IABSE COLLOQUIUM
STOCKHOLM 1986

Thin-Walled Metal Structures
in Buildings
Structures métalliques à parois minces
dans les bâtiments
Dünnwandige Metallkonstruktionen
im Hochbau

POSTER SESSIONS
Introduction
The IABSE Colloquium «Thin-Walled Metal Structures in Buildings» was held in Stockholm from June 9 to 11, 1988. It was attended by 176 participants from 26 countries.
Organizer was the Swedish Group of IABSE in cooperation with the European Convention for Constructional Steelwork and the Swedish Institute of Steel Construction.
The main themes of the Colloquium were:
Theme I Thin-Walled Components, New Developments in Theory and Practice
Theme II Light-Gauge Metal Construction and Building Systems
Theme III Composite Light-Gauge Metal Construction
Theme IV Building Physics in Light-Gauge Metal Construction
As a basis for the working sessions of the Colloquium served a report, Proceedings, containing 56 written contributions. The report is available from the IABSE Secretariat in Zürich (IABSE Reports, Volume 49).
During the Colloquium an exhibition of posters was arranged where the authors had the opportunity to present and discuss their contributions with smaller groups of particularly interested persons.
The 17 contributions to these Poster Sessions are reproduced in the present brochure together with supplementary information from the authors.
Of the posters 8 relate to theme I, 4 to theme II, 3 to theme III and 2 to theme IV. In the brochure the contributions are arranged accordingly.

Authors and titles
E.L. AIRUMYAN, V.F. BELYAEV, I.A. RUMYANTSEVA, USSR
Load-Carrying Capacity of Steel Corrugated Sheeting 2
J.C. ELLUM, Denmark
Thin-Walled Trussed Rafter 4
P.C. GOUDZWAARD, The Netherlands
Shear Action of Fully Welded Corrugated Steel Sheets 6
M. HIRANO, H. HOZUMI, M. ARAYA, M. IWATA, Japan
Development of Long-Span Siding – Wind Pressure Test 8
P. JUHÁS, E. JUHÁSOVÁ, Czechoslovakia
Elasto-Plastic Behaviour of Thin-Walled Steel Elements 10
D. POLYZOIS, B. DANIELS, C-Y LIN, USA
Torsionally Elastic End Supports for Girts and Purlins 12
R. STURK, Sweden
Fastening in Thin Material with Selfdrilling Screws 14
K. TAKAHASHI, M. MIZUNO, Japan
Distortion of Thin-Walled Open Cross Section Members 16
J.O. BATS, The Netherlands
Industrialization of Housebuilding 18
T.E. FENKES, M. YENER, USA
Roof Deck-Zee Purlin Interaction in Thin-Walled Metal Buildings 20
J.G. POHL, R.S. SANCHEZ, USA
Fluid Supported Building Systems 22
J. STRÖMBERG, Sweden
A New Concept for Double-Skinned Roof’s 24
L. INGVARSSON, Sweden
Foam Concrete Reinforced by Light-Gauge Steel Members 26
K. JARMAI, Hungary
Analysis of Three-Layered Polymer-Concrete Steel Beams 28
G. WESTERGREN, Sweden
Moisture Movement in Composite Structures 30
K.H. KLIPPSTEIN, USA
Behavior of Cold-Formed Steel-Studs during Fire Test 32
H.A. VINBERG, Sweden
Radiation Properties of Surfaces 33
Analysis of Three-Layered Polymer-Concrete Steel Beams

Károly JÁRMAI
Dr.
Techn. Univ. for Heavy Industry
Miskolc, Hungary

The aim of the research was to determine the loss factors of the sandwich beams consisting of two metal faces and a core made of polyester-concrete, regarding various concrete thicknesses, and their load-carrying capacity. The static behaviour of the beams is characterized by stress-strain curves, the elastic modulus of the concrete and the admissible stress. We used the forced vibration technique to examine the dynamic behaviour of beams with the Brüel-Kjær devices. The loss factors of beams have been determined according to Oberst for various stresses and eigenfrequencies. The loss factor and the dynamic shear modulus of the polymer-concrete were measured by the Jones-method. The results make it possible to calculate the loss factor of sandwich beams using the Ungar’s formula and the eigenfrequencies of the beams by Yin.

It can be concluded that the polymer-concrete-steel beams may be used not only for static loads, but also for dynamic excitations. The loss factors of the beams (\(\xi\)) were between 0.01-0.11. Fatigue tests have been carried out to determine the fatigue behaviour of core and connections between layers.


ANALYSIS OF THREE-LAYERED POLYMER-CONCRETE-STEEL BEAMS

K. JARMAI

TECHNICAL UNIVERSITY FOR HEAVY INDUSTRY, DEPARTMENT OF MATERIALS HANDLING EQUIPMENT, MISKOLC HUNGARY

MODEL DIMENSIONS

LENGTH 1200 MM
WIDTH 75 MM
END CONDITIONS FREE-FREE, CLAMPED-CLAMPED
THICKNESS MODEL NO.
3.25-3 MM 1 4
3.40-3 MM 2 6
3.60-3 MM 3 6

STATIC ANALYSIS
THICKNESS (MM) EFFECT OF POLYMER-CONCRETE ON FREQUENCY
F1 F2 F3 F4
FREQUENCY (KHZ)
0 10 20 30
500 1000 1500 2000

DYNAMIC ANALYSIS
FATIGUE EFFECT
LOSS FACTORS

MEASURING EQUIPMENT

EIGENFREQUENCY DIAGRAM
LOSS FACTOR
F1 1600 F2 1600 F3 1600
FREQUENCY (KHz)
500 1000 1500 2000
STRESS LEVEL (MPa)
LOSS FACTORS
0.01 0.02 0.03 0.04
0 -1 -2 0 1 2

STATIC ANALYSIS
POLYMER-CONCRETE THICKNESS ON FREQUENCY