His Majesty's Government of Nepal
Ministry of Physical Planning and Works
Department of Roads

Sept ' 2000 **Number 15**

HMIS News

Highway Management Information System Unit, Planning Branch, DOR

www.dorhmis.gov.np

MALEKHU-DHADING BESI ROAD PROJECT

Malekhu - Dhading Besi Road Project lies entirely in the Dhading District of Central Region of Nepal. This road starts from Malekhu (approximately 70 km from Kathmandu) and ends at district headquarter, Dhading Besi. The total length of the road is 17.5 km.

Initially this road was constructed by Dhading District Authority in 1968/69. Later it was included in the Dhading Integrated Rural Development Project. The construction work was executed by Department of Roads. The Bailey bridge over Trishuli river was built in 1993 under the financial assistance of German Technical Cooperation (GTZ).

(continue in Page No.2)

R.M.D.P

Environmental Impact Assessment (EIA)

The consideration of environmental issues in any development project has become increasingly important in recent days. Because it has been accepted that the environmental degradation occurred mostly by the construction of the new projects, which hampers the natural stability causing the natural disaster to be imminent. Therefore it is very important for the people to undertake construction projects with lesser impact in the environment.

During the construction of a road, one can not deny that the environment will not be affected. From the excavation of road to exploration of the querries, all will hamper the environment. So the people responsible for the road construction should minimize the environmental hazard and also mitigate the environmental impacts caused by the construction.

(continue in Page No.3)

Bridge Unit

Progress of Bridge Design in 2056/57

Bridge Unit as part of design branch of the department is carrying out the design of bridges lying at different parts of the kingdom. This unit carries out the detailed survey and design of bridges through local consultants. After various administrative formalities, the unit was able to call tender at the 2nd week of Marga 2056. After provision of adequate time to consultants and proper screening of technical and financial proposals, the agreement could be done at the 3rd week of Chaitra 2056. The work orders were issued to consultants immediately after the agreement. The consultants had about 3 months time to submit the draft report. After the submission of draft reports, bridge unit provided the comments on the report and design. Incorporating all the comments, the consultants have finalized the design. The reports submitted by the consultants are then sent to respective division road offices with reference copies to regional directorate and the library and documentation center.

(continue in Page No.4)

H.M.I.S

NRS survey data:

Highway Management Information System Unit of Planning Branch is responsible for updating the Nepal Road Statistics. Last year we published the NRS 1998. It has been planned that this statistics will be updated every two years.

HMIS Unit has hired NEPECON to carry out the data updating of NRS in the previous fiscal year. NEPECON has already submitted the final report of this survey. According to the TOR of the survey, the data has to be brought from the related road division offices. Due to budgetary constraints, it was decided that the map of the NRS 1998 will be only updated in this fiscal year.

(continue in Page No.5)

S.M.D.P

Strengthened Maintenance Divisions Programme

Road Maintenance, Nepal

By JürgChristen, SKAT

During the last decades, Nepal has undertaken major efforts to build up a strategic road network. In 1956, it consisted of only 500 km, but since then is has been slowly increasing, with the support of various donors, to a total length of 10,000 km. However, due to inadequate maintenance and to the chronically overloaded vehicles, the roads are subject to very rapid decay.

In view of these facts, SDC decided in 1988 to support Nepal in its efforts to properly maintain its roads. SDC expressed this decision also in the Transport Sector Strategy Paper of 1995 and in its Country Programme for 1998-2000. As a result, since 1994, SDC has been supporting - within the framework of the Road Maintenance and Rehabilitation Project (RMRP) of IDA

Main Attraction in Next Issue: Traffic data of 75 traffic stations in Strategic Road Networks

(International Development Association) - a programme package which not only comprises institutional and conceptual development aspects, but also practical project execution components. One important component is the so-called "Strengthened Maintenance Divisions Programme (SMDP)", the target of which is to introduce a national maintenance concept for the road network.

Since the closure of phase 1 had been scheduled for mid 1998, SKAT was commissioned to evaluate the programme at the end of 1997. The evaluation found that the programme had been successfully implemented in 9 of the 24 Divisions since 1994, and that it had contributed significantly to the improved condition of the roads The programme's approach is considered to have been a success - a conclusion widely appreciated and recognised by both Government and users.

Based on the outcome of this evaluation, SKAT has been entrusted with the preparation of the project document for phase II, the objectives of which are to consolidate the maintenance concept and to set it up in the remaining Divisions. Besides reducing the costs of maintenance of the approximately 5'500 km road network, the programme also enhances the population's mobility and consequently increases income-generating opportunities. Basically, the following goals are being pursued:

- Introduction of the Maintenance Management System at the national level, including development and implementation of binding strategies, norms and guidelines.
- Decentralisation of management and administration, including planning and monitoring of maintenance work at regional and district levels.
- Safeguarding and sustainable management of resources, including personnel and finance. Enhancing involvement of the private sector in maintenance work.
- Increasing capacities at all levels by means of adequate training. The above article is published on the Internet:

http://www.skat.ch/ti/proj/proj.htm#Road%20Maintenance.%20Nepal

The above is the excerpt from the SKAT NEWS NR40 March 2000 Issue.

