PREFACE

In Egypt, it is estimated that at least 400,000 housing units are needed every year. If conventional reinforced concrete construction continues to be employed alone, 50% of annual demand will not be met, leaving the situation to worsen.

In addition to demands for more residential housing units, the demands for better residential housing must be recognized. These demands exist along two vectors: (1) sustainability: fully consider the important balancing act between economic, environmental, and social constraints when considering materials, means and methods, and long-term function of the structure, and (2) resiliency: increase the performance of residential structures against natural hazards, particularly earthquakes and wind events. This confluence of greater demand in number and performance, for residential housing makes today an excellent time to question if traditional residential construction methods should be augmented by new systems.

To meet such a challenge, it is necessary to explore the latest construction technologies, and to create innovative building systems that have the potential to bring high-performance affordable housing within reach of new markets, particularly in developing regions. Beyond being affordable, these systems have to be flexible enough to suit local climate and site conditions, cultural and living habits, and spatial standards. Construction solutions also should reduce or eliminate the need for skilled personnel on the site, and ideally should be assembled with simple tools and erectable without machinery. Among the available construction systems that satisfy the previous conditions, light (cold-formed) steel framing systems have proven to be a worthy alternative to traditional systems.

Potential advantages of such light steel framing systems include the high degree of dimensional exactness of the members, high strength-to-weight ratio of the members, high recycled content, and ease of construction. These qualities have lead cold-formed steel studs and tracks to be the framing method of choice for non-load bearing walls in mid- and high-rise construction worldwide.

This workshop explores the use of cold-formed steel framing in residential housing with a focus on creating the necessary awareness in the society to include such systems in the solutions adopted to solve the existing housing problem.
Objectives of the Workshop:

- To create awareness in the society about the worldwide applications of light steel framing in residential buildings.
- To give an overview about the design, production and erection considerations related to such systems.

The scientific material included in this proceedings aims at providing the attendance with a general overview of the covered topics. Materials included contain some parts by the individual speakers in each topic and the rest have been collected from available resources such as books, journals, and public domain web sites. All these resources are hereby acknowledged.

Organizing Committee:

**Egypt**

Prof Dr Metwally Abu-Hamd
Prof Dr Mohammed Badr
Dr Maged Hanna

**United States**

Prof Dr Ben Schafer
Dr. Zhanjie Li
Egypt-United States Workshop on
Use of Light Steel Framing in Residential Buildings

Final Program

Day 1: Sunday December 9, 2012
08:00 – 09:00 Registration
09:00 – 09:30 Opening Session

Session 1: Application of Light Steel Framing (LSF) in Residential Buildings
Moderator: Ben Schafer
09:30 – 09:45 Current Housing Status in Egypt (M. Abu-Hamd)
10:15 – 11:15 Worldwide Applications of LSF in Residential Building Construction (G. Richards)
11:15 – 11:30 LSF Applications in the Arabian Gulf Area (N. El-Hajj)
11:30 – 12:15 Coffee Break

Session 2: Resources for the Engineering and Design of Light Steel Framing
Moderator: George Richards
12:15 – 12:30 Egyptian Design Codes and LSF (M. Abu-Hamd)
12:30 – 13:00 International Design Codes and Manual Design Aids (B. Schafer)
13:00 – 13:30 Overview of CFS Design Software** (N. Rahman)
13:30 – 14:15 Coffee Break

Session 3: Design Examples of LSF Residential Buildings
Moderator: Don Allen
14:15 – 15:00 Alternative Solutions for floors and walls. (M. Badr and N. El-Hajj)
15:00 – 15:30 Design Case Studies (M. Abu-Hamd /M. Hanna)

Day 2: Monday December 10, 2012

Session 4: Connections and Nonstructural Details for LSF
Moderator: Nader El Hajj
09:00 – 09:45 Connections in LSF (N. Rahman)
09:45 – 10:00 Architectural and Services Details (D. Allen)
10:00 – 10:30 Fire & Acoustic Performance (B. Schafer /N. El-Hajj)
10:30 – 11:00 Sustainability Assessment (D. Allen and Zhanjie Li)
11:00 – 11:45 Coffee Break

Session 5: Production and Erection Technology - American Case Studies
Moderator: Ben Schafer
11:45 – 12:15 DSI (D. Allen)
12:15 – 12:45 TSN (N. Rahman)
12:45 – 13:15 FRAMECAD (N. El-Hajj)
13:15 – 13:45 BORM (G. Richards)
13:45 – 14:30 Coffee Break

