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# Proceedings of the 9th International Conference of EURO ASIA Civil Engineering Forum - Volume 1

## EACEF 2025, September 9–11, Kuching, Malaysia

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# Preface

Civil engineering has long been at the leading edge of human civilization, offering the essential infrastructure that continually strives for advances in both theoretical aspects and practical applications. To date, it experiences ever-expanding challenges that require sustainable, resilient, and future-ready solutions. In this spirit, the 9th International Conference of Euro Asia Civil Engineering Forum (EACEF 2025) was organized with the theme “Beyond Boundaries: Empowering Innovations in Civil and Environmental Engineering.” The conference illuminates the importance of interdisciplinary collaboration and cutting-edge research to meet future needs.

The event was hosted by Universiti Malaysia Sarawak (UNIMAS) in cooperation with Universitas Pembangunan Jaya (UPJ), Indonesia, at Dewan Tunku Abdul Rahman Putra (DeTAR Putra), UNIMAS, Sarawak, Malaysia, on 9–11 September 2025.

EACEF 2025 brought together researchers, academics, and practitioners from across the globe to share insights for a wide range of topics, including structural and materials engineering, geotechnical engineering, construction management, building information modeling, green and sustainable construction, geotechnical construction material innovations, water resources engineering, transportation engineering, and other developing fields within civil and environmental engineering.

This proceedings book reflects the rigorous academic readiness that was carried out for the conference. Eighty manuscripts were received. Each paper underwent a single-blind review process by at least two reviewers. Based on their recommendations and

the publication committee's evaluation, 37 papers were accepted for this book. This procedure ensures that the papers fulfill the required standards for quality and field-relevance.

We extend our heartiest gratitude to the authors for their valuable contributions, the reviewers for their critical and constructive comments, and the organizing team for their dedication in bringing this conference to fruition. We also acknowledge the institutional support from UNIMAS and UPJ, whose collaboration has enriched the success of this event.

To promote the healthy advancement of civil and environmental engineering, we hope that the research outcomes, discussions, and innovations in this proceeding will motivate future cross-disciplinary and cross-border cooperations.

November 2025

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## Information

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# Contents

# Comparative Study on Structural Steel Bondek II Decking for Composite Floor Connections: Design Analysis in Compliance with EN 1994-1-1: 2004

Faisal Amsyar(✉), Abdul Razak Abdul Karim, Norsuzailina Mohamed Sutan, Norazzlina M. Sa'don, and Siti Farhanah S. M. Johan

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**Abstract.** Due to their enhanced load-bearing capacity and structural effectiveness, composite slabs – which integrate concrete and profiled steel sheeting – are AQ1 essential to recent industrial building. The structural performance, endurance and sustainability of these systems are greatly enhanced by the combination of concrete, which provides compressive strength, and Lysaght Bondek II profiled steel sheeting, which provides tensile reinforcement. In accordance with EN 1994-1-1: 2004, this study reevaluates the design of composite floor systems employing Bon- AQ2 dek II profiled steel sheeting. The design of composite steel and concrete structures is outlined in Eurocode 4: Part 1-1: General rules and building regulations. The goal is to compare the results of manual Excel calculations with those obtained from MegaFloor software for both construction/formwork and composite (slab) stages. A case study was conducted using Bondek II, a hot-dipped, zinc-coated high-tensile steel, considering various span lengths and load conditions. The partial connection approach, in accordance with EN 1994-1-1: 2004, was used to evaluate shear resistance and bending moments. The analysis revealed a high level of agreement between the manual calculations and the software outputs, with only minor differences in bending moment and shear force values. However, significant discrepancies were captured in the shear (web crippling) capacity, suggesting the need for further validation through an experimental program. Ultimately, the study affirms that MegaFloor software is a reliable tool for composite floor system design, adhering to both British Standards and Eurocodes. The integration of modern software tools with traditional design methods enhances the accuracy, efficiency and sustainability of construction practices.

**Keywords:** Composite Action · Cold-formed Steel · Profiled Steel Sheeting · Partial Connection Method · Computational Analysis · Composite Floor Systems

## 1 Introduction

Composite floor systems play a vital role in modern construction due to their ability to effectively combine the strengths of both steel and concrete elements. Among the many types of profiled steel sheeting available, Bondek II and Smartdek profiled steel


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decking have become significantly popular in the industry due to their better structural performance and versatility [1]. These decking systems offer numerous advantages, such as reduced construction time, enhanced load-carrying capacity and efficient material utilization [2]. In addition to these advantages, the increasing need for lightweight, high-strength materials that can handle longer spans at lower costs has led to wider use of cold-formed type of profiled steel decking. Profiled steel sheeting, such as Lysaght Bondek II, has dual purposes: it provides tensile reinforcement after the concrete cures and acts as permanent formwork during the concrete casting process. This synergy, referred to as composite action, results in stronger, lighter floors compared to traditional reinforced concrete systems [1, 3]. The design and analysis of composite slabs using Lysaght Bondek II decking follow the guidelines outlined in EN 1994-1-1: 2004, which establishes the structural behaviour and design principles for composite floor systems. According to EN 1994-1-4: 2004 [4], the steel decking and concrete must act as a single structural element. The design procedure considers various factors, including bending moments, shear forces, concrete cracking control, deflection limits and fire resistance, to ensure the composite slab performs as intended [5]. Research on profiled steel decking has identified several critical aspects of composite slab design. For example, Siddh et al. [6] investigated the structural behaviour of composite slabs with profiled steel sheeting, particularly focusing on the effects of profile thickness on deflection and end slip under load. Their findings revealed that slabs with thicker decking demonstrated improved load-bearing performance and reduced deflections, contributing to the durability and overall performance of composite floors [6].

