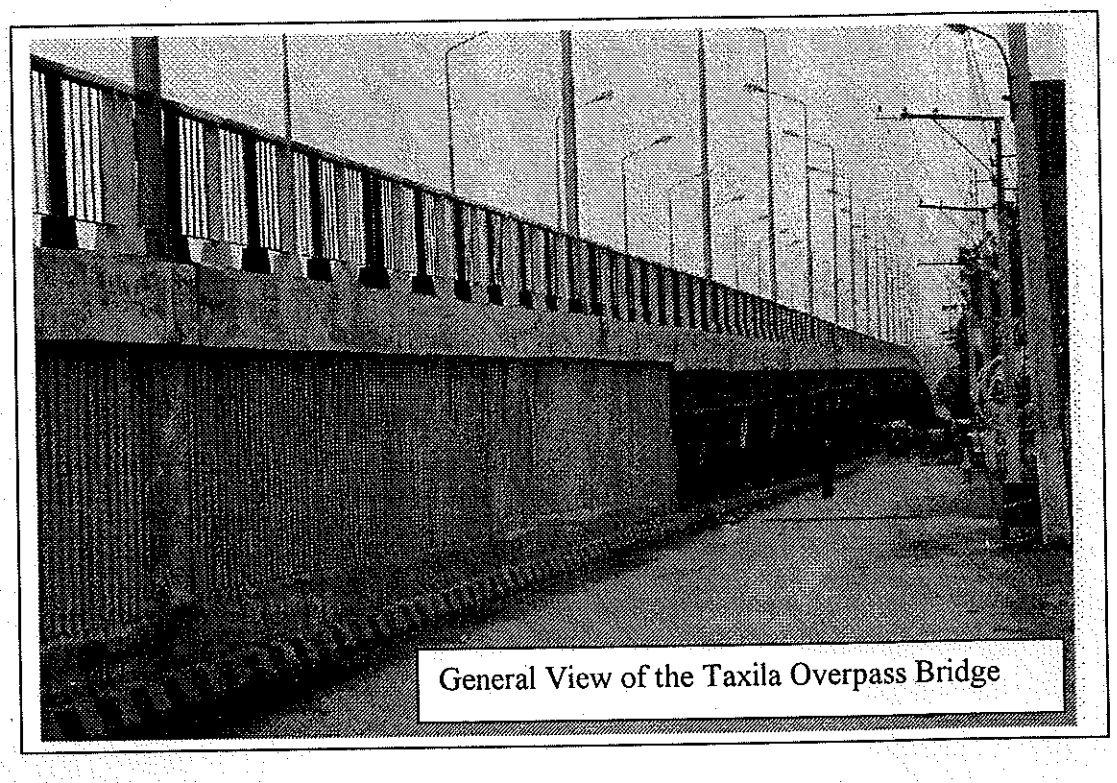
Overhead Bridge – Railway Crossing at Taxila

On Sarai Kala & Haripur Road

Bridge Directorate, Highway Department

Government of the Punjab



General View of the Taxila Overpass Bridge

This report was prepared by:

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For

The National Transport Research Centre, Islamabad

NTRC-250

May 2003

EXECUTIVE SUMMARY

The services of Dr. Abdul Shakoor Uppal, an expert in Bridge Engineering were requisitioned by the National Transport Research Centre (NTRC), Islamabad for a period of four weeks during February – March, 2003 under the Transfer Of Knowledge Through Expatriate Nationals (TOKTEN) Programme.

During his visit, Dr. Abdul Shakoor Uppal also inspected the overhead bridge – Railway Crossing on Sarai Kala & Haripur road. The bridge was constructed by the Punjab Highways Department in 1999-2000 and had developed serious cracking in deck slab on certain sections. Some panels of the deck slab had fallen down and were subsequently replaced.

Dr. Uppal made thorough inspection of the bridge alongwith NTRC engineers and based on his inspection visit and examination of relevant documents, the recommendations are as under:-

- The current expansion joints are weak both from the design and from the actual performance points of view. These joints should be replaced with those with a modified design. The new design should have wider and thicker plates.