SKAT Programme Support

SKAT is a leading Swiss consultancy firm working internationally in the areas of Water and Sanitation, Architecture and Building, Transport Infrastructure, and Urban Development. SKAT is involved in SMD programme to guide and support in the aspect of capacity building and institutional strengthening at different levels in order to further anchor and consolidate the SMD process in Nepal. For this purpose, a programme support mission was commissioned by SDC (Swiss Development Co-operation) and carried out by Jürg Christen from SKAT between 27 January and 11 February 2000 in Nepal.

If you are interested in full Mission Report please download from the following web site address:

http://www.sdat.ch/sk/ti/proj/download/Mission%20Report.doc

(Continue from Page No. 1)

Malekhu -Dhading Road Project

The salient features of this project are as follows;

Alignment:

Starting Point	:	Trisuli Bridge - Malekhu
End Point	:	Dhanding Besi
Total Length	:	17.5 km
Major settlements along the road:		Parewatar, Phistar, Bungchung, Nalang Bairani, Kalidaha, Sasah and Dhading Besi.
Lowest Point	:	Trishuli bridge 360m from MSL
Highest Point		Near Dhading Besi 605m from MSL
Major bridges		Trisuli bridge at km 0+000 (proposed length= 118m), Thopa Khola bridge at km 6+200 (proposed length=61m), Thopal khola bridge at km 17+425 (proposed length= 25m)

Cross drainage structures: Small bridge/ slab culverts:

- 3nos. new (1.5m, 3m, & 12m span)
- 5 nos. existing / rehabilitation causeways:
- 5 nos. new/ replacement.

Pipe culverts/ crossings for irrigation:

- 62 nos. new/ replacement
- 51 nos. existing / rehabilitation.

Technical Standard

Type of road : Major Feeder Road (F34)

Formation width:
3.5 m black top (DBST), penetration macadam at sharp curves and high gradient areas over 15cm - 20cm thick crushed stone base and 20 cm thick sub-base with 1m hard shoulder both sides (exceptional reduction in narrow sections). Passing places at suitable locations.

Average gradient: 7%

Maximum gradient; 11%

Exceptional horizontal curve radius: 10m

Design speed: 25 kmph

Super elevation: Maximum 7% and slope towards hill in case of horizontal radius>60m.

Department of Roads had already started the rehabilitation of the road. This project is financed by Federal Republic of Germany through Kreditanstalt für Wiederaufbau (KfW). The design and supervision consultant are ITECO Engineering Limited, Switzerland in joint venture with ITECO Nepal (P) Ltd., Nepal. The major construction work to be done during the rehabilitation will be as follows:

- Replacement of Mabey & Johnson (M&J) Bailey type bridge by composite (steel truss and concrete) structure at Trishuli Bridge.
- New construction of a 61m long composite bridge at Thopal Khola.
- Minor horizontal realignment in some locations
- Improvement of vertical alignment
- New construction of one minor bridge at Bungchung, two major floodways and two slab culverts
- Construction of additional cross drainage structures and retaining walls
- Construction of lined side drains throughout the road.
- Construction of pavement works up to surface level with Double Bituminous Surface Treatment (DBST)

One of the special works of this project is strengthening the existing Trishuli M&J Bailey Bridge to sustain for longer duration in respect of traffic load and hydrological condition. The main works to be done in this bridge are as follows:

- New construction of left bank abutment, about 8m far from the existing one, which requires special works to protect the Prithivi Highway.
- Anchoring of abutments,

- Erection of auxiliary column to support the Bailey bridge,
- Dismantling of piers and right abutment up to about 4 m and new concrete work,
- subsoil high pressure grouting and anchoring in northern pier caisson foundation,
- River training works with flexible structures such as RCC tetrapods,
- Above mentioned works are to be carried out without major traffic interruption.

To upgrade the feeder road is one of the government's policies. The construction of this road will help to improve the access of the Dhading district to the strategic road network and to the economic centers such as Kathmandu, Narayghat and Pokhara etc. This will ultimately help to increase the economic activities in this district. The total cost of this project is estimated as NRs. 608 million (German Mark 16.44 million), out of which HMG/ Nepal will contribute 82.90 million rupees and KfW/ Germany will invest NRs. 525.4 million rupees.

The contracts of this project have been already awarded. The total construction work of this project has been divided into three contracts. The major contract of rehabilitation of Trishuli Bridge and new construction of Thopal Khola bridge was awarded to DSD Dillinger Stahlbau, Germany. The second contract of road upgrading works from km 9+600 to km 17+516, has been awarded to Arniko Nirman Company, Nepal. The third contract of road upgrading works from km 0+030 to km 9+600, was awarded to Amar and Super Sherpa Construction (JV), Nepal. The targeted completion date of all three contracts is 31st May 2001.