Session 6: Implementation of LSF in Egypt
Moderator: Metwally Abu-Hamd
14:30 – 15:00 Present Capabilities of LSF in Egypt (Alex form)
15:00 – 15:15 Implementation of LSF in Egypt (M. Abu-Hamd)
15:15 – 15:30 Closing Remarks (All)

*Questions and discussion from the audience is highly encouraged. Five minutes is set aside for shorter talks (less than 30 minutes) and 10 minutes of questions and discussion is set aside for longer talks.
**Join us in the exhibition space for more information about design software associated with the U.S. participants and their companies.
Speakers Biography

Metwally Abu-Hamd, Cairo University, Egypt

Dr Abu-Hamd is a Professor of Steel Structures and Bridges in the Structural Engineering Dept of the Faculty of Engineering at Cairo University, Egypt. He received his B.Sc. form Cairo University, Egypt in 1971 and his M.Sc. and Ph.D. in 1975 and 1977 from Duke University, USA. On the academic level, Dr Abu-Hamd served as Department Head from 2007 to 2009 and served as Director of the Civil Engineering Research and Studies Center from 1994 to 2005. He authored two text books on the design of Plate Girder Bridges and Steel Bridges. His research interests include optimization of steel structures, composite columns, local stability of plate girders and cold formed steel construction. Dr Abu-Hamd has published numerous research papers and supervised several M.SC. and Ph.D. theses in the field of Structural Steel Design. He received the Cairo University Award for Distinguished Research in Structural Engineering in 1985 and the Egyptian Government State Prize for Engineering Sciences in 1989. Dr Abu-Hamd is chairman of the Egyptian Universities Committee for Promotion of University Professors since 2011. On the professional level, Dr Abu-Hamd is a member of the Permanent Committee of the Egyptian Code of Practice for Steel Structures and Bridges since 1984 and a registered Professional Engineer since 1991. He has been working as a Consulting Engineer since 1980 and was involved in the structural steel design of many major projects in Egypt.

Don Allen, DSi Engineering, USA

After working for a product manufacturer, a specialty engineer, and full-service structural engineering firm, Don Allen, P.E. spent 8 years as Technical Director for the Steel Stud Manufacturers Association, the Steel Framing Alliance, and the Cold-Formed Steel Engineers Institute. Having returned to private practice in 2012, Mr. Allen still has a special interest in the structural role of materials in sustainable construction. He is a LEED® Accredited Professional, a member of ASCE Structural Engineering Institute (SEI) Committee on Sustainability, the ASCE SEI Committee on Cold-Formed Steel, and chairs the General Provisions subcommittee of the American Iron and Steel Institute (AISI) Committee on Framing Standards. Allen has given presentations on steel throughout North America, as well as China, Colombia, South Africa, and Hawaii. He was instrumental in the recent development of the SSMA Code Compliance Certification program, and chairs the education Task Group of the Structural Engineers Association of Georgia Structural Engineers’ Emergency Response committee. Allen currently oversees engineering marketing for DSi Engineering in Norcross, Georgia.
Mohamed Ragaee Badr, NHBRC, Egypt

Mohamed Ragaee Badr has B.Sc. in 1982, M.Sc. in 1990 and Ph.D. in 1996 in repair of steel under load. He is the Professor and Head of Structure and Steel Construction Institute in National Housing and Building Research Center in Egypt. He has over 30 years of experience in steel research and rehabilitation of structures and in design, supervision of construction of steel and concrete projects.

Nader El Hajj, FRAMECAD Middle East, USA

Nader El Hajj is a licensed structural engineer with a Master's of Science degree in Structural engineering and an MBA. He has over 30 years of experience in the design, construction and analysis of building materials. He is the director for the Dubai based FRAMECAD Middle East. Prior to FRAMECAD, Mr. El Hajj was the Director of the Research Centre for the National Association of Home Builders in the USA. He managed research and development projects for alternative building materials and emerging technologies. He also managed tasks related to design, construction, analysis, and field evaluation of construction materials in housing. Mr. El Hajj developed standardized design and other prescriptive specifications for light gauge steel framing. Mr. El Hajj is active in writing engineering standards, codes, and specifications for the building industry. Mr. El Hajj authored several publications on the subject of housing design and cold-formed steel framing. Mr. El Hajj serves on several industry-related steel committees.

