

**MINISTRY OF TRANSPORT
VIETNAM**

**RURAL TRANSPORT PROGRAMME 3:
TRIAL PREPARATION (MODULE 1)**



RURAL TRANSPORT PROGRAMME 3: TRIAL PREPARATION (MODULE 1)

SEACAP 30

FINAL REPORT

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Executive Summary

In the light of the achievements of the RRST and RRSR programmes the MoT requested a further extension of the RRSR programme in a letter to the World Bank, DFID and SEACAP, dated 9 May 2007.

Following discussions between MoT, World Bank and SEACAP it was decided to initiate a third phase of trials (RRST-III) to be associated with the RT3 programme as regards construction funding and with SEACAP supporting the initial trials design stage. Formal ToR for the proposed SEACAP 30 were drawn up with the following identified as the key outputs:

- Recommendations for appropriate surfacing and paving options for the selected provinces;
- Trial designs, cost estimates, and technical aspects of the tender documents for the trials;
- Updated RRSR database.

Six province were eventually selected for further trials

- Northern border mountainous area: Dien Bien, Cao Bang ,
- Midland: Thai Nguyen,
- Red River Delta: Thai Binh
- Middle Area: Thanh Hoa, Phu Yen,

Trial sites within the six provinces were identified and surveyed for soil conditions, using both Dynamic Cone Penetrometer (DCP) and laboratory testing, and for traffic. The investigation showed that existing pavement structures consist of granular base layers up to 175mm thick overlying generally soft subgrades of California Bearing Ratio (CBR) less than 10%, with low to moderate plasticity.

Estimated 10-year traffic flows varied from less than 0.02 million standard axles (msa) to relatively high values up to 2.0 msa. Roads with the higher values would not normally be classified as Low Volume Rural Roads (LVRRs). Conservative design values of subgrade CBR have been derived by combining results from DCP and laboratory testing. Four trial pavement designs at each of the six sites have been developed from the options discussed with representatives from the provinces, including various types of bitumen seal, clay and concrete bricks and unreinforced concrete, using TRL and Austroads design standards.

The pavement designs for the trial provinces were completed and presented to the RRSR Steering Committee. The Steering Committee then approved the next stage of the programme namely that the cost of the trial designs should be estimated and incorporated into overall trial road designs following the existing RT3 guidelines. This work has been now been completed by five of the six province through contractual arrangements with SEACAP and TRL Ltd. The sixth Province (Dien Bien) declined to take part in this part of the programme.

The TRL-OtB recommendation is that the RRST-III programme should continue to its logical practical conclusion of construction and condition monitoring. However, it is important for the research that;

1. Construction funding must include appropriate supervision and quality control over and above that normally applied to rural road construction programmes.
2. Commitment to the construction of the trials must carry with it a commitment to monitor the performance of the trials.

Without these the construction of trials is not justifiable on research grounds.

ABBREVIATIONS and ACRONYMS

ADT	Average Daily Traffic
ASEAN	Association of South East Asian Nations
CBR	California Bearing Ratio
DBM	Dry Bound Macadam
DBST	Double Bituminous Surface Treatment
DCP	Dynamic Cone Penetrometer
DfID	Department for International Development
EADT	Equivalent Average Daily Traffic
ENS	Engineered Natural Surface
EOD	Environmentally Optimised Design
esa	equivalent standard axles
GOV	Government of Vietnam
gTKP	global Transport Knowledge Partnership
HQ	Headquarters
ILO	International Labour Organisation
Km	kilometre
LCS	Low Cost Surfacing
LVRR	Low Volume Rural Road
m	metre(s)
MoT	Ministry of Transport
mm	millimetre(s)
MERLIN	M achine for E valuating R oughness using L ow-cost I Nstrumentation
MPa	Mega pascals
MoU	Memorandum of Understanding
Msa	Million standard axles
ORN	Overseas Road Note
Pen Mac	Penetration Macadam
PDoT	Provincial Department of Transport
PI	Plasticity Index
QA	Quality Assurance
Ref.	Reference
RRGAP	Rural Road Gravel Assessment Programme (Vietnam)
RRSR	Rural Road Surfacing Research (Vietnam)
RRST	Rural Road Surfacing Trials (Vietnam)
RT	Rural Transport programmes

SCC	SEACAP Coordinating Committee
SEACAP	South East Asia Community Access Programme
SOE	State Owned Enterprise
SPM	SEACAP Practitioners Meeting
SNP	Modified structural number
TRL	Transport Research Laboratory
UCS	Uniaxial compressive strength
UK	United Kingdom
UNOPS	United Nations Office for Project Services
VN	Vietnam
VOCs	Vehicle Operating Costs
VPD	Vehicles per day
WBM	Water Bound Macadam
WLAC	Whole Life Asset Costs
WLC	Whole Life Costs

1 Introduction

1.1 *The Overall SEACAP Context*

SEACAP 30 is part of the wider South East Asia Community Access Programme (SEACAP) whose strategic theme is ‘livelihoods of poor and vulnerable people in SE Asia - improved sustainably’. The core SEACAP concept relevant to infrastructure was stated as “maximizing input of local resources, which are materials, labour, enterprise and ingenuity, which ensures affordability”.

SEACAP aims to influence infrastructure funders in the provision of low-cost, maintainable, locally owned access to rural communities through adoption of local materials and training local people in evidence-based sustainable techniques. SEACAP builds on existing knowledge, but also provides a research resource for filling gaps in knowledge, particularly in the local environment. Mainstreaming ensures that these solutions are accepted, adopted and applied on a large scale. This involves a process of dissemination through participatory workshops, guideline documents, demonstrations, training and implementation.

1.2 *Technical Background*

In response to the increasing recognition that gravel surfacing was not a universal solution for rural roads in Vietnam, in 2002 the Ministry of Transport (MoT) requested studies of alternative surfaces for rural roads as part of the World Bank-funded Rural Transport programme 2 (RT2). These studies became known as the Rural Road Surfacing Research (RRSR) initiative through which Phase I and Phase II of the Rural Road Surfacing Trials (RRST) were carried out. This research programme was subsequently incorporated into the DfID-funded South East Asia Community Access Programme (SEACAP).

Between 2005 and 2006 over 140km of trial roads in 12 provinces were constructed under the RRST I and RRST II programmes with a wide variety of pavement and surfacing options. The subsequent condition monitoring of a representative 108 sections of these trial roads under the SEACAP initiative has delivered a substantial database of information on the sustainable alternatives to unsealed gravel for Vietnamese rural roads.

Analysis of the data from this RRST monitoring programme has highlighted key issues of design selection, construction methodology, quality control and maintenance that are now having a practical impact on current rural infrastructure programme in Vietnam, such as Rural Transport 3 (World Bank) and the ADB-funded Central Provinces Infrastructure programme under the Ministry of Agriculture and Rural Development. The practical outcomes of this research are also having a significant regional impact in the development of rural infrastructure design and management approaches in Lao PDR and Cambodia.

1.3 *The SEACAP 30 Project Origins*

Following the completion of RT2 in July 2006, the MoT, with further support from the World Bank and DfID, initiated the third Rural Transport programme (RT3). The development objective of this is to reduce travel costs and improve access to markets, off-farm economic opportunities, and social services for poor rural communities in the 33 participating provinces in Northern and Central Vietnam.

One of the principal components of the programme is the rehabilitation of the core rural road network taking into account lessons learnt from previous SEACAP RRSR programmes, including the adoption of RRST pavement options where appropriate.

In the light of the achievements of the RRST programmes, the MoT requested a further extension of the programme in a letter to the World Bank, DFID and SEACAP, dated 9 May 2007. The extension was requested in order to continue the long-term monitoring of the existing RRST road sections as well extending the trials programme to ten further provinces as follows:

- Northern border mountainous area: Dien Bien, Cao Bang, Lang Son
- Midland: Thai Nguyen, Bac Giang
- Red River Delta: Thai Binh
- Middle Area: Thanh Hoa, Nghe An, Phu Yen, Quang Nam.

[Subsequently only six of the provinces were included in the trials programme – see Section 3.3]

Following discussions between the MoT, the World Bank and SEACAP, it was decided to initiate a third phase of trials (RRST-III) to be associated with the RT3 programme as regards construction funding and with SEACAP supporting the initial design stage of the trials. Formal ToRs for the proposed SEACAP 30 were drawn up with the following key outputs:

- Recommendations for appropriate surfacing and paving options for the selected provinces;
- Trial designs, cost estimates, and technical aspects of the trials tender documents;
- Updated RRSR database.

The rationale for undertaking a third phase of trial was that although RRST-I and RRST-II had already included a wide selection of paving options in a range national road environments, there were strong practical arguments in favour of this extension. Principal amongst these were:

- The need to cover additional road environments in the Northern Hill and Coastal areas;
- A requirement to trial additional options (eg Otta Seal; lime-stabilised natural gravels; thinner non-reinforced concrete);
- The importance of extending the province-level practical dissemination of the research outcomes.

It was appreciated that the dissemination of practical research down to provincial (PDoT) level was an important step in establishing a flexible approach to rural infrastructure design.

1.4 Document Aims

The aim of this document is to present a concise *summary* of the SEACAP 30 programme and its related extensions as follows:

SEACAP 30: This was the main SC30 contract concerned with the research and preparation of trial designs for the RRST-III programme.

SEACAP 30.2: This was concerned with the gathering and analysis of site data for trials design. It was split between ITST and TRL-OtB. The former undertook the geotechnical surveys of the selected roads for the trials whilst TRL-OtB supplied guidance and QA.

SEACAP 30.3: This was essentially an enabling contract to allow funding to be made available to the RRST-III provinces fully participating in the programme for road surveys and document preparation as per RT3 Guidelines.

In particular, this document highlights:

- The work undertaken in relation to the stated objectives;
- Key technical outcomes from the programme; and,
- Recommendations on the way forward.

2 Project Framework

2.1 Contractual Arrangements

In response to a Request for Proposals dated 7th February 2008 from Crown Agents for Overseas Governments and Administrations Ltd (acting as Contracting Agent for DfID), TRL submitted a comprehensive technical and financial proposal for carrying out the project. Following a period of discussion on contractual detail, TRL Ltd subsequently entered into a contractual arrangement with Crown Agents for SEACAP 30.

TRL was supported by OtB Engineering (International) Ltd, consulting engineers, who provided office and administrative support in addition to the services of Dr J Cook as Team Leader and by the local Vietnamese consulting group, TEDI, who supplied local professional expertise. In addition, a formal sub-contract was signed with ITST for administrative and organisational support.

2.2 Mobilisation

Mobilisation followed on from a Project Initiation meeting with the RRSR Steering committee on 13th May 2008 and comprised the finalisation of local contractual arrangements; the activation of local staff resources; and agreement on additional office space. The project was run out of an extension to the existing OtB-Intech project office in Hanoi Towers, Hai Ba Trung Street.

2.3 Project Objectives

The ToR and related TRL-OtB technical proposal identified five Task Groups whose satisfactory completion is essential to the success of the project:

Programme: Establish working links with the RRST Steering Committee, the relevant PMUs, PDoTs/PPMUs, and other relevant programmes and consultants.

Survey Data Collection and Storage. The task group was concerned with *advising* the PDoTs on the collection and storage of data relevant to the appropriate design of rural road trials.

