly Miceli, ASME TEC Operations Manager, Jamie Hart, and our ASME Publishing & WebTool Coordinator, Stacey Cooper. Without their contributions and assistance, we would not have been able to achieve the success of the BJRS2022. Finally, we would also like to recognize our financial sponsors for their generosity. Their contributions are greatly appreciated. I sincerely hope that you enjoy the technical presentations, discussions, exhibits and social program, and that you find your participation in BJRS2022 to be very worthwhile.

Hakim A. Bouzid
Symposium Chair

SYMPOSIUM/TECHNICAL SESSIONS

Hakim A. Bouzid

Symposium Chair

Plenary Technical Session 1.0 – Session chair

Session 2.2: Joining and Fastening I – Session chair

Session 2.3: Joining and Fastening II – Session chair

Randy Wacker

Session 1.1: Understanding BFC Design Methods – Session Chair

Hubert Lejeune

PVP International Coordinator

Session 1.2: Gasket Selection and Testing – Session Chair

Clay Rodery

PVP Division vice-Chair

Session 1.3: High Temperature Applications – Session chair

Plenary Technical Session 2.0 – Session chair

Anita Bausman

Session 2.1: Special Applications and Lessons Learned Testing – Session Chair

Opening Ceremony & Plenary Session

A New Era in Sealing Technology

The Symposium opens in Magnolia, Norris Conference Center, on Wednesday, October 26th 2022 at 8:45 AM. Representatives of the American Society of Mechanical Engineers will welcome the attendees. The first plenary technical presentation will be delivered on Wednesday October 26th 2022 at 9:00 AM by Randy Wacked, P.E. Senior Consultant, Inertech, Inc, USA. The second plenary technical presentation will be delivered on Thursday October, 27th 2022 at 9:00 AM by Dr. Hakim Bouzid, Professor and Director of the Static and Dynamic Sealing Laboratory, Ecole de Technology Superieure, Canada.

Leak Tightness Considerations for Bolted Flange Connections

Randy Wacker
P.E. Senior Consultant,
Inertech, Inc.
Monterey Park, CA, United States

Randy Wacker graduated from California Polytechnic University with a BSME in 1980. He then began 33 years of employment with E.I. DuPont. Responsibilities included Area Engineer, Maintenance Supervisor, Production Supervisor, Mechanical Lead for plant expansion(s) and the development of company engineering codes. 20 years were spent working in plant environments and an additional 13 years as a consultant in the DuPont Engineering Technology Department, Process Equipment Group.

Since 2013 he has functioned as the Senior Consultant for Inertech, Inc. where he develops PVRC leak-tight solutions for a wide array of equipment and provides customer training. He was the instructor for the ASME PD539 course Bolted Joints and Gasket Behavior until the pandemic restricted travel. Current and past engineering memberships and endeavors are listed below.

ASTM F03 Committee on Sealing (where he led the effort to finalize ASTM F2836-18, Standard Practice for Gasket Constants for Bolted Flange Design), European Sealing Association (ESA), Flange Committee, ASME RTP-1 Subcommittee on design, ASME. ASME NPPS NM-2 Subgroup on Material. ASME Special Working Group for Bolted Flange Joints. Founding member of Advisory Group that developed the ASME Bolted Specialist Qualification Training (BSQT) course. SAE AMS Aerospace G9 Committee on Sealing. National Board Inspection Code (NBIC), Fluid Sealing Association (FSA). API 510 (Pressure Vessel Inspector) and API 653 (above ground storage tank inspector) Certificates.

Completed Pressure Vessel Research Council project PVP 2008-61410, finite element analysis of welding neck flanges. Over 3000 FEAs completed. Reviewer for Nuclear Engineering and Design Magazine Speaker at Plant Engineers FRP Forum Presenter ASME PVP, 2014, Session 2.24, Practical Issues Related to Bolted Flange Joints. Presenter ASME PVP 2008-6140, Fastener Preload Guidance Methodology for ASME B16.5 Welding Neck Flanges. Published over ten magazine articles that discuss various sealing considerations for bolted flange connections.

