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GOVERNMENT OF PAKISTAN
MINISTRY OF COMMUNICATIONS
NATIONAL TRANSPORT RESEARCH CENTRE(NTRC)

FAILURE ON
NOWSHERA - PESHAWAR SECTION (N - 5)
(INTERIM REPORT)



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INTERIM REPORT

SUBJECT: FAILURE OF NOWSHERA - PESHAWAR SECTION OF NATIONAL HIGHWAY N - 5

BACKGROUND

Rehabilitation of Nowshera - Peshawar section of N - 5 was started in August 2004. The total length of the project is 68 kilometers at an estimated cost of Rs. 512.242 million. M/s ECLI, M/s SMEC JV (KECI) and M/s PUT SARAJEVO are the Design Consultant, Supervisory Consultants and Contractor for this project. A total number of 6 sections measuring 21.3 kms have been rehabilitated and opened to traffic from 01-06-2005 to 10-01-2006 as per details given in Annex-I.

Soon after opening to traffic, signs of distress / failure like cracking, rutting and settlement appeared in the pavement and the pavement deteriorated rapidly thereafter (Photo No. 1,2,3 & 4).

A team of NTRC engineers visited the site on 17-06-2006 and 23-06-2006 for physical / visual assessment and to obtain field samples from some of the sections to ascertain the quality of material used and workmanship.

Field Samples

During field sampling, the aim was to obtain representative samples for assessment as described below:

- Five cores were extracted, three from failed sections & two from the section still working satisfactorily.
- Two pits of 2' x 2' were dug to obtain the Asphalt Wearing Course, Asphalt Base Course and Granular Base Course

material and to check the thickness of pavement layer and compaction of Granular Base Course (Photo No. 5, 6 & 7).

- Aggregate Granular Base Course material was also collected from primed section, which was ready for Asphalt Base Course and Asphalt Wearing Course. At some locations, the contractor has also started repair works. (Photo No. 8)

FIELD OBSERVATIONS

The field observations have revealed that:-

1. Large sections of rehabilitated highway have shown signs of pre mature distress.
2. Asphalt concrete extracted from Pits was found to be brittle and lacking adhesion.
3. During core cutting of 2'x2' pit, the appearance of clayey-silty slurry points to the usage of dirty aggregates and large amount of fines in the mix (Photo No.9).
4. Traces / lumps of mud were found inside the Asphalt Concrete mix extracted from pits.
5. All except one core, the asphalt concrete cores have 'dull appearance' and no clear indication of Asphalt Wearing Course and Asphalt Base Course (Photo No.10)
6. Coarse and fine aggregates were found in 'bunches' rather than in uniform distribution. Some times all fine aggregates and at other times, all coarse aggregates were found packed at one place.

CROSS SECTION OF THE HIGHWAY

According to the information provided by NHA, the highway pavement has following thickness.

<u>Layer Type</u>	<u>Thickness (mm)</u>
A.C wearing Course	50
A.C Base Course	110
Aggregate Base Course	100

(Only from 1675 + 000 to 1694+000 on north bound)

LABORATORY TESTS / LABORATORY ANALYSIS

Laboratory testing of the selected samples is being carried out in NTRC Laboratories. The following tests have been carried out on the selected material samples in the laboratory:-

1. Grain size analysis.
2. Modified AASHTO compaction test (T-180).
3. Determination of Bitumen Content in Asphalt Wearing Course and Asphalt Base Course as per ASTM D 2172-88 / AASHTO 16-490.
4. Determination of strength of Aggregate Base Course through Moisture Content, Percentage fines and Atterberg limits as per AASHTO requirement.

The present position is as under:-

- Bitumen content of 4 samples (2 for Asphalt wearing course and 2 for AC Base course) has been completed.

- Aggregate gradation of Asphalt Base Course and Asphalt Wearing Course of four samples has been determined and four more are under process.
- Aggregate gradation for granular base course for four samples has been determined.
- Moisture content, percent fines and Atterberg Limit as per AASHTO has been determined.

REPORT FINALIZATION

The Project Director (PD) Nowshera - Peshawar Section has been requested to provide project specific information for comparison of design specifications with the actual work done so that the variations may be identified (Annex-II). The Report will be finalized within a week after the receipt of the requisite information. It is also proposed that the copy of this Interim Report may be forwarded to NHA so that the requested information may be expedited by them.

Highway Rehabilitation Project
C-14 (Nowshera- Peshawar Section), N-5
Work done upto 13.06.2006.

