INTERNATIONAL SYMPOSIUM ON
SEISMIC RETROFIT OF UNREINFORCED MASONRY CHURCHES OF THE PHILIPPINES
National Museum Auditorium, Manila, Philippines

PROGRAM

Jan. 13, 2016: WEDNESDAY

0. INTRODUCTION

8:00-8:15 Welcome Remarks by NCCA and Partner Sponsoring Organizations

8:15-8:40 **0.1** Brief Overview of Bohol and Philippine Church Architecture and Construction Technology. Typology of Churches, Towers, Convents (***Architectural Historian/Author Regalado Trota Jose,*** *Philippines*)

8:40-9:00 ~~Brief Statement of Importance of Historic Preservation (***Archt. Augusto Villalon,*** ~~*Philippines*~~) Cancelled

9:00-9:30 **0.2** The Earthquake Threat In The Philippines (***Dr. Mario Aurelio****, Philippines*)

9:30-10:00 0.3 Retrofit Issues and Practices in the Philippines (***Engr. Carlos Villaraza****, Philippines*)

10:00-10:15 *Recess/Coffee Break*

1.0 First Session: CONTEXT

10:15-11:15 **1.1** Global Seismic Responses of Unreinforced Heritage Masonry Construction (***Prof. Claudio Modena****, Italy*)
-Damages and failure mechanisms: In-plane and out-of-plane behavior
-Masonry typologies and masonry quality
-Hybrid Unreinforced Masonry and Reinforced Concrete Structures
-Building typologies: churches and towers

11:15-12:15 **1.2** Component Typologies and Localized Damage Mechanisms of Unreinforced Heritage Masonry Construction (***Dr. Gorun Arun****, Turkey*)
-Walls and Columns
-Wood Floors and Roofs
-Connections Between Components
-Previously Repaired Buildings

12:15-1:15 Lunch

2.0 Second Session: DATA GATHERING

1:15-2:00 **2.1** Conditions Survey (***Archt/Engr. Stephen Kelley,*** *USA*)
-Historical Evolution: Identification of vulnerable elements, previous repairs
-Geometrical Survey: Base drawings, photogrammetry, laser scanning, topo survey
-Visual Inspection: Loss, displacement, crack patterns
-Detailed survey of Macro-elements: survey of decay and damage of walls, masonry characterization, survey of connections

2:00-2:45 **2.2** Materials Testing Techniques (***Eng. Michael Schuller,*** *USA)*
-Non-destructive Techniques: Visual, thermography, sonic pulse velocity, ultrasonic, radar, pendulum hammer testing, moisture assessment, boroscopy
-Slightly Destructive Techniques: Flat jack, hardness, pull-out tests, core drilling, sampling, and other in-situ techniques
-Destructive Techniques: Stone, brick, mortar, and masonry properties testing: Sampling techniques, optical and mineralogy-petrography examination, mechanical, physical, durability and chemical tests

2:45-3:00 *Recess/Coffee Break*

3.0 Third Session: STRUCTURAL ANALYSIS

3:00-3:30 **3.1** International Models for Seismic Codes and Guidelines (***Prof. Sergio Lagomarsino,*** *Italy*)

3:30-5:30 **3.2a** Analysis Methods for Unreinforced Heritage Masonry (***Prof. Paulo Lourenço,*** Portugal and
3.2b (***Prof. Claudio Modena,*** Italy)
-Appropriate Modeling Strategies: Issues of accuracy, structural complexity, availability of data, end use of results
-Rigid Block Analysis: Limit analysis of out-of-plane and in-plane mechanisms
-Structural Elements Models: Frame modeling of piers and spandrels
-Discrete Element Models: Masonry units and interfaces
-Finite Element Modeling: Non-linear constitutive laws
-Modeling of Strengthened Structures
-Problems with Models

5:30-6:00 Discussion

Jan. 14, 2016 THURSDAY

4.0 Fourth Session: REMEDIES

8:00-8:30 **4.1** Philippine Seismic Retrofit Code (***Engr. Carlos Villaraza, ASEP,*** *Philippines)*

8:30-9:15 **4.2** Remediation and Retrofit Strategies in the Philippines (***Engr. Emilio M. Morales***, *Philippines*)

9:15-10:00 **4.3** Overview of Repair Criteria and Compatibility of Intervention - (***Dr. Arun Menon,*** *India)*
-Traditional Repair Techniques
-Modern Repair Techniques

10:00-10:15 *Recess/Coffee Break*

10:15-11:00 **4.4** Overview of Seismic Retrofit (***Archt/Engr. Stephen Kelley,*** *USA*)

11:00-12:00 **4.5** Overview of Improvement Connections Between Components and Improvement of Floors and Roofs (***Prof. Claudio Modena****, Italy****)***
-Connection Between Walls
-Tie Beams and Tie Rods
-Hysteretic Dissipation Anchors
-Reconnecting Walls to Floors
-Stiffening with Wood and Steel: Plates and Diagonals

12:00-1:00 *Lunch*

5.0 Fifth Session: CASE STUDIES AND SOLUTIONS

1:00-1:30 **5.1** Case Study 1 (***Engr. Ruel Ramirez****– re: Malate, Philippines*)

1:30-2:00 **5.2** Case Study 2 (***Prof. Daniel Torrealva-*** *re: Peru/Chile*)

2:00-2:30 **5.3** Case Study 3 - Analysis of Spires and Towers (***Dr. Matthew DeJong,*** *UK*)

2:30-2:45 *Recess/Coffee Break*

2:45-3:30 **5.4** Case Study 4 (Solutions for URM Churches (***Prof. Sergio Lagomarsino, Italy)***

3:30-4:00 **5.5** International Best Practices for Seismic Evaluation and Retrofit of Heritage Structures: A Proposal for the Philippines (***Archt. Zach Watson Rice***, *USA)*

4:00-5:00 Final Open Panel/Discussion (Moderator: **Archt. Roz Zacarias Li**)
-Solutions applicable to the Philippines

5:00-7:00 *Reception (for all Attendees and Speakers)*

END OF SYMPOSIUM