

DETAILED PROGRAM SCHEDULE AND PARTICIPANT INSTRUCTIONS

6th INTERNATIONAL CONFERENCE
on PROTECTIVE STRUCTURES

ICPS6


MAY 14-17, 2023



AUBURN
UNIVERSITY

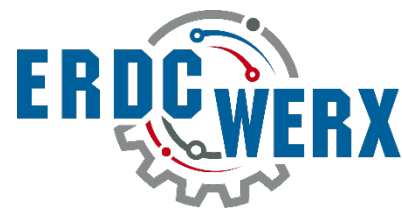
SMULL GINN
COLLEGE OF ENGINEERING

Website: eng.auburn.edu/icps6
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 IAPS International Association
of Protective Structures



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CONFERENCE CHAIRPERSONS:

James S. Davidson (**Jim**)

Gottlieb Professor of Structural Engineering, Auburn University

Catherine S. Stephens (**Catie**)

Director, International Research Office

U.S. Army Engineer Research and Development Center

Auburn Alabama is in the central time zone; all times shown are central time. Note that Atlanta Georgia (and ATL) is in the eastern time zone, which is one hour ahead of central time.

PARKING

For those that will have vehicles . . . we will ask at check-in, and then we will provide your email address to the registration system. You subsequently get an email with a link to register your vehicle through a webpage. You will be permitted to park in any 'A' or 'B' zone (<https://auburn.edu/administration/parking/visitors/>), which includes the second and third levels of the parking deck on the south side of AUHCC. Parking space demand is typically not high during the summer, and summer semester does not begin until the last day of the conference (17 May), but everyone with vehicles must register and be sure to park in an 'A' or 'B' zone space.

PROGRAM VENUES

All plenary and technical sessions will be on the second floor of the Brown-Kopel Engineering Student Achievement Center (B-K), which is approximately 500m from AUHCC; the Tuesday night dinner is next door to B-K, and the Monday evening stadium function is also approximately 500m from AUHCC and B-K. Therefore all ICPS6 events are within easy walking distance. Signs and students wearing orange shirts will help guide. Monday and Tuesday lunches will be served in B-K. The center of town is essentially the northeast corner of campus, so is also within easy walking distance from AUHCC and all events.

FOR THOSE STAYING AT HOTELS OTHER THAN AUHCC

There are many other hotels in the area, but they are not within easy walking distance. We intend to provide a shuttle to/from the Marriott TownePlace Suites for early morning and evenings, but will not be able to accommodate all hotels and frequent shuttles. The usual taxi services, Uber, Lyft, etc. are available but may require a call or reservation ahead of time as they are not typically stationed at hotels or on campus as they tend to be in large cities. **If you are staying at the Marriott TownePlace Suites and need the shuttle ride to the conference, please be at the front entrance by 7:20 on Monday, Tuesday, and Wednesday mornings.** Other shuttle rides will be arranged as-needed.

ASSISTANTS

AU graduate students will be wearing orange shirts and are here to assist.

A FEW IMPORTANT GENERAL NOTES FOR EVERYONE

- Please participate fully. Evening events will be fun and are intended to encourage persons with similar interests but from disparate backgrounds and regions to develop collaborations and friendships.
- To facilitate all of the presentations over the 2.5-day period, we had to schedule five parallel sessions, which will spread us somewhat thin. It is very important that we populate all technical sessions so that every session and presentation has an audience.
- Note that most of the breaks are quite short (15 minutes) and the sessions are somewhat long (2 hours). We will keep the coffee flowing.

INSTRUCTIONS FOR PRESENTERS

- We can help upload your presentation, including at the Sunday check-in / reception. The PoC is John Hatfield, jeh0047@auburn.edu. Presenters are also welcome to bring their PPT file to the session on USB flashdrives, but please make sure that everything is loaded and working before the session begins.
- We will not collect presenter bios ahead of the conference. For simplicity and time efficiency, the moderator will briefly introduce each presenter, affiliation and presentation title, and then the presenter can provide subsequent introduction at the beginning of their presentation. However, presenters are also welcome to bring a very brief introduction on paper to the moderator at the beginning of the session.
- Please watch your time. Each 2-hour session typically has 5 or 6 presentations, which corresponds with 15 minute presentations, plus a couple of questions.

INSTRUCTIONS FOR MODERATORS

- Please introduce yourself and your affiliation at the beginning of the session.
- Each session will have at least one AU student assistant assigned to manage the computer and AV.
- Please let me know if your moderator assignment interferes with your presentation or plans; we can easily find another moderator.
- For sessions with six presentations, the primary challenge will be to keep everyone on schedule.

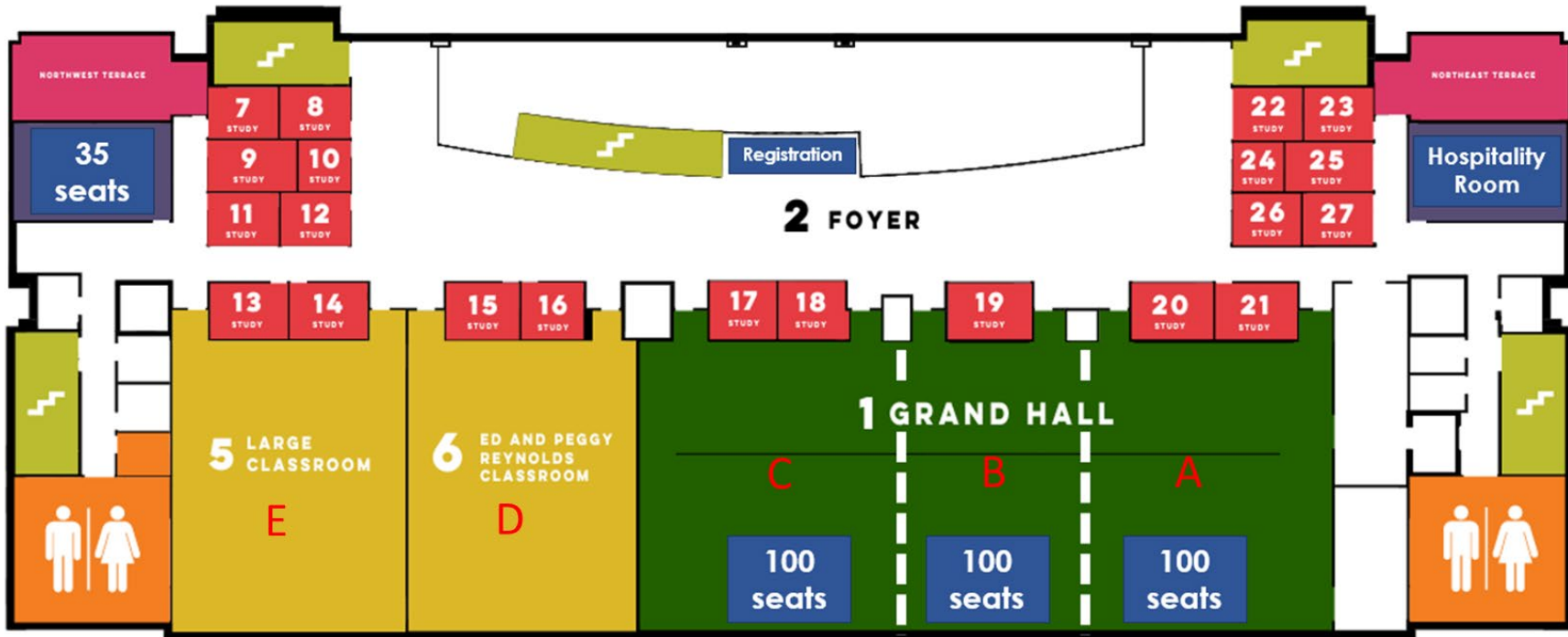
TECHNICAL PROGRAM VENUE

Brown-Kopel Engineering Student Achievement Center



BROWN-KOPEL

FLOOR 2



Sunday 14 May 4:00 – 8:00

Check-in, Registration and Reception

Auburn University Hotel and Conference Center (AUHCC.com)

Terrace Room

Registration opens at 4:00; hors d'oeuvres and beverages begin at 5:00

Monday 15 May

7:30 to 7:50

Registration continues at B-K

7:50

Gather in the Grand Hall for Plenary Session

OPENING

8:00 to 8:05

Welcoming from President Chris Roberts and representatives from the Samuel Ginn College of Engineering

8:05 to 8:10

ICPS6 open and call to order by IAPS President, Hong Hao

8:10 to 8:15

Brief logistics notes, Jim

PLENARY SESSION

Chair: Catie

8:15 to 8:45 **KEYNOTE 1**

Integrated R&D for Protective Structure Design: Strategy to Capitalize on State-of-the-Art Experiments and Simulation

M. Jason Roth and Andy Frank (collaborator), U.S. Army Engineer Research and Development Center, Vicksburg, MS, USA

8:45 to 9:15 **KEYNOTE 2, Norman Jones Lecture**

Developments in the Modelling and Simulation of Protective Structures in the realm of Defence and Security at Dstl

Daniel J. Pope, Defence Science and Technology Laboratory (Dstl), UK

Group pictures will be taken in place during the Monday plenary.

9:15 to 9:30, coffee/beverage break

NOTE: Friends named in the third row of each session group chart are the session moderators.