So it is expected that the road will be paved at the end of May 2001.

(Continue from Page No. 1)

R.M.D.P

Considering these facts, His Majesty's Government has also formulated Environment Protection Act (EPA) 1996 and Environment Protection Regulations 1997(2054). Because of government's strict policy and World Bank's environment guidelines, Road Maintenance and Rehabilitation Project (RMDP) had also conducted the Environmental Impact Assessment (EIA) study of Surkhet- Jumla, Baitadi - Darchula, Chinchu - Jajarkot, Sanfe - Martadi and Sanfe - Mangalsen road.

The EIA of these roads were carried out by Snowy Mountain Engineering Consultant (SMEC) International Pt. Ltd. in association with CEMAT consultants (Pvt.) Ltd. According to the extent of the environmental damage to be caused by the construction of these roads, the detail EIA has to be carried out. But for the roads under upgrading phase only Initial Environmental Examination (IEE) were carried out. These EIA study was carried out in accordance with the World Bank's GP/BP/OP4.12 guidelines.

The following steps were carried out during the EIA study.

EIA scoping: It includes the literature review, publication of a Public Notice, inspections of the proposed alignments and discussion with local people, and government officials at destination district headquarters etc.

Alignment Inspection; Walkover inspection of the proposed road alignments were undertaken by the environment and social teams along with road engineer, geologist, surveyor etc.

District interviews: Interviews were conducted with key government departments at all destination district head quarters, including the Administration Office, Development Office, Agricultural Office and Forestry Office. Interviews were also conducted with VDC and community representatives.

Inspection of existing roads: Existing roads in the locality of the proposed roads were inspected to identify the local environmental impacts associated with road construction. It was identified during the inspection what the impact will be in landform, landuse, ecological degradation, loss of assets and population displacement due to the construction of the road.

Impact assessment: Following field work and data collection, potential environmental impacts were assessed. The level of assessment of each issue was on the relative importance assigned to the issue in the scoping of the EIA.

Analysis of Alternatives.

Initially Priority Investment Plan (PIP) project screened and prioritised 10 potential roads based on the evaluation of potential costs and benefits. Later RMDP recommended these five roads considering economic, environmental and social factors.

During the environmental screening , the candidate roads were considered for the ;

- Determine the magnitude of potential impacts and ensure that environmental considerations were given adequate weight in the selection of roads to be constructed.
- Identify candidate roads that should not be constructed due to major potential environmental impacts.
- Recommend in order of priority, roads to be constructed based on overall environmental impact, both adverse and beneficial.
- Classify the level of environmental assessment required for each proposed road.

Four macro-level primary environmental issues were used to screen the candidate roads in terms of potential major impacts that may result from the proposed roads. They are

- Land use change
- Ecological degradation
- Landform stability
- Damage of other significant features.

The relative percentage of each impact along the entire length of each road was used to calculate the screening score. Each primary issue was identified as having an adverse impact or no impact, therefore scores of between 0 and minus 10 were assigned, with a negative score indicating a net adverse impact and a zero indicating no significant benefit or impact. Then four primary issue scores were added then divided by four to give a total score.

The following table shows the environmental screening scores for candidate construction roads.

Name of the Road	Primary Environmental Issue				Total Score
	Land use change	Ecological Degradation	Landform Stability	Other significant feat.	
Chameliya - Darchula	-4	-2	-7	0	**-3**
Sanfebagar - Martadi	-5	-1	-2	0	**-2**
Sanfebagar - Manglasen	-9	0	0	0	**-2**
Kalikot - Jumla	-4	0	-3	0	**-2**
Chedagad - Jajarkot	-8	-2	-1	-1	**-6**
Thamare - Musikot	-6	-2	-2	0	**-3**

It was recommended that Beni -Jomsom road not to be constructed due to its internationally significant geographical features that it would detract from or damage. These include the Kali Gandaki valley, Annapurna and Dhaulagiri ranges and the Kali Gandaki River floodplain above 2500m.

Roads to be constructed were decided by considering the economic, regional development prospectus, environmental and social aspects. The weightage given for them are 30%, 15%, 30% and 25% respectively. Then the total score was calculated to give the final value. According to these criteria, Kalikot -Jumla road was ranked first where as Chameliya - Darchula road was in last position.

During the EIA study, potential environmental impacts, both bio-physical and socio-economic are assessed in terms of the direct or indirect nature of the impact, extent, duration and significance.

