Report on One-Day Seminar on Design & Applications of Cold-Formed Steel in Buildings

CIVIL AND STRUCTURAL ENGINEERING TECHNICAL DIVISION

reported by

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Group picture of the speakers with CSETD representative and BlueScope representative

On 21 March 2017, the Civil and Structural Engineering Technical Division (CSETD), in collaboration with NS BlueScope Malaysia Sdn. Bhd., organised a seminar on the design and applications of Cold-Formed Steel (CFS) in buildings.

Attended by 79 participants from the construction industry, it started with a warm welcome by Ms. Yeoh Moi Thian from BlueScope, who expressed hope that through the seminar, cold-formed steel will be promoted positively and be the industry's choice for structure products.

CSETD Chairman Ir. Dr Ng Soon Ching thanked BlueScope, two speakers from Australia and local speakers for making the time and effort to promote cold-formed steel to the industry. The workshop will enable those in the industry to have a better understanding and appreciation of as well as insight into the use of CFS.

The first keynote speaker, Mr. Ken Watson, is no stranger to the CFS industry. He has extensive experience in its management, design, market research and development. He is also a technical publication author and in the standards committee. For his topic, Introduction to Cold-Formed Steel, Typical Application and National Association of Steel Framed Housing Inc (NASH), he gave a brief overview of CFS and its advantages as well as the differences between hot-rolled and cold-formed steel. Countries such as Australia, New Zealand, South Africa and North America have adopted the use of CFS in the housing industry due to its cost, durability, light weight, flexibility in design and speed of construction without compromising on strength.

The next speaker, Prof. Emad Gad, is the Dean of Engineering at Swinburne University of Technology, Australia. He has wide experience in structural dynamics, residential construction, structural connections, experimental techniques and modelling. He spoke on Introduction to Design Members – Effective Width & Direct Shear Methods, giving a brief outline of cold-formed design methods, design of tension members, compression members, flexural members and connections.

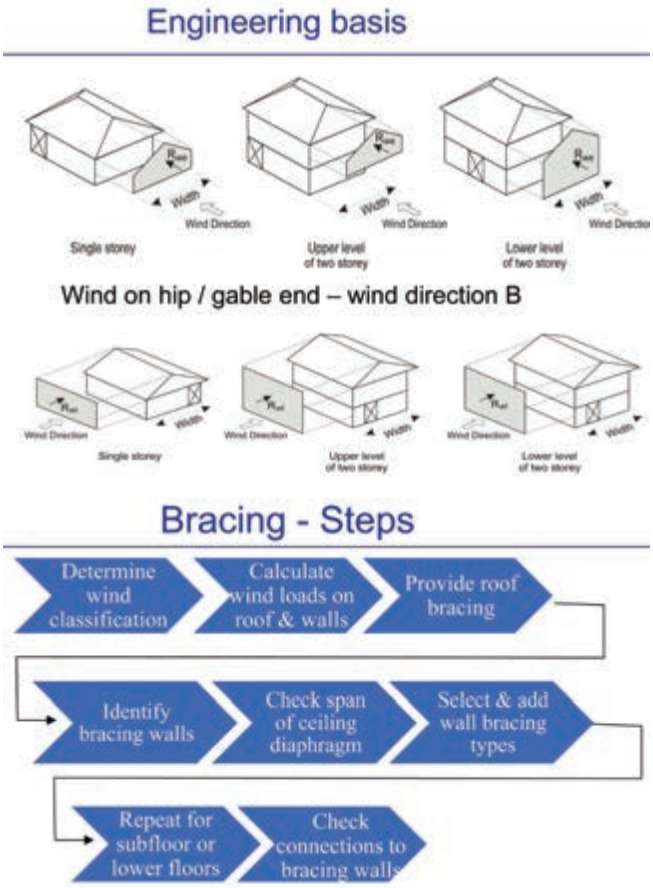
From the review, it is noted that CFS has a different mechanical and physical behaviour from hot-rolled steel especially in local/post buckling, propensity for twist, distortional buckling, web crippling, corrosion rate and connection details. This is largely due to the fact that CFS is more slender (both local and global element) than hot-rolled steel.

Mr. Ken Watson then introduced Design of Frames Using NASH Standards. NASH is an industry association on light steel structural framing systems for residential and commercial construction in Australia. The standards cover roof members, wall members, floor member, connections, bracing and testing for CFS. NASH standards provide a guide for designers in modelling, elemental designs and building performances. Span tables of generic products for the design and detailing of CFS structures were also provided. This will give users a gauge in sizing the steel members.