- A 6000 psi @ 28 days concrete seems adequate for the required design strength. However, the quality of workmanship of the cast-in-place concrete appears to be questionable. It is suggested therefore that random core samples be taken and tested to determine the matrix and strength of the concrete in the deck slab. This would be the first measure to determine what remedial action, if warranted, should be recommended.

  Also, the actual location and the amount of reinforcing bars should be verified by non-destructive means. This is to ensure that their placement was done in accordance with the design drawings.

- Manholes in the footpaths be cleaned and covered with the lids. Also the manholes should be provided with drain holes. This will enhance the overall service life of the structure.

- Bridge seat areas and areas at ground level adjacent to piers and abutments be kept clean, dry and well drained to prevent early deterioration of the substructure. Similarly, the deck drains and spouts should be periodically cleaned and kept open.

Description:

This is a 2151-ft long concrete structure for trucks to service the heavy mechanical complex in Taxila. It was built around 1999-2000 by contract. The design was carried out by NESPAK. It consists of approach ramps at each end and concrete spans in the middle. The main span that is over the railroad is 56'-0" long while the other spans are 35'-0" long. These spans consist of pre-cast, pre-stressed concrete beams (9 per span for the 56'-0" span and 4 per span for the 35'-0"spans) with cast-in-place concrete deck slab on them. The deck also has a pre-mix asphalt concrete wearing surface on it (thickness varying from 3" in the middle to 1-1/2 inch at the edges). The beams are supported on piers and abutments through elastomeric type pad bearings.

The piers and abutments are resting on concrete blinding layer that is placed on the virgin soil.

The approach ramps consist of parallel reinforced concrete walls and space between them is backfilled with soil.

The roadway width is 24'-0" with 3'-0" wide footpath on each side. The clearance under the main span is 56'-0" wide by 22'0" high above top of rail. Currently there is only one railroad track but there is provision for another track in the future.

The front page shows a general view of the overpass bridge. Figure 1. - shows a general view of the bridge deck

Site Visit:

The bridge was visited on 03 March 2003 by Messrs: Shakoor Uppal, TOKTEN Consultant and Bashir Ahmed and Hameed Akhtar of the NTRC. A walking visual inspection was carried out from the ground as well as from the deck level of the bridge.
The following general observations were made:

1. **The deck slab:** The deck slab of the approach spans seen from underneath shows