Monday 15 May, Sessions Group 1, 9:30 to 11:30

A	B	C	D	E
BALLISTICS, PENETRATION AND FRAGMENTATION	ADVANCED MATERIALS / CHARACTERIZATION	ANALYTICAL AND COMPUTATION METHODS / ADVANCED ANALYSES / MODELING AND SIMULATION	BLAST RESPONSE AND BLAST PROTECTION / INNOVATIVE MITIGATION	ENGINEERING AND DESIGN / ASSESSMENT / ANALYSIS TOOLS
Chengqing Wu	Andrew Sorensen	David Yankelevsky	Eric Jacques	Martin Larcher
<p><u>054 Wu</u> <i>Experimental Study on Projectile Resistance of Geopolymer-Based High Performance Concrete</i> Jian Liu and Chengqing Wu, University of Technology Sydney and Guangzhou University, Australia, China</p> <p><u>077 Bodepati</u> <i>Study of Various Effects on Penetration Mechanisms of Long Rod Penetrators through Numerical Simulations</i> B Venkataramudu and B Ramakrishna, Defence Metallurgical Research Laboratory, Kanchanbagh, Hyderabad, India</p> <p><u>104 Beppu</u> <i>Failure Behavior of UHPFRC Panels subjected to Projectile Impact</i> Masuhiro Beppu, National Defense Academy Shinnosuke Kataoka, National Defense Academy Hiroyuki Musha, Taisei Corp. Hiroyoshi Ichino, National Defense Academy Japan</p>	<p><u>097 Hupfauf</u> <i>Influence of Steel Fibers on Secondary Debris resulting from Concrete Slabs Subjected to Contact Detonations</i> Moritz Hupfauf and Norbert Gebbeken, University of the Bundeswehr Munich, Germany</p> <p><u>098 Sorensen</u> <i>Temperature Effects on Drop Hammer Impact Resistance of High Strength Fiber Reinforced Concrete</i> Andrew D. Sorensen, Dept. of Civil & Env. Engineering, Utah State University Nick Langford, Gerhart Cole Inc., Salt Lake City, Utah Md. Abdullah Al Sarfin, Dept. of Civil & Env. Engineering, Utah State University USA</p> <p><u>126 Dijkers</u> <i>Material Characteristics of 3D Printed Concrete under Highly Dynamic Loads</i> H.P.A. Dijkers, TNO G.H.D. Simon and T.A.M. Salet, Eindhoven University of Technology Netherlands</p>	<p><u>224 Saleem</u> <i>Evaluating Concrete Material Models for Blast Analysis using 3D FEA</i> Omair Bin Saleem and Amit H. Varma, Purdue University, Jakob C. Bruhl, United States Military Academy, USA.</p> <p><u>137 Nayel</u> <i>Response of Unreinforced Masonry Walls to Blast Loads using Mesoscale Simulations</i> Ashraf Nayel, Housing and Building National Research Center, Egypt and Imperial College London, UK Christian Malaga-Chuquitaype and Lorenzo Macorini, Imperial College London, UK</p> <p><u>156 Loya</u> <i>Numerical Analysis of the Influence of the Brick Layout in Masonry Walls under Blast Conditions</i> Abraham Fernández del Rey, Josué Aranda Ruiz and José Antonio Loya Dpt. of Continuum Mechanics and Theory of Structures, Carlos III University of Madrid. Avda. de la Universidad Madrid, España Spain</p>	<p><u>080 Schunck</u> <i>Explosion Mitigation by Grids Combined with Water Curtain</i> T. Schunck and D. Eckenfels, French-German Research Institute of Saint-Louis, ISL, Saint-Louis, France</p> <p><u>141 Rigoulet</u> <i>Blast Protection with Fluids</i> T. Rigoulet and L. Blanc, ISL, French-German Research Institute of Saint-Louis, France F. Daghia, Université Paris-Saclay, CentraleSupélec, ENS Paris-Saclay, CNRS, Laboratoire de Mécanique Paris-Saclay, France P. Wriggers, Institute of Continuum Mechanics, Leibniz University Hannover, Germany</p> <p><u>089 Brandys</u> <i>Adaptive Real-Time Protective System with a Controlled Changeable Angle Protective Plate</i> Brandys Irad and Ornai David, Ben-Gurion University of the Negev, Beer-Sheva, Israel Levy Robert, Shamoon College of Engineering, Beer-Sheva, Israel</p>	<p><u>067 Stewart</u> <i>Spatial Variability of Explosive Blast Loading and its Effect on Damage Risks</i> Mark G. Stewart, Centre for Built Infrastructure Resilience, School of Civil and Environmental Engineering, University of Technology Sydney, New South Wales, Australia</p> <p><u>068 Stewart</u> <i>Fragmentation Safety Hazards from VBIEDs and Large Calibre Munitions</i> Hao Qin and Mark G. Stewart, University of Technology Sydney, Australia</p> <p><u>087 Larcher</u> <i>Towards an Easier and Faster Blast Assessment through a Geodata-Assisted Semi-Automated Process</i> Martin Larcher and Ralf Schumacher, European Commission, Joint Research Centre Georgios Valsamos, European Commission, DG Research & Innovation</p> <p><u>161 Bishop</u> <i>Using a Performance-Based Approach to Predict the Effect of Defective Construction on Deaths, Dollars, and Downtime</i> Cliff D. Bishop, Piotr D. Moncarz and William Locke, Exponent, Inc., USA</p>

<p><u>119 Nanema</u> <i>Numerical Study of Composite Structures Behavior under Ballistic Impacts</i> Billy L. T. NANEMA and Mohamed MEJRI, Aviation School of Borj El Amri, Tunis, Tunisia Nizar BEN SALAH, Materials and Process Mechanics Laboratory (LMMP), National Superior School of Engineers of Tunis (ENSIT), Tunis, Tunisia</p> <p><u>142 Swinea</u> <i>Ballistic Performance of Cross-Laminated Timber with Thermally Modified Western Hemlock</i> Juliet Swinea, Georgia Institute of Technology Peter Stynoski, Army Corps of Engineers ERDC-CERL Andrew Lessel, Army Corps of Engineers ERDC-GSL Lauren Stewart, Georgia Institute of Technology USA</p> <p><u>186 Rios-Estremera</u> <i>Modeling Spaced Armor Configurations' Protection Ballistic Limit Against Fragment Simulating Projectiles via Monte Carlo Simulation</i> Daniel H. Rios-Estremera, U.S. Army Engineer Research and Development Center, Vicksburg MS, USA</p>	<p><u>127 Jungwirth</u> <i>Increase of Structural Protection for Reinforced Concrete Structures under High Dynamic Loads using Ultra High Performance Fiber Reinforced Concrete (UHPFRC)</i> Andre Strotmann, Laboratory for Concrete Structures and Structural Engineering, Munich University of Applied Sciences Vahan Zohrabyan and Thomas Braml, Institute for Structural Engineering, University of Armed Forces, Munich Jörg Jungwirth, Laboratory for Concrete Structures and Structural Engineering, Munich University of Applied Sciences Germany</p> <p><u>134 Woodson</u> <i>Cratering Response of Ultra-High Performance Fiber-Reinforced Concrete Slabs</i> Bowen G. Woodson, Bradley W. Foust, William B. Lawrimore, Donald H. Nelson and Shelby B. Buckley, U.S. Army Engineer Research and Development Center, Vicksburg MS, USA</p> <p><u>069 Li</u> <i>Heterogeneity-Induced Strain-Rate Effect on the Compressive Strength of Concrete</i> Baiyu Chen and Q.M. Li, Department of Mechanical, Aerospace and Civil Engineering, The University of Manchester, Manchester, UK Jiaming Wang, Department of Civil and Structural Engineering, University of Sheffield, UK</p>	<p><u>065 Edri</u> <i>Blast Response Analysis of Arching Masonry Walls</i> Idan E. Edri, David Z. Yankelevsky, and Oded Rabinovitch, Faculty of Civil & Environmental Engineering, National Building Research Institute, Technion-Israel Institute of Technology, Haifa, Israel</p> <p><u>195 Hatfield</u> <i>Calculation of Secondary Fragment Velocities in Fully Grouted Unreinforced Concrete Masonry Walls under Blast Loading</i> John E. Hatfield, Genevieve L. Pezzola, Robert E. Walker, John M. Hoemann and Catherine S. Stephens, U.S. Army Engineer Research and Development Center, Vicksburg MS, USA James S. Davidson, Auburn University, USA</p>	<p><u>124 Kipfmiller</u> <i>Experimental Evaluation of Blast Resistance for OSB-Faced Structurally Insulated Panels with Differing Foam Cores and Spline Additions</i> Timmy Kipfmiller III, Elijah Ruiz, Luke Masisak and Jakob Bruhl, United States Military Academy Eric Jacques, Virginia Polytechnic Institute Brad McCoy, United States Military Academy</p> <p><u>147 Rosin</u> <i>"Multischutz" A Multifunctional Component System to Protect People from the Effects of Explosion Events</i> Julia Rosin, Christoph Roller, Johannes Solass, Alessandro Stocchi and Alexander Stolz Fraunhofer-Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, Germany</p> <p><u>236 Aldjabar</u> <i>Blast Protection of Thin Aluminum Plates by Using Mineral Foam-Core Sacrificial Cladding</i> Aminou Aldjabar (a), Ben Rhouma Mohamed (a), Belkassem Bachir (a), Atoui Oussama (a,b), Pyl Lincy (b) and Lecompte David (a) (a) Royal Military Academy, Propellant Explosives and Blast Engineering Department, Brussels, Belgium (b) Vrije Universiteit Brussels, Mechanics of Materials and Constructions Department, Brussels, Belgium</p>	<p><u>228 Railey</u> <i>Remote Assessment of Damaged Infrastructure</i> Corrigan Railey, Luke Masisak, James Burroughes, William Graves and Eric Williamson, United States Military Academy</p>
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LUNCH