Trial Designs Cost Estimates and Tender Documents: For each trial section, advise the PDoTs on the preparation of detailed pavement designs and cost estimates including appropriate pavement and surfacing specifications.

Technical Reporting: A series of technical reports associated with key stages in the project programme.

Dissemination: Key workshops and the posting of outcomes on appropriate national, regional and international websites.

2.4 Project Responsibilities

The project responsibilities as defined in the original SEACAP 30 documents differed from those in the previous RRST-I and RRST-II programmes. Under SEACAP 30 it was envisaged that the PDoTs/PPMUs would undertake much of the field investigation and budget development work which had previously been the responsibility of the international consultants, although TRL-OtB would supply training and technical advice. The original division of responsibilities is presented in

Table 2.1. The funding of the PDoT/PPMU activities was intended to be through an RT3 counterpart budget.

Table 2.1. Original Project Responsibilities

PDoT Responsibilities	SEACAP 30 (TRL-OTB) Responsibilities
1. Review RT3 programme of road construction in province	1. Review existing RRST documentation
2. Identify short list of suitable candidate roads for trials	2. Undertake preliminary discussion visits to provinces
3. Support TRL-OtB in preliminary site visits	
4. Support TRL-OtB in identifying laboratories to be used	3. Review laboratory facilities
5. Select trial road lengths in conjunction with TRL-OtB	4. Agree on trial road selection with PDoTs
6. Discuss pavement or surfacing options to be trialled with TRL-OtB	5. Agree on trial road pavement and surfacing options with PDoTs
7. Undertake 3-day traffic surveys on trial roads	6. Supply advice on how to conduct data collection surveys for trials
8. Inventory survey of proposed trial roads including sub-grade and existing pavement	
9. Identify sources of construction materials	
10. Undertake standard soil tests on construction materials and from existing road	
11. Include TRL-OtB proposed pavement designs in complete road design	7. Review and organise data collected by PDoTs and design trial pavements
12. Liaise with Local Authorities/Communes	
13. Draft required cost norms in conjunction with TRL-OtB	8. Assist in development of temporary cost norms
14. Agree temporary cost norms with PPCs	
13. Prepare overall Trials Budget	9. Derive costs for trial road pavements and surfaces
15. Final BoQ and procurement documents	10. Draft any required pavement specifications
16. Prepare and submit documents as per RT3 procurement requirements	11. Prepare any technical amendments required for pavement aspects of procurement documents
18. Agree contractual arrangements for construction	12. Prepare Module 1 report

2.5 *Project Development*

It had been agreed during project conception that the World Bank RT3 funds would be available to support this programme. However, as the project developed beyond the inception phase it became clear that there were problems in mobilising the RT3 counterpart for the specific purpose of the PDoT/PPMU trials data collection. As a consequence, DfID agreed that additional funding could be made through SEACAP for this data collection. An additional contract (SEACAP 30.02) was therefore initiated whereby the data collection and laboratory work would be undertaken by ITST who would also support TRL-OtB in the subsequent analysis. TRL-OtB would have an overall quality assurance and project direction role. The PDoTs/PPMUs would supply on-site support.

It also became clear that a similar funding difficulty existed concerning the preparation of documents under the RT3 guidelines. Again DfID agreed to cover the shortfall and another contract extension (SEACAP30.03) was negotiated whereby TRL Ltd would commission sub-consultancy agreements with the PPMUs to prepare the relevant documents using funds supplied through SEACAP.

The final responsibilities for the whole SEACAP 30 operation are summarised in Table 2.2

Table 2.2. Project responsibilities

No	Activities	TRL-OtB	ITST	PDoTs
1	Review documentation - previous trials & review			
2	Review RT3 construction programme			
3	Select provisional list of candidate roads			
4	Preliminary discussion visit to provinces			
5	Review local laboratory facilities			
6	Select trial roads			
7	Select pavement/surfacing options			
8	1st Interim Report to Steering Committee			
9	Geotechnical survey of trial road lengths			
10	Review materials resources			
11	Advice on field data collection procedures			
12	Laboratory tests trial road and material samples			
13	Traffic survey of trial roads			
14	Technical review of site and lab data			
15	Trial pavement design			
16	Trial pavement costs			
17	Trial road pavement specifications			
18	Trial pavement cost norms			
19	Incorporate trial pavement into road design			
20	Complete trial road design drawings etc			
21	Overall trial road costs			
22	Final consultations with Local Authorities/Communes			
23	Agree temporary cost norms with PPCs			
24	Prepare detailed Trials Budget			
25	Prepare technical amendments to contract docs.			
26	Final BoQ and procurement documents			
27	Submit documents for No Objection Letter			
28	Agree contractual arrangements			
29	Module 1 Report			

Notes Darker shading = more responsibilities

3 Site Selection

3.1 *Provincial Liaison*

Based on experience with RRST-I and RRST-II it was clear that only by visiting each PDoT could these key stakeholders be fully informed of their responsibilities within the project and a clear picture be obtained of any likely difficulties. The principal objectives of early visits to the provincial authorities were therefore to discuss the project with each PDoT, explain clearly the objectives and timescales and also to obtain information on a number of key issues such as

- Willingness or otherwise of PDoTs to support the programme;
- Proposed candidate trial roads;
- Individual PDoT views on the trial pavement options;
- Budget resources available for road surveys.

Issues that arose out of the provincial visits, which took place in June and July 2008, are summarised as follows:

1. All of the original 10 provinces were keen to participate in the programme. Some had previously considered doing research themselves but did not have sufficient funds.
2. The provinces supported the concept of themselves undertaking the design surveys and data collection through local consultants under existing mechanisms for funding under RT3.
3. All the provinces had government (MoT or MoC) licensed geotechnical laboratories.
4. Although willing to use the DCP as a means of assessing sub-grade strength the PDoTs noted that this is generally assessed following Vietnamese standards by means of an in situ compression test for subgrade E-modulus (22TCN 211:93). It was apparent, however, that some provinces probably simply extrapolated from previous data from adjacent roads. It was not clear exactly how much actual subgrade testing and traffic counting was being undertaken for RT3 designs.

3.2 *Candidate Road Selection*

Each of the 10 provinces had proposed from 3 to 8 roads with lengths from 1 to 15km. This number had to be drastically reduced bearing in mind resource limitations and the guidance in the project ToR of..... *“three to four LVRR trial pavement sections of 0.5 to 1.0 km in length for the most common environmental conditions found in each of the provinces”*

The TRL-OtB team aimed to identify one trial road per province which, ideally, should contain a minimum of 4-5km of suitable alignment representative of the road environment being trialled with a traffic pattern falling within the Commune A road class definition. An initial screening of those roads proposed by the PDoTs allowed the elimination of candidate roads for the following reasons:

- Roads too short: less than 2-3km;
- Roads containing damaged bridge sites that are inhibiting vehicular traffic;
- Roads connected directly to National roads and therefore likely to have heavy vehicle traffic;

- Roads very remote from provincial administration. This makes the control of construction and maintenance for research purposes very difficult.

3.3 Provincial Short List

There were sound arguments for including all 10 provinces in the programme on the basis both of research dissemination and their variable environments. However, in the light of the tight timescales involved and concerns regarding the allocation of construction funds, it was suggested that SEACAP 30 should prioritise the provinces with a view to identifying six provinces on which to concentrate initially. The TRL-OtB team therefore reviewed the available information and identified six provinces which were discussed and agreed by the key stakeholders, Table 3.1.

Table 3.1. Priority of RRST III province list

No	Province	Terrain Types	Annual Rainfall (mm)
1	Dien Bien	Mountain valley, inter - mountain plain	2500
2	Phu Yen	Coastal Plain	1700
3	Thai Nguyen	Flat inland – padi and hilly	2500
4	Cao Bang	Mountainous	1500
5	Thanh Hoa	Flat coastal, hilly, mountainous	2500
6	Thai Binh	Red river delta	1800
7	Lang Son	Hilly, mountainous	1600
8	Bac Giang	Hilly,	1500
9	Nghe An	Hilly,	2000
10	Quang Nam	Coastal	3000

Note: Recommended for initial phase

The priority listing took account of whether previous RRST research had been undertaken in similar provinces and the extent to which opportunities were available for increasing and widening the rural road pavement knowledge base.

3.4 Option Matrix

During the initial provincial visits the local authorities made suggestions concerning the pavement and surfacing options that they would like trialled. TRL-OtB reviewed these options in the light of the following RRST guiding principles:

- Designs should be appropriate to the traffic, climatic and terrain environments;
- Local construction materials should be used where possible;
- Maintenance requirements must be sensibly in line with local community resources; and,
- Construction techniques should be suitable for small contractors and local employment.

TRL-OtB then drew up a suggested RRST-III trial matrix for the initial six provinces (Table 3.2) which was further discussed with the PDOs and the RRSR Steering Committee before being formally adopted for detailed design.

The matrix also took into account the wider requirements for a balanced selection of pavement and surfacing options within the RRSR programme as a whole. The provinces all suggested that control sections should be hot bitumen DBST seal over WBM.

Table 3.2. Proposed Trial Options for the Initial RRST-III Provinces

	Dien Bien	Cao Bang	Thai Nguyen	Thai Binh	Thanh Hoa	Phu Yen
DBST (Emulsion)						
OTTA Seal						
DBST(Hot bitumen)- control						
DBM base/sub-base						
WBM base/Sub-base - control						
Lime stabilised clay-gravel base/sub-base						
Cement stabilised sand base/sub-base						
Concrete brick						
Mortared joint clay brick						
Mortared Macadam						
Non-reinforced Concrete						
Sealed shoulders						
Quarry-run/gravel shoulders						

The proposed trial roads were finally selected in discussion with the PDoTs in parallel with the discussions on selection of the trial options. Although two provinces, Dien Bien and Cao Bang, made late changes to the trial roads, the final selection (Table 3.3) was agreed prior to the site data collection phase.

Table 3.3. Trial Road List

Province	Road Name	District	Surveyed length (km)
Thai Nguyen	Uc Son - Lu Van	Phu Binh	4.050
Cao Bang	Hong Vie	Hoa An	4.375
Thai Binh	Hong An	Hung Ha	2.000
Thanh Hoa	Quang Trung – Quang Chinh	Quang Xuong	3.500
Phu Yen	Phu Vang – Phu Luong	Tuy Hoa city.	3.013
Dien Bien	Co Chai, Thanh An	Dien Bien	4.500

4 Trial Investigations

4.1 Contractual Arrangements

The site data collection was undertaken by ITST under the quality control and direction of TRL-OtB. This contract was agreed in early December 2008 and the site work completed by the end of January 2009.

4.2 Field Surveys

Based on experiences of the RRST I and RRST-II projects, the TRL-OtB core team drew up a programme of investigation for each of the selected RRST-III trial roads. Following a training exercise in Thai Binh, each trial site was investigated by an ITST site survey team who undertook the following:

- Visual walkover survey;
- Dynamic Cone Penetrometer Testing (DCP);
- Soil and materials sampling;
- Traffic Count.

Visual walkover survey. A standard inventory form was used to summarise the general conditions along each trial road, Figure 4.1. Full results from this survey are included in Appendix A.