On the Self Loosening of Bolted Joints

Hakim A. Bouzid
Ph.D, ASME fellow,
Professor, Ecole de Technologie Supérieure
Montreal, Qc, Canada

Dr. Hakim Bouzid is a full professor at Ecole de Technologie Supérieure of Montreal Canada. He graduated from mechanical engineering Department of Nottingham University, UK, 1981. He holds a master Degree in Tribology from Leeds University, UK in 1982. He has a Ph.D in bolted joints received from École Polytechnique, Montreal, Canada, 1995. He worked in the nuclear industries for 8 years specializing in pressure vessels and piping before joining the Tightness Testing Research Laboratory at Ecole Polytechnique in 1990 as a research scientist. In 2000, he became a professor at Ecole de Technologie Superieure in Montreal. He is currently the director the Static and Dynamic Sealing Laboratory of ÉTS. Prof. Bouzid has authored or co-authored over 250 technical papers on different subjects including stress analysis, bolted joints, valves, polymers and biomechanics.

Dr. Bouzid is a fellow of ASME. He is a member of the Pressure Vessel ad Piping Division Executive committee and a member of the ASME Fellow Review Committee. He served as a member of the Pressure Vessel Research Council, ASME subworking Group on Bolted Flange Connections, ASME PCC-1 and ASTM F03 committee on gaskets.

ASME COURSE

Bolted Joints and Gasket Behavior

Course Type: In-Person
Product Number: IPPD539
Credits: CEUs: 1.50 | PDHs: 15.00

Understand bolted joint fundamentals and gasketed joint torque factors, bolting patterns, and gasket behavior, tightness, selection and specification.

This course is a two-day in person course being offered in conjunction with the Bolted Joint Reliability Symposium (BJRS). The course commences at 8:30 AM and ends at 5:30 PM (Central Time) on Monday and Tuesday October 24-25th 2022, each day with breaks scheduled throughout.

Bolted and gasketed joints are critical to pressure-containing and industrial systems worldwide. This two-day course is an engineer's guide to bolting and gasket design, selection and installation. It provides an overview of bolted joint fundamentals and focuses on the roles of bolts and gaskets in developing and maintaining leak-tight connections of bolted flange joints, including troubleshooting of existing bolted flange connection.

This course examines how to assess a successful value of bolt load, as well as explains the importance of specifying a tightening procedure. It introduces the subject of PVRC (Pressure Vessel Research Council) leak tightness calculations and presents an overview of current trends and practices to achieve reliable leak-tight bolted joint solutions.

Instructor:

Jack Hawkins, P.E.
Boeing, Michoud
New Orleans, LA, United States

Jack Hawkins, has over 30 years of experience, primarily in technical roles of stress analysis and mechanical design of equipment and components. While employed by engineering service providers, he specialized in stress analysis and code compliance of piping and pressure systems in the petrochemical industry. Jack's piping and pressure vessel work includes fitness-for-service (FFS) assessments of damaged equipment, design by analysis, troubleshooting and analysis of bolted flange joint connections, expansion joint design and analysis, and fire damage assessment of piping and equipment. He has extensive experience in FEA analysis and has performed numerous finite element analyses of bolted connections, with and without gaskets. Jack has served on the LSU (Louisiana State University) Capstone Review panel for over 20 years and as an alumni advisor for multiple LSU mechanical engineering Capstone projects.

MONDAY OCTOBER 24, 2022

Course part 1:

Bolted Joints and Gasket Behavior I

Houston, Norris Conference Center,

Pecan 8:30 am - 5:30 pm

Course Instructor: Jack Hawkins, Boeing Michoud,

New Orleans, LA, United States

Course Content Part 1

Introduction to the Bolted Joint

Properties Affecting In-service Conditions

Stress and Strain Considerations

Introduction to Assembly and Clamping Force

TUESDAY OCTOBER 25, 2022

ASME Course

Course part 2:

Bolted Joints and Gasket Behavior II

Houston, Norris Conference Center,

Pecan 8:30 am - 5:30 pm

Course Instructor: Jack Hawkins, Boeing, Michoud,

New Orleans, LA, United States

Course Content Part 2

ASME PCC-1 Guidelines

Understanding & Preventing Gasket Failure

Joint Calculation Methods

WEDNESDAY OCTOBER 26, 2022

Plenary Technical Session I

Plenary Session 1.0: LEAK TIGHTNESS CONSIDERATIONS FOR BOLTED FLANGE CONNECTIONS

Presented by Randy Walcker, Inertech, Inc., Monterey Park, CA, United States

Houston, Norris Conference Center,
Magnolia 9:00 am - 10:00 am

Session Chair: Hakim A. Bouzid, Ecole de Technologie Superieure, Montreal, QC, Canada

Technical Session

Session 1.1: UNDERSTANDING BFC DESIGN METHODS

Houston, Norris Conference Center,
Magnolia 10:30 am - 12:30 pm

Session Organizer: Randy Wacker, Inertech, Inc., Monterey Park, CA, United States

Bolted Joint Calculations for Combined Loading Conditions

Oral Presentation. BJRS2022-98907
Tuan Nguyen, *Raytheon, Tustin, CA, United States*

Gasket Design and Assembly for Large Diameter Glass Lined Vessel Flanges

Oral Presentation. BJRS2022-100355
Fitzgerald A. Waterland, Anita Bausman,
SP Technologies, Prince George, VA, United States

On the Tightness and Strength of ASME Section X FRP Flanges

Oral Presentation. BJRS2022-98251
Sofiane Bouzid, Hakim A. Bouzid, Anh Dung Ngo, *Ecole de Technologie Superieure, Montreal, QC, Canada*

The Use of different Media in Leakage Tests

Oral Presentation. BJRS2022-100374
Ethan Mansfield, amtec North America, Inc., Athens, OH, United States, **Frank Herkert, Manfred Shaaf,** amtec advanced measurements Gmbh, Lauffen am Neckar, Germany

Technical Session

Session 1.2: GASKET SELECTION AND TESTING

Houston, Norris Conference Center,
Magnolia 1:30 pm - 3:00 pm

Session Organizer: Randy Walcker, *Inertech, Inc., Monterey Park, CA, United States*

Performance Evaluation of Non-Elastomer Gaskets in Fiberglass Reinforced Plastic Flanges

Oral Presentation. BJRS2022-99143
Tim Rice, Jeff Wilson, *SP Technologies, Prince George, VA, United States*

A Study on the Influence of Operational Factors on Flange Face Corrosion Using a Novel Experimental Test Bench

Oral Presentation. BJRS2022-99171
Soorosh Hakimian, Hakim A. Bouzid, Lucas Hof, *Ecole de Technologie Superieure, Montreal, QC, Canada*

PTFE as a Bolted Flanged Joint Gasket – Why, Why Not, and Which One?

Oral Presentation. BJRS2022-100263
Anita Bausman, *VSP Technologies, Prince George, VA, United States*

Technical Session

Session 1.3: HIGH TEMPERATURE APPLICATIONS

Houston, Norris Conference Center,
Magnolia 3:30 pm - 5:00 pm

Session Chair: Clay Rodery, *C&S Technology LLC, League City, TX, United States*

Flange Leakage Due to Thermal Bowing

Oral Presentation. BJRS2022-98727
Yuqing Liu, Philip Diwakar, Matt Jaouhari, *Bechtel Oil, Gas, and Chemical, Houston, TX, United States*

Understanding Bolt Stress Behavior in Temperature Cycling Environments

Oral Presentation. BJRS2022-98973
Robert Taylor, *3S Superior Sealing Services LLC, Houston, TX, United States*

Temperature Variation in the Bolted Flange Joint

Oral Presentation. BJRS2022-99065
Robert Taylor, *3S Superior Sealing Services LLC, Houston, TX, United States*

THURSDAY OCTOBER 27, 2022

Plenary Technical Session II

Plenary Session #2.0: ON THE SELF LOOSENING OF BOLTED JOINTS

Presented by Hakim A. Bouzid, *Ecole de Technologie Superieure, Montreal, QC, Canada*

Houston, Norris Conference Center,
Magnolia 9:00 am - 10:00 am

Session Chair: Clay Rodery, *C&S Technology LLC, League City, TX, United States*

Technical Session

Session 2.1: SPECIAL APPLICATIONS AND LESSONS LEARNED TESTING

Houston, Norris Conference Center,
Magnolia 10:00 am - 12:00 pm

Session Organizer: Anita Bausman, *SP Technologies, Prince George, VA, United States*