Figure 1. - General view of the bridge deck

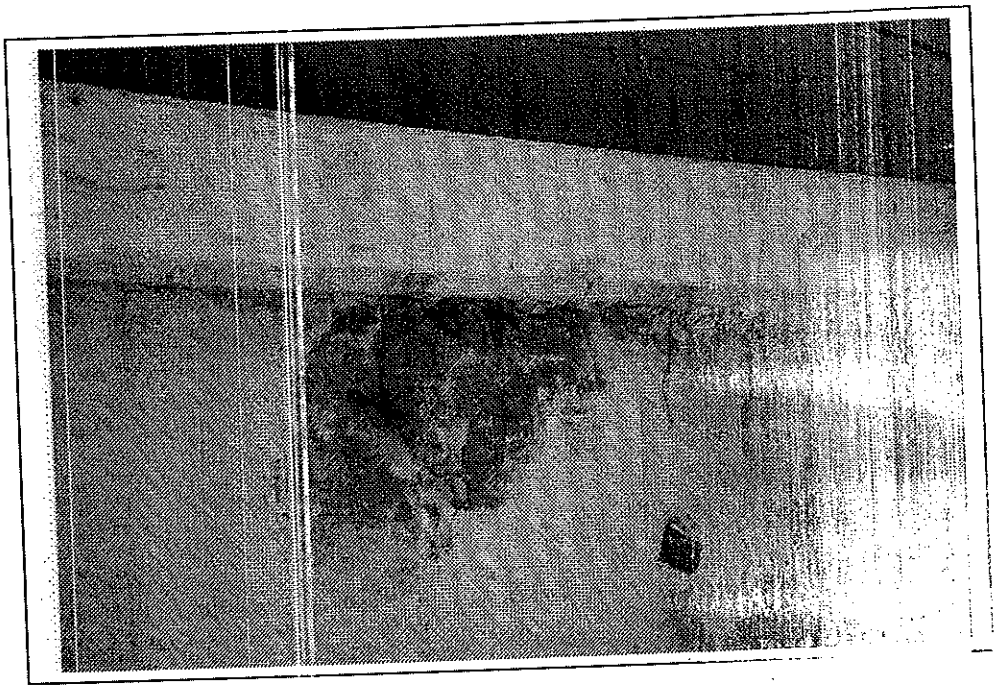

Figure 2. – Cracks in deck slab – view from ground l.

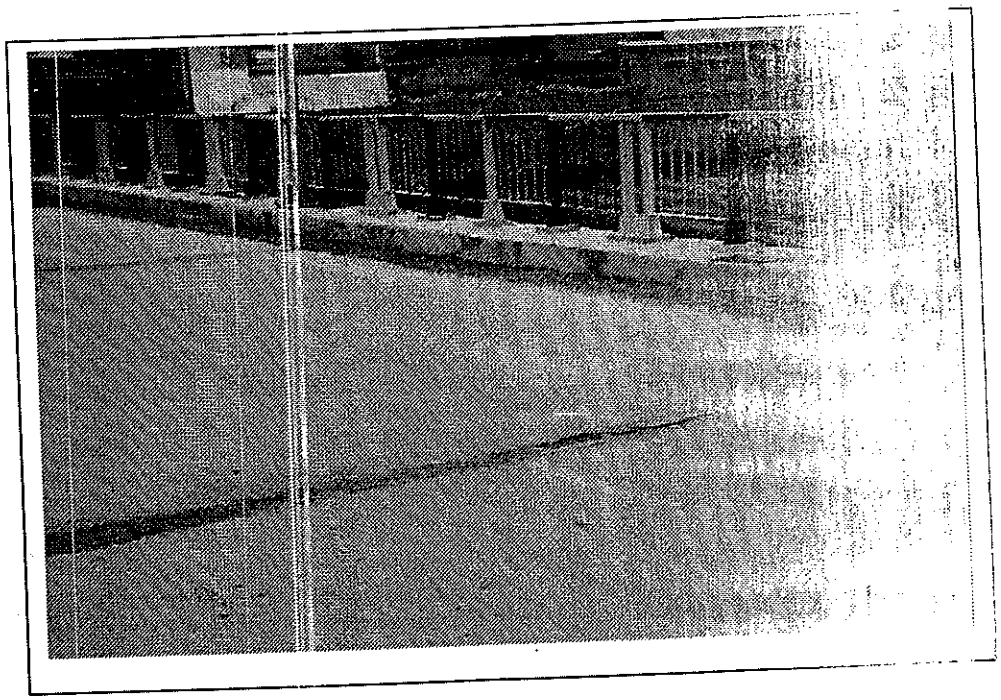

Figure 3. – Location of railing, lamp-posts and manholes in the [illegible].