Permanent Works.

• **Section-wise work status.**

- Section - 1 From km 1670+275 to km 1674+450(4.200 kms N.B)
Opened to traffic on 1st June 2005.
- Section - 2 From km 1683+125 to km 1686+275(3.150 kms N.B)
Opened to traffic on 9th July 2005.
- Section - 3 From km 1670+275 to km 1674+450(4.175 kms S.B)
Opened to traffic on 18th August 2005.
- Section - 4 From km 1679+500 to km 1683+100(3.600 kms S.B)
Opened to traffic on 9th September 2005.
- Section - 5 From km 1674+450 to km 1677+500(3.050 kms S.B)
Closed for execution on 26.08.2005.
Opened to traffic on 31.10.2005.
- Section - 6 From Km 1683+125 to Km 1686+275 (3.150 Kms S.B)
Opened to traffic on 10.12.2005.
- Section - 7 From km 1674+450 to km 1677+300 (2.850 kms N.B)
Opened to traffic on 10.01.2006.
- Section - 8 From km 1679+725 to km 1683+125 (3.400 kms N.B)
Closed for execution on 17.01.2006.
- Section - 9 From km 1688+000 to km 1690+550 (2.55 kms N.B)
Closed for execution on 17.03.2006.

Attention:- Mr. Mukhtar Durrani,
Project Director,
Nowshera Peshawar (N-5) Section,
Peshawar

Subject: NOWSHERA - PESHAWAR (N-5) SECTION

The following information is urgently required for the preparation of report, which may kindly be sent at the earliest please.

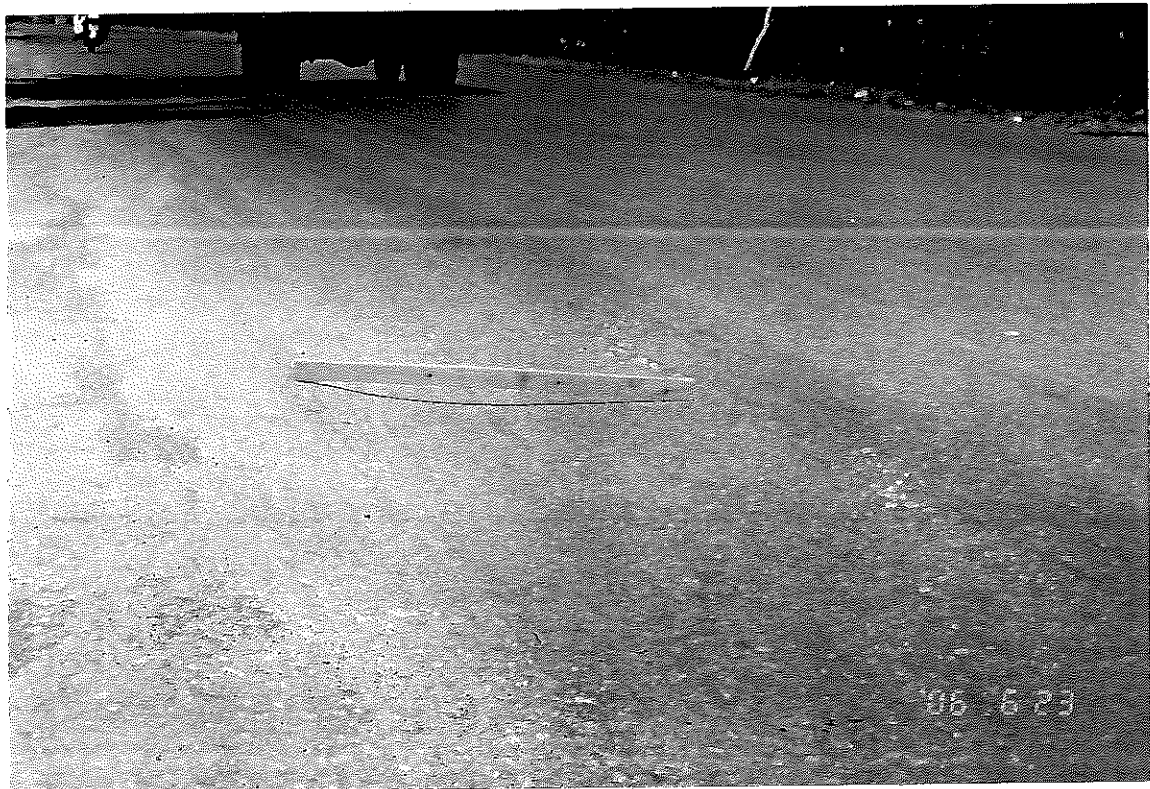
- a. Please indicate the RDs for rehabilitated sections & total length of rehabilitated section
 - (i) With aggregate base course.
 - (ii) Without aggregate base course.
 - (iii) Any other change made in the rehabilitated section. If so please specify the RDs and the changes made.
 - (iv) Reason for adopting different design layers in different RDs.
- b. Designed gradation and actual gradation of aggregates used in pavement construction for RD 1685 + 385 and 1675 + 345 and other section (if different) for
 - i. Granular aggregate base course.
 - ii. Asphalt base course.
 - iii. Asphalt wearing course.
- c. Aggregate properties of granular base course, Asphalt base course and Asphalt wearing course.
 - i. Density. (Agg. Base Course)
 - ii. Optimum Moisture Content (OMC) for Agg. Base Course
 - iii. Absorption value of bitumen content.
 - iv. Specific gravity of aggregates for asphalt base / wearing course
 - v. Loss Angeles value of aggregate used, aggregate base course, asphalt base and asphalt wearing course, etc
 - vi. Crushing value of aggregates for asphalt base and wearing course.
- d. Marshal Method information for A.C Base and Wearing Course
 - ❖ Stability and flow.
 - ❖ Air voids
 - ❖ Bitumen Content
 - ❖ Penetration grade of Asphalt
 - ❖ Softening point of bitumen.
 - ❖ Mixing temperature and laying temperature for AC base and wearing course.
- e. Any other information considered relevant for performance evaluation