Dynamic Cone Penetrometer (DCP). This testing was undertaken every 250m or at changes in condition in both left and right wheeltrack. Global positioning system (GPS) fixes were taken at each DCP site and at the start and end of the test section. The raw DCP data were analysed using the UKDCP 3.1 software developed by TRL.

Soil sampling. Representative samples of existing road surface and subgrade were taken at regular intervals as well as samples from likely sources of construction materials. Large bulk samples were taken where required for strength testing of cement or lime-stabilised materials.

Traffic Count. Three-day traffic counts over a 12-hour period were undertaken on the selected trial roads using procedures developed under the RRSR trials construction and monitoring contracts.

4.3 Laboratory Testing

Table 4.1 lists the tests undertaken as part of the ITST programme. Full test results are stored within the RRSR database held by the Department of Science and Technology (MoT). Summaries of test results are included in Appendix B of this report.

Figure 4.1. Sample Walkover Survey Sheet

TRL-OtB										(Sheet No) 03 / 05			
(RRST-III Initial Road Survey)													
Chain	General	E'Work	Shoulder L	WTL	WTR	Shoulder R	E'Work	General	Current Condition	Material	Gradient	Curve	
3000	Riv	E	0,5m	5,3m	0,5m	N		<input type="checkbox"/>	3	Gr	b	(
2950	Riv	E	0,4m	5m	0	N		<input type="checkbox"/>	3	Gr	b	l	
2900	Riv	E	0,2m	4,8m	0	E		<input type="checkbox"/>	3	Gr	b	l	
2850	Riv	E	0	4,8m	0,2m	N		<input type="checkbox"/>	3	Gr	b	l	
2800	Riv	E	0,3m	5m	0,3m	N		<input type="checkbox"/>	3	Gr	d	l	
2750	Cầu Thùng			2,7m				Cầu Thùng					
2700	Riv	E	0	4,9m	0	E		R	3	Gr	d)	
2650	Riv	E	0,3m	4,9m	0	E		R	3	Gr	b	(
2600	Riv	E	0	4,5m	0	E		R	3	Gr	b	(
2550	Riv	E	0	4,8m	0	E		R	3	Gr	b	l	
2500	Riv	E	0	4,3m	0	E		R	3	Gr	b	l	
2450	Riv	E	0	4,7m	0	E		R	3	Gr	b	l	
2400	Riv	E	0	4,4m	0	E		R	3	Gr	b	l	
2350	Riv	E	0	4,8m	0	E		R Tr <input type="checkbox"/>	3	Gr	b	l	
2300	Riv	E	0,5m	4,6m	0,7m	E		Tr R	3	Gr	b	l	
2250	Riv	E	0,5m	5m	0,5m	E		R Tr	3	Gr	b	l	
2200	Riv	E	0,4m	4,9m	0,6m	E		R <input type="checkbox"/>	3	Gr	b	l	
2150	Riv	E	0,5m	4,7m	0,8m	N		Tr <input type="checkbox"/> R	3	Gr	b	l	
2100	Riv	E	0,5m	5m	1m	N		Tr <input type="checkbox"/>	3	Gr	b	l	
2050	Riv	E	0,5m	4,8m	1m	N		Tr <input type="checkbox"/>	3	Gr	b	(

Road Name	GPS Start	N
Uc Sơn - Lữ Văn		E
Phủ Bình, Thái Nguyên	GPS End	N
		E
Ký hiệu (LEGEND)	Người K.S (Surveyor)	ITST Team 1
	Date	20/12/2008

<p><input type="checkbox"/> Nhà (Houses)</p> <p><input checked="" type="checkbox"/> Cầu (Bridge)</p> <p> Cống (Culvert)</p> <p> Đường (Road)</p> <p><u>W</u> Mặt nước (Surface water)</p> <p>R Ruộng lúa (Rice field)</p> <p>↓ Rãnh (Ditch)</p>	<p>Công tác đất (E'Work)</p> <p>E - Nền đắp (Embankment)</p> <p>C - Nền đào (Cutting)</p> <p>N - Không (None)</p> <p>Tình trạng đường (Condition)</p> <p>1 - Rất tốt, xe 1 cầu (Excellent 2WD)</p> <p>2 - Xe 1 cầu đi mùa khô (2WD in dry season)</p> <p>3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)</p> <p>4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)</p> <p>5 - Rất xấu - không đi được (Failed - Not passable)</p>	<p>Vật liệu (Material)</p> <p>E - Đất (Earth)</p> <p>S - Cát (Sand)</p> <p>Cl - Sét (Clay)</p> <p>Gr - Cấp phối, sỏi (Gravel-cobble)</p> <p>BS - Nhựa (Bitumen)</p> <p>Đốc dọc (Gradient)</p> <p>a - <0%</p> <p>b - 0-2%</p> <p>c - 2-4%</p> <p>d - 4-6%</p> <p>e - 6-8%</p> <p>f - >8%</p>
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Riv: Sông, river
 Tr: Cây, tree
 Ao, pond

Bridge: Width 2.7m, length 24m. Reinforced cement concrete single span, there is a concrete repaired area with about 1m2 in the middle of bridge, bridge surface have cracks. There is sign board 5T (Vehicle weight).

Table 4.1. List Laboratory Tests

Test	Reference	Number of tests undertaken					
		Province					
		TB	CB	TN	TH	PY	DB
Soil							
Particle size	T87 T88	11	23	21	18	14	23
Atterberg Limits	T88-T89	9	22	21	18	14	23
Modified Compaction	T99-A	3	6	4	5	4	4
CBR	T193	3	6	4	5	4	4
Aggregate							
Particle size	TCVN 7572-2	4	4	5	7	2	7
Specific Gravity	TCVN 7572-4	4	4	5	7	2	7
Porosity	TCVN 7572-6	4	4	5	7	2	7
Clay content	TCVN 7572-8	2	4	1	2	1	2
Organic content	TCVN 7572-9	2	1	1	2	1	2
Mica content	TCVN 7572-20	2	1	1	2	1	2
UCS	22TCN 59-84	4	4	0			
Aggregate crushing	TCVN 7572-11	1	1	1	1	1	1
LAA	T96	1	1	1	1	1	1
Bitumen adhesion	22 TCN 279-01	1	1	1	1	1	1
Brick							
Compressive strength	TCVN 6355-1	2	0	0	0	0	0

Notes:

TB: Thai Binh; CB: Cao Bang; TN: Thai Nguyen; TH: Thanh Hoa; PY: Phu Yen; DB: Dien Bien.

T: = AASHTO test; otherwise Vietnamese Standards

4.4 Traffic Surveys

Traffic surveys were conducted at each road for a 12-hour period over three days using local PDoT technicians. The results are summarised in Table 4.2 on the basis of 10-year design values for traffic load in equivalent standard axles (esa). It was assumed that only trucks over 5 tons contribute to pavement load and that each axle on such trucks is equivalent to one standard axle. It should be noted that the results from Thai Nguyen showed traffic well outside the normal range for low volume Commune A roads.

Table 4.2. Summary of traffic data from the six trial sites

Province	Road	Vehicle	Motorcycle	Car	Cong Nong	Truck < 5T	Trucks=5t, 2 axles	Truck > 5t, 3 axles	Truck > 5t, 4 or more axles	Bus	esa (12 Hours)	esa (24 Hours)	100% growth in 5 years	Design esa
		esa factor	0		0.1	0.1	2	3	4	1.5				
Cao Bang	Hong Viet – Lam Son	Daily Nos	824	8	4	42	5	0	0	1				
		esa	0	0	0	4	9	0	0	1	15	18	36	130,000
Thai Nguyen	Uc Son - Lu Van	Daily Nos	1039	19	3	91	85	1	0	21				
		esa	0	0	0	9	171	5	0	32	217	261	522	1,900,000
Thai Binh	Hong An	Daily Nos	757	10	33	52	2	0	0	3				
		esa	0	0	3	5	5	0	0	3	16	19	38	140,000
Dien Bien	Co Chai, Thanh An	Daily Nos	578	4	5	8	0	0	0	0				
		esa	0	0	1	1	1	0	0	0	2	2	5	17,000
Thanh Hoa	Quang Trung – Quang Chinh	Daily Nos	337	1	1	17	0	0	0	0				
		esa	0	0	0	2	0	0	0	0	2	2	4	16,000
Phu Yen	Phu Vang – Phu Luong	Daily Nos	860	0	8	23	0	0	0	0				
		esa	0	0	1	2	0	0	0	0	3	4	7	27,000

5 Trial Pavement Designs

5.1 Data Analysis

A summary of the in situ characteristics of the roads selected for the trials is shown in Table 5.1. The lowest 10th percentile CBR values for each site are shown in this table.

In most cases the DCP-CBR testing was conducted in dry conditions. Thus an adjustment of the CBR was required to obtain the appropriate value for pavement design. This is the minimum value likely to be obtained under the road throughout the year. In a country such as Vietnam where the rainfall is usually high, this is likely to be the soaked value at the appropriate field density. Thus the soaked laboratory CBR values were used to produce CBR values appropriate for design. A summary of the laboratory CBR testing is shown in Table 5.2. The laboratory results show low to moderate plasticity soils, with laboratory CBRs averaging around 4.5%. These were generally lower than the corresponding in situ DCP derived values, which is to be expected.

Table 5.1. Existing pavement layer thickness and strengths and design subgrade CBR %

Ref site	Province	Wheeltrack	In situ CBR (%) by DCP		Base thickness (mm)	Design subgrade CBR %
			Base	Subgrade		
1	Thai Nguyen	Left and Right	8	7	75	6
1	Thai Nguyen	Oiltrack (centre)	11	9	98	
2	Cao Bang	Left and Right	22	8	57	6
2	Cao Bang	Oiltrack (centre)	23	9	58	
3	Thai Binh	Left and Right	6	2	175	2
4	Thanh Hoa	Left and Right	8	3	123	3
5	Phu Yen	Left and Right	5	4	141	4
6	Dien Bien	Left and Right	14	8	124	8

Table 5.2. Laboratory Plasticity and Strength for Subgrade Materials

No	Site	Range of plasticity (Ip) (%)	Range of Soaked CBR (%)
1	Thai Nguyen	7.0 - 16	4.0 - 6.0
2	Cao Bang	7 - 17	3.5 - 5.5
3	Thai Binh	10 - 17	1.3 - 4.1
4	Thanh Hoa	7 - 16	3.9 - 4.2
5	Phu Yen	8 - 16	3.8 - 4.7
6	Dien Bien	6 - 16	3.2 - 4.4

It can be seen that roads 3, 4 and 5 show CBR values below 10% for both subgrade and base. For each site the design value of subgrade CBR was taken as the 10th percentile of the combined laboratory and DCP results.

For each road a longitudinal profile of CBR and structural number were plotted for each wheel-track and used to identify locations of softer subgrade. An example is shown in Figure 5.1. Longitudinal plots of all the DCP testing are included in Appendix C.