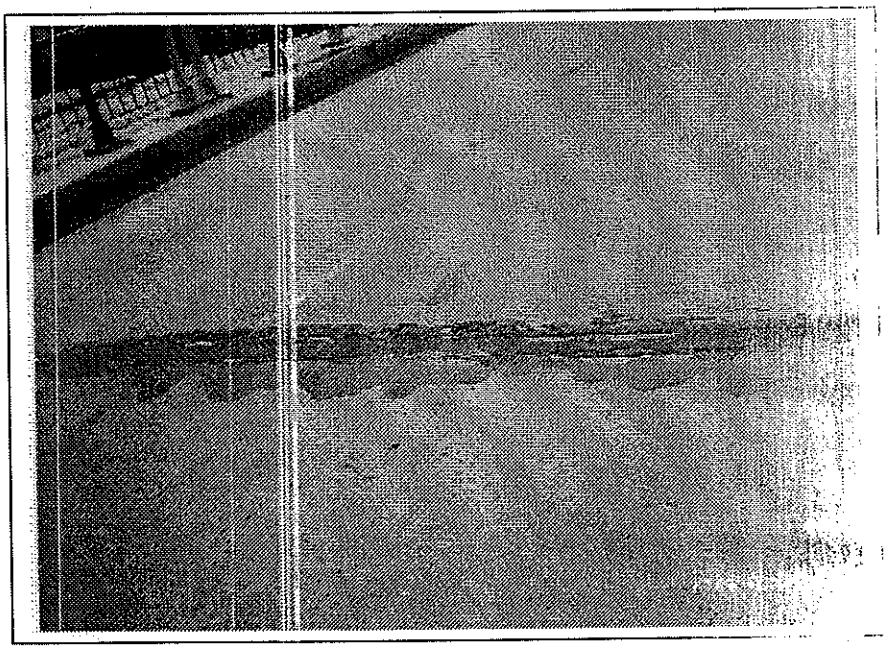

Figure 4. – Typical Expansion Joint – Asphalt have been used as an [illegible]fective repair

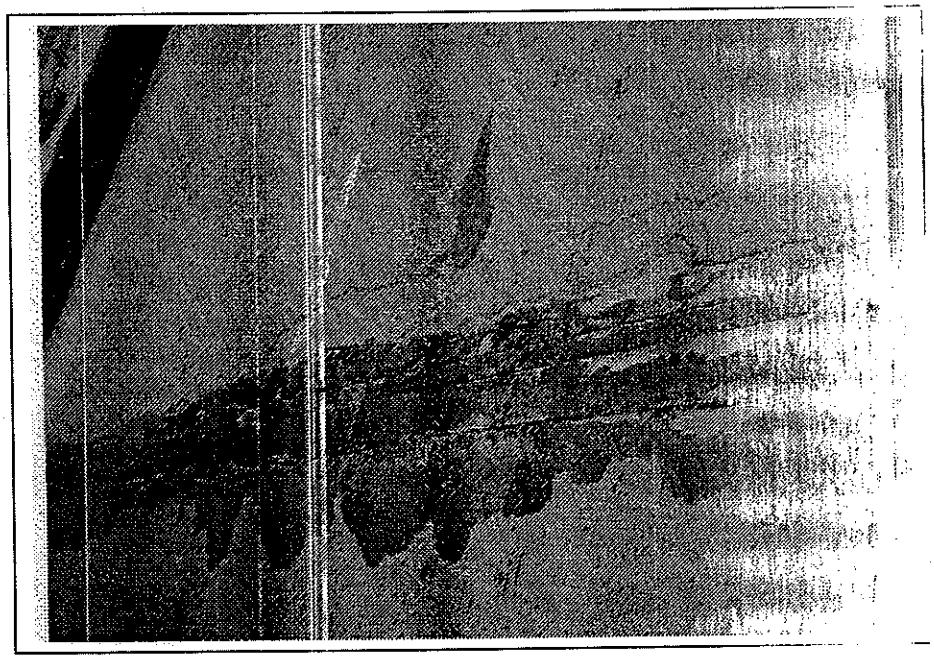

Figure 5. – A close-up view of the Expansion Joint shown in Figure

cracking at some locations. Figure 2. – shows cracks in deck slab. This view was taken from ground looking up. There is an indication of water leakage through the cracks. It was mentioned that a portion of the deck fell down and was replaced. Consequently some areas of the slab appeared to have been subsequently repaired. Cores were taken from certain visibly weaker areas of the slab. It would be interesting to see these cores as well as the results of any tests done on them.

2. **Deck Expansion Joints:** Almost all of the deck expansion joints have deteriorated and malfunctioning. They vibrate and create a lot of noise under traffic. The joint plates are broken off at locations and asphalt cover has been used as an ineffective repair. Water and dirt is leaking through these joints on to the bridge seats. Figure 4. shows a typical expansion joint. Figure 5. – shows a close-up view of the expansion joint shown in Figure 4.

