

## CHIANG RAI BYPASS ROAD, THAILAND

# Enhancing connectivity and resilience with MIRAGRID



**Industry:** Transportation  
**Sub-industry:** Roadways  
**Location:** Thailand  
**Product:** **MIRAGRID®**

The Chiang Rai Bypass Road project was a significant infrastructure development by Thailand's Department of Highway, designed to alleviate traffic congestion in Chiang Rai, a cultural and commercial hub bordering Laos and Myanmar. The project involved constructing a 22 km (13.7 mi) four-lane bypass to improve transportation efficiency, enhance safety, and support the local economy by making the region more accessible to tourists.

**A groundbreaking project that reduced travel times by 50% and highlighted seismic resilience through innovative engineering.**

Situated in a seismically active area, the project required a design resilient enough to withstand earthquakes with magnitudes of 7.5 or higher, a response to the destruction caused by a magnitude 6.2 earthquake in 2014. This led to stringent engineering specifications for bridge abutments, demanding a design life exceeding 120 years, in accordance with British Standard BS8006-1: 2010. The project's path also posed challenges, as it cut through crucial agricultural lands. To minimize land use and adhere to environmental concerns, the design included a steep retaining structure that exceeded national height limits for such constructions.

To overcome these challenges, the project utilized a mechanically stabilized earth wall, reinforced with **MIRAGRID GX** geogrids. This innovative approach ensured the wall's seismic resilience and longevity, while also allowing for a steep, high structure that preserved valuable agricultural land. The use of in-situ soil as backfill reduced construction costs and environmental impact.

Completed in October 2019, the Chiang Rai Bypass Road has since reduced travel times by 50% during peak hours, significantly benefiting local communities by improving connectivity, fostering economic development, and enhancing the tourism sector.



## CASE STUDY

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### Overview

The Chiang Rai Bypass Road project was initiated to construct a new four-lane bypass road extending 22 km (13.7 mi) within the Chiang Rai province of Thailand. This initiative was driven by the province's significant position adjacent to the borders of Laos and Myanmar, coupled with its unique historical and cultural richness, which has been a magnet for an increasing number of tourists. The burgeoning tourist influx, however, resulted in heightened traffic and congestion issues. The Department of Highway, aiming to enhance transportation efficiency and safety, stimulate the local economy, and bolster the tourism sector, orchestrated the development of the bypass road.

### Challenge

The project encountered a series of formidable challenges. Firstly, the region's high susceptibility to seismic events was highlighted by a magnitude 6.2 earthquake in 2014, which inflicted substantial damage on the infrastructure. This necessitated the design of the project to withstand earthquakes of magnitude 7.5 or higher. Secondly, the construction of bridge abutments was bound by rigorous engineering criteria, demanding long-term stability and a design life exceeding 120 years, in compliance with the British Standard BS8006-1: 2010. Another significant hurdle was the project's trajectory through agricultural lands, crucial for the



local economy, requiring a retaining structure with a steep angle to minimize land disturbance. Additionally, the proposed retaining structure exceeded Thailand's maximum height limitation for reinforced soil structures, prompting the need for an innovative approach. Lastly, budgetary and timeline constraints dictated the use of in-situ soil for backfill, necessitating a cost-effective and environmentally friendly solution.

### Solution

The project successfully overcame these obstacles by implementing a mechanically stabilized earth wall, reinforced with **MIRAGRID GX** geogrids. This solution offered several advantages. It provided seismic resilience, ensuring the structure's integrity against the intense loadings and deformations resulting from severe earthquakes. The **MIRAGRID GX** geogrids assured long-term stability, exhibiting high tensile stiffness and minimal creep, crucial for the sustainability of bridge abutments. Furthermore, the geogrids facilitated the creation of a steep-angle retaining structure that not only preserved the agricultural land but also integrated seamlessly with the environment through green vegetation. The geogrids' global track record of success instilled confidence in their capability to exceed the national height restrictions, enabling the construction to reach up to 18 m (59 ft). Moreover, the utilization of in-situ soil as backfill material effectively reduced carbon emissions and construction costs.

Completed in October 2019, the Chiang Rai Bypass Road has improved travel times by reducing them by 50% during peak hours since its opening. The project, with its **MIRAGRID GX** solution, has established infrastructure that supports the prosperity of local communities, opens new business opportunities, and promotes economic development while prioritizing safety.



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