The study also describes the incorporation of environmental impact mitigation measures in the preliminary design to date, the need for additional mitigation measures and recommended measures contained in the Environmental Management Action Plan (EMAP) and Resettlement Action Plan (RAP). Design, construction and maintenance mitigation recommendations for the proposed roads have been formulated to avoid or mitigate potential bio-physical impacts. In addition to this, specific socio-economic impact mitigation measures have been proposed for the displacement of people and acquisition of land for the roads. The major mitigation measures undertaken were:

Alignment planning: During the selection of the alignment of the roads, emphasis was given to have most stable alignment with less active landslides area with gentle terrain.

Road Design mitigation measures:
The major principal adopted to avoid more environmental impacts is to design the road balancing cut and fill. Also the preliminary design specifications for embankments and retaining walls attempted to balance "low cost" design standard with the minimisation of environmental impacts. They are primarily based on the following principles:

- Utilisation of compacted earth fills embankments wherever possible (i.e. generally slopes of less than 25°).
- Increasing cut batter grades through rocky areas in order to reduce excavation, slope disturbance and construction costs.
- Use of hillside retaining walls and breast walls to reduce earthworks where high cut batters are required through soil.
- Minimum excavation of slopes above 60°. These slopes will either be stable (i.e. stable rock) or prone to slides (e.g. overlying colluvial material). If a site is prone to slides, material can be removed from the road once it has fallen, thus saving significant excavation costs.
- Use of gabion or dry stone retaining walls on the hillside where the road passes through irrigated cultivation land prone to seepage and landslips.
- Minimising the amount of excess fill material.

Similarly side drains and cross drainage had been designed in such a way that the rain water and natural water can be trapped efficiently.

Road construction mitigation measures:
Road construction methods have a direct baring on the degree of direct environmental impacts that will result from new roads. Therefore the construction program and process should be such that it will less hamper environmental stability. The key principles that have to be adhered to are limiting the area of disturbance and land take, sequencing construction activities to save the double handling of materials, installing all major retaining and drainage works in the initial year of construction (prior to the monsoon) and progressively revegetating the completed batters.

(Source: Report of EIA submitted by SMEC Pty. Ltd and CEMAT Pvt. Ltd.)

(Continue from Page No. 1)

Bridge Unit

Following is the list of 24 bridges designed in the fiscal year 2056/57.

List of Bridges Designed during Fiscal Year 2056/57

S. No	*Bridge Name*	*River Name*	*Road*	*District*	*Total Length (m)*	*Span Arrangement and material*	*Estimated Cost (million Rs.)*
1	Aduwa	Aduwa	Chakchaki-Goldhap	Jhapa	51.02	2@25 RCC	22.012
2	Bhedawa	Bhedawa	Kalyanpur-Chikna	Siraha	50.97	2@25 RCC	23.149
3	Bighi	Bighi	Janakpur-Bramapur	Mahottari	51.04	2@25 RCC	30.224
4	Rato	Rato	Janakpur-Banchauri	Mahottari	25.41	1@25 RCC	17.617
5	Pachayin	Pachayin	Aurahi-Gausala	Mahottari	12.41	1@12 RCC	7.473
6	Manusmara	Manusmara	Madhubani-Aurahi	Sarlahi	25.41	1@25 RCC	8.337
7	Sundarighat	Bagmati	Sundarighat-Sanepa	Kathmandu	94.04	4@23 RCC	57.627
8	Chandi	Chandi	Garuda-Samanpur	Rautahat	17.75	1@17.75 RCC	9.352
9	Punit	Phanti	Jitpur-Biruwaguthi	Parsa	16	1@16 RCC	7.030
10	Khahare	Khahare	Labhdhu-Samudratar	Nuwakot	17.75	1@17.75 RCC	5.974
11	Chipleti	Panpa	Birendranagar-Thakuri Bhanjyang	Chitwan	36	2@18 RCC	15.271
12	Banjariya	Turiya	Parasi- Banjariya	Rupandehi	54	3@18 RCC	16.801
13	Andhi	Andhi	Syangja-Panchamul	Syangja	100	4@25 RCC	29.832
14	Ameliya	Ameliya	Ameliya-Tulsipur	Dang	40	2@20 RCC	10.565
15	Kathekhola	Kathe	Baglung-Burtibang	Baglung	24	1@24 RCC	8.217
16	Lalmatiya	Praganna	Kataha-Khurmiya	Dang	20	1@20 RCC	7.234
17	Parshottam	Parshottam	Parshottam-Rakhi-Marmikarma	Kapilvastu	8	1@8 RCC	3.252

18	Jethinala	Jethinala	Chandanichowk-Sonapur	Banke	25.6	1@25 RCC	11.879
19	Budhiyanala	Budhiyanala	Chandanichowk-Sonapur	Banke	25.6	1225 RCC	11.923
20	Magragadhi	Rajkulo	Magaragadhi-Jayanagar	Bardiya	40	2@20 RCC	14.860
21	Kadha	Kadha	Thapapur-Bhajani	Kailali	50	2@25 RCC	16.947
22	Rapti	Rapti	Nepalgunj-Bagauda	Banke	336	7@48 Truss	172.645
23	Sundarighat	Bishnumati	Old Teku Road	Kathmandu	61.92	3@20 RCC	19.028
24	Babai	Babai	Dharana-Sandiyar	Dang	71.1	3@23 RCC	19.122