3. **Deck Drainage:** Although deck is being drained due to slopes, a number of deck spouts are plugged and water is not draining through them.

4. **Approach Ramps:** On the roadway portion of the approach ramp a few soft pavement spots could be noticed. These may be attributed to insufficient compaction of the fill material beneath or thinner pavement. Figure 6. – shows a typical softer spot in the pavement of the approach ramp.

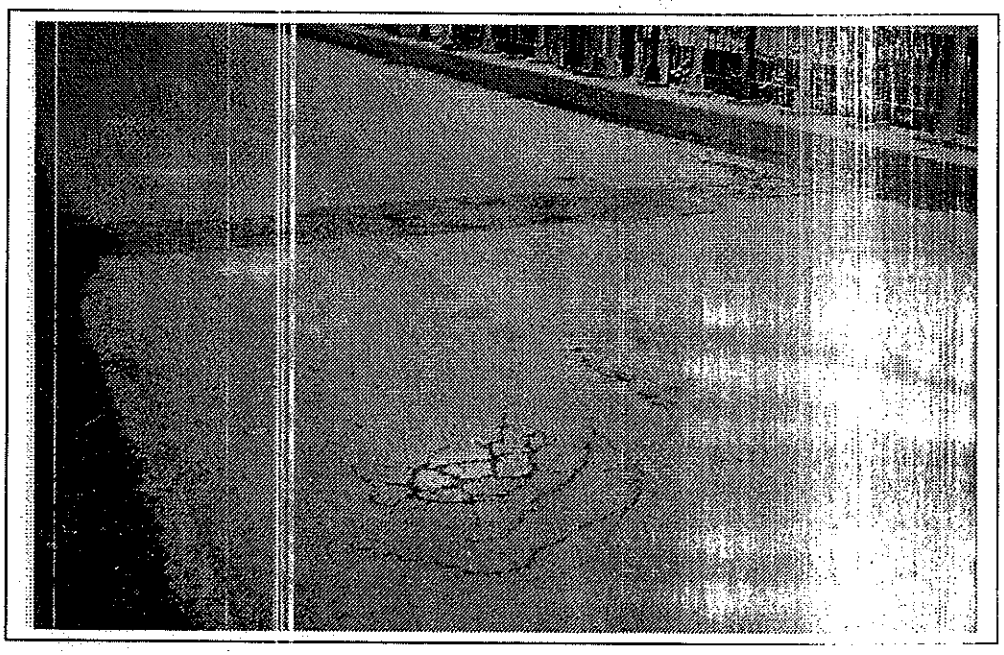

Figure 6. – A typical softer spot in the pavement of the approach ramp

5. **Manholes in the Footpaths:** The reinforced concrete covers over the manholes are non-existent. Consequently, water and trash is gathering in the holes. This is not only an undesirable situation for the reinforcing but also the PVC pipes that are being damaged.

6. **The Lamp Posts:** The 3'-0" width of the walkways is partially consumed by the lampposts making it difficult for the pedestrians to walk on. These lampposts could have been located closer to edge of walkways. Figure 3. shows the location of railing, lamp-posts and manholes in the foot path.

7. **Cleanliness:** Bridge seats are staying wet and accumulating dirt. Similarly some areas under the spans and around piers are becoming garbage dumps. The smell of the trash is not only unsightly and unhealthy for the people but also detrimental for the new structure.

8. **Crossing Length:** For a mere railroad crossing, for an onlooker this structure seems unusually long. Understandably ramps are intended to provide a 3% grade. However, the trucks operate over the road at a reduced speed. A few trucks were seen using the service roads below on both sides of the structure. The structure is also dividing this quarter of the town into two whereby certain streets are blocked permanently by the structure. This structure could have been built shorter to avoid or minimize the above-mentioned issues as well as to save costs. This overhead structure could have been located at a less busy part of the town to prevent blockage of the street in the middle of the town. Figure 7. – shows a view from the bridge – the busiest part of the town