11:45 to 12:45

Custom sandwich and salad buffet by Tiger Catering

Served in B-K Grand Hall

Monday 15 May, Sessions Group 2, 1:00 to 3:00

A	B	C	D	E
LOAD CHARACTERIZATION	BLAST PROTECTION / STRUCTURAL RESPONSE / PROTECTIVE SYSTEMS	ANALYTICAL AND COMPUTATION METHODS / ADVANCED ANALYSES / MODELING AND SIMULATION	BLAST RESPONSE AND BLAST PROTECTION / INNOVATIVE MITIGATION	ENGINEERING AND DESIGN / ASSESSMENT / ANALYSIS TOOLS
Kadir Sener	Serdar Astarlioglu	Peter McDonald	Kevin McMullen	John Nevels
<p><u>022 Mizukaki</u> <i>Global Overpressure Measurement for Blast Loading Assessment</i> Toshiharu Mizukaki, Ryunosuke Shimizu, Kaname Sawaguchi, Daijyu Numata, Tokai University, Japan</p> <p><u>046 Fischer</u> <i>Experimental and Numerical Investigation of the Interaction of Blast Waves with Buildings Facades</i> Kai Fischer, Fraunhofer EMI, Germany</p> <p><u>058 Lodge</u> <i>Effect of Soil Particle Composition on the Impulse Generated From Shallow Buried Charges</i> Lodge, T – University of Sheffield, Blastech Ltd Waddoups, R – University of Sheffield Clarke, SD – University of Sheffield Rigby, SE – University of Sheffield Langdon, GS – University of Sheffield Tyas, A – University of Sheffield, Blastech Ltd Gant, M – Dstl Elgy, ID - Dstl UK</p> <p><u>073 Li</u> <i>The Effect of Fluid-Structure-Interaction of Close-in Underwater Explosions</i> Lingquan Li and Rainald Löhner, George Mason University, USA</p>	<p><u>029 Ibrahim</u> <i>Improving Blast Performance of Reinforced Concrete Panels using Sacrificial Cladding with Hybrid-Multi Cell Tubes</i> Mahmoud Abada, Ahmed Ibrahim and S. J. Jung, Department of Civil and Environmental Engineering, University of Idaho, Moscow, ID, USA</p> <p><u>033 Pham</u> <i>An Enhanced Meta-Panel with Dual-Resonators for Blast Loading Mitigation</i> Thong M Pham, Nhi H Vo, and Hong Hao, School of Civil and Mechanical Engineering, Curtin University, Australia</p> <p><u>085 Astarlioglu</u> <i>Behavior of Ultra-High-Performance Panels Subjected to Airblast Loads</i> Serdar Astarlioglu and Krystal M. Rodriguez-Soto, U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, USA</p> <p><u>165 Anderson</u> <i>Effective Width of Stiffened Steel Plates Subject to Blast Loading</i> Thomas H. Anderson, Baker Engineering and Risk Consultants, Inc., USA</p>	<p><u>045 TerMaath</u> <i>Reduced Order Modeling of Progressive Failure in Composite/Metal Structure</i> Stephanie TerMaath and Cody Crusenberry, University of Tennessee, Knoxville TN, USA</p> <p><u>086 McDonald</u> <i>Numerical Investigation of Shockwave Diffraction around Building Corner</i> P.G. McDonald, C. G. Stirling and A. Nicholson, Viper Applied Science, Stirling Simulation Services Ltd, United Kingdom T. Gajewski and P. W. Sielicki, Institute of Structural Analysis, Poznan University of Technology, Poznan, Poland</p> <p><u>140 Esquilin-Mangual</u> <i>Numerical Study of Mismatch Layering Effects on Reaction Structures Subjected to Blast</i> Omar Esquilin-Mangual, Donald H. Nelson and Genevieve L. Pezzola, U.S. Army Engineer Research and Development Center, Vicksburg, MS, USA</p>	<p><u>038 Naito</u> <i>Vulnerability Assessment of Roadway Tunnels to Blast Effects</i> Clay Naito, Ziyang Ouyang and Spencer Quiel, Lehigh University USA</p> <p><u>057 McMullen</u> <i>Design and Analysis of 3d-Printed Armor Plating For Vehicle Underbody Protection against Improvised Explosive Devices</i> 1LT Victor Kao, 1LT Eric Niino, 1LT Nolan Collins, 1LT Seth Normington, Dr. Kevin McMullen and COL Jakob Bruhl, US Military Academy, USA</p> <p><u>035 Turygan</u> <i>Effects of Weaponized Commercial Unmanned Aerial Vehicles (UAVs) on Structures. Experimental Testing Comparison to Numerical Models</i> Scott Turygan, US Army Europe and Africa, Wiesbaden, Germany Piotr Sielicki, Institute of Structural Analysis, Poznan University of Technology, Poznan, Poland</p> <p><u>053 Wu</u> <i>A Case Study of Natural Gas Explosion Characteristics in a Semi-Confined Building</i> Di Chen, Chengqing Wu and Jun Li, University of Technology Sydney and Guangzhou University, Australia, China</p>	<p><u>061 Pickett</u> <i>Optimizing Explosives Operations in Cells Using Linear Regression Curve Fit</i> Michael C. Pickett, US Army Corps of Engineers, Facilities Explosives Safety MCX, USA</p> <p><u>174 Nevels</u> <i>US Army Corps of Engineers Earth Covered Magazine Structural Integrity Assessment Program</i> John Nevels, Susan Hamilton and Josh Umphrey, US Army Engineering and Support Center Huntsville, USA</p> <p><u>063 Richey</u> <i>Earth Covered Magazine Structural Integrity Analysis (ECMSIA) in the Indo-Pacific Command</i> Daniel Richey, Michael Pickett and Josh Umphrey, USACE Huntsville Center, USA</p> <p><u>175 Nevels</u> <i>Explosives Safety Requirements for Protective Construction Subjected to Internal Detonation in a Production Environment</i> John Nevels, Daniel Richey and Michael Pickett, U.S. Army Engineering and Support Center Huntsville, USA</p>

<p><u>101 Sun</u> <i>Destructive Characteristics of Double-Layer Structure Subjected to Underwater Explosion</i> Yuanxiang SUN and Yanwu CHEN, State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing, China</p> <p><u>094 Whittaker</u> <i>Development of a Predictive Framework for Assessing the Viability and Power of Ideal and Non-Ideal Explosives with respect to Mitigating and Protecting Against Energetic Effects</i> Mark Whittaker, Dstl Ajen Limbu, Dstl Andrew Tyas, University of Sheffield Dan Pope, Dstl UK</p>	<p><u>192 Foglar</u> <i>Experimental Investigations on Blast Resistance of Steel-Concrete Composite Slabs</i> Marek Foglar and Radek Hájek, Czech Technical University in Prague, Czech Republic</p>	<p><u>157 Saffarini</u> <i>Comparative Study of the Blast-Resistant Curtain System Response via Both Finite Element Method and Material Point Method</i> Mohammed Saffarini, Ahmed Elbelbisi, Zhen Chen and Hani Salim, University of Missouri Alaa Elsis, Southern Illinois University Kyle Perry, Missouri University of Science and Technology Andrew Bowman, U.S. Army Engineer Research and Development Center USA</p> <p><u>158 Elbelbisi</u> <i>Calibration of Material Model Parameters for a Blast-Resistant Curtain Wall System via Integrated Computational and Experimental Approaches</i> Ahmed Elbelbisi, Mohammed Saffarini, Zhen Chen, and Hani Salim, University of Missouri Alaa Elsis, Southern Illinois University Kyle Perry, Missouri University of Science and Technology Andrew Bowman, U.S. Army Engineer Research and Development Center USA</p> <p><u>230 Weaver</u> <i>Modeling Steel Column Fracture Resulting from Blast Loading</i> Mark K. Weaver, Joseph M. Magallanes, Huiyang Luo, Karagozian & Case, Inc. James Lee Nelson, Defense Threat Reduction Agency USA</p>	<p><u>117 Witty</u> <i>Hydrogen Explosions in Domestic Properties</i> Lisa Witty and Dan Allason, DNV Spadeadam Research and Testing, UK</p>	<p><u>234 Durant</u> <i>Dynamic Response of Slabs with Shallow Earth Cover to External Blast Loading</i> Brad Durant, Explosion Effects and Consequences Division, NAVFAC Engineering and Expeditionary Warfare Center</p> <p><u>159 Duffy</u> <i>Explosives Safety Considerations for Design-Build Projects</i> Leslie Duffy, KPFF Protective Design, USA</p>
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Monday 15 May, Sessions Group 3, 3:15 to 5:15