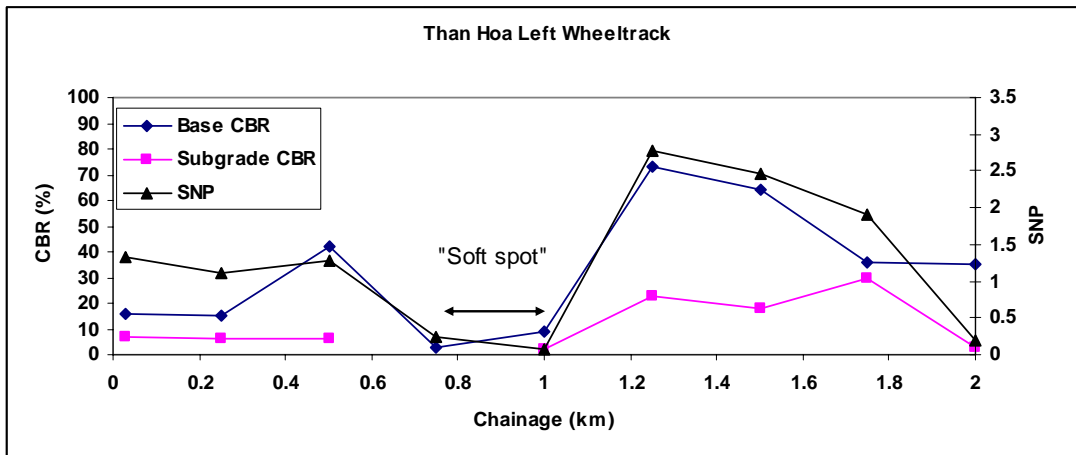


Figure 5.1. Typical Longitudinal Trial Road Profile

5.2 Materials Issues

The testing of the potential construction materials generally indicated that there were materials of suitable quality available for construction. However, the testing highlighted a number of issues.

The Initial Consumption of Lime (ICL) test on soil samples from Cao Bang indicated that maximum benefit would be obtained from the addition of 8% - 9% of slaked lime, Figure 5.2. The principle of the test is based on the fact that a saturated solution of lime in distilled water that is completely free of carbon dioxide has a pH value of 12.4 at 25°C. The minimum amount of lime needed to give a pH of 12.40 is known as the ICL of the material.

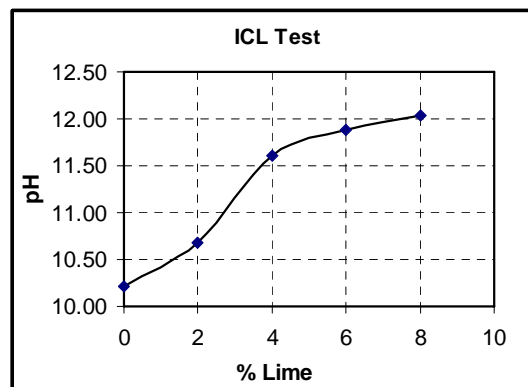


Fig 5.2. ICL Test at Cao Bang

The actual lime stabilisation testing on the Cao Bang material proved initially disappointing (Figure 5.3). However, a close examination of the material actually tested showed it to be

essentially a red sandy clay soil with little or no gravel content. Further testing of the designated clayey gravel materials must be undertaken prior to finalising the contract using 8% slaked lime.

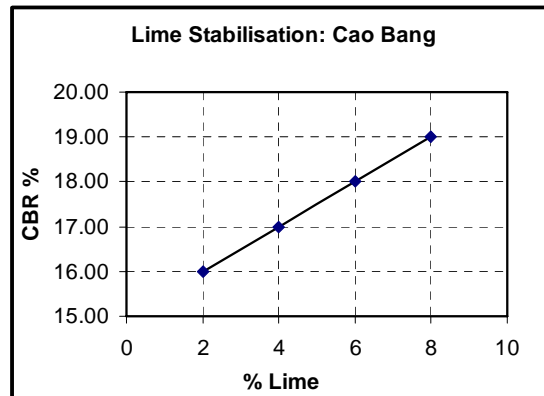


Fig 5.3. Stabilisation testing at Cao Bang

The cement stabilisation of sandy material from Thai Binh (Figure 5.4) showed that after a 14-day cure the Uniaxial Compressive Strength (UCS) strength (0.177MPa) was equivalent to a CBR of approximately 70%. A number of correlations exist for comparison of UCS and CBR. The one used in this case was :

$$\text{UCS (MPa)} = 0.00325 \text{ CBR}$$

The current recommendations for the RRST-III trials are to use 8% cement for base stabilisation and 6 % for sub-base stabilisation.

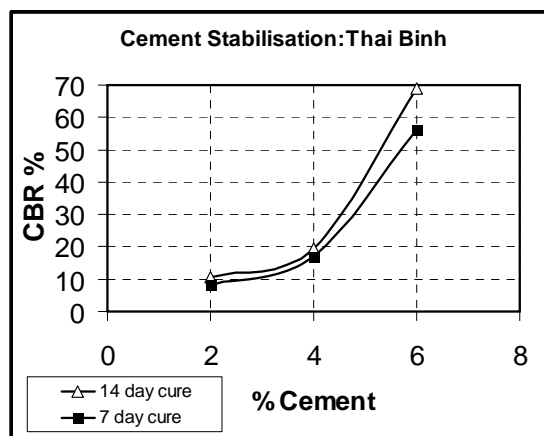


Fig 5.4. Stabilisation Testing at Thai Binh

The strength testing of standard fired clay bricks from Thai Binh showed that they had a crushing strength of only around 17 - 18 MPa. This is below the minimum 20 - 25MPa and the selection of higher quality bricks will be required for actual construction.

5.3 Pavement Designs

Trial pavement designs were developed from the analysed site and laboratory data in line with similar structural designs for low volume roads developed during previous phases of SEACAP and following existing recommendations on low volume roads by ARRB (1995) and TRL (1993, 1999). The general approach was that recommended in SEACAP 1 whereby the pavement options are selected on road environmental criteria (Stage I) and the detailed design of the selected option is undertaken taking into account the key engineering factors of subgrade strength and traffic level (Stage II). The resulting pavement layer designs were then reviewed by TRL Ltd and are presented in Table 5.3 below.

Table 5.3. SEACAP 30 Trial Road Designs

From	To	Design ref.	Surface/Base	Sub-Base	Required Subgrade
Thai Nguyen					
0.000	1.000	TN1	Double Bitumen Emulsion Surface Treatment on 200mm dry-bound macadam	300mm water-bound macadam	> 6%CBR
1.000	2.000	TN2	Hot bitumen seal on 200mm waterbound macadam	300mm water-bound macadam	> 6%CBR
2.000	3.000	TN3	200 mm non-reinforced concrete	120mm dry-bound macadam	> 6%CBR
3.000	4.000	TN4	Double Bitumen Emulsion Surface Treatment on 200mm cm dry-bound stone macadam	300mm river gravel	> 6%CBR
Cao Bang					
0.000	1.100	CB1	150 mm non-reinforced concrete	120mm lime stabilised clay-gravel	> 6%CBR
1.200	2.200	CB2	OTTA seal on 150mm stabilised clay- gravel	150mm lime stabilised clay-gravel	> 6%CBR
2.200	3.300	CB3	Double Bitumen Emulsion Surface Treatment on 150mm dry-bound macadam	150mm lime stabilised clay-gravel	> 6%CBR
3.300	4.375	CB4	Hot bitumen seal on 150mm waterbound stone macadam	150mm water-bound macadam	> 6%CBR
Thai Binh					
0.000	0.500	TB1	Double Bitumen Emulsion Surface Treatment on 120mm dry-bound macadam	150mm stabilised sand	Subgrade to be improved to a minimum thickness of 200mm at CBR> 6% - eg use additional quarry
0.500	1.000	TB2	Hot bitumen seal on 120mm waterbound stone macadam	15mm water-bound macadam	

			macadam		run layer
1.000	1.500	TB3	150 mm non-reinforced concrete	150mm cement stabilised sand	
1.500	2.000	TB4	1 course mortared clay brick	150mm cement stabilised sand	
Thanh Hoa					
0.000	0.750	TH1	Hot bitumen seal on 150mm dry-bound macadam	150mm dry-bound macadam	Subgrade to be improved to a minimum thickness of 200mm at CBR> 5%
0.750	1.750	TH2	150m Non reinforced concrete	120mm dry-bound macadam	
1.750	2.625	TH3	Double Bitumen emulsion Surface Treatment on 150mm dry-bound macadam	150m dry-bound macadam	
3.500	3.500	TH4	One course concrete bricks	150 dry-bound macadam	
Phu Yen					
0.000	0.750	PY1	Hot bitumen seal on 120mm dry-bound macadam	150mm dry-bound macadam	> 4%
0.750	1.500	PY2	Double Bitumen Emulsion Surface Treatment on 120mm dry-bound macadam	150mm dry-bound macadam None	
1.500	2.250	PY3	Double Bitumen Emulsion Surface Treatment on 120mm stabilised sand	150mm cement stabilised sand	
2.250	3.013	PY4	1 course mortared clay brick	150mm cement stabilised sand	

On the Than Hoa and Thai Binh roads a minimum subgrade strength is required above that of the existing subgrade, hence it is necessary to import additional materials (for example quarry-run) or improve existing base and subgrade layers with 2 - 3% of lime.

Cross sections for each of the above pavement designs were drafted by TRL-OtB and these are included in this report in Appendix D. Copies of the detailed trial pavement designs and related cross-sections were sent to all PPMUs for inclusion in the overall road designs and associated documentation.

5.4 Specifications and Cost Norms

Detailed technical specifications and cost norms for the trial options were updated from those used in the RRST-I and RRST-II programmes. For the most part this involved only minor modification suggested in the light of the ongoing research. For example, to alleviate potential erosion issues it is

now proposed that concrete slabs should be constructed directly on well prepared sub-base rather than on a 50mm sand bedding layer as previously suggested.

One additional technical proposal and associated cost norm was added to the RRST and that was for the Otta Seal. The specification was based on that used in the parallel SEACAP 17 project in Lao and cost norm adapted from the nearest existing Vietnamese equivalents.

6 Document Preparation

6.1 Contractual Arrangements

As noted previously the SEACAP 30.03 contract was negotiated as a means of funding the preparation of contract documentation as required by the RT3 programme. Under the terms of the SC30.03 contract, TRL-OtB drafted sub-contracts to facilitate the overall trial road design, cost estimation and document submission for PPMUs in five of the six RRST III provinces. The sixth province, Dien Bien, declined the opportunity to take part in this phase of the project.

After some discussion between SEACAP, TRL-OtB and the MoT as to the exact sums of money required, these contracts were issued for signature by TRL-OtB the on 18th April. The following were the key technical tasks contained within the contracts.

1. Submit a brief work plan to the PPMU and Consultant that includes all proposed activities immediately following contract start-up.
2. Undertake any necessary field surveys as per RT3 guidelines.
3. Prepare any necessary design and contract drawings as per RT3 guidelines.
4. Incorporate the agreed trial pavement designs into the overall road design package.
5. Prepare an overall trial road design in cooperation with the PPMU and the Consultant.
6. Complete trial road design drawings and associated documents.
7. Finalise the technical bid documents as per RT3 guidelines in conjunction with the PPMU.

6.2 Document Status

By mid June 2009 all five provinces had submitted the road design drawings with associated Bills of Quantities. As discussed at a meeting on 9th June with key stakeholders, these documents were reviewed by TRL-OtB and written recommendations were made to each province containing improvements and any amendments that were required.