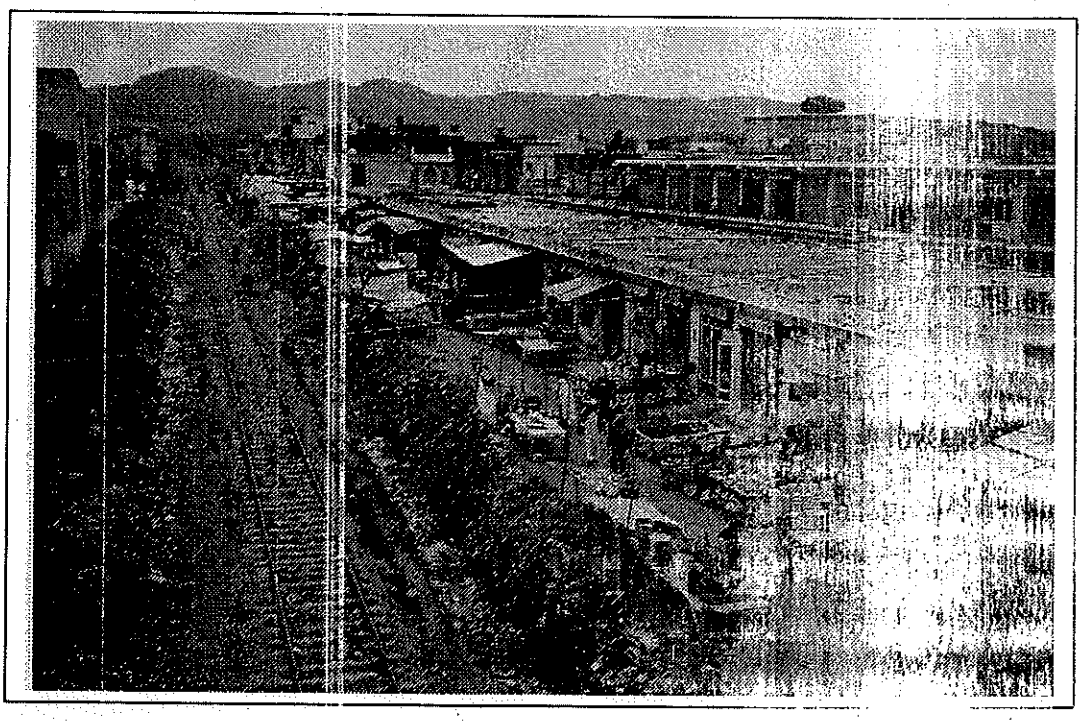

Figure 7. – A view from the bridge – the busiest part of the

Drawings Examined:

The following plans were provided by Mr. Chaudhary Shabir, XEN, Punjab Highway Department on 12 March 2003.

Dwg: TX – 2, General Arrangement
Dwg: TX – 3, Detail of Retaining Wall
Dwg: TX – 4, Detail of Retaining Wall
Dwg: TX – 5, Detail of Abutment
Dwg: TX – 6, Detal of Piers
Dwg: TX – 7, Detail of Railway Piers 11 & 12
Dwg: TX – 8, Prestressed Beam (35'-0" Span)
Dwg: TX – 9, Prestressed Beam (56'-0" Span)
Dwg: TX – 10, Detail of Diaphragms
Dwg: TX – 11, Detail of Deck Slab
Dwg: TX – 12, Details of Deck Slab – Railway Span
Dwg: TX – 13, Railing Details
Dwg: TX – 14, Sundry Details

The drawings were reviewed for design and construction details.

Recommendations:

After a site visit and upon a cursory look at the above plans, the TOKTEN Consultant would like to make the following comments and suggestions:

- The current expansion joints are weak both from the design and from the actual performance points of view. These joints should be replaced with those with a modified design. The new design should have wider and thicker plates.

- A 6000 psi @ 28 days concrete seems adequate for the required design strength. However, the quality of workmanship of the cast-in-place concrete appears to be questionable. It is suggested therefore that random core samples be taken and tested to determine the matrix and strength of the concrete in the deck slab. This would be the first measure to determine what remedial action if warranted should be recommended.
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