(Muhammad Zaheem)
Deputy Chief

26/6/22



**Photo No. 1 CRACKS VISIBLE ON PAVEMENT SURFACE
(Rehabilitated Section)**



**Photo No. 2 RUTTING / DEFORMATION
(Rehabilitated Section)**

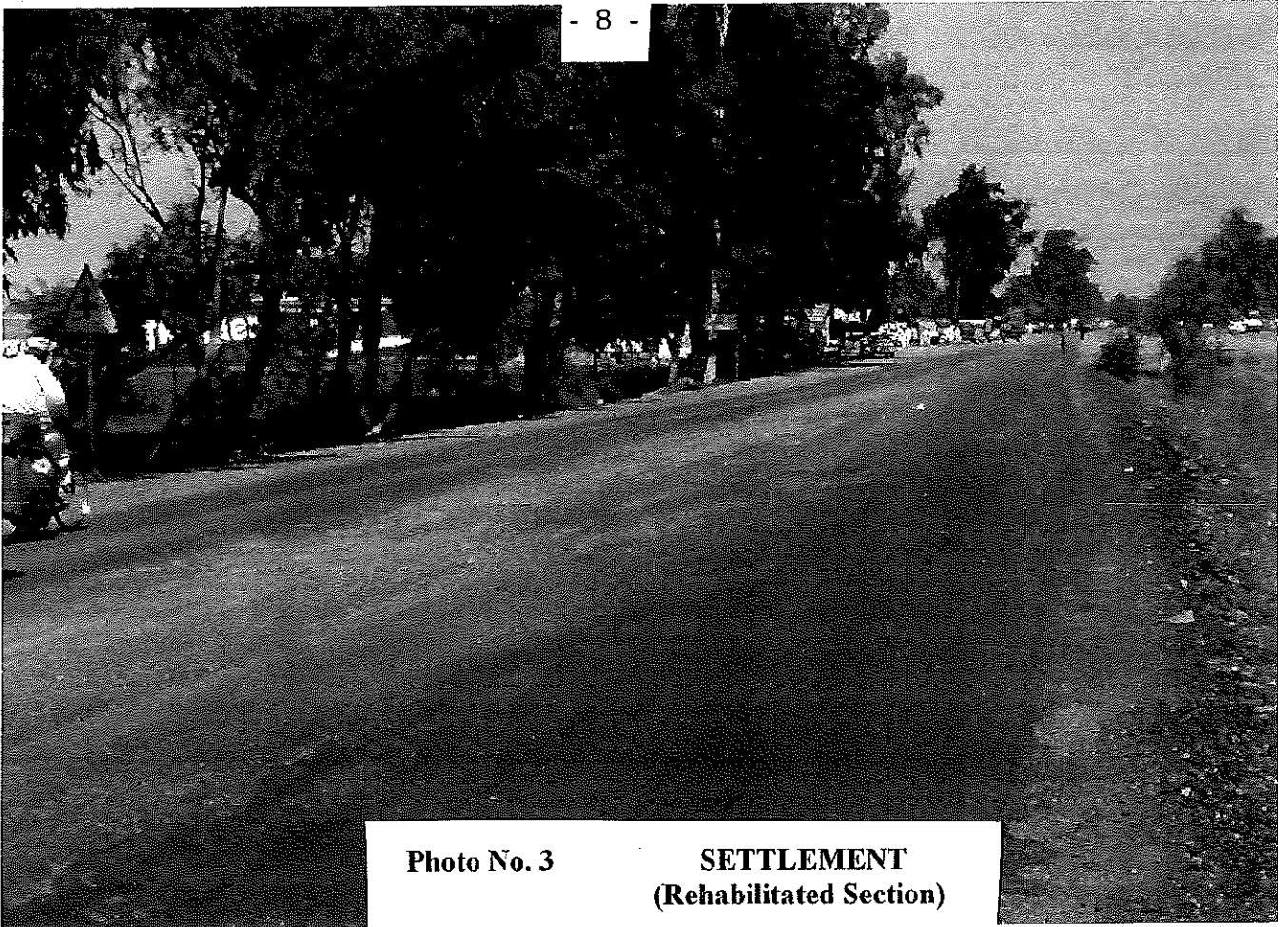