Amended documents were received by TRL-OtB during week ending 3rd July 2009 and a quick review indicated that some errors still remained to be corrected. No further action however could be taken by TRL-OtB under their existing SEACAP contract. SEACAP were advised of the status of the documents and also that TRL-OtB could not accept responsibility for their Quality Assurance.

7 Programme

7.1 Human Resources

The project team and relevant responsibilities are summarised below.

Dr J R Cook. Team Leader - overall planning and technical reporting responsibility.

Bach The Dzung. Local Team Leader – site team and provincial co-ordination and planning.

Dr J Rolt. Analytical Consultant – Quality Assurance and advice on pavement design.

Dr. Richard Bennet. Pavement Specialist – Advice on pavement design and quality control of data collection.

Pham Gia Tuan; Materials Specialist – Advice on materials, cost norms and cost modelling.

Do Van Dang. Road Engineer – Site support to provincial data collection.

Nguyen Quynh Lan. Office Manager – logistic support.

Pham Thi Hang. Translator – translation of technical documents and reports.

7.2 Programme

The overall as-completed SEACAP 30 programme is summarised in Figure 7.1.

7.3 Workshops and Seminars

The following workshops were organised during the programme period of SEACAP 30. These are listed below:

- Project Initiation workshop 13th May 2008
- Inception workshop 26th August
- Progress workshop 2nd December 2008
- Progress workshop 24th February 2009
- Final Workshop 9th June 2009

In addition, a presentation was made at the SEACAP Practitioners Meeting in Vientiane in November 2008.

Figure 7.1. SEACAP 30 Programme

		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Mobilisation		■													
Task Group 1	Programme		■	■	■	■									
Task Group 2	Data Collection				■	■	■	■	■	■	■				
Task Group 3	Trial Designs									■	■	■	■	■	■
Task Group 4	Technical Reporting		■	■	■	■	■	■	■	■	■	■	■	■	■
Task Group 5	Dissemination											■	■	■	■
PPMU (30.03)	Document Preparation												■	■	■
Key Reports					★	★			★			★	★		★
Workshops			★		★				★		★				★

8 Summary and Recommendations

The pavement designs for the trial provinces have been completed and presented to the RRSR Steering Committee. The Steering Committee approved the next stage of the programme namely that the cost of the trial designs should be estimated and incorporated into overall trial road designs following the existing RT3 guidelines. This work has been now been completed by five of the six provinces through contractual arrangements with SEACAP and TRL Ltd. The sixth Province (Dien Bien) declined to take part in this part of the programme.

The status of the RRST-III project at the end of June 2009 is as follows:

- Trial sections in five provinces have been identified, the pavements designed, the costs estimated, and all submitted with appropriated technical specifications.
- A sixth road has been selected (Dien Bien) and preliminary pavement designs completed.
- The overall design of five trial roads has been completed and appropriate RT3 documentation largely completed.

The TRL-OtB recommendation is that the RRST-III programme should continue to its logical practical conclusion of construction and condition monitoring. However, it is important for the research that;

1. Construction funding must include appropriate supervision and quality control over and above that normally applied to rural road construction programmes.
2. Commitment to the construction of the trials must carry with it a commitment to monitor the performance of the trials.

Without these the construction of trials is not justifiable on research grounds.

9 Acknowledgements

This report was produced as part of the SEACAP 30 project contracted to TRL Ltd in association with OtB, ITST and TEDI. The drafting of this report was undertaken by Dr Jasper Cook (OtB Engineering Ltd), Dr Richard Bennett (TRL Ltd) with Bach The Dzung (TEDI). The final quality assurance and technical review was undertaken by Dr John Rolt. Valuable assistance was supplied by other members of the SEACAP30 Team. The support and cooperation of ITST and provincial PPMUs is gratefully acknowledged. Comment and support from members of the SEACAP 30 Steering Committee under the Chairmanship of Dr Nhan is gratefully acknowledged. David Salter, the SEACAP Programme Manager, provided key facilitation, guidance and programme support.

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**RURAL TRANSPORT PROGRAMME 3:
TRIAL PREPERATION**

SEACAP 30

FINAL REPORT

June 2009

APPENDIX A – Visual Survey Data Sheets

Site Sheets: Thai Nguyen

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

TỜ SỐ (Sheet No) 01 / 05

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dốc (Gradient)	Cong bằng (Curve)
1000	Riv	E	0,2m	4,7m	0,4m			R	3	Gr	b)
950	Riv	E	0,3m	4,5m	0,6m			R	3	Gr	b	l
900	Riv	E	0,5m	4,6m	1m			R	3	Gr	b	l
850	Riv	E	0,5m	4,7m	0,5m			R	3	Gr	b	l
800	Riv	E	0,3m	4,5m	0,2m			R	3	Gr	b	l
750	Riv	E	0,4m	4,6m	0,3m			R	3	Gr	b	(
700	Riv	E	0,2m	4,5m	0,2m			R	3	Gr	b	l
650	Riv	E	0,4m	4,6m	0			R	3	Gr	b	(
600	Riv	E	0,3m	4,5m	0			R	3	Gr	b	(
550	Riv	E	0	4,2m	0			R	3	Gr	b	(
500	Riv	E	0,2m	3,8m	0			R	3	Gr	b	l
450	↔ Riv	E	0,2m	4,2m	0			R ○ ↔	3	Gr	b	l
400	Riv	E	0,5m	3,8m	0,3m			□ Tr	3	Gr	b	l
350	Riv	E	0,4m	4m	0,2m			□ Tr	3	Gr	b	l
300	Riv	E	0,2m	3,5m	0,7m			□ R	3	Gr	b	l
250	Riv	E	0,5m	3,5m	0,5m			□	3	Gr	b	l
200	Riv	E	0,5m	3,5m	0,5m			□	3	Gr	b	l
150	Riv	E	0,5m	3,5m	0,5m			□	3	Gr	b	l
100	Riv	E	2m	5,5m	0,5m			□	3	Gr	b	(
50	Riv	E	2m	15m	1m			□	3	Gr	b)

Tên đường (Road Name)
Úc Sơn - Lữ Văn
Phủ Bình, Thái Nguyên

GPS đ.đầu (Start)	N	21°27,687'
	E	105°58,753'
GPS đ.cuối (End)	N	
	E	
Người K.S (Surveyor)	ITST Team 1	Ngày (Date): 20/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- ▬ Cầu (Bridge)
- ↔ Cống (Culvert)
- ══ Đường (Road)
- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- ↓ Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dốc (Gradient)




- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

Riv: Sông, river
Tr: Cây, tree
○: Ao, pond

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

TỜ SỐ (Sheet No) 02 / 05





Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dốc (Gradient)	Cong bằng (Curve)
2000	Riv	E	0,5m	4,7m		0,5m	E	Tr R □	3	Gr	b	(
1950	Riv	E	0	4,3m		0	E	Tr R	3	Gr	b	(
1900	Riv	E	0	4,2m		0	E	Tr R	3	Gr	b	l
1850	Riv	E	0	4,8m		0	N	□	3	Gr	b)
1800	 Riv	E	0	4,3m		0	E	□ Tr	3	Gr	b)
1750	Riv	E	0	4,8m		0	E	□ R Tr	3	Gr	b)
1700	Riv	E	0	4,7m		0	E	□ Tr R	3	Gr	b	l
1650	Riv	E	0	4,7m		0	E	Tr R □	3	Gr	b	l
1600	Riv	E	0	4,8m		0	E	Tr R	3	Gr	b	l
1550	Riv	E	0	4,7m		0	E	Tr R	3	Gr	b	(
1500	Riv	E	0	4m		0	E	Tr R	3	Gr	b	(
1450	Riv	E	0	3,8m		0	E	Tr ○ R	3	Gr	b	(
1400	Riv	E	0	4,6m		0	E	□ Tr ○	3	Gr	b	l
1350	Riv	E	0	4,5m		0	E	□ Tr ○	3	Gr	b	l
1300	 Riv	E	0	3,7m		0	E	Tr ○ □ R 	3	Gr	b	l
1250	Riv	E	0	4,7m		0	E	Tr R ○ □	3	Gr	b	l
1200	Riv	E	0	4,3m		0	E	Tr R ○	3	Gr	b	l
1150	Riv	E	0	4,6m		0	E	R Tr	3	Gr	b	l
1100	Riv	E	0	4,5m		0	E	R Tr	3	Gr	b)
1050	Riv	E	0	4,3m		0	E	R Tr	3	Gr	b)

Tên đường (Road Name)	Uc Sơn - Lữ Văn
	Phú Bình, Thái Nguyên

GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	20/12/2008

Ký hiệu (LEGEND)

□ Nhà (Houses)

 Cầu (Bridge) Cống (Culvert) Đường (Road) **W** Mặt nước (Surface water) **R** Ruộng lúa (Rice field) Ranh (Ditch)**Công tác đất (E'Work)**

E - Nền đắp (Embankment)

C - Nền đào (Cutting)

N - Không (None)

Tình trạng đường (Condition)

1 - Rất tốt, xe 1 cầu (Excellent 2WD)

2 - Xe 1 cầu đi mùa khô (2WD in dry season)

3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)

4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)

5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

E - Đất (Earth)

S - Cát (Sand)

Cl - Sét (Clay)

Gr - Cáp phối, sỏi (Gravel-cobble)

BS - Nhựa (Bitumen)

Đốc dốc (Gradient)

a - <0%

b - 0-2%

c - 2-4%

d - 4-6%

e - 6-8%

f - >8%

Riv: Sông, river

Tr: Cây, tree

○: Ao, pond

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 03 / 05

Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)		Lề đường Phải (Shoulder R)		Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dốc (Gradient)	Cong bằng (Curve)
			Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)	Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)					
3000	Riv	E	0,5m	5,3m	0,5m	N		3	Gr	b	(
2950	Riv	E	0,4m	5m	0	N		3	Gr	b	
2900	Riv	E	0,2m	4,8m	0	E		3	Gr	b	
2850	Riv	E	0	4,8m	0,2m	N		3	Gr	b	
2800	Riv	E	0,3m	5m	0,3m	N		3	Gr	d	
2750	Cầu Thủng		2,7m				Cầu Thủng				
2700	Riv	E	0	4,9m	0	E	R	3	Gr	d)
2650	Riv	E	0,3m	4,9m	0	E	R	3	Gr	b	(
2600	Riv	E	0	4,5m	0	E	R	3	Gr	b	(
2550	Riv	E	0	4,8m	0	E	R	3	Gr	b	
2500	Riv	E	0	4,3m	0	E	R	3	Gr	b	
2450	Riv	E	0	4,7m	0	E	R	3	Gr	b	
2400	Riv	E	0	4,4m	0	E	R	3	Gr	b	
2350	Riv	E	0	4,8m	0	E	R Tr	3	Gr	b	
2300	Riv	E	0,5m	4,6m	0,7m	E	Tr R	3	Gr	b	
2250	Riv	E	0,5m	5m	0,5m	E	R Tr	3	Gr	b	
2200	Riv	E	0,4m	4,9m	0,6m	E	R	3	Gr	b	
2150	Riv	E	0,5m	4,7m	0,8m	N	Tr R	3	Gr	b	
2100	Riv	E	0,5m	5m	1m	N	Tr	3	Gr	b	
2050	Riv	E	0,5m	4,8m	1m	N	Tr	3	Gr	b	(

Tên đường (Road Name)
Uc Sơn - Lữ Văn
Phủ Bình, Thái Nguyên

GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	20/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
 Cầu (Bridge)
 Cống (Culvert)
 Đường (Road)

- W Mặt nước (Surface water)
R Ruộng lúa (Rice field)
 Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
C - Nền đào (Cutting)
N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
2 - Xe 1 cầu đi mùa khô (2WD in dry season)
3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
S - Cát (Sand)
Cl - Sét (Clay)
Gr - Cáp phối, sỏi (Gravel-cobble)
BS - Nhựa (Bitumen)

Đốc dốc (Gradient)

- a - <0%
b - 0-2%
c - 2-4%
d - 4-6%
e - 6-8%
f - >8%

Riv: Sông, river
Tr: Cây, tree
○: Ao, pond

Cầu Thủng: Bề rộng 2,7m, chiều dài 24m. Dầm giản đơn BTCT, giữa chiều dài cầu có miếng vữa bằng bê tông, rộng khoảng 1m², trên mặt cầu có những vết nứt ngang. Tải trọng theo biển báo là 5T.
Bridge: Width 2.7m, length 24m. Reinforced cement concrete single span, there is a concrete repaired area with about 1m² in the middle of bridge, bridge surface have cracks. There is sign board 5T (Vehicle weight).