A BLAST RESPONSE AND BLAST PROTECTION / INNOVATIVE MITIGATION	B BLAST PROTECTION / STRUCTURAL RESPONSE / PROTECTIVE SYSTEMS	C TESTING / INNOVATIVE EXPERIMENTAL METHODS	D PROTECTION INNOVATION	E BLAST INNOVATION (AWE)
Bradley Foust	Genny Pezzola	Rafael Santiago	Alaa Elsis	Steve Fay
<p><u>209 Harmon</u> <i>Two-Way Bending Behavior of Steel-Plate Composite (SC) Panels for SDOF Analysis</i> Joshua Harmon, Purdue Applied Research Institute (PARI) and Amit Varma, Purdue University, USA</p> <p><u>211 Choe</u> <i>Application of Steel-Plate Composite (SC) Structures subjected to Confined Explosion</i> Lisa Choe, Purdue Applied Research Institute, Sanjeev Malushte, Purdue Applied Research Institute, Amit Varma, Purdue University, USA</p> <p><u>214 Broberg</u> <i>Behavior of Shear Connectors in Steel-Plate Composite Structures for Protective Structure Applications</i> Morgan Broberg, Purdue Applied Research Institute (PARI), Cecelia Germann, Purdue University, Lisa Choe, Purdue Applied Research Institute (PARI), Amit Varma, Purdue University, USA</p> <p><u>215 Broberg</u> <i>Design of Steel-Plate Composite (SC) L-Shaped Corner Joint Connections</i> Morgan Broberg, Purdue Applied Research Institute (PARI), Amanda Lefebvre, Purdue University, Lisa Choe, Purdue Applied Research Institute (PARI), Amit Varma, Purdue University, USA</p>	<p><u>121 Wang</u> <i>Response of Axially Loaded RC Walls Subjected to Airblast Load</i> G. S. Wang, Swedish Defense Research Agency, Grindsjön, Stockholm, Sweden</p> <p><u>149 Zhang</u> <i>Influence of Membrane Actions on the Behavior of RC Components</i> Liuliang Cui, Xihong Zhang, Hong Hao Centre for Infrastructural Monitoring and Protection, School of Civil and Mechanical Engineering, Curtin University, Australia</p> <p><u>125 Ambrosini</u> <i>Dynamic Response of Confined Masonry Walls Subjected to Blast Loadings</i> Ramón Codina and Daniel Ambrosini, Universidad Nacional de Cuyo, CONICET, Argentina.</p> <p><u>180 Elsis</u> <i>Blast Mitigation of Concrete Walls Using Sheet Retrofit Systems</i> Alaa Elsis, Southern Illinois University Edwardsville Ahmed Elbelbisi and Hani Salim, University of Missouri Columbia USA</p>	<p><u>024 Teshima</u> <i>Application of Similarity Law for Scaled Experiments to Elasto-Plastic Behavior of Beams in a Gravitational Field</i> Ryosuke Teshima, Masuhiro Beppu, and Hiroyoshi Ichino National Defense Academy, Japan</p> <p><u>182 Flores</u> <i>Design of an Impulsive Center-Point Testing System with Realistic Boundary Conditions</i> Noel R. Flores, Engineering Systems Inc., GA T. Russell Gentry and Lauren K. Stewart, Georgia Institute of Technology, Atlanta GA USA</p> <p><u>235 Oussama</u> <i>A Laboratory-Scale Approach to Investigate the Effects of Blast and Fragment Impact Loading on Structures</i> Atoui Oussama (a,b), Kechagiadakis George (a), Maazoun Azer (a), Belkasssem Bachir (a), Pyl Lincy (b) and Lecompte David (a) (a) Royal Military Academy, Propellant Explosives and Blast Engineering Department, Brussels, Belgium (b) Vrije Universiteit Brussels, Mechanics of Materials and Constructions Department, Brussels, Belgium</p>	<p><u>072 Kang</u> <i>Evaluation of Flood Reduction and Development of Safety Factor using HCFD Model</i> Jaekyoung Kim, Hyereong Yun and Junsuk Kang Department of Landscape Architecture and Rural Systems Engineering / Integrated Major in Smart City Global Convergence, Seoul National University, South Korea</p> <p><u>167 Bhatt</u> <i>Comparative Fire Performance of FRP- and SRP-Strengthened Concrete Slabs</i> Bhatt, P. P., Pacific Structural Forensics, Jersey City, NJ, USA Kodur, V. K. R., Dept. of Civil & Environmental Engg., Michigan State University, East Lansing, MI, USA</p> <p><u>179 Elsawi Mahmoud</u> <i>Assessment of Resistance of Cold-Formed Self-Drilling Screwed Connections</i> Mohamed Elsawi Mahmoud, University of Missouri, Columbia Alaaeldin Elsis, Southern Illinois University, Edwardsville Michael Newberry, Battelle Hani Salim, University of Missouri, Columbia USA</p>	<p><u>AWE Introduction Fay, Taggart, Newman</u></p> <p><u>216 Fay</u> <i>Cylindrical Floating Roof Storage Tank Response to Large-Scale Blast: Scaled Experimental Validation</i> John Newman, Chris Metcalfe, Alessandro Dimech, David Munro, Laura Cannon, Alexander Rogers, Chris Taggart, AWE, Aldermaston, Reading, Berkshire, United Kingdom</p> <p><u>219 Rogers</u> <i>Storage Tank Response to Large-Scale Blast: Validation of Numerical Analysis</i> Alexander Rogers, Laura Cannon, John Newman, Chris Metcalfe, Alessandro Dimech, David Munro, Stephen Fay, Chris Taggart, AWE Aldermaston, Reading, Berkshire, United Kingdom</p> <p><u>220 Metcalfe</u> <i>Automating the Derivation of Building Dynamic Properties</i> Chris Metcalfe, Alessandro Dimech, David Munro, Laura Cannon, Alexander Rogers, John Newman, Chris Taggart, Stephen Fay, AWE Aldermaston, Reading, Berkshire, United Kingdom</p>

<p><u>143 Chikhradze</u> <i>Experimental Studies of the Explosion Resistance of Steel Plate with Energy-Absorbing Layers</i> Nikoloz Chikhradze, Edgar Mataradze, Karlo Tavlalashvili, Mikheil Chikhradze, Irakli Akhvlediani and Zurab Malvenishvili, LEPL G. Tsulukidze Mining Institute and Georgian Technical University, Tbilisi, Georgia</p>	<p><u>047 Lim</u> <i>Combined Blast and Fragmentation Effects on Steel-Concrete Composite Panels</i> Lim Jia Yuan, Kang Kok Wei and Melvin Goh Chong Yik, Defence Science and Technology Agency (DSTA), Singapore</p> <p><u>212 Sanai</u> <i>Fragmentation of Building Facade Materials Exposed to High Pressure Air Blast</i> Mohsen Sanai, Test Technology Division, Applied Research Associates, Inc., USA</p>	<p><u>198 Santiago</u> <i>Experimental Evaluation of the Impact Performance of Projectiles</i> Omar Ba Nabila, Henrique Ramos, Kapil Krishnan, Haleimah Al Abdouli, Alia Aziz, Zhongwei Guan and Rafael Santiago, Technology Innovation Institute, Abu Dhabi, UAE</p>	<p><u>181 Kim</u> <i>Structural Response Estimation Method for the Submerged Floating Tunnel Based On Deep Learning and Transfer Learning Algorithms</i> Seongi Min, Kiwon Jeong, Jeonghwa Lee and Seungjun Kim, School of Civil, Environmental, and Architectural Engineering, Korea University</p>	<p><u>217 Cannon</u> <i>Investigating the Significance of Non-Ideal Effects in Large-Scale Blast Propagation</i> Laura Cannon, Alexander Rogers, John Newman, Chris Metcalfe, Alessandro Dimech, David Munro, Stephen Fay, Chris Taggart, AWE, Aldermaston, Reading, Berkshire, United Kingdom</p> <p><u>221 Dimech</u> <i>Investigating the Effects of Terrain on Blast Wave Propagation and Structural Damage</i> Alessandro Dimech, David Munro, Laura Cannon, Alexander Rogers, John Newman, Chris Metcalfe, Chris Taggart, Stephen Fay, AWE Aldermaston, Reading, Berkshire, United Kingdom</p> <p><u>218 Newman</u> <i>A Multi-Fidelity Approach for Approximating Structural Damage due to Blast Loading</i> John Newman, Chris Metcalfe, Alessandro Dimech, David Munro, Laura Cannon, Alexander Rogers, Chris Taggart, Stephen Fay, AWE Aldermaston, Reading, Berkshire, United Kingdom</p>
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Monday 15 May

BBQ TAILGATE SOCIAL

5:30

Meet at B-K main entrance

5:30 to 6:00

Delegates walk together to the tailgate social, south entrance to the stadium, Jordan-Hare Stadium Tiger Walk Club Level 2

Those that are not already at B-K can meet at the south entrance of the stadium

6:00 to 9:00

BBQ tailgate social at Jordan Hare Stadium sponsored by **Viper Applied Science** (www.viper.as)
(<https://auburntigers.com/facilities/jordan-hare-stadium/11>)

Beverages catered by Proof of the Pudding (www.proofpudding.com)

BBQ catered by Jim 'N Nick's (www.jimnicks.com)

Tuesday 16 May

7:50 gather for plenary, B-K Grand Hall

8:00 to 9:15 Plenary Session

Chair: Jim

8:15 to 8:45 **KEYNOTE 3**

Protective Design for Windstorms: A Blast Oriented Perspective

David B. Roueche, Auburn University, USA

8:45 to 9:15 **KEYNOTE 4**

Windstorm Protection: Storm Shelters, Safe Rooms, and Best Available Refuge Areas

