TensarTech TW3 abutments support semi-integral bankseats carrying vertical and lateral bridge deck loading.

Walls & Slopes
№ 493

M42 Junction 6 Improvements (BR03)

West Midlands, UK

CONSTRUCTED IN 2023

Semi-integral bridge abutment solution for reduced maintenance

A new dual carraigeway link road connects the M42 to Birmingham airport. Catherine de Barnes Lane crosses this road on a new 83m long bridge. The deck is supported on semi-integral bankseats on Tensar reinforced soil abutments, carrying both vertical and horizontal deck loading.

Benefits

Reliable partner
From previous collaborations, Skanska knew they could trust Tensar's design service and delivery

Optimised design from Tensar
provided the most economical solution for this complex, time critical structure

Lower carbon solution
compared to RC abutments, aligns with National Highways carbon cutting objectives

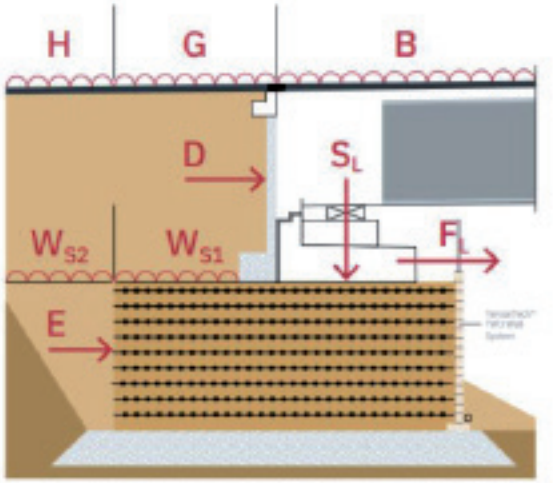
CLIENT'S CHALLENGE

The bridge design comprises a 2-span multi-girder steel/concrete composite deck, supported on semiintegral bankseats. This low maintenance solution has no expansion joints, transferring lateral load to the bankseats. A proven reinforced soil abutment system was required to carry the high vertical and horizontal bankseat loadings. The solution needed a certified 120-year life with a precast concrete facing.

TENSAR SOLUTION

Tensar was engaged by the main contractor, Skanska following successful collaboration on similar schemes. Tensar proposed the TensarTech TW3 wall system for the abutments and wing walls. Working closely with Skanska's design partner Mott McDonald, Tensar took responsibility for the design of the reinforced soil structures. TensarTech System components were then supplied by Tensar.

Loads acting on reinforced soil structure	
W_{S1}	Bankseat backfill W_{S2} weight
W_{S2}	Backfill weight
D	Backfill pressure behind bankseat
E	Backfill pressure behind earth structure
F_L	Lateral load from deck through bankseat – shrinkage, creep, temperature effects
S_L	Vertical load from deck through bankseat – dead and live loading cases
G	Live load on fill behind bankseat
H	Live load on embankment
B	Live load on bridge deck



The semi-integral bridge deck imparts vertical and lateral loading to the abutment

PROJECT BACKGROUND

As part of the M42 Junction 6 improvement scheme. A new dual carriageway link road was planned to join the M42 to Birmingham Airport and Birmingham International train station. The existing B4238 Catherine de Barnes Lane crosses over the new road twice. The southern bridge design comprises a multi-girder steel/concrete deck. There are 2 spans, totalling 83m in length. The bridge is skewed 60° to the road beneath. To minimise future maintenance costs, there are no deck expansion joints. Asphaltic plug joints are used between the end screen wall and the structural backfill behind the wall. This requires a semi-integral bankseat design. The decision was made to use reinforced soil abutments and wingwalls to support the bankseats, based on cost and speed of construction. The lower carbon footprint of this type of construction, when compared to RC retaining walls, also aligned with the carbon cutting targets of the client, National Highways.

Having collaborated with Tensar on similar integral bridge structures, Skanska appointed Tensar for design of the reinforced soil abutments and wing walls. Tensar worked closely with the contractors' design consultant, Mott McDonald, who had overall design responsibility for the bridge works.

Tensar proposed their BBA/HAPAS Certified TensarTech TW3 wall system with a precast concrete block facing, combined with Tensar uniaxial soil reinforcement geogrids.

Semi-integral bridge design imparts both horizontal and lateral loading to the supporting embankments. Lateral loads are generated from creep and shrinkage of the composite bridge deck plus expansion/contraction forces due to daily and seasonal temperature variation. Braking forces are minor and assumed to be transferred to the backfill behind the headwall.

Construction of the TensarTech TW3 structures was completed by PC Construction.

Bridge Details:

TensarTech System	Abutment Loading		Bridge bankseat type			Bridge function		Spans	Total deck length
	Non-load bearing	Load bearing	Simply supported	Semi-integral	Integral	Over Structure	Under structure		
TensarTech TW3		X		X		2-lane single carriageway	2-lane dual carriageway	2	83m

Client
National Highways

Contractor
Skanska

Contractor Design Consultant
Mott MacDonald

Sub-Contractor for TensarTech TW3 Wall Construction
PC Construction

"The key thing from our perspective is the carbon reduction we get from a TensarTech abutment system compared to a RC wall solution."

"The construction went really well. We used PC Construction for the installation. They have installed TensarTech systems many times before and know exactly how to do it."

"We have used the same TensarTech system on a number of bridges on this project. To date we are happy with the way things went."

Sam Linley
Engineering Manager
Skanska