INTÉCH_TRL

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**
Tờ số (Sheet No) 04 / 05

Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
4000	Riv	E 0					E	R	3	Gr	b	l
3950	Riv	E 0					E	R	3	Gr	b	l
3900	Riv	E 0					E	R	3	Gr	b	l
3850	Riv	E 0					E	R	3	Gr	b	l
3800	Riv	E 0					E	R	3	Gr	b	l
3750	Riv	E 0					E	R	3	Gr	b	l
3700	Riv	E 0					E	R	3	Gr	b	l
3650	Riv	E 0					E	R	3	Gr	b	l
3600	Riv	E 0					E	R	3	Gr	b	l
3550	Riv	E 0					E	R	3	Gr	b	l
3500	Riv	E 0					E	R	3	Gr	b)
3450	Riv	E 0					E	R	3	Gr	b)
3400	Riv	E 0					E	R	3	Gr	b)
3350	Riv	E 0,3m					E	R	3	Gr	b	l
3300	Riv	E 0,4m					E	R	3	Gr	b	l
3250	Riv	E 0,4m					N	<input type="checkbox"/> R	3	Gr	b	l
3200	Riv	E 0,5m					N	<input type="checkbox"/> R	3	Gr	b	l
3150	Riv	E 1m					N	<input type="checkbox"/> R	3	Gr	b	l
3100	Riv	E 1m					N	<input type="checkbox"/> R	3	Gr	b	l
3050	Riv	E 1m					N	<input type="checkbox"/> R	3	Gr	b	(

Tên đường (Road Name)
Uc Sơn - Lữ Văn
Phú Bình, Thái Nguyên

GPS đ.đầu (Start)	N	
	E	
GPS đ.cuối (End)	N	
	E	
Người K.S (Surveyor)	ITST Team 1	Ngày (Date): 20/12/2008

Ký hiệu (LEGEND) Nhà (Houses)

Cầu (Bridge)

Cống (Culvert)

Đường (Road)

Mặt nước (Surface water)

Ruộng lúa (Rice field)

Rãnh (Ditch)

Công tác đất (E'Work)

E - Nền đắp (Embankment)

C - Nền đào (Cutting)

N - Không (None)

Tình trạng đường (Condition)

1 - Rất tốt, xe 1 cầu (Excellent 2WD)

2 - Xe 1 cầu đi mùa khô (2WD in dry season)

3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)

4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)

5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

E - Đất (Earth)

S - Cát (Sand)

Cl - Sét (Clay)

Gr - Cáp phối, sỏi (Gravel-cobble)

BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

a - <0%

b - 0-2%

c - 2-4%

d - 4-6%

e - 6-8%

f - >8%

Riv: Sông, river




Tr: Cây, tree

Ao, pond

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**


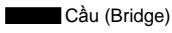
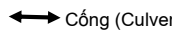
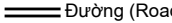
Tờ số (Sheet No) 01 / 05




Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)						Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
		Lề đường Trái (Shoulder L)	Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)						
5000												
4950												
4900												
4850												
4800												
4750												
4700												
4650												
4600												
4550												
4500												
4450												
4400												
4350												
4300												
4250												
4200												
4150												
4100	Riv	E	0	4,9m		N		3	Gr	b	f	
4050	Riv	E	0	4,7m	0	E	R 	3	Gr	b	l	

Tên đường (Road Name)
Uc Sơn - Lữ Văn
Phủ Bình, Thái Nguyên

GPS đ.đầu (Start)	N	
	E	
GPS đ.cuối (End)	N 21°26,899'	
	E 106°00,730'	
Người K.S (Surveyor)	ITST Team 1	Ngày (Date): 20/12/2008

Ký hiệu (LEGEND)

-  Nhà (Houses)
-  Cầu (Bridge)
-  Cống (Culvert)
-  Đường (Road)

-  **W** Mặt nước (Surface water)
-  **R** Ruộng lúa (Rice field)
-  Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

Riv: Sông, river
Tr: Cây, tree
○: Ao, pond

Site Sheets: Cao Bang

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 01 / 05

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
1000	Tr, R	E	1m	3,5m	1m	N		□ ↓	3	St	d)
950	R	N	1m	3,5m	1m	N		□	3	St	d)
900	□ Db, R, □	N	1m	3,5m	1m	N		R	3	St	b	l
850	Db, R	N	1m	3,5m	1m	N		□ R	3	St	b	l
800	Db, R	N	1m	3,5m	1m	N		R	3	St	b	l
750	Db, R	N	1m	3,5m	1m			R	3	St	b	l
700	Db, R	N	1m	3,5m	1m			R	3	St	b	l
650	Db, R	N	1m	3,5m	1m			R	3	St	b	l
600	Db, R	N	1m	4m	1m			R	3	St	b	l
550	Db, R	N	1m	4m	1m			R	3	St	b	l
500	<u>W</u> _{0,5m} R	N	1m	4m	1m			R	3	St	b	(
450	R	N	1m	4m	1m			R	3	St	d	l
400	↔ R	N	1m	4,5m	1m			R ↔	3	St	d)
350	R	E	1m	4,3m	1m			R	3	St	c)
300	Cầu Hồng Việt			4m				Cầu Hồng Việt				l
250	Cầu Hồng Việt			4m				Cầu Hồng Việt				l
200	R	E	1m	3,5m	1m	E		R (đường đầu cầu)	3	St	c	l
150	R	N	1m	5m	1m	N		□ Db	3	St	b	(
100	R	N	1m	5m	1m	N		□ Db	3	St	b	l
50	↔ R	N	1m	5m	1m	N		□ ↔ Db	3	St	b	l

Tên đường (Road Name)	Hồng Việt - Cao Bằng
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GPS đ.đầu (Start)	N 22°43,953'
	E 106°09,544'
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	15/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- ▬ Cầu (Bridge)
- ↔ Cống (Culvert)
- ══ Đường (Road)

W Mặt nước (Surface water)

R Ruộng lúa (Rice field)

↓ Rãnh (Ditch)

Tr : Cây

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

St: Đá thải

Db: Rãnh xây

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phôi, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

Điều tra dân: Từ Km0÷Km1 hàng năm nước ngập mấp mé mặt đường. Năm 1996 nước ngập trên mặt đường là 30cm. Mùa lũ hàng năm nước ngập 2 bên đường ~50÷100cm. From km0-km1 yearly flooding is reported as covering the road surface. in in 1996 - 30cm above road surface. Flooding on either side of road 50-100cm.

Cầu Hồng Việt: Tải trọng 17T, 03 nhịp dầm I BTCT DU'L 33m, tình trạng cầu còn tốt. Bề rộng cầu 4m, các lỗ thoát nước còn tốt nhưng bị bùn đất lấp gần hết. Hong Viet bridge, load 17T, 3 -span 33m pre-stressed concrete structure in good condition. Width 4m. Drainage blocked by mud and soil.

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 02 / 05

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vết xe bên Trái (WTL)	Vết xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
2000	↔ R	N	0,5m	4m	0,5m	N	Tr, ↓	↔	3	St	b	l
1950	↔ R	N	1m	4m	0,5m	N	□	↔	3	St	b)
1900	Db, R	E	0,6m	3,8m	0,6m	E		R	3	St	b	l
1850	↔ Db, R	N	0,7m	4m	1m	N		R	3	St	b)
1800	Db, R	N	0,8m	4m	1m	E	R	↔	3	St	c	l
1750	↔, R □	N	0,7m	3,5m	1m	N		R	3	St	c	l
1700	Db □	N	0,6m	4m	0,7m	N	□		3	St	c)
1650	↔ Tr, R	N	0,6m	3,5m	0,5m	N	□ ↓ ↔		3	St	b	l
1600	Tr, R	N	1m	3,5m	1m	N	□ ↓		3	St	b	l
1550	Tr, R	E	1m	3,2m	1m	N	□		3	St	c	(
1500	↔, R, Tr	N	1m	3,5m	1m	N	□ ↓		3	St	d	l
1450	Tr, R	E	1m	3,5m	1m	N	□ ↓		3	St	d	(
1400	↔ R, Tr	E	1m	3,5m	1m	N	□ ↔		3	St	c	l
1350	Tr, R	E	1m	3,5m	1m	N	□		3	St	d	l
1300	R	E	1m	3,5m	1m	N	Tr, □		3	St	d	l
1250	R, □	N	1m	3,5m	1m	N	□ ↓		3	St	d	(
1200	↔, R □	N	1m	3,5m	1m	N	□ R		3	St	d	l
1150	□ R	N	1m	3,5m	1m	N	□		3	St	d	l
1100	□ R	N	1m	3,5m	1m	N	↓ Tr		3	St	d	(
1050	↔ R, Tr	E	1m	3,5m	1m	N	↓ Tr ↔		3	St	d	(

Tên đường (Road Name)	Hồng Việt - Cao Bằng
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GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	15/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- ▬ Cầu (Bridge)
- ↔ Cống (Culvert)
- ══ Đường (Road)
- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- ↓ Rãnh (Ditch)
- Tr : Cây

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

St: Đá thải Db: Rãnh xây

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 03 / 05

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Mặt xe bên Trái (WTL)	Mặt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
3000		N	1m	3,8m	1m	N			3	St	b	l
2950		N	1m	3,8m	1m	N			3	St	b	l
2900		N	1m	3,8m	1m	N			3	St	b	l
2850		N	1m	4m	1m	N			3	St	d	(
2800		N	1m	4m	1m	N			3	St	d	l
2750		N	0,7m	3,5m	1m	N			3	St	b	l
2700		N	0,6m	3,7m	1m	N			3	St	b	l
2650		E	0,5m	3,5m	1m	N			3	St	c	l
2600		N	1m	3,8m	1m	N			3	St	c	l
2550		N	0,8m	4,2m	0,8m	N			3	St	c	l
2500		E	0,5m	3,5m	0,8m	N			3	St	d)
2450		E	0,5m	3,5m	0,6m	E			3	St	c	l
2400		E	0,5m	3,6m	0,5m	E			3	St	c	l
2350	Cầu Thâm Huyền			5m				Cầu Thâm Huyền				
2300		N	1m	3,5m		N			3	St	d	(
2250		C	1m	3,5m	1m	N			3	St	d	l
2200		C	0,8m	3,5m	0,5m	E			3	St	d)
2150		C	0,5m	3,5m	0,5m	E			3	St	b	(
2100		N	0,5m	4m	0,5m	N			3	St	d	l
2050		E	0,6m	4m	0,5m	N			3	St	b)