After lunch, Mr. Jack Chum, Technical Marketing Manager for NS BlueScope Malaysia, spoke on Sustainability and Durability of Coated Steel for Lightweight Steel Framing. He gave participants an insight into the performances of

CFS with different coatings. He showed videos of how cold-formed steel is made and coated. There are two types of metallic coated steel, galvanised steel (Z-type) and aluminium/zinc-alloy coated steel (AZ type). The coating provides a protection layer for the steel. Different thicknesses and coatings will yield different corrosion protection levels. He illustrated the severity of corrosion on different corrosion protection type; AZ type has better corrosion protection. Corrosion rate is also influenced by the environment, i.e. severe marine > industrial marine > rural.

The next topic on lateral loading and bracing wind and earthquakes, was presented by Prof. Emad Gad. The idea of bracing is to ensure the whole structure acts as a system for stability. Lateral force acting on different directions of a building will yield different forces on the steel elements. Step-by-step design of bracing was illustrated for easier understanding.



Engineering basis and bracing steps

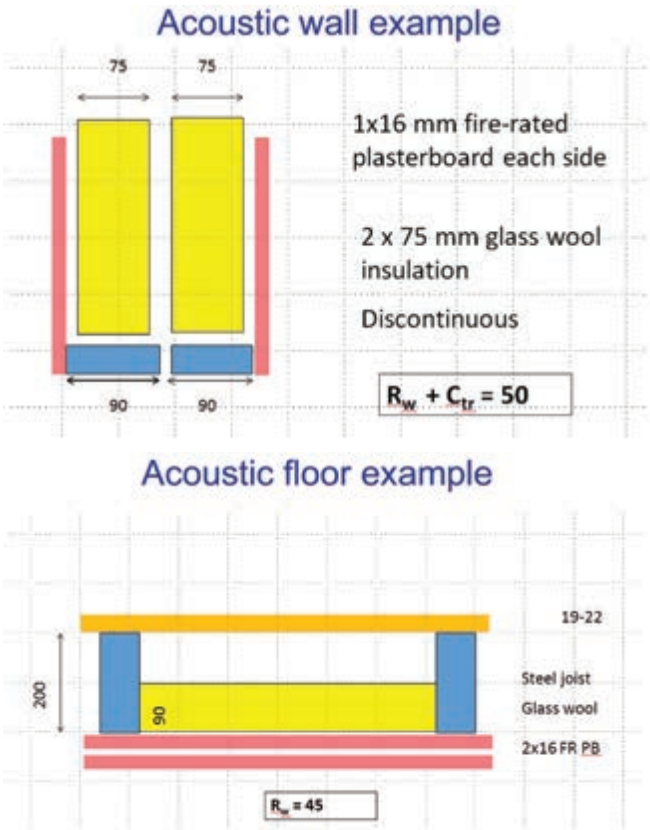
Bracing for roof and walls is assisted by the load distribution through diaphragm effect from the plasterboard or cement-board. Prof. Emad Gad went through a design example of the design checks that need to be covered through design calculations.

Mr. James Lim gave a hands-on session on construction using enduroframe. With a shop drawing at hand, his team assembled a mock-up unit of a scaled-down house. With motorised screwdriver and the cold-formed channels, the unit was installed with ease and speed but without compromising on accuracy. He emphasised good practices where there is a need for a good fabricator and installer. The design must be endorsed by a Professional Engineer and all materials must be covered by warranties.

The next topic was Design of Cold-Formed Steel Structures for Fire & Acoustic. Mr. Ken Watson made a quick study and comparison of fire regulations requirements in buildings between Australia and Malaysia.

Malaysian fire regulations tend to be more prescriptive in nature and performance-based solutions have also been adopted. Parameters that influence cold-formed steel fire rating levels include stud depth, thickness of steel, different stud cross sections, different steel types, wall configurations and insulations in walls.

Acoustic, on the other hand, can be controlled by using glass wool and plasterboard.



Typical wall and floor fire and acoustic protection layers

The final topic on design by testing was presented by Professor Emad Gad. Design by testing is encouraged for steel framing systems because some elements are difficult to produce capacities from first principals due to thin steel behaviour and composite structures. To ensure a comprehensive result through design by testing, it is important to identify critical design issues, design the test to critical situations, to have ample samples and to standardise procedure to ensure consistency in application. He went through a worked example on how to obtain a reliable target method.

The seminar concluded with a brief question and answer session and an appreciation gift ceremony between IEM CSETD, NS BlueScope and the speakers. ■