Sulfuric Acid Tank Car Fill Port Gasket Evaluation

Oral Presentation. BJRS2022-100330
Tim Rice, *VSP Technologies, Prince George, VA, United States*

Valve Packing Calculation for Tightening Optimization Regarding Emissions and Energy Consumption

Oral Presentation. BJRS2022-99116
Hubert Lejeune, Jordan Leray, *CETIM, Nantes, France*

Strategies for Realizing and Declaring Significantly Lower Emissions on Gasketed Connectors at US Refineries

Oral Presentation. BJRS2022-100357
Robbie Riggs, *Teadit North America, Pasadena, TX, United States*

Technical Session

Session 2.2: JOINING AND FASTENING I

Houston, Norris Conference Center,
Magnolia 1:15 pm - 3:15 pm

Session Organizer: Hakim A. Bouzid, *Ecole de Technologie Superieure, Montreal, QC, Canada*

ASME PCC-1 and EN 1591-1 - A Comparison

Oral Presentation. BJRS2022-100377
Stean Hufnagel, Manfred Shaaf, *amtec advanced measurements Gmbh, Lauffen am Neckar, Germany*

Measurement of Bolt Force and Flange Gap Using the Electric Power Research Institute's Flanged Joint Assembly Module Training Tool

Oral Presentation. BJRS2022-100354

Matthew Hinman, *Electric Power Research Institute, Palo Alto, CA, United States,* **Matthew Wolfson**, *Dominion Engineering, Inc., Reston, VA, United States*

On the Stiffness of Bolts and Clamped Members

Oral Presentation. BJRS2022-100361
Rashique Iftikhar Rousseau, Hakim A. Bouzid, *Ecole de Technologie Superieure, Montreal, QC, Canada*

Technical Session

Session 2.3: JOINING AND FASTENING II

Houston, Norris Conference Center,
Magnolia 3:45 pm - 4:45 pm

Session Organizer: Hakim A. Bouzid, *Ecole de Technologie Superieure, Montreal, QC, Canada*

No Reference Measurements? No Problem! A Machine Learning-Based Approach to Measuring Bolt Tension

Oral Presentation. BJRS2022-100366
Joshua Scott, *FDH Infrastructure Services, Raleigh, NC, United States*

Gall-Free Fastener Performance Evaluation

Oral Presentation. BJRS2022-100373
Michael F. Dolan, Mark Ruffin, *HYTORC Corporation, Mahwah, NJ, United States*

BJRS2022 Program Schedule

Day 1:	Start	Finish			Presenter
Wednesday	7:30	8:45	Registration, Breakfast, Exhibits Open		
October 26	8:45	9:00	Welcome		H. Bouzid
	9:00	10:00	**Plenary I**		
			Leak Tightness Considerations for Bolted Flange Connections		R. Wacker
	10:00	10:30	*Break*		
Paper #			**Session 1.1: Understanding BFC Design Methods** Session Chair: Randy Wacker		
1	10:30	11:00	#98907	Bolted Joint Calculations for Combined Loading Conditions	T. Nguyen
2	11:00	11:30	#100355	Gasket Design and Assembly for Large Diameter Glass Lined Vessel Flanges	A. Bausman
3	11:30	12:00	#98251	On the Tightness and Strength of Asme Section X FRP Flanges	H. Bouzid
4	12:00	12:30	#100374	The Use of different Media in Leakage Tests	E. Mansfield
	12:30	1:30	*Lunch*		
			Session 1.2: Gasket Selection and Testing Session Chair: Hubert Lejeune		
5	1:30	2:00	#99143	Performance Evaluation of Non-Elastomer Gaskets in Fiberglass Reinforced Plastic Flanges	T. Rice
6	2:00	2:30	#99171	A Study on the Influence of Operational Factors on Flange Face Corrosion Using a Novel Experimental Test Bench	H. Bouzid
7	2:30	3:00	#100263	PTFE as a Bolted Flanged Joint Gasket – Why, Why Not, and Which One?	A. Bausman
	3:00	3:30	*Break*		
			Session 1.3: High Temperature Applications Session Chair: Clay Rodery		
8	3:30	4:00	#98727	Flange Leakage Due to Thermal Bowing	Y. Liu
9	4:00	4:30	#98973	Understanding Bolt Stress Behavior in Temperature Cycling Environments	R. Taylor
10	4:40	5:00	#99065	Temperature Variation in the Bolted Flange Joint	R. Taylor
	5:00		*Adjourn Day 1*		