Tên đường (Road Name)	Hồng Việt - Cao Bằng
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GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	15/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)
- W** Mặt nước (Surface water)
- R** Ruộng lúa (Rice field)
- Rãnh (Ditch)
- Tr : Cây

- Công tác đất (E'Work)**
- E - Nền đắp (Embankment)
 - C - Nền đào (Cutting)
 - N - Không (None)

- Tình trạng đường (Condition)**
- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
 - 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
 - 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
 - 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
 - 5 - Rất xấu - không đi được (Failed - Not passable)
- St: Đá thải Db: Rãnh xây

- Vật liệu (Material)**
- E - Đất (Earth)
 - S - Cát (Sand)
 - Cl - Sét (Clay)
 - Gr - Cáp phối, sỏi (Gravel-cobble)
 - BS - Nhựa (Bitumen)

- Đốc dọc (Gradient)**
- a - <0%
 - b - 0-2%
 - c - 2-4%
 - d - 4-6%
 - e - 6-8%
 - f - >8%

Cầu Thâm Huyền: Cầu dầm bản BTCT, rộng 5m, dài 6m, chất lượng còn tốt, đảm bảo cho xe có tải trọng dưới 10T.
 _ KM 2+950 Trời mưa nước ngập trên mặt đường do không có lối thoát.

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 04 / 05

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Mặt xe bên Trái (WTL)	Mặt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
4000	↔ R	E	1m	3m	1m	N		↔ Tr	3	St	d	l
3950		N	1m	3,2m	1m	N		↓ Tr	3	St	d	l
3900	Tr ↓	N	1m	3,5m	1m	N		↓ Tr	3	St	d	l
3850	□	N	1m	3,5m	1m	N		□	3	St	d	(
3800	↔ □	N	0,5m	3,1m	0,8m	N		↓ □ ↔	3	St	c	l
3750	R □	N	1m	3,5m	0,5m	N		↓ Tr □	3	St	d	l
3700	□	N	1m	3m	0,5m	N		↓ Tr	3	St	d	l
3650	□	N	1m	3,5m	1m	N		↓ Tr	3	St	d	l
3600	□ Tr	N	1m	3,2m	0,7m	N		↓ Tr	3	St	d	(
3550	Tr	N	1m	4m	1m	N		↓ Tr	3	St	d)
3500	Tr	N	1m	3,5m	1m	N		↓ Tr	3	St	d)
3450	□	N	1m	3,5m	1m	N		↓ Tr	3	St	d	l
3400	□	N	1m	3,7m	1m	N		□ ↓	3	St	d	l
3350	R □	N	1m	3,2m	1m	N		□ ↓	3	St	d	l
3300	□ R	N	1m	3,1m	1m	N		□ ↓	3	St	d	l
3250	↔ Db R	N	0,5m	3,6m	0,5m	E		R ↔	3	St	c)
3200	Db R	N	0,5m	4m	1m	E		W _{1,5m} ↓	3	St	b)
3150	Db ↔ R	N	1m	3m	0,5m	E		W _{1,5m} ↔	3	St	c)
3100	□	N	1m	3,7m	1m	N		□ ↓	3	St	b)
3050	□	N	1m	3,8m	1m	N		□ ↓	3	St	b	l

Tên đường (Road Name)	Hồng Việt - Cao Bằng
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GPS đ.đầu (Start)	N
GPS đ.cuối (End)	N
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	15/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- ▬ Cầu (Bridge)
- ↔ Cống (Culvert)
- ▬▬ Đường (Road)
- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- ↓ Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

Tr : Cây
St: Đá thải
Db: Rãnh xây

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 05 / 05

Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)					Mô tả chung (General)	Tình trạng đường (Condition)				
		Lề đường Trái (Shoulder L)	Việt xe bên Trái (WTL)	Việt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)		Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)		
5000												
4950												
4900												
4850												
4800												
4750												
4700												
4650												
4600												
4550												
4500												
4450												
4400		N	1m	3,7m	1m	N		3	St	d)	
4350		N	1m	3,8m	1m	N		3	ccp	d	l	
4300		E	0,5m	3,5m	0,5m	N		3	St	c)	
4250		E	0,8m	3,2m	0,8m	N		3	St	c	(
4200		E	0,7m	3,5m	0,8m	N		3	St	c	l	
4150		N	1m	3,6m	1m	N		3	St	c	l	
4100		N	0,6m	3,5m	0,8m	N		3	St	c	l	
4050		N	0,5m	3,1m	0,5m	N		3	St	d	(

Tên đường (Road Name)
Hồng Việt - Cao Bằng

GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N 22°42,359'
	E 106°08,629'
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	15/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)
- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

ccp: Mặt đường BTXM
Tr: Cây
St: Đá thải
Db: Rãnh xây
○: Ngầm

Site Sheets: Thai Binh

TRL-0tB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**
TỜ SỐ (Sheet No) 01 / 02

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
1000	R W _{1,5M} ↓	N	1m	3m	1m	N	R		3	CS	a	(
950	W _{1,5M} ↓	N	0,5m	2,5m	0,5m	N	R		3	CS	a)
900	W _{1,2M} ○ ←→ ↓	N	0,5m	1,7m	0,5m	N	□ R		3	CS	a	(
850	W _{1,0M} R ↓	E	0,5m	1,4m	0,5m	N	R		3	CS	a	(
800	W _{1,2M} R ↓	E	0,5m	1,4m	0,5m	N	R		3	CS	a	l
750	W _{1,2M} R ↓	E	0,5m	1,4m	0,5m	N	R		3	CS	a	l
700	W _{1,2M} R ↓	E	0,5m	1,4m	0,5m	N	R		3	CS	a	l
650	W _{1,2M} R ↓	E	0,5m	1,6m	0,5m	N	R		3	CS	a	l
600	W _{1,2M} R ↓	E	0,5m	2,4m	0,5m	N	□ R		3	CS	a	l
550	W _{1,0M} ↓	N	1,6m	3,5m	1,6m	N	W _{1M}		3	CS	a	l
500	Db R ←→ ↓	N	1,5m	3,5m	1,5m	N	R		3	CS	a	(
450	Db R ↓	N	1,25m	3,5m	1,25m	N	R		3	CS	a	l
400	Db R ↓	N	1,25m	3,5m	1,25m	N	R		3	CS	a	l
350	W _{1,1M} R ↓	N	2,2m	3,5m	2,2m	N	↓ R		3	CS	a	l
300	W _{1,1M} R ↓	N	1,5m	3,5m	1,5m	N	↓ W _{0,9M} R		3	CS	a	l
250	R ↓	N	1,25m	3,5m	1,25m	N	W _{0,9M} R		3	CS	a	l
200	R ↓	N	1,25m	3,5m	1,25m	N	W _{0,9M} R		3	S	a	l
150	○ ←→ ↓	N	1,25m	3,5m	1,25m	N	W _{0,8M} R		3	CS	a	l
100	□ ↓	N	1,6m	3,5m	1,6m	N	↓ W _{0,8M} R		3	S	a)
50	□ R ↓	N	2m	3,5m	2m	N	↓ W _{0,8M} R		3	S	a	l

Tên đường (Road Name)
Hồng An - Hưng Hà
Thái Bình

GPS đ.đầu (Start)	N 20°34,541'
	E 106°10,431'
GPS đ.cuối (End)	N
	E
Người K.S (Surveyor)	ITST Team 1 Ngày (Date): 06/12/2008

Ký hiệu (LEGEND)

□ Nhà (Houses)

▬ Cầu (Bridge)

←→ Cống (Culvert)

— Đường (Road)

W Mặt nước (Surface water)

R Ruộng lúa (Rice field)

↓ Rãnh (Ditch)

Công tác đất (E'Work)

E - Nền đắp (Embankment)

C - Nền đào (Cutting)

N - Không (None)

Tình trạng đường (Condition)

1 - Rất tốt, xe 1 cầu (Excellent 2WD)

2 - Xe 1 cầu đi mùa khô (2WD in dry season)

3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)

4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)

5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

E - Đất (Earth)

S - Cát (Sand)

Cl - Sét (Clay)

Gr - Cấp phối, sỏi (Gravel-cobble)

BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

a - <0%

b - 0-2%

c - 2-4%

d - 4-6%

e - 6-8%

f - >8%

Db: Rãnh xây, Mortared Ditch

○ : Ao, pond

CS : Cát pha, clayey sand

Điều tra dân: Mực nước mùa lũ ngập mặt đường 10cm (tháng 8), lũ lịch sử ngập mặt đường 1,0m (1991)

từ KM 0+100 ÷ KM 0+300. Local interview: Road surface is under water 10cm (August), history flood: 1.0m (1991): From Km 0+100 ÷ Km 0+300

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

TỜ SỐ (Sheet No) 02 / 02

Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dốc (Gradient)	Cong bằng (Curve)
2000												
1950												
1900												
1850												
1800												
1750												
1700												
1650	W _{2,2m} ↓	E	1,25m	1,5m	1,25m	E		3	CS	a	(
1600	W _{2,2m} ↓	E	0,75m	1,5m	0,75m	E		3	CS	b)	
1550	W _{2,2m} ↓	E	0,75m	2m	0,75m	E		3	CS	b	(
1500	W _{2,0m} ↓	E	1m	2m	1m	E	R	3	CS	b)	
1450	W _{2,0m} ↓	E	0,5m	2m	0,5m	E	↓	3	CS	b	(
1400	W _{1,9m} ↓	N	1m	3m	1m	N	R	3	CS	b	l	
1350	W _{1,7m} ↓	N	1,25m	1,5m	1,25m	N	R	3	CS	b	l	
1300	W _{1,7m} ↓	N	1,25m	3m	1,25m	N	R	3	CS	b	l	
1250	W _{0,8m} ↓	N	1,5m	3m	1,5m	N	R	3	CS	a	l	
1200	W _{1,7m} ↓	N	1m	3m	1m	N	R	3	CS	a	l	
1150	W _{1,7m} ↓	N	0,1m	3m	0,1m	N	R	3	CS	a	l	
1100	↓	N	1m	3m	1m	N	R	3	CS	a	(
1050	W _{1,6m} ↓	N	1m	3m	1m	N	R	3	CS	a	(

Tên đường (Road Name)
Hồng An - Hưng Hà
Thái Bình

GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N 20°35,361'
	E 106°10,707'
Người K.S (Surveyor)	ITST Team 1
Ngày (Date):	06/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)

- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- ↓ Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dốc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

