



Experimental Study on Sewri-Worli Elevated Corridor Project

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ABSTRACT

This study evaluates the structural and performance aspects of the Sewri-Worli Elevated Corridor (SWEC), a key link in Mumbai's urban transport network. Implemented by MMRDA, SWEC is a 4-lane, 4.5 km elevated corridor connecting the Mumbai Trans Harbour Link (MTHL) to the Bandra-Worli Sea Link and Coastal Road. The project uses M45 grade concrete for piles, pile caps, and piers to ensure high strength and durability. Experimental tests on workability and compressive strength validate the suitability of M45 concrete for elevated infrastructure. The corridor is expected to serve 35,000–45,000 motorists daily, reduce travel time, and contribute 15–20% of MTHL traffic, offering a signal-free, fuel-efficient commute.

Keywords – Elevated Corridor, Urban Mobility, Compressive Strength, Workability, Safety and Precaution.

1. INTRODUCTION

Mumbai's rapid urbanization demands efficient and resilient transport systems. The **Sewri– Worli Elevated Connector (SWEC)** is a key component of the MMRDA's traffic dispersal strategy for the Mumbai Trans Harbour Link (MTHL). Serving as a crucial east–west bridge, SWEC links Navi Mumbai to South Mumbai, enhancing connectivity across the city's core corridors.

The corridor's structural stability is supported by the use of M45 and M55 grade concrete, chosen for their high compressive strength and long-term durability. Major structural elements open/RCC bored cast-in-situ pile foundations, piers, pier caps, pedestals, portal beams, PSC box girders, PSC I-girders, steel composite girders (I/Tub/Box), and a 100-m obligatory Network Arch span—are engineered to withstand heavy traffic loads and environmental stresses.

The project also incorporates POT-PTFE bearings, Strip Seal/Modular Strip Seal expansion joints, and Fe500 HYSD reinforcement with Fusion Bonded Epoxy (FBE) coating for all PSC/RCC works in foundation and substructure. No reinforcement coating is required for precast segmental superstructure elements.

The corridor is designed for speeds of 80 km/h on straight sections, with customized speed parameters on curved portions based on the available curvature radius.

Key project features:

- ❖ **Length:** 4.5 km, 4-lane elevated corridor
- ❖ **Purpose:** Connects eastern and western corridors, disperses traffic from the **Mumbai Trans Harbour Link (MTHL)**, easing access between Navi Mumbai and South Mumbai
- ❖ **Contractor:** M/s J Kumar Infraproject Ltd.
- ❖ **Project Management Consultant (PMC):** M/s Assystem Stup

Financials

- ❖ **Revised Cost:** ₹2283.53 Cr
- ❖ **Contract Cost:** ₹1051.86 Cr
- ❖ **Railway Over Bridge (ROB) Cost:** ₹214 Cr

Engineering Highlights

Concrete Grades: M45 and M55 for high strength and enhanced durability

Structural Components:

- ❖ **Foundations:** Open / RCC bored cast-in-situ piles
- ❖ **Superstructure:** PSC box girders, precast segmental box girders, PSC I-girders, steel composite I/Tub/Box girders
- ❖ **Special span:** 100-m Network Arch for an obligatory crossing
- ❖ **Crash barriers and medians** designed for stringent traffic safety norms

Reinforcement: HYSD Fe500 with FBE coating for foundation and substructure works

Bearings & Joints: POT-PTFE bearings and Strip Seal/Modular expansion joints

Urban Impact

- ❖ Strengthens connectivity between Navi Mumbai, Eastern Freeway, Worli, and South Mumbai.
- ❖ Expected to significantly reduce travel time and ease congestion in central business districts.
- ❖ Supports Mumbai's rapid urban growth by enhancing critical east–west mobility infrastructure.

2. METHODOLOGY**2.1 Materials Used**

- ❖ **Concrete:** M45 & M55 grade are high-strength concrete grades used for heavy structural Elements; M45 \approx 45 MPa characteristic compressive strength at 28 days and M55 \approx 55 MPa. Typical mix limits: maximum w/c \approx 0.40, minimum cement \approx 360–380 kg/m³, and use of OPC 53 + superplasticiser are standard to achieve workability and strength.

Cement type: OPC 53 (IS 8112/IS 269) is commonly specified for M45–M55 mixes in India.

Aggregate: Use well-graded crushed aggregates (max 20 mm) and control fines to achieve target workability.

Admixture dosage: Superplasticizer per manufacturer to reach required slump (M45: 50– 100 mm slump typical; M55: 100–150 mm depending on placement).