Photo No. 3

**SETTLEMENT
(Rehabilitated Section)**

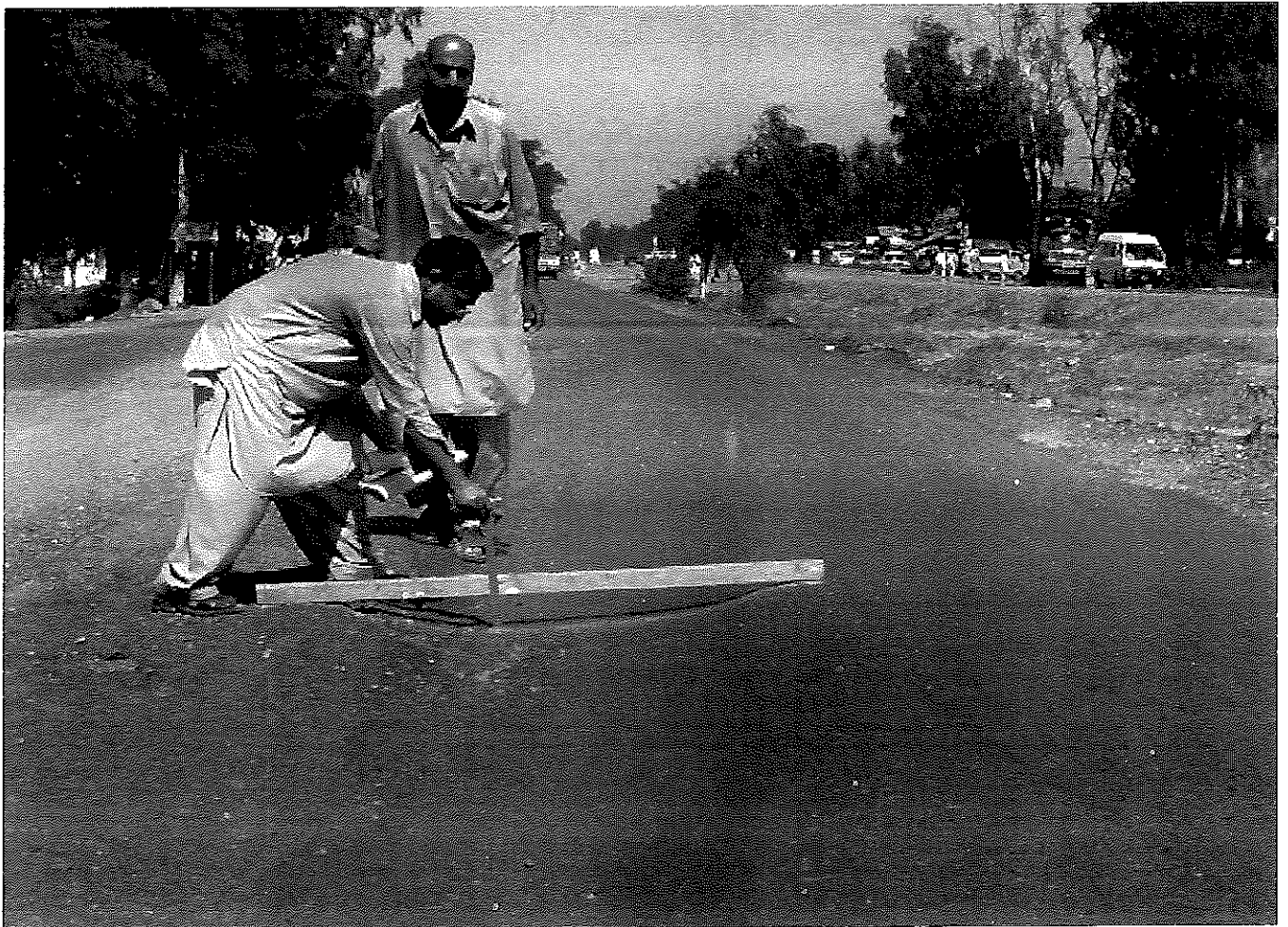


Photo No. 4

**DEFORMATION
(Rehabilitated Section)**

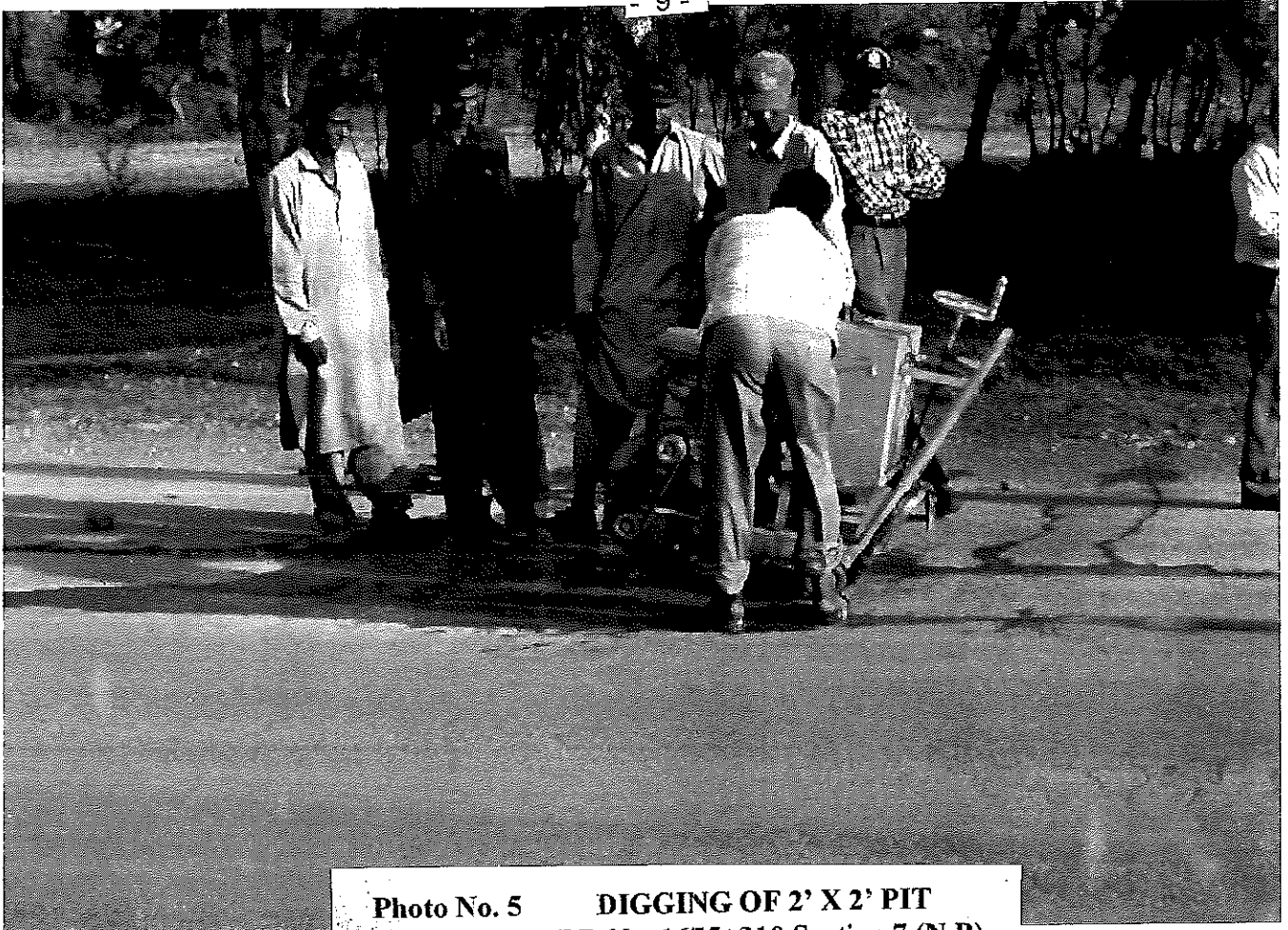