Marc L. Levitan, National Institute of Standards and Technology (NIST), USA

9:15 to 9:30, coffee/beverage break

Tuesday 16 May, Sessions Group 4, 9:30 to 11:30

A	B	C	D	E
VEHICLE BARRIER	ADVANCED MATERIALS / CHARACTERIZATION	IMPACT	STORMS IMPACTS AND PROTECTION	ENGINEERING AND DESIGN / ASSESSMENT / ANALYSIS TOOLS
Norbert Gebbeken	Arthur van Lerberghe	Hong Hao	David Roueche	Dan Linzell
<p><u>034 Turygan</u> <i>Numerical Simulation of Bollards as Vehicle Security Barriers - Modeling Strategies and Sensitivity Analysis</i> Scott Turygan, US Army Europe and Africa, Wiesbaden, Germany Matthias Andrae and Norbert Gebbeken, University of the Bundeswehr Munich, Department of Civil Engineering, Research Group BauProtect, Research Center RISK, Neubiberg, Germany</p> <p><u>088 Larcher</u> <i>Generic Vehicle Models for Simulating Vehicle-Ramming Scenarios</i> Martin Larcher, Damijan Markovic and Ralf Schumacher, European Commission, Joint Research Centre Georgios Valsamos, European Commission, DG Research & Innovation</p> <p><u>129 Meau</u> <i>Measuring Impulse Load from Anti-Ram Perimeter Wall Debris due to a VBED</i> Alfred Meau, Protection Engineering Consultants, USA</p> <p><u>184 Farley</u> <i>A Comparison of Simulation and Physical Test for a Shallow Mount Bollard System</i> Jonathan Farley, Arup Australia, Joel Smith, Arup Australia, Daniel Aggromitto, Arup USA, Luke Pasoe, Arup Australia</p>	<p><u>027 Mishra</u> <i>Dynamic Compressive Properties of Pre-Crack Sandstone Rock</i> Rabin Kumar Samal and Sunita Mishra, Department of Mining Engineering, Indian Institute of Technology Kharagpur, West Bengal, India</p> <p><u>028 Mishra</u> <i>Effect of Specimen Size and Loading Rate on Dynamic Properties of Sandstone Rock</i> Sunita Mishra, Department of Mining Engineering, Indian Institute of Technology Kharagpur, West Bengal, India Tanusree Chakraborty, Department of Civil Engineering, Indian Institute of Technology (IIT) Delhi, Hauz Khas, New Delhi, India Dipanjan Basu, Civil and Environmental Engineering, University of Waterloo, Waterloo, ON, Canada</p> <p><u>059 Orlov</u> <i>A Comprehensive Study of Ice Destruction under Impact and Explosion Loading. Full-Scale and Laboratory Experiments and Numerical Results</i> Maxim Yu. Orlov, Victor P. Glazyrin and Yu. N. Orlov, National Research Tomsk State University, Russia</p>	<p><u>112 Kishi</u> <i>Drop-Weight Impact Loading Tests on 330 MPa Class Porosity-Free Fiber-Reinforced Concrete (PFFRC) Beams</i> N. Kishi, M. Komuro and T. Kawarai, Muroran Institute of Technology K. Kono, Central Research Inst., Taiheiyo Cement Corporation Japan</p> <p><u>116 Johansson</u> <i>Residual Capacity of RC Beams Subjected To Impact Loading: Influence of Reinforcement Ductility</i> Morgan Johansson, Norconsult AB / Chalmers University of Technology Joosef Leppänen, Chalmers University of Technology Malin Andersson and Emma Pettersson, ELU Konsult AB Sweden</p> <p><u>132 Kawarai</u> <i>Low-velocity Impact Loading Tests of Cushion Rubber Set RC Beams</i> T. Kawarai, N. Kishi, and M. Komuro, Muroran Institute of Technology K. Suzuki, Koken Engineering Co., Ltd. Japan</p> <p><u>139 Lee</u> <i>Enhancement of the Impact Resistance of Masonry Walls using Fiber-Reinforced Polymer Composites</i> Dongkeun Lee and Alex Hak-Chul Shin, Department of Civil and Environmental Engineering, Southern University and A&M College, Baton Rouge, LA, USA</p>	<p><u>155 Overcash</u> <i>Storm Shelters: ICC 500 Structural Design Criteria Overview</i> Glenn Overcash, AECOM USA</p> <p><u>240 Roueche</u> <i>Hurricane Ian</i> David Roueche, Auburn University</p> <p><u>233 Scott</u> <i>Storm Impacts and Protection Session: FEMA Building Science Disaster Support – December 2021 Kentucky Tornadoes</i> Pataya Scott, Federal Emergency Management Agency</p> <p><u>241 Levitan</u> <i>Design for Tornadoes using the new ASCE 7-22 Tornado Load Methodology</i> Marc L. Levitan, National Institute of Standards and Technology</p> <p><u>110 Chen</u> <i>Laboratory Test of Lightweight Geopolymer Composite Panels against Windborne Debris Impact</i> Zhixing Li, Wensu Chen and Hong Hao, Centre for Infrastructural Monitoring and Protection, School of Civil and Mechanical Engineering, Curtin University, Australia</p>	<p><u>055 Sadique</u> <i>Safety Analysis of Greenfield Underground Urban Space Subjected to Surface Blast</i> M. R. Sadique, J. A. Khan and M. M. Alam, Department of Civil Engineering, ZHCET, Aligarh Muslim University, Aligarh, INDIA</p> <p><u>071 Fang</u> <i>Multihazard Assessment and Mitigation of Bridge Piers under Fire, Vehicle Impact, and Air Blast</i> Chen Fang, Midwest Roadside Safety Facility, University of Nebraska–Lincoln Qusai Alomari and Daniel G. Linzell, Department of Civil and Environmental Engineering, University of Nebraska-Lincoln, USA</p> <p><u>075 Caldwell</u> <i>Finding Safe Havens in the Disaster Zone</i> Tom Caldwell and Mike Riccitiello, Atlas Engineering, Inc. Raleigh, NC USA</p> <p><u>081 Gajewski</u> <i>Building and People Safety vs. Investment Costs for a Multi-Story Residential Building in a Large-Scale Threat</i> T. Gajewski, P. Peksa, M. Malendowski, R. Studzinski, W. Sumelka, and P. W. Sielicki, Institute of Structural Analysis, Poznan University of Technology, Poznan, Poland</p>

<p><u>193 Do</u> <i>Using Dynamic Analysis in Design Structures against Vehicle Impacts</i> Tin V. Do and Asher Gehl, Karagozian & Case (K&C), NSW, Australia</p> <p><u>197 Sovják</u> <i>Mobile Road Barrier Made of UHPFRC</i> Michal Mára, Petr Konrád, Jindřich Fornůšek and Radoslav Sovják, Czech Technical University in Prague, Faculty of Civil Engineering, Prague, Czech Republic</p>	<p><u>082 van Lerberghe</u> <i>High Strain Rate Testing of Cohesive Soils</i> Arthur van Lerberghe, Sam D. Clarke and Andrew D. Barr, Department of Civil & Structural Engineering, The University of Sheffield, Sheffield, UK Stephen L. Kerr, Defence science and technology laboratory (Dstl), UK</p> <p><u>106 Klimenko</u> <i>Simulation of PVB-glass Adhesion and its influence on the Blast Protection Properties of Laminated Safety Glass</i> D.Agromito, Arup US, L.Pascoe, Arup Australia, J.Klimenko, Arup Australia, J.Farley, Arup Australia, M.Tatarsky, Arup US, W.Wholey, Arup US</p> <p><u>160 Tawfik</u> <i>Shear Performance of Protective Cementitious Composites with 3D-woven Hybrid Cellular Reinforcement under High Loading Rates</i> Ahmed Tawfik, Cesare Signorini and Viktor Mechtcherine, Institute of Construction Materials, Technische Universität Dresden, Germany</p>	<p><u>148 Zhang</u> <i>Response of Ambient Cured Geopolymer Concrete Slab under Impact Loading</i> Chong Chen, Xihong Zhang, Hong Hao Centre for Infrastructural Monitoring and Protection, School of Civil and Mechanical Engineering, Curtin University, Australia</p> <p><u>205 Bracklow</u> <i>Testing of Reinforced Concrete Plates under Impact Loading and Investigation of Strengthening Layers</i> Franz Bracklow, Marcus Hering, Thomas Schubert, Birgit Beckmann, Nicholas Unger and Manfred Curbach, Institute of Concrete Structures, Technische Universität Dresden, Germany</p>		<p><u>099 Chiquito</u> <i>Post-Blast Damage Assessment on Brick Masonry Walls</i> María Chiquito, Lina M López, Ricardo Castedo, and Anastasio P Santos, Universidad Politécnica de Madrid Alejandro Pérez-Caldentey, Universidad Politécnica de Madrid, FHECOR Consulting Engineers Spain</p>
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LUNCH