EXHIBITS OPEN

Day 2:	Start	Finish			
Thursday	7:30	8:45	Breakfast, Exhibits Open		
October 27	9:00	10:00	**Plenary II**		
			On the Self Loosening of Bolted Joints		H. Bouzid
	10:00	10:30	*Break*		
Paper #			**Session 2.1: Special Applications and Lessons Learned Testing** Session Chair: Anita Bausman		
11	10:30	11:00	#100330	Sulfuric Acid Tank Car Fill Port Gasket Evaluation	T. Rice
12	11:00	11:30	#99116	Valve Packing Calculation for Tightening Optimization Regarding Emissions and Energy Consumption	H. Lejeune
13	11:30	12:00	#100357	Strategies for Realizing and Declaring Significantly Lower Emissions on Gasketed Connectors at US Refineries	R. Riggs
	12:00	1:15	*Lunch*		
			Session 2.2: Joining and Fastening I Session Organizer: Hakim Bouzid		
14	1:15	2:15	#100377	ASME PCC-1 and EN 1591-1 - A Comparison	S. Hufnagel
15	2:15	2:45	#100354	Measurement of Bolt Force and Flange Gap Using the Electric Power Research Institute's Flanged Joint Assembly Module Training Tool	M. Hinman
16	2:45	3:15	#100361	On the Stiffness of Bolts and Clamped Members	H. Bouzid
	3:15	3:45	*Break*		
			Session 2.3: Joining and Fastening II Session Organizer: Hakim Bouzid		
17	3:45	4:15	#100366	No Reference Measurements? No Problem! a Machine Learning-Based Approach to Measuring Bolt Tension	J. Scott
18	4:15	4:45	#100373	Gall-Free Fastener Performance Evaluation	M. Dolan
	4:45		*Symposium Closing*		

EXHIBITS OPEN

BJRS 2022 EXHIBITORS

Red Oak Ballroom B

3S – Superior Sealing Services manufactures and stocks superior quality semi-metallic gaskets at our Houston facility, and by utilizing the latest technology in equipment, along with a very experienced team, we provide a higher level of service from quoting to shipping.

We sell through established relationships with our knowledgeable distribution network, and we provide value-added service to our customers and theirs through quick response, competitive pricing, excellent technical support and superior fluid sealing products.
https://3sgaskets.com/