Curing: Minimum 7 days (preferably 14–28 days) for high-strength mixes to develop design strength.

- ❖ **Steel: Fe-500D for reinforcement**

HYSD (High Yield Strength Deformed) bars of Grade Fe500 are widely used in modern reinforced concrete construction, especially when paired with high-strength concrete grades like M45 for foundations and M55 for superstructures.

❖ Structural Elements:

- Piles: 1.0 M & 1.2 m diameter, 20–30 m depth
- Pile Caps: RCC caps distributing load
- Piers: Circular RCC piers, 8–12 m height

2.2 Testing

- ❖ **Workability:** Slump test
- ❖ **Compressive Strength:** Cubes tested at 7 and 28 days
- ❖ **Traffic Simulation:** VISSIM software
- ❖ **Cost Analysis:** Compared with cement road widening

3. WORK DONE

3.1 Sieve Test (75-micron): -

When it comes to building concrete roads, the amount of material that slips through the 75-micron sieve (the No. 200 sieve) is something you can't ignore. Those ultra-fine particles- mostly silt and clay-tends to coat the sand and stone. Once that happens, the cement paste struggles to grip the aggregate properly, and the whole mix loses strength and durability.

Most standards keep a tight rein on this. ASTM, AASHTO, and the Indian Roads Congress all set limits on how much can pass the 75-micron sieve. For fine aggregate (your sand), you're usually allowed no more than about 3–5%. For coarse aggregate, the tolerance is even stricter- around 1% or less.

Push beyond those limits and you'll run into trouble. The mix gets sticky and harder to work with, it demands more water, and the finished concrete ends up weaker. Over time, that can mean shrinkage, cracks, and a road surface that simply doesn't last the way it should.



Fig.01 - Material finer than 75 micron silt contact (Sand)

3.2 Moisture content in Aggregate Test: -

Moisture in aggregate is one of those things you have to keep an eye on every day. Sand and stone always carry some water - sometimes it's locked inside, sometimes it's just sitting on the surface. If you don't account for it, that extra water sneaks into the mix and throws off your water-cement ratio.

Too much moisture and the concrete get weaker shrink more, and cracks earlier than it should. Too little, and the dry aggregate pulls water out of the mix, leaving it stiff and hard to place.

On site, we usually talk about four conditions: oven-dry, air-dry, saturated surface dry (SSD), and wet. SSD is the target-you want the pores full but no water film outside. That way, the water you add to the mix is the only water that counts.

The practical step is simple: test your aggregates, know their moisture content, and adjust your mixing water. If your sand shows 6% moisture when you expected 2%, you cut back the added water. That’s how you keep the pavement strong and durable, instead of dealing with scaling and cracks down the line.



Fig.02 - Moisture content in Aggregate



Fig.03 - Sieve analysis coarse aggregate and fine aggregate



Fig.04. Flakiness and Elongation



Fig.05. Aggregate impact test



Fig.06. Aggregate crushing test



Fig.07. Specific gravity & water absorption



Fig.08. Concrete material (M45 Grade)



Fig.09. Concrete temperature at site



Fig.10. Slump checking



Fig.11. Slump test at site



Fig.12. Concrete cube marking at site



Fig.13. Cube testing machine



Fig.14. Cube Testing at Knack Laboratory at Vadala



Fig.15. Cube test readings

4. RESULTS AND DISCUSSION

4.1 Workability Test – Slump Values

Mix	Slump Value (mm)	Workability
Mix 1	75	Medium
Mix 2	90	Good
Mix 3	100	Excellent

4.2 Compressive Strength Test

Age	Avg. Strength (N/mm ²)
7 days	32
28 days	47

4.3 Traffic Simulation

- ❖ Travel speed increased from 18 km/h to 42 km/h
- ❖ Time savings: 35%
- ❖ Emissions reduced by 20%
- ❖ SWEC expected to carry 15–20% of MTHL traffic
- ❖ Daily benefit to 35,000–45,000 motorists

5. CONCLUSIONS

- ❖ M45 & M55 concrete ensures high strength and durability for elevated structures.
- ❖ Workability and strength tests confirm its suitability for piles, pile caps, and piers.
- ❖ SWEC offers signal-free, fuel-efficient travel across Mumbai.
- ❖ Cost-effective compared to traditional road widening.
- ❖ Environmental benefits include reduced emissions and fuel savings.
- ❖ SWEC is a critical link in Mumbai's integrated transport network.

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