11:45 to 12:45

Fusion bowls buffet by Tiger Catering

Served in B-K Grand Hall

Tuesday 16 May, Sessions Group 5, 1:00 to 3:00

A	B	C	D	E
LOAD CHARACTERIZATION	ADVANCED MATERIALS / MATERIAL CHARACTERIZATION	PROGRESSIVE COLLAPSE / FULL-SCALE STRUCTURE RESPONSE / COLUMN RESPONSE	BLAST PROTECTION / STRUCTURAL RESPONSE / PROTECTIVE SYSTEMS	ENGINEERING AND DESIGN / ASSESSMENT / ANALYSIS TOOLS
Socrates Angelides	Piotr Sielicki	Lina Lopez	Norbert Gebbeken	Ken Herrle
<p><u>123 Farrimond</u> <i>Far-Field Positive Phase Blast Parameter Characterisation of Small-Scale Ammonium Nitrate Based Explosives</i> D. G. Farrimond, S. Woolford, A. Tyas, S. E. Rigby, S. D. Clarke and A. Barr, University of Sheffield M. Whittaker and D. J. Pope, Defence Science and Technology Laboratory (DSTL), UK</p> <p><u>153 Pezzola</u> <i>Experimental and Computational Investigation of TNT Equivalencies for ANFO</i> Genevieve L. Pezzola, Shelby B. Buckley, and John M. Hoemann, US Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS USA</p> <p><u>187 Sullivan</u> <i>Prediction of Blast Wave Pressure Using Artificial Neural Networks</i> Kellan Sullivan, Colorado State University and U.S. Army Engineer Research and Development Center, USA Hussam Mahmoud, Colorado State University Genevieve L. Pezzola, Jesse A. Sherburn and Catherine S. Stephens, U.S. Army Engineer Research and Development Center, USA</p>	<p><u>032 Bendarma</u> <i>Perforation Analysis of Aluminum-Polyethylene Composite Structure - Experimental and Numerical Approach</i> A. Bendarma Poznan University of Technology, Institute of Structural Engineering, Poznan, Poland and Universiapolis, Ecole Polytechnique d'Agadir Bab Al Madina, Qr Tilila, Agadir, Morocco T. Jankowiak and T. Lodygowski, Poznan University of Technology, Institute of Structural Engineering, Poznan, Poland A. Rusinek, Lorraine University, Laboratory of Microstructure Studies and Mechanics of Materials (LEM3), Metz, France S. Bouslikhane, Universiapolis, Ecole Polytechnique d'Agadir Bab Al Madina, Qr Tilila, Agadir, Morocco</p> <p><u>076 Qi</u> <i>Energy Absorption of Lightweight Auxetic Honeycombs</i> Chang Qi, Dalian University of Technology, China</p> <p><u>102 Szlachta</u> <i>Strength of Wooden Elements subjected to Contact Detonation</i> Szlachta A., Gajewski T. and Sielicki P.W., Poznan University of Technology (PUT), Poznan, Poland</p>	<p><u>200 Li</u> <i>Research Progress on Progressive Collapse Resistant Mechanism of Prestressed Precast Concrete Frame Structures</i> Zhong-Xian Li, Key Laboratory of Coast Civil Structural Safety of the Ministry of Education; Haokun Liu, School of Civil Engineering; Yang Ding, Key Laboratory of Coast Civil Structural Safety of the Ministry of Education; Yanchao Shi, Key Laboratory of Coast Civil Structural Safety of the Ministry of Education; Tianjin University, Tianjin, China</p> <p><u>070 Yankelevsky</u> <i>The Impact between RC Flat Slabs in a Progressive Collapse Event</i> David. Z. Yankelevsky, Yuri. S. Karinski, and Vladimir R. Feldgun, National Building Research Institute, Technion-Israel Institute of Technology, Haifa, Israel; Orit Leibovich, Sami-Shamoon College of Engineering, Ashdod, Israel</p> <p><u>091 Perez Caldentey</u> <i>Robustness of RC Structures: Conclusions from Two Full-Scale Tests and Their Analysis</i> Alejandro Pérez Caldentey, FHECOR North America, Universidad Politécnica de Madrid, ETSI Caminos, Madrid, Spain; Yolanda G. Diego, Universidad Politécnica de Madrid, ETSI Caminos, Madrid, Spain; Tasio Santos, Lina López, María Chiquito, Ricardo Castedo, Universidad Politecnica de Madrid, ETSI de Minas y Energía, Madrid.</p>	<p><u>025 Warnstedt</u> <i>Innovative Blast Protection with Plants – Experimental and Numerical Investigations</i> Paul Warnstedt and Norbert Gebbeken Bundeswehr University Munich, Research Center RISK, Research group BauProtect, Germany</p> <p><u>026 Gebbeken</u> <i>Protection of Urban Spaces</i> Norbert Gebbeken, Paul Warnstedt, and Matthias Andrae Bundeswehr University Munich, Research Center RISK, Research Group BauProtect, Germany</p> <p><u>229 Johnson</u> <i>Blast Performance of Hybrid GFRP and Steel Reinforced Concrete Beams</i> Jalen Johnson, Battelle Memorial Institute Eric Jacques, Virginia Polytechnic Institute and State University USA</p> <p><u>115 Johansson</u> <i>Comparison of Blast Load Results from Shield Tests with Independent Numerical Simulations</i> Morgan Johansson, Norconsult AB / Chalmers University of Technology Leo Laine, LL Engineering AB / Chalmers University of Technology Ola Pramm Larsen, Joosef Leppänen, CAEwiz Consulting AS / Chalmers University of Technology, Sweden</p>	<p><u>151 Kjolsing</u> <i>Updating and Documenting Single-Degree-of-Freedom Response Limits for Antiterrorism Design</i> Eric Kjolsing and Mark Weaver, Karagozian & Case Chuck Oswald, AG&E Structural Engenuity John Geringer, USACE Protective Design Center USA</p> <p><u>083 Bazan</u> <i>Simplified Blast Assessment Tool</i> Stephen Bratz and Marlon Bazan, Protection Engineering Consultants William R Earl, US General Services Administration (GSA) USA</p> <p><u>078 Stone</u> <i>Is 20 the New 10 for Blast Resistant Film?</i> William Earl, US General Services Administration Hollice Stone, Stone Security Engineering, PC Scott Haddock, Glasslock, Inc. USA</p> <p><u>092 Garsch</u> <i>Design Concepts for Civil Protection Shelters</i> Maximilian Garsch and Norbert Gebbeken, University of the Bundeswehr - Research Centre RISK, Research Group BauProtect</p>

<p><u>189 Judson</u> <i>Effects of Explosive Charge Configuration on Blast Loading Characteristics</i> John S. Judson, John M. Hoemann, Genevieve L. Pezzola and Robert E. Walker U.S. Army Engineer Research and Development Center (ERDC), Vicksburg MS, USA</p> <p><u>194 Angelides</u> <i>An Application of the Hudson Clearing Method to Near-Field Blast Loading and Above-Ground Explosions</i> Socrates C. Angelides, Steel Construction Institute, University of Sheffield Bassam Burgan and Constantinos Kyrianiou, Steel Construction Institute Samuel E. Rigby and Andrew Tyas, University of Sheffield, UK</p>	<p><u>103 Zhou</u> <i>Study on the Response Characteristics of Laminate under the Combined Action of Shock Wave and Fragmentation</i> Hu Zhou, Xiangshao Kong, and Cheng Zheng, Green & Smart River-Sea-Going Ship, Cruise and Yacht Research Center, Wuhan University of Technology, China</p> <p><u>109 Chen</u> <i>Dynamic Crushing Behaviours of Sandwich Structures Inspired by Beetle Forewing Core</i> Lalin Lam, Wensu Chen and Hong Hao, Centre for Infrastructural Monitoring and Protection, School of Civil and Mechanical Engineering, Curtin University, Australia Zhejian Li, School of Civil Engineering, Guangzhou University, China Ngoc San Ha, School of Engineering, RMIT, Australia</p> <p><u>145 Matsagar</u> <i>Glass Fiber-Reinforced Polymer and Foam Sandwich Composite Panel with Polyurea under Blast Impulse</i> Kusum Saini, Varun Datta, and Vasant Matsagar, Department of Civil Engineering, Indian Institute of Technology (IIT) Delhi, New Delhi, India</p>	<p><u>095 Lopez</u> <i>Full-Scale Test of Two-Span Concrete Frame Subjected to Successive Blast Loads</i> Lina M. Lopez, Universidad Politécnica de Madrid Alejandro Pérez Caldentey, FHECOR North America, Universidad Politécnica de Madrid Anatasio P. Santos, Ricardo Castedo, Maria Chiquito and Yolanda G. Diego, Universidad Politécnica de Madrid, Spain</p> <p><u>120 Yang</u> <i>Evaluation of Dynamic Increase Factor for Progressive Collapse Design of Hybrid Frame Structure System</i> Yang Yong, Li Shan and J.Y. Richard Liew, Department of Civil and Environmental Engineering, National University of Singapore</p> <p><u>122 Liu</u> <i>Progressive Collapse Analysis of Steel-Concrete Composite Frames under Different Column Removal Scenarios</i> Haokun Liu, J. Y. Richard Liew and Shan Li, Department of Civil and Environmental Engineering, National University of Singapore, Singapore</p>	<p><u>204 Hoemann</u> <i>The Use of Experimental Scaled Airblast Testing to Support Numerical Validation</i> John Hoemann, Jessica Vankirk, Genevieve Pezzola and Jesse Sherburn, U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS, USA James Davidson, Auburn University, USA</p>	<p><u>114 Karlos</u> <i>Predictions of Injurious Effects Due To Explosions: Computational Practice and Tool Implementation</i> Vasilis Karlos, George Solomos and Martin Larcher, European Commission, Joint Research Centre (JRC), Ispra, Italy</p> <p><u>169 Herrle</u> <i>Protective Design for Multi-threat Environments</i> Kenneth Herrle and J. Mikhael Erekson, Applied Research Associates, Inc., USA</p>
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Tuesday 16 May, Sessions Group 6, 3:15 to 5:15