Furthermore, experimental tests reviewing the behaviour of different shear connection types in composite slabs were carried out by Hedaoo et al. [7], highlighting the significance of strengthening the shear connection between the concrete and steel deck. The composite slab's capability to support loads and maintain its structural strength depends on that connection [7]. The substantial influence that profiled steel decking type and shape have on composite floor systems' structural performance has also been highlighted by earlier studies. Amsyar [1] and Avudaiappan et al. [3], for example, examined the structural behaviour of different decking materials in previous investigations, showing that systems such as Lysaght Bondek II offer substantial advantages in terms of both cost-effectiveness and mechanical behaviour [1, 3]. In addition, the shear bond strength – which is essential for preserving the composite action in steel-concrete connection – is influenced by several shear connector types, including bolted connectors and perfobond ribs. Through manual calculations using an Excel spreadsheet and an evaluation of the results using the general-purpose MegaFloor software, this study attempts to reevaluate the design of composite floor slabs utilizing Bondek II profiled steel sheeting, which is supplied by NS BlueScope Lysaght. The focus of this study is on ensuring compliance with EN 1994-1-1: 2004, with the aim of providing valuable insights into best practices for utilizing Bondek II decking in modern construction. By doing so, the research contributes to the advancement of more sustainable and efficient composite floor systems, which are critical in meeting the demands of contemporary construction projects.

## 2 Methods and Procedures

In this study, a case analysis was conducted to design and evaluate a composite steel slab system incorporating Lysaght Bondek II profiled steel sheeting. The Bondek II, produced through roll-forming, consists of hot-dip galvanized, high-tensile steel and is available on base metal thicknesses (BMT) of 0.75 mm, 1.00 mm and 1.20 mm. Serving simultaneously as permanent formwork, tensile reinforcement and an exposed ceiling finish, the Bondek II system offers notable efficiency, versatility and durability. The Bondek II profile's dimensions, geometry and specifications are illustrated in Fig. 1. In this investigation, a continuous composite floor arrangement was achieved using three (3) span lengths of Bondek II sheeting, allowing concrete to be cast directly over the deck without any installation of separate shear connectors. To assess longitudinal shear resistance – including configurations with supplementary top and bottom reinforcement – the partial connection method specified in Clause 9.7.3 of EN 1994-1-1: 2004 [4] was applied. This method was implemented in both manual Excel spreadsheet calculations (assuming ductile behaviour) and in the MegaFloor software analysis. The geometric properties of the slab configurations are summarized in Table 1, while Table 2 lists the technical specifications of Bondek II provided by NS BlueScope Lysaght.

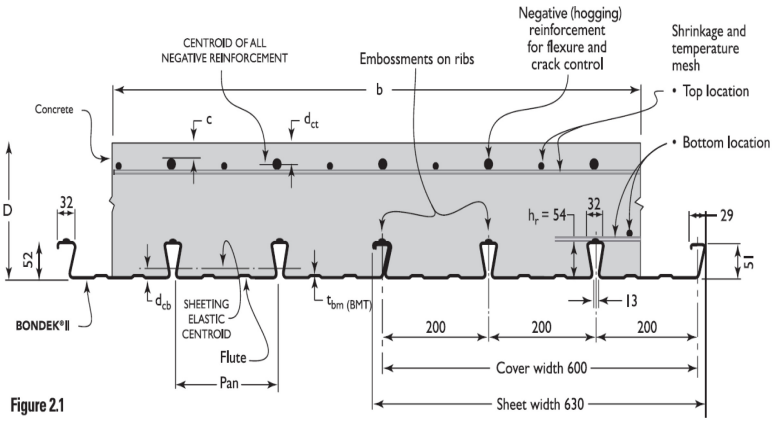


**Fig. 1.** Bondek II profile dimensions, geometry and specification

### 2.1 Span – Material Data

The case study used a continuous span arrangement with three (3) span lengths, each with a beam span of 3210 mm, as illustrated in Fig. 2. Two distinct static systems are taken into consideration, namely simply supported and continuous spans, as per EN 1994-1-1: 2004 [4]. To start the comparisons, inserting input parameters for both manual Excel spreadsheet and modelling software MegaFloor need to be initiated. From the MegaFloor interface, there are four (4) main features that need to be considered in order to design the composite continuous slab based on the case study of three continuous spans with one