(Continue from Page No.1)

H.M.I.S

NRS Survey data

In this newly surveyed data, only those road data, which can be verified from the road division offices have been updated. Those road data which is not under the jurisdiction of the road office has not been updated and those data which were unable to verified from the related road division offices have been kept as it was in the NRS 1998**.**

There are many road construction agencies in our country such as District Development Committee, Hydro power company, Irrigation offices etc, who are involved in road construction. It is very difficult to have the updated data from these agencies every year. So we have concentrated this time to update those road data which is under Department of Roads. HMIS Unit is planning to send the survey data to the concerned division to cross check it. The following table depicts the total road length with category and pavement type.

LENGTH OF ROADS WITH CATEGORY & PAVEMENT IN THE COUNTRY - REGION WISE (In Kilometers)

Classification	Region	Blacktopped	Gravelled	Earthen	Total
National Highway	Eastern	506	117	45	668
	Central	658	63	6	727
	Western	479	7	0	486
	Mid-Western	341	52	181	574
	Far-Western	340	0	148	488
	Sub-Total	**2324**	**239**	**380**	**2943**
Feeder Road (MAJOR)	Eastern	147	69	90	306
	Central	268	131	136	535
	Western	227	82	130	439
	Mid-Western	40	119	226	385
	Far-Western	0	79	124	203
	Sub-Total	**682**	**480**	**706**	**1868**
Feeder Road (MINOR)	Eastern	0	0	0	0
	Central	109	6	0	115
	Western	14	14	0	28
	Mid-Western	0	0	23	23
	Far-Western	0	0	0	0
	Sub-Total	**123**	**20**	**23**	**166**
District Road	Eastern	68	652	1165	1885
	Central	304	1058	2315	3676
	Western	34	230	992	1257
	Mid-Western	15	259	660	934
	Far-Western	42	146	407	595
	Sub-Total	**463**	**2345**	**5539**	**8347**
Urban Road	Eastern	128	146	167	441
	Central	593	315	182	1090
	Western	179	49	123	351
	Mid-Western	19	32	12	63
	Far-Western	11	20	8	39
	Sub-Total	**930**	**562**	**492**	**1984**
Grand Total		**4522**	**3646**	**7140**	**15308**

(To get more information, please visit our website http://www.dorhmis.gov.np)

Share your views on this PLATFORM

CONSTRUCTION OF BORE PILES FOR BUMP BRIDGE

Er. Dipak Shrestha

Bridge Upgrading and Maintenance Project
A DOR / DFID Project

This paper is an extract from a BUMP Technical Seminar held at Staff College, Jawlakhel on 19/9/2000. The event was supported by the DOR, SCAEF, FCAN, Institute of Engineering, Nepal Engineering College.

At the Biratnagar-Rangeli Road site, 3 bridges across Judi, Cheka and Chesang khola are being constructed with Bore Pile foundation. These foundations were specified with the intention of introducing appropriate bored piling techniques suited to soil types in Lower Terai and in the process build capacity in the Nepali contracting sector.

Three pilot piles were installed at each bridge site at static load tested to 150% of the design load to confirm the design parameters. Of the 167 permanent piles, 151 piles have been completed to date. The piles are 600 mm in diameter and 21.50 m to 28.50 m in length. After initial teething problems, a construction rate of 1 pile a day was achieved for each of the 2 piling rigs engaged on site.

Design Principle followed:
The piles were designed for allowable loads using the following principle :

$Q_f = Q_{shaft} + Q_{base}$
$Q_a = (Q_{shaft} + Q_{base})/FOS$
In clays : $Q_f = (\alpha\ Cu)A_s + (Nc\ Cu)\ A_b$
In sand : $Q_f = (k\ p'_{ave})A_s + (Nq - 1)\ A_b$
$FOS = 2.5$, $\alpha = 0.3$, $Cu = 6 \times SPT$, $k = 0.5$

Using soil information from site investigation report, an Excel based "Pile capacity program" was developed to calculate allowable pile capacity at different depths. The soil strata at Judi and Cheka consist of alternate layers of stiff to very stiff silty clay and fine to coarse (medium-dense) sand. The strata at Chesang is fine to coarse (medium-dense) sand, mixed with gravel at higher depths.