A	B	C	D	E
BLAST AND IMPACT, WOOD AND ROCKS	PROGRESSIVE COLLAPSE / FULL-SCALE STRUCTURE RESPONSE / COLUMN RESPONSE	TESTING / INNOVATIVE EXPERIMENTAL METHODS	BLAST PROTECTION / STRUCTURAL RESPONSE / PROTECTIVE SYSTEMS	PROTECTION INNOVATION
Michael Newberry	Eric Williamson	Nick Misselbrook	Mark Weaver	Andy Groeneveld
<p><u>107 Komuro</u> <i>Elasto-plastic Response Analysis of Conventional Rockfall Protection Fence under Falling-Weight Impact Loading</i> Masato Komuro, Tomoki Kawarai and Norimitsu Kishi, Muroran Institute of Technology, Japan</p> <p><u>108 Hayashi</u> <i>Proto-type Impact Loading Tests on Steel Posts for Rockfall Protection Fences Embedded in Retaining Concrete Wall</i> Shigeki Hayashi, Masato Komuro, Tomoki Kawarai and Norimitsu Kishi, Muroran Institute of Technology, Japan</p> <p><u>113 Yamasawa</u> <i>Impact Loading Tests of Full-Scale Rockfall-Protection Plain-Concrete Walls</i> Fumio Yamasawa, Masato Komuro, Norimitsu Kishi and Osamu Hatakeyama, Muroran Institute of Technology, Japan</p> <p><u>128 Mourão</u> <i>Open-Air Blast Test Response of Laminated Wood in BRMs</i> Rodrigo Mourão, Arturo Montalva, Khaled El-Domiaty, Dicle Firat, David Holgado and Bryan Calidonna, Stone Security Engineering, P.C., USA</p>	<p><u>136 Fang</u> <i>Experimental and Numerical Investigations of High Rise Reinforced Concrete Building Resistance to Progressive Collapse</i> Chen Fang, Midwest Roadside Safety Facility, University of Nebraska-Lincoln Daniel G. Linzell, Department of Civil and Environmental Engineering, University of Nebraska-Lincoln, USA</p> <p><u>138 Williamson</u> <i>Performance of Composite Floor Systems under Column Loss Scenarios</i> E. B. Williamson, University of Texas at Austin M. Hadjoannou, Protection Engineering Consultants USA</p> <p><u>154 Makoond</u> <i>Improving Building Robustness through Fuse-Segmentation</i> Nirvan Makoond, Manuel Buitrago and Jose M. Adam, ICITECH-Universitat Politècnica de València, Spain</p>	<p><u>051 Jacques</u> <i>Large-scale Gas Detonation Shock Tube for Energetics and Blast-Effects Research</i> Chris Jackson, Molly Kamide and Eric Jacques, Virginia Polytechnic Institute and State University, USA</p> <p><u>150 Santiago Padilla</u> <i>Modeling Shock-Tube Pressure Wave Propagation to Design Dynamic Loading Experiments</i> Jean Santiago-Padilla, Kyle Moss and John Hoemann U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg MS, USA</p> <p><u>166 Roller</u> <i>Shock Tube Testing of Soil-Filled Wall Elements – Applicability of High-Speed Diagnostics</i> Christoph Roller and Malte von Ramin, Fraunhofer Institute for High-Speed Dynamics, EMI, Germany</p> <p><u>131 Laflamme</u> <i>High-Rate State Estimation enabling Sub-Millisecond Feedback Systems</i> Simon Laflamme, Iowa State University Chao Hu, University of Connecticut Austin Downey and Jason Bakos, University of South Carolina Jacob Dodson, Air Force Research Laboratory - Munition Directorate USA</p>	<p><u>178 Elkilani</u> <i>Effect of Panel Type and Thickness on the Blast Response of the Laminated Glass Panels</i> Ahmed Elkilani, Ahmed Elbelbisi, Mohamed Elsayi Mahmoud and Hani Salim, University of Missouri Alaa Elsis, Southern Illinois University Andrew Bowman, U.S. Army Engineer Research and Development Center USA</p> <p><u>037 Andrae</u> <i>Experimental Investigations on Retrofitted uPVC Windows under Blast Loads</i> Matthias Andrae and Norbert Gebbeken, University of the Bundeswehr Munich, Germany</p> <p><u>225 Weaver</u> <i>An Investigation into the Blast Resistance of Ethylene-Vinyl Acetate Laminated Glazing Panels</i> Mark K. Weaver, Karagozian & Case, Inc. Phillip Benschhoff, Department of State, Bureau of Diplomatic Security, Physical Security Division, Research and Development Branch Daniel Duke, Department of State, Bureau of Diplomatic Security, Physical Security Division, Research and Development Branch Huiyang Luo, Karagozian & Case, Inc. Michael Lowak, Baker Engineering and Risk Consultants, Inc. Leila Abdul Hadi, Battelle</p>	<p><u>222 Li</u> <i>Mitigation Performance of Origami-Inspired Tri-Directional Auxetic Metastructure</i> Qiusong Yang and Zhejian Li, Guangzhou University, China, Hong Hao and Wensu Chen, Curtin University, Australia</p> <p><u>064 Ngo</u> <i>A Multi-Deformation Stage Auxetic Structure for Blast Energy Absorption</i> Rajendra Prasad Bohara, Steven Linforth, Tuan Nguyen, Abdallah Ghazlan, and Tuan Ngo, Department of Infrastructure Engineering, The University of Melbourne, VIC, Australia</p> <p><u>039 Groeneveld</u> <i>Simulating Quasi-Static Loading of Damaged Reinforced Concrete Structures</i> Andrew B. Groeneveld and M. Wesley Trim, U.S. Army Engineer Research and Development Center, Vicksburg, MS USA Robert S. Browning, Browning Solutions, LLC, Sardis, AL, USA</p> <p><u>210 Perlman</u> <i>Experimental and Numerical Investigation of Direct Shear Mechanism in Steel-Plate Composite (SC) Structures</i> Margaret Perlman, Purdue University, Joshua Harmon, Purdue Applied Research Institute, Amit Varma, Purdue University and Lisa Choe, Purdue Applied Research Institute, USA</p>

<p><u>226 Weaver</u> <i>Results from a Blast Test on a 7-Ply Cross-Laminated Timber Panel</i> Mark K. Weaver, Karagozian & Case, Inc., Michael Newberry and Jalen Johnson, Battelle, USA</p>	<p><u>237 Ben Rhouma Mohamed</u> <i>Numerical Investigation of the Blast Performance of Reinforced Concrete Columns Subjected to Close-In Explosion</i> Ben Rhouma Mohamed (a,b), Aminou Aldjabar (a,b), Maazoun Azer (a), Belkassem Bachir (a), Tine Tysmans (b), and Lecompte David (a) (a) Royal Military Academy, Propellant Explosives and Blast Engineering Department, Brussels, Belgium (b) Vrije Universiteit Brussels, Mechanics of Materials and Constructions Department, Brussels, Belgium</p> <p><u>052 Zohrabyan</u> <i>Input Parameters for the Numerical Model of Reinforced Concrete Slabs after Contact Detonation for the Computing of the Residual Static Load Bearing Capacity</i> Vahan Zohrabyan and Thomas Braml, Bundeswehr University Munich, Germany</p>	<p><u>207 Song</u> <i>Pre-compression Kolsky Tension Bar Technique for Dynamic Direct Tensile Characterization of Brittle Materials</i> Bo Song, Angela Ku and Thomas Martinez, Sandia National Laboratories, Albuquerque, NM Ethan Hofer and Francisco Valentin, nou Systems Inc., Huntsville, AL USA</p> <p><u>208 Hofer</u> <i>Novel, Adaptable Specimen Holders for Modified Kolsky Bar Testing of Brittle Materials</i> Ethan Hofer and Francisco Valentin, nou Systems Inc., Huntsville, AL Vinamra Agrawal, Auburn University, Auburn, AL Bo Song, Sandia National Laboratories, Albuquerque, NM USA</p>	<p><u>168 Erekson</u> <i>Review and Evaluation of Blast-induced Glass Hazards and Probability of Breakage using Explosive Test Results</i> J. Mikhael Erekson and Kenneth W. Herrle, Applied Research Associates, Inc., USA</p> <p><u>172 Elbelbisi</u> <i>Different Effects on the Blast Performance of Laminated Glass Panels</i> Ahmed Elbelbisi, University of Missouri Alaa Elsis, Southern Illinois University Hani Salim, University of Missouri Michael Newberry, Battelle USA</p>	
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Tuesday 16 May

5:00 to 6:00 IAPS board meeting

B-K meeting room (map shows as 35 seats, northwest corner)

6:30 to 9:00 ICPS6 Conference Dinner

Shelby Center for Engineering Technology, Oliver & Sally Kingsley Courtyard

Food catered by Terra Cotta Catering (www.tcc-catering.com)

Beverages catered by B&B Beverage Management (beveragemgmt.com)