Photo No. 5 DIGGING OF 2' X 2' PIT
RD No. 1675+310 Section 7 (N.B)



Photo No. 6 DIGGING OF 2' X 2' PIT
RD No. 1675+310 Section 7 (N.B)

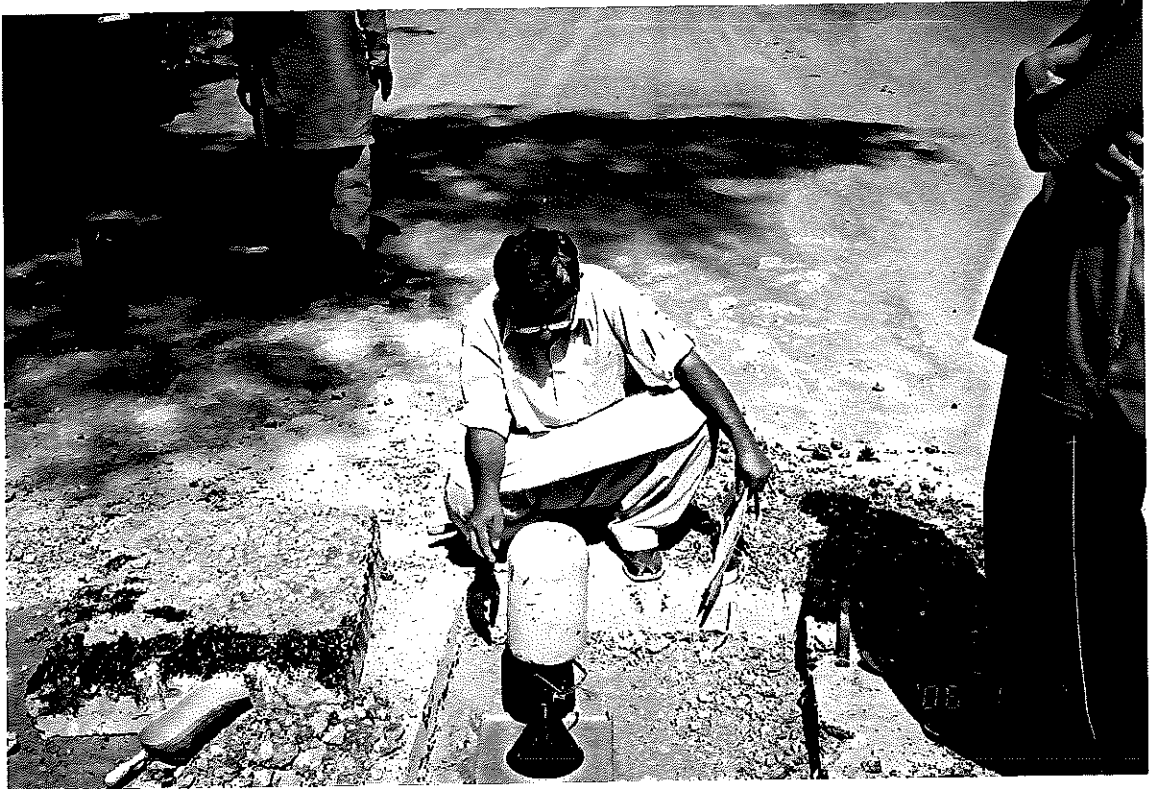


Photo No. 7

**FIELD DENSITY TEST
RD No. 1685+385 Section 6 (S.B)**



Photo No. 8

REPAIR WORK IN PROGRESS



**Photo No. 9 APPEARANCE OF CLAYEY - SILTY
SLURRY DURING CUTTING OF 2' X 2' PIT
RD No. 1885+385 Section 6 (N.B)**



Photo No. 10 FIVE CORES TAKEN FROM THE SITE