The length of piles designed are 24.5m (east abutment) and 20.5m (west abutment) for Judi; 18.5 m for Cheka and 17.5 m for Chesang for the working loads of 42 t, 37 t and 54 t respectively. In plan, the minimum spacing of adjacent piles in a pile group is kept to 3 x pile diameter. Piles are reinforced with 9 nos. of 12 m long T25 Cold Twisted deformed bars protruding 600 mm in to the pile cap. R10 (Mild steel) spirals are used for the transverse reinforcement. The reinforcement cages are fabricated on site and lifted in place into the bore.

Construction Equipment and Procedure:
The construction equipment was procured from Calcutta, India. The equipment comprise of: Tripod, a 5 ton capacity Winch, Bailer (700kg), Casing (3m x 0.62ϕ), Mud Pump, Chisel (0.58 to 0.60 dia), Tremie Pipes (1.6 m, 0.8 m and 3 m long with 8" dia), Drill pipes (3 m long with 5" dia), and a Concrete Hopper.

A piling platform is constructed with a hydrostatic head of 1 to 2 meters. A mud tank for supplying and circulating drilling fluid is constructed with brick masonry with the tank top at a level lower than the platform level. Reference numbers and construction sequence of piles is agreed and pile centers are set out. The center of temporary casing is positioned over the pile center and driven in place by a Bailer. Mud is used as drilling fluid and made from high plastic local dark gray clay. Mud is circulated by pump through the drilling pipe down to the chisel. Drilling is advanced by the chisel by loosening the soil, which travels to the top of the casing and flows under gravity to the tank where mud is re-circulated after allowing the heavier sand / soil particles to settle.

Once the required boring depth is reached, the bore is cleaned by circulation of clean mud. A tape tied to a sampler checks the depth and a sample of mud is collected at toe level, and the specific gravity is maintained at less than 1.25. A 600 mm diameter guage is inserted into the pile bore in order to confirm the achievement of 600 mm minimum diameter pile bore. A prefabricated reinforcement cage, with 150 mm dia circular cover blocks is positioned in the pile bore at required level by hanging the cage hooks on the top of the casing and welding them to prevent a possible up lift of the cage during concreting. Tremie is installed to approximately 200 - 300 mm above bottom of the pile. Washing of the bore through the Tremie pipe is recommended in case of high specific gravity of the fluid/sediments. Concreting is started by discharging bulk volume of concrete from the hopper and in order to separate the drilling fluid and the fresh concrete, a conical shaped tin-sheet separator is installed in the hopper for the first load of concrete. As concrete level in the bore rises, Tremie pipes are taken off to aid the concreting operation.

Construction Control :
- **Drilling Fluid** : Local clay is used for making drilling fluid. The advantages of this are two folds: environmental friendly material and a lower reduction in skin friction in comparison to bentonite. Care is taken to ensure that the drilling fluid is not too thin to hinder the boring operation nor too viscous for it to stick to the reinforcement bars and the bore wall during concreting. Specific gravity not exceeding 1.10 and 1.25 is specified for the supply and bore cleaning operation.

- **Concreting** : After a series of field/lab trials M20/20 concrete with W/C = 0.45 and C = 400 kg/m^3 with Emce plast 4BV was the adopted design mix. This gave acceptable slump retention of up to 1/2 hour (longer period is desirable), a better degree of slump repeatability and no delay in hardening process. Coarse Aggregates conforming to AASHTO M80 with Elongation Index and Flakiness Index not exceeding 30% are used by blending 60% of 14 mm down and 40% of 20 mm down aggregates. Fine aggregates conforming to AASHTO M6 (BS zone 2) are used. Minimum slump specified was 150 mm and concrete with repeatable slump ranging 175 - 200 mm is targeted. A low slump concrete (stiffer mix) increases the chance of blockage in the tremie and high slump concrete followed by low slump tends to create an air void inside the Tremie pipes leading to an inflow of mud into the fresh concrete. Precautions were taken to ensure concrete temperature not higher than 35^{o}c.

-**Tremie pipes** : Concreting operation is started with the Tremie bottom at 200 to 300 mm above the pile bottom. Sections of tremie pipes are dismantled as concrete level rises but keeping the Tremie outlet immersed to a depth of 2m in fresh concrete. On-site verification of this is done by plotting a graph of concrete volume against the depth of the pile with relative Tremie lengths. Surging of Tremie during concreting should be avoided, since this lead to the inclusion of mud into the concrete.

Construction Time : Concreting should start as early as possible after boring is completed. In case of major break downs the bore should be backfilled with sand 2 m above the bottom of the pile. In case of minor break downs, the bore should be washed out by circulating drilling fluid through the Tremie or drill pipes. No piles should be bored within 6m of a newly cast pile until after 24 hours curing period. Tremie pipes and concrete quality are better controlled in day lights, thus concreting for all BUMP piles are done during day light.