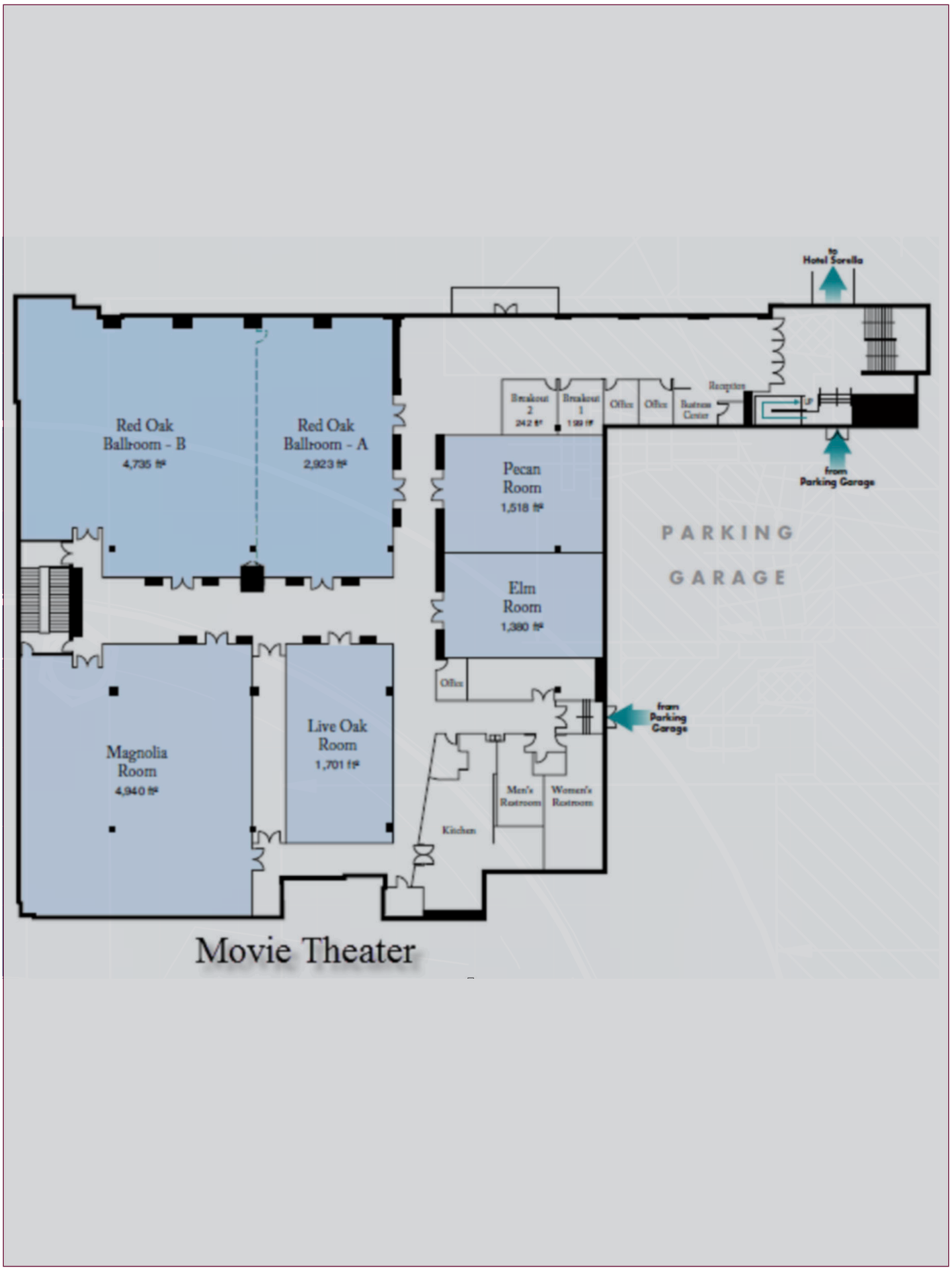
amtec North America, Inc. is operating a testing laboratory in Athens, OH. We offer all kind of gasket testing like ROTT, HOBT or EN 13555 as well as valve qualification testing according to API 641 and ISO 15848-1. In addition, we provide engineering services for the design of bolted flanged joints including Finite Element Analysis.

For 25+ years Applied Bolting has been manufacturing self-indication direct tension indicators, known as DuraSquirt DTIs. We offer three types of DuraSquirt DTIs for the flange market, Target Stress DTi verifies that your torqueing pass actually achieved the proper stud stress. The second is called Single Pass Tightening, in which a #300 and #600 flange can be tightening in a single tightening pass. The SSR DTI is designed for Hot Bolting applications.
https://www.appliedbolting.com/

HYTORC makes industrial bolting safer and simpler. With 50 years of experience focused entirely on developing the highest quality industrial bolting systems. HYTORC is the most trusted name in the industry. From steel mills and mining equipment to refineries, power plants, and wind turbines; we have developed solutions for every bolting application imaginable. For custom projects, our highly experienced engineering team is at your service to design the most efficient solution for your project.
https://hytorc.com/

We are an internationally renowned manufacturer of hot forged industrial fasteners. Our patented bolting products are trusted for their quality, performance and reliability. At Valley Forge, we have developed patented technologies that will completely change your way of thinking about a bolted joint. Our manufacturing technologies give you the ability to monitor direct load in the fastener while it is in service.
www.vfbolts.com

MAP



NOTES

ASME BJRS

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