Zhanjie Li, Johns Hopkins University, USA

Dr. Li received his B.S. in Civil Engineering from Shanghai Jiao Tong University in China and his M.S. in Structural Engineering from both Harbin Institute of Technology in China and Johns Hopkins University and Ph.D. in Structural Engineering from Johns Hopkins University. His Ph.D. research was on Finite Strip Modeling of Thin-walled Members by developing a new finite strip method that accounts for general boundary conditions and a modal identification method for shell finite element analysis quantify the buckling and failure modes. Currently he is working as a post-doctoral researcher on US Egypt Cooperative Research: Use of Cold-Formed Steel in (Mid-rise) Residential Housing focusing on a novel cold-formed steel framing system and study of its sustainability features. Dr. Li is a member of Structural Stability Research Council, Cold-Formed Steel Engineers Institute and American Institute of Steel Construction.
Nabil Rahman, The Steel Network, USA

Nabil A. Rahman, Ph.D., P.E. is the Director of Engineering and R&D for The Steel Network, Inc. in Durham, NC. He also currently the chairman of the Cold-Formed Steel Engineers Institute (CFSEI), an international coalition of CFS design engineers with 900+ professional and student members. Dr. Rahman has vast experience in CFS product development, design software development, as well as the analysis and protection of CFS structures against extreme loads (progressive collapse, blast, Impact and hurricanes). He has given numerous continuing education seminars on Design of Cold Formed Steel Framing Systems to engineering associations around the US and internationally in Europe and South America. He has participated in several vulnerability, blast and progressive collapse assessments of commercial and military buildings. He serves as a member of the Committee on Specification and Committee on Framing of the American Iron and Steel Institute (AISI) and a member of ASCE Committee on Cold-Formed Steel.

George Richards, P.E., BORM Group of Companies, USA

George is a technical strategist who has been analyzing and formulating design solutions for over 30 years. His expertise lies in research, design, and the development of construction methodologies, techniques, tooling, manufacturing, intellectual property and specialized product development. George has brought his innovations to bear on over 250,000 homes and buildings in America, Asia, the Middle East & Africa. George brings a unique approach and vision to the industry. Always focused on the most practical and efficient solutions, he brings valuable insight into the optimization of material usage and reduction of waste. He has played a pivotal role in the research and development of cold-formed steel framing through collaborations with both industry alliances and university research centers. George is also well known for his work in improving the efficiency of concrete construction. George holds a Bachelor's degree in Architectural Engineering from California Polytechnic State University, San Luis Obispo. He is a member of the North American Steel Alliance, American Steel Institute, SEAOC (Structural Engineers Association of California) and is former president of the CFSEI (Cold-Formed Steel Engineers Institute). He is a registered engineer in the state of California, and has served on many committees that have written and published building codes.
Ben Schafer, Johns Hopkins University, USA

Professor Schafer received his B.S.E. in Civil Engineering from the University of Iowa with Honors and Distinction and his M.S. and Ph.D. in Structural Engineering from Cornell University. Before joining academia he worked as a practicing structural engineer at Simpson, Gumpertz & Heger, Inc. in Boston, MA and is licensed as a Professional Engineer. He currently holds the titles of Professor, Swirnow Family Faculty Scholar, and Chair of the Department of Civil Engineering at Johns Hopkins University. Professor Schafer serves on numerous technical committees related to cold-formed steel structures, is a past-president of the Cold-Formed Steel Engineers Institute, and is the current Vice-Chair of the Structural Stability Research Council. He has received a National Science Foundation CAREER Award, the ASCE Collingwood and Huber Prizes, and Teaching Awards. For further information on Professor Schafer's activities please see www.ce.jhu.edu/bschafer.

Maged Tawfick Hanna, NHBRC, Egypt

M.T. Hanna, Ph.D. is an associate professor in Structure and Metallic Construction Department at Housing and Building National Research Center, Cairo, Egypt. He obtained his B.Sc. degree from Cairo university in 1994, and the M.Sc. as well as the Ph.D. degrees from Ain-Shams University in 1999 and 2004, respectively, in the field of elastic stability of planer steel frames, and behavior of slender I-section beam-columns. He spent one academic year (2008-2009) as a visitor at Johns Hopkins University, USA. Dr. Hanna has several papers published in international journals and conferences. In-addition to the academic experience, Dr. Hanna shared in the design of several steel and concrete buildings. He is also a member of the Egyptian Engineering Syndicate and the Egyptian Steel Bridges Code Committee.
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