Music by AU Jazz Combo (<https://www.cla.auburn.edu/music/prospective-students/ensembles/auburn-jazz-combo/>)

Wednesday 17 May, Session Group 7, 8:00 to 10:00

A	B	C	D	E
IMPACT	ADVANCED MATERIALS / CHARACTERIZATION	ANALYTICAL AND COMPUTATION METHODS / ADVANCED ANALYSES / MODELING AND SIMULATION	BLAST PROTECTION / STRUCTURAL RESPONSE / PROTECTIVE SYSTEMS	ENGINEERING AND DESIGN / ASSESSMENT / ANALYSIS TOOLS
Hong Hao	Fengtao Bai	John Puryear	Hezi Grisaro	Bob Browning
<p><u>023 Ngo</u> <i>Effects of Shear Keys and Different Fibers on the Impact Responses of Dry Beam-Column Joints Using GFRP Bolts and Reinforcements</i> Tuan T Ngo, Thong M Pham, and Hong Hao School of Civil and Mechanical Engineering, Curtin University, Australia</p> <p><u>041 Tran</u> <i>Post-tensioned Precast Segmental vs Monolithic Geopolymer/Portland Cement Concrete Beams against Impact Loading</i> Duong T. Tran, Thong M. Pham, and Hong Hao, Curtin University, Australia</p> <p><u>042 Seidl</u> <i>Impact Experiments on Steel Ropes for Explosion Debris Catching</i> Seidl M. and Klavzar A., French-German Research Institute of Saint-Louis, Saint-Louis, France Pahl R. B., Foreign Office, Berlin, Germany Kühner K., Jacob GmbH, Ostfildern, Germany</p>	<p><u>031 Dancygier</u> <i>Effect of Applying Steel Fibers in RC Barriers on the Rear Face Damage Caused by Non-Deforming Projectile Impact</i> Osnat Shrira and Avraham N. Dancygier, Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology</p> <p><u>162 Signorini</u> <i>On the Role played by Textile-to-Matrix Bond in the Mitigation of Spalling of Hybrid Mineral-Bonded Protective Layers for Concrete Structures Subjected to Collision</i> Cesare Signorini and Viktor Mechtcherine, Institute of Construction Materials, Technische Universität Dresden, Germany</p> <p><u>171 Kim</u> <i>Evaluation on SIFRCC Properties under High Strain Rate through SHPB Test</i> Cheolwoo Park, Kangwon National University Sung-Wook Kim, Korea Institute of Civil Engineering and Building Technology Seungwon Kim, Kangwon National University South Korea</p>	<p><u>049 Nowak</u> <i>Preliminary Studies on a Numerical Model for Estimating Underwater Explosion</i> Piotr R. Nowak, Tomasz Gajewski, Piotr Peksa and Piotr W. Sielicki, Poznan University of Technology, Poland</p> <p><u>163 Sewell</u> <i>Finite Element Analysis of Aluminum Panel Blast Tests</i> Caitlin M. Sewell, Robert Lunceford, James T. Brokaw, and J. Mikhael Erekon Applied Research Associates, USA</p> <p><u>164 Elsis</u> <i>Numerical Modeling of Window Systems under Static Loading</i> Alaa Elsis, Southern Illinois University Edwardsville Andrew Bowman and Stephen Robert, U.S. Army Engineer Research and Development Center Hani Salim, University of Missouri USA</p> <p><u>170 Elsis</u> <i>Spatial Grillage Model for Simulating Laminated Glass Failure</i> Alaa Elsis, Southern Illinois University Edwardsville Hani Salim and Zhen Chen, University of Missouri USA</p>	<p><u>036 Kewaisy</u> <i>Simulation-Based Design of RC Walls for Close-In Blast Effects</i> Tarek Kewaisy, FLUOR Mission Solutions, Greenville SC, USA Ahmed Khalil and Ayman Elfouly, Applied Science International LLC, Durham NC, USA</p> <p><u>040 Grisaro</u> <i>Numerical and Experimental Study on the Response of Bare and Strengthened Steel I-Shaped Members to Near-Field Detonations</i> Hezi Y. Grisaro, Technion – Israel Institute of Technology, Haifa, Israel Michael V. Seica, Department of Civil & Mineral Engineering, University of Toronto, Toronto, ON, Canada and Explora Security Ltd., London, United Kingdom Jeffrey A. Packer, Department of Civil & Mineral Engineering, University of Toronto, Toronto, ON, Canada</p> <p><u>043 Wattad</u> <i>On the Efficiency of Aluminum Foam as a Sacrificial Layer for Protection of Structures under Blast Loads</i> Ola Wattad and Hezi Grisaro Technion – Israel Institute of Technology, Technion City, Haifa, Israel</p>	<p><u>044 von Ramin</u> <i>Quantifying the Debris Hazard from Explosions</i> Malte von Ramin, Johannes Schneider, Daniel Eberhardt and Alexander Stolz, Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut EMI, Germany</p> <p><u>060 Dennis</u> <i>Towards the Development of Machine Learning Tools for Blast Load Prediction</i> Adam A Dennis, Department of Civil & Structural Engineering, University of Sheffield Christopher G Stirling, Viper Applied Science, Glasgow Samuel E Rigby, Department of Civil & Structural Engineering, University of Sheffield UK</p> <p><u>152 Netherton</u> <i>An Exploration of Protective Structures and Range Design</i> Michael D. Netherton, The MAJAM Group Pty Ltd., NSW, Australia Bruce B. Hughes, Perth, WA, Australia Peter C. Reynolds, Canberra, ACT, Australia</p> <p><u>062 Pickett</u> <i>Non-Uniform Loading Considerations in Single Degree of Freedom (SDOF) Modelling</i> Michael C. Pickett and John R. Nevels, USACE HNC Facilities Explosives Safety Mandatory Center of Expertise, USA</p>

	<p><u>190 Kim</u> <i>Investigating the Pullout Resistance of Steel Fibers under High Rate Pullout Using a Strain Energy Frame Impact Machine</i> Jun Kil PARK, Korea Institute of Ocean Science and Technology Hyeon Woo NOH and Dong Joo KIM, SEJONG University South Korea</p> <p><u>206 Liu</u> <i>An Efficient and High-Volume Fraction 3D Mesoscale Modeling Framework for Concrete under High-Strain-Rate Compression</i> Yishuo Li, Libao Liu and Fengtao Bai, Ocean University of China</p>	<p><u>188 Chong</u> <i>Numerical Investigation of Fully-Bolted Steel Beam to CFST External Diaphragm Connection</i> K.S.Chong, Department of Civil and Environmental Engineering, National University of Singapore S.D Pang, Department of Civil and Environmental Engineering, National University of Singapore</p> <p><u>227 Puryear</u> <i>Constitutive Model for Polyurethane Elastomer in Response to Contact Detonation</i> John Puryear, Applied Physical Sciences, Groton, CT USA Lynsey Reese, Naval Facilities Engineering Command, Engineering and Expeditionary Warfare Center, Port Hueneme, CA USA</p>	<p><u>118 Castedo</u> <i>Testing and Modeling of RC Structure Response to IEDs</i> Ricardo Castedo, Anastasio P. Santos, Lina M. López, and María Chiquito, Universidad Politécnica de Madrid José I. Yenes, Escuela Politécnica Superior del Ejército—Ministry of Defense Santiago Martínez-Almajano, Escuela Politécnica Superior del Ejército—Ministry of Defense Claudio Oggeri, Politecnico di Torino Spain</p> <p><u>183 Holgado</u> <i>Breach Diameter Prediction of Reinforced Concrete Wall under Contact / Near-contact Explosives Using Deep Neural Network</i> David Holgado, Arturo Montalva, Jason Florek and Rodrigo Mourão, Stone Security Engineering, P.C., USA</p>	<p><u>084 Yeo</u> <i>Development of a Fast-Running Method for Prediction of Blast Propagation in Partially Confined Spaces</i> Hwee Kiat YEO and Swee Hong TAN, Blast Engineering Section, Protective Security and Safety Centre of Expertise, Home Team, Science and Technology Agency, Singapore</p> <p><u>232 Browning</u> <i>Open Source Software for Simulation: Friend or Foe?</i> Robert S. Browning, Browning Solutions, LLC</p>
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Wednesday 17 May

10:00 to 10:30
coffee/beverage break

IAPS GENERAL ASSEMBLY MEETING

10:30 to 11:30
Conclusions, recognitions, IAPS general assembly meeting and adjourn

12:15 light lunches available for those staying for the shortcourse

SHORTCOURSE

1:00 to 5:00
Shortcourse: "Blast Vulnerability Assessment – First step to economical protection!" presented by Stone Security Engineering

WWW.STONESECURITYENGINEERING.COM

Free
Post-conference short course



BLAST VULNERABILITY ASSESSMENT

First step to economical protection!



ICPS6

6TH INTERNATIONAL CONFERENCE
ON PROTECTIVE STRUCTURES

May 17, 2023 - 1pm

Registration required



SECURITY OPERATIONS

Get to know more about the specifics of security operations and the role they play in a blast assessment.



BLAST PERFORMANCE AND MITIGATION

What to do when a building fails to meet the performance requirements? - IT DEPENDS!



COMMUNICATING WITH CLIENTS

No blast assessment is efficient without mastering the dollar language and dismistifying the concept of blast-proof.