Pile Tests :
One pilot pile from each bridge site was constructed and tested to 1.5 times the design load prior to constructing the contract piles. Static load test was performed with kentledge reaction system using a single ISMB 600 main beam (2 for Chesang) overlain by 14 nos. of ISMB 250 cross beams supporting the sand bag loads (Weight of sand bags = 1.12 times the test load). Maintained Loads were applied progressively with 25% increments in 2 cycles : 1st cycle up to design load and 2nd cycle up to 1.5 * design load. Summary of test result is given below :

Bridge	Details of test	Cycle 1 (1*D.L.)	Cycle 2(1.5*D.L.)
Judi	Load (tons)	42	63
	Total Settlement (mm)	.765	1.4
	Residual Settlement (mm)	.005	0.25
Cheka	Load (tons)	37	55.5
	Total Settlement (mm)	.98	1.72
	Residual Settlement (mm)	.365	0.83
Chesang	Load (tons)	54	81
	Total Settlement (mm)	1.91	3.29
	Residual Settlement (mm)	.57	1.11

All the piles are tested by Integrity Testing system developed by IFCO Foundation Expertise BV. The tests are conducted by striking the top of a trimmed pile by a plastic hammer and the sonic wave generated in the pile is recorded as a velocity - time signal. This response plot is then used to confirm the insitu length of pile, any relative reduction or necking in pile diameter, and inclusions or irregularities within the pile column.

Remarks :

There is a trend of increasing use of bore piles for bridge and tall building construction in Asia and other part of the world. Some of the advantages of bore piles are: no ground heaving, pile length can be varied as required, soil log can be verified during construction, no noise pollution, ease of construction in built up areas and no tilting as in the well foundation.

The equipment used on BUMP project was selected bearing in mind initial cost and the ability of the equipment to be dismantled into transportable segments for delivery to remoter sites.

The cost of boring and concreting per running meter of 600 mm dia. bore piles constructed on this system based on BUMP project is estimated at NRs 850.00 and 1790.00 respectively, excluding Contractor's overhead and profit. It can be considered as good type of foundation for tall buildings and bridges with clayey, sandy and gravely soil conditions.

A follow-on site visit is being organised next month to witness the pile construction operations and integrity testing of piles completed in the last season. Please contact HMIS editor or the project office for early bookings.

R.S.S.D.U

DG of DoR Mr. Ananda Prasad Khanal visited U.S.A from 16-22 July, 2000 to participate in Executive Seminar on Contract Management, International Experience.

DDG of DoR Mr. Shreekantha Lacoul also visited U.S.A from 23 -28 July, 2000 to participate in Executive Seminar on Contract Management, Contractor Operational.

Road Sector Skill Development Unit has managed the training opportunities to the following staff of the department.

In Country Training:

1. **Master in Construction Management (18 months), Nepal Engineering College, Nepal**

Mr. Kailash K. Shrestha, Engineer
Mr. Niraj Sharma

2. **Trainers Training from SMD (2 Weeks), Sanothimi TITI**

Mr. Amulya Das Shrestha, Engineer
Mr. Prabin Banepali, Engineer
Mr. Uday Prakash Hada, Engineer
Mr. Dol Raj Adhikari, Engineer
Mr. Babu Ram Sapkota, Engineer
Mr. Madhab Kumar Karki, Engineer
Mr. Shiva Adhikari, Engineer
Mr. Madhu S. Shakhi, Overseer
Mr. Kameshor Shah, Overseer

3. **Overseer Maintenance Training (2 Weeks), Kurintar**

Mr. Kahi Mahato
Mr. Shuresh B. Tumbahamfe
Mr. Satya Narayan Raya
Mr. Dal B. Gurung
Mr. Sone Lal Saha
Mr. Dila Ram Bastola
Mr. Ashok Shakya
Mr. Sailendra Shakya
Mr. Sailendra Sharma
Mr. Indra Kumar Poudel
Mr. Giri Dhar Sharma
Mr. Bashanta K. Yadav
Mr. Amit Kafle
Mr. Mahendra Shah
Mr. Indra Dev Bhatta

4. **Supervisors Training from SMD (18-19 Sept. 2000)**

26 Supervisors from Kathmandu, Lalitpur, Bhaktapur, Nuwakot and Charikot divisions.

Out Country Training:

1. **M.Sc in Geotech Engineering (Jun 2000 - Jun 2002), Bangkok, Thailand.**

Mr. Nava Raj Adhikari, Engineer

2. **TRL Course Roads and Transport in Development Countries and Emerging Nation (2 July -14 July 2000), U.K**

Mr. Pawan Man Shrestha , SDE

3. **Master in Civil Engineering (10 July 2000 to 10 Jan 2002), Australia.**

Mr. Pradip Raj Pant, Engineer

4. **Study Tour (27 August - Sept. 2000), Indonesia & Bangladesh**

Mr. Keshav Prasad Pokharel, DDG
Mr. Suresh Kumar Regmi, RD
Mr. Daya Ram Dhungana, SDE
Mr. Harish Chandra Shah, SDE
Mr. Guru Prasad Dhakal, SDE

Presentation of Interim Report of Feasibility study on Kathmandu - Naubise Alternate Road

It has been generally felt even by public that the bottleneck in Thankot and high gradient of existing road has created lot of problems to the traffic in Thankot - Naubise road. Now the traffic growth rate of this road per year is around 7.5% according to the traffic study conducted by HMIS unit every year. So the time has come now to reconsider the alternate road for this existing road. Therefore Japanese International Co-operation Association (JICA) has come with a new concept of alternate road from Sitapaila to Dharke.

JICA study team (Nippon Koei) has already started doing the feasibility study of this road. They have presented first interim report on 16 th June 2000, whose detail information have been published in our previous newsletter issue. Now they have presented the second interim report on 24 August, 2000 in DoR. During the presentation DG of DoR Mr. Ananda Prasad Khanal was present along with all four DDGs and other technical staffs of the department.

The major issues addressed in this presentation were

⇒ Future Traffic Demand
⇒ The Optimum Route Selection
⇒ EIA Study

According to the traffic study done by the study team, the Annual Average Daily Traffic at Thankot and Kalanki point were 5990, and 14300 vehicles per day. From this traffic data, the future AADT for the year 2010 and 2020 has been projected and it has been estimated that about 90% of vehicles will travel in this new road in future due to low vehicle operating cost and safe in travel time.

The study team has divided the total road into 6 sections developing 138 alternatives. In the last progress report, they have opened all the 5 alternates in section A, 2 alternates in section B, 3 alternates in section C, 1 alternate in each section D, E and F. Now they have removed one alternate from section B by considering construction and land acquisition cost. They have decided that the alternate of section A will be decided by detailed survey and they have left all three options of long tunnel, short tunnel and no tunnel option in section C open. Therefore the alignment selection is more about finished. The alignment of this new alternate road will be as follows:
Sitapaila - Syuchatar - Ramkot- Bhimdhunga - Chhatredeuralli - Jiwanpur - Dharke.

The length of this road will be as follows:
Long tunnel option - 24.8 km.
Short tunnel option - 25.4 km.
No tunnel option - 28.6 km.

The study team has also done economic calculation considering the Vehicle Operating Cost (VOC) and saving in the travel time cost. They had taken the time value for passenger same as in Fourth Road Improvement Project (FRIP). The following table shows the comparison of three alternates.

Items	Alternate 1 (Long Tunnel)	Alternate 2 (Short Tunnel)	Alternate 3 (No Tunnel)
Length (Km)	24.8	25.4	28.6
Project Cost	5.7 Billion	4.0 Billion	3.7 Billion
Construction Period	39 months	34 months	37 months
Land Acq. cost	Rs. 62.2 Mil	Rs. 65.4 Mil	Rs.72.0 Mil
EIRR	9.4%	12.1%	11.6%
NPV	-1,225 Mill.	23 Mill.	-143 Mill.
B/C	0.71	1.01	0.95

According to this table, it is cleared that alternate 1 with long tunnel option has highest project cost and lowest economic feasibility, hence it is screened out. There is no significant difference between alternate 2 and 3, as former has high project cost with higher economic feasibility and latter has low project cost with lower economic feasibility.

But the study team has recommended the optimum route as alternate 2 with short tunnel option due to the following reasons:

♦ **Better reliability of the road.**
⇒ avoids steepest topography and poorest geological conditions
⇒ better reliability against road disasters, reducing maintenance cost.

♦ **Smooth project implementation**
⇒ comparatively less land acquisition
⇒ more environmental friendly

♦ **Decrease in total traffic accidents**
⇒ due to decrease in total length

♦ **Necessity of Highway tunnel in Nepal**
⇒ Eminent mountainous country in the world.
⇒ tunnels are indispensable for future road development in Nepal

Do You Know

❖ ***According to recently survey done by NEPECON, the total road length of our country is 15308 km.***

❖ ***According to recently done survey of Node Updating, the exact length of the Mahendra Highway (H01) is 1027.7 km.***

Address for correspondence:

The HMIS Unit

Planning Branch Tel. : 262693, Ext.147
Fax. : 255746

Email: hmis@htp.com.np
Web site: http://www.dorhmis.gov.np

HMIS would like to thank to the colleagues Babu Ram Ranabhat, Shakil Manandhar, Bina and Rajendra Thapa of Planning Branch for compilation and production of this **HMIS** newsletter.

EDITORIAL

This newsletter is being produced for the **dissemination of information** of activities related to Highway Engineering and its development in the country and abroad. **Highway Management Information System (HMIS)** welcomes any article, news, events, suggestions related to Highway Engineering development.

Planning Branch
Chief Advisor: Keshav Pd. Pokharel,DDG
Advisor: Sushila Dali, Senior Transport Economist

H.M.I.S Unit
Editor: Pramen P. Shrestha, Engineer