Db: Rãnh xây, Mortared Ditch
 ○ : Ao, pond
 CS : Cát pha, clayey sand

Site Sheets: Thanh Hoa

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 01/02

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
1000		N	1.0m	<---2,8m---	1.2m	N		T	3	Gr	b	I
950		E	0,7m	<---2,7m---	0,7m	N		T	3	Gr	b	I
900	W 1,1	E	0,9m	<---2,9m---	0,9m	N		T	3	Gr	b	I
850	W 1,0	E	0,6m	<---2,8m---	0,5m	N			3	Gr	b	I
800	W 1,0	E	0,7m	<---2,7m---	0,8m	N			3	Gr	b	I
750	W 1,0	N	1,0m	<---2,8m---	1,2m	N		T	3	Gr	b	(
700		E	0,6m	<---2,8m---	0,7m	N		T	3	Gr	b	I
650	W 1,1	E	0,7m	<---2,8m---	0,6m	N		T	3	Gr	b	I
600	W 1,1	E	0,9m	<---2,8m---	0,9m	N		T	3	Gr	b	I
550		N	1,0m	<---2,7m---	1,3m	N		T				
500	W 1,1	E	0,4m	<---2,6m---	0,4m	E	R W1,0		3	Gr	b	I
450	W 1,1	E	0,6m	<---2,2m---	0,6m	E	R W0,9	T	3	Gr	b	I
400	W 1,1	E	0,4m	<---2,1m---	0,6m	E	R	T	3	Gr	b	I
350	W 1,1	E	0,5m	<---2,3m---	0,5m	N	R	T	3	Gr	b	I
300	W 1,1	E	0,3m	<---2,2m---	0,3m	N			3	Gr	b	I
250	W 1,1	E	0,6m	<---2,5m---	0,6m	N		T	3	Gr	b	I
200	W 1,1	E	0,9m	<---2,2m---	0,7m	E	W1,0	T	3	Gr	b	I
150	W 1,1	N	1,2m	<---2,6m---	1,2m	N		T	3	Gr	b	I
100		N	1,2m	<---2,6m---	1,2m	N		T	3	Gr	b	I
50	Tường gạch	N	1,7m	<---2,4m---	1,7m	N		T	3	Gr	b	(

Tên đường (Road Name)	GPS đ.đầu (Start)	N 19°08.835'
Lộc Tiến	E 105°46.608'	
Quảng Trung - Thanh Hóa	GPS đ.cuối (End)	N
		E

Người K.S (Surveyor)	ITST Team 2	Ngày (Date): 24/12/2008
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Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)
- Mặt nước (Surface water)
- Ruộng lúa (Rice field)
- Rãnh (Ditch)
- Đường điện
- Tường rào

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 02 / 02

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Dốc dọc (Gradient)	Cong bằng (Curve)
1500												
1450												
1400	W1,25		E 0,6m	<---2,8m---	0,6m	N			3	Gr	b)
1350	W1,2		E 0,9m	<---2,8m---	0,9m	E			3	Gr	b	I
1300	Cống tràn W1,1		E 0,9m	<---2,8m---	0,9m	E			3	Gr	b)
1250	T		E 0,5m	<---2,8m---	0,4m	E			3	Gr	b	I
1200	T Đường BTXM		N 0,9m	<---2,8m---	0,95m	N			3	Gr	b	I
1150	T W1,5		E 2,3m	<---3,0m---	2,3m	N			3	Gr	b	(
1100	T W1,3		E 1,4m	<---2,8m---	1,3m	E			3	Gr	b)
1050			N 0,6m	<---2,7m---	0,7m	E		W1,2 Đường ngang	3	Gr	b	I

Tên đường (Road Name)	GPS đ.đầu (Start)
Lộc Tiên	E
Quảng Trung - Thanh Hóa	GPS đ.cuối (End)
	N 19°36.553'
	E 105°47.329'

Người K.S (Surveyor)	ITST Team 2	Ngày (Date):	24/12/2008
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Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

- Mặt nước (Surface water)
- Ruộng lúa (Rice field)
- Rãnh (Ditch)
- Tường rào
- Ao T Đường điện

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Dốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 01/02

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
1000		⊗	N 1.0m	<---2.8m---	0.7m	E	↓ W 1,8		3	Gr	b	
950		⊗	N 1,1m	<---2.8m---	0,8m	E	↓ W 1,8		3	Gr	b	
900		⊗	N 1,6m	<---2.6m---	0,8m	E	↓ W 1,8		3	Gr	b	
850		⊗	N 0,6m	<---2.6m---	0,6m	E	↓ W 1,7		3	Gr	b	I
800		⊗	N 1,0m	<---2.7m---	0,9m	E	↓ W 1,7		3	Gr	b	I
750	W1,1m hồ	⊗	E 1,0m	<---2.6m---	0,6m	E	↓ W 1,2		3	Gr	b)
700			E 1,5m	<---2.5m---	1,5m	E	↓ W 1,0		3	Gr	b) (1)
650	W1,0 R		E 0,5m	<---2.2m---	0,5m	E	↓ W 1,7		3	Gr	b	I
600	W1,7 R		E 0,2m	<---2.2m---	1,2m	N	□		3	Gr	b	I
550	W1,5 R		E 0,3m	<---2.2m---	0,4m	E	↓ W 1,6		3	Gr	b	I
500		R	E 0,5m	<---2.0m---	0,2m	E	↓ W 1,2		3	Gr	b	I
450	Đường ngang		E	<---2.2m---		E			3	Gr	b	I
400				<---2.5m---				Cầu bản L=5m, b=2,2m	3	Gr	b	I
350		R ↓	N 2,5m	<---2.5m---	0,2m	N	↓ W 1,0		3	Gr	b	I
300		R ↓	N 0,75m	<---3.0m---	1,3m	N	↓ W 1,3		3	Gr	b	I
250			N 0,75m	<---3.5m---	0,75m	N			3	Gr	b) (2)
200			N 0,5m	<---3.2m---	0,5m	N			3	Gr	b	I
150	Mương nước bên trái		E 0,7m	<---2.8m---	0,7m	N			3	Gr	b	I
100			E 0,8m	<---2.6m---	0,8m	N			3	Gr	b)
50	Ao đầu tuyến	⊗	N 1,0m	<---3.2m---	1,2m	N			3	Gr	b	

Tên đường (Road Name)	GPS đ.đầu (Start)	N 19°36.406'
Quảng Chung	E 105°46.759'	
Quảng Chính - Thanh Hóa	GPS đ.cuối (End)	N
	E	

Người K.S (Surveyor)	ITST Team 2	Ngày (Date):	24/12/2008
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Ký hiệu (LEGEND)

- Nhà (Houses)
- ▬ Cầu (Bridge)
- ↔ Cống (Culvert)
- ══ Đường (Road)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- ↓ Rãnh (Ditch)
- ↓ Bờ đất ao
- ⊗ Ao
- ~ Tường rào

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

(1): Cầu bản đá học xây 1,5x1,5; b=2,5+2x0,3, Masonry Slab bridge 1,5x1,5; b=2,5+2x0,3
 (2): Cống bản còn tốt 1x1m L cống 4,1x3,5, Slab culvert in good 1x1m L culvert 4,1x3,5
 Đường ngang BTXM, Cement concrete across road.

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 02 / 02

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dốc (Gradient)	Cong bằng (Curve)
2000	⊗	E	0,4m	2,8m	0,4m	E	⊗ W1,6					
1950	W1,8 ⊗	E	0,5m	2,9m	0,5m	E	⊗ W1,8	3	Gr	b	I	
1900	W1,8 ⊗	E	0,4m	2,7m	0,4m	E	⊗ W1,8	3	Gr	b	I	
1850	W1,8 ⊗	E	0,3m	2,2m	0,3m	E	⊗ W1,8	3	Gr	b	I	
1800	⊗	E	0,3m	2,2m	0,3m	E	⊗ Hồ nuôi tôm	3	Gr	b	I	
1750	↔ ⊗	E	0,5m	2,2m	0,4m	E	⊗ ↔ -1	3	Gr	b	I (1)	
1700	W1,7 ⊗	E	0,6m	2,6m	0,6m	E	↑ W 1,8	3	Gr	b	I	
1650	W1,7 ⊗	E	0,7m	2,6m	0,5m	E	↑ W 1,7	3	Gr	b	I	
1600	W1,7 ⊗	E	0,75m	4,7m	0,75m	E	↑ W 1,7	3	Gr	b	I	
1550	W1,6 ⊗	E	0,5m	3,1m	0,5m	E	↑ W 1,7	3	Gr	b	I	
1500	W1,7 ⊗	N	0,5m	3,0m	0,5m	E	↑ W 1,7	3	Gr	b	I	
1450	W1,7 ⊗	E	0,5m	3,2m	0,5m	E	↑ W 1,7	3	Gr	b	I	
1400	W1,7 ⊗	E	0,6m	3,0m	0,5m	E	↑ W 1,7	3	Gr	b	I	
1350	Cống thủy lợi đang thi công ↔ ⊗	N	0,5m	3,5m	0,5m	N	↑ W 1,6 ↔	3	Gr	b	I (2)	
1300	W1,7 ⊗	E	0,6m	2,8m	0,6m	E	↑ W 1,6	3	Gr	b	I	
1250	⊗	E	0,75m	2,8m	0,75m	E		3	Gr	b	I	
1200	W1,6 ⊗	E	0,7m	2,8m	0,5m	E	↑ W 1,6	3	Gr	b	I	
1150	W1,6 ⊗	N	1,6m	2,7m	0,7m	N	↑ W 1,5	3	Gr	b	I	
1100	W1,6 ⊗	N	1,8m	2,8m	1,0m	N	↑ W 1,5	3	Gr	b	I	
1050	Cống bản đôi 1,2m ↔ ⊗	E	0,75m	2,8m	0,75m	E	↑ W 1,5 ↔	3	Gr	b	I (3)	

Tên đường (Road Name)	Quảng Chung
Quảng Chính - Thanh Hóa	

GPS đ.đầu (Start)	N
	E
GPS đ.cuối (End)	N 19°37.340'
	E 105°47.130'
Người K.S (Surveyor)	ITST Team 2
Ngày (Date):	24/12/2008

Ký hiệu (LEGEND)

- Nhà (Houses)
 ▬ Cầu (Bridge)
 ↔ Cống (Culvert)
 = Đường (Road)

- W Mặt nước (Surface water)
 R Ruộng lúa (Rice field)
 ↓ Rãnh (Ditch)
 ⊗ Hồ nuôi tôm

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
 C - Nền đào (Cutting)
 N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
 S - Cát (Sand)
 Cl - Sét (Clay)
 Gr - Cấp phối, sỏi (Gravel-cobble)
 BS - Nhựa (Bitumen)

Đốc dốc (Gradient)

- a - <0%
 b - 0-2%
 c - 2-4%
 d - 4-6%
 e - 6-8%
 f - >8%

- (1): Cống thủy lợi, hư hỏng bản, mặt cống 1,2x2 L=5m, Irrigation culvert, damaged slab, surface 1,2x2 L=5m
 (2): Cống thủy lợi đang thi công 2x1,2x2m Cống rộng 3,5m dài 35m, Irrigation culvert in under construction 2x1.2x2m, width 3.5m, length 35m
 (3): Cống đá học xây nứt nẻ KM1+025 L=3,6m Bxh=1,2x1,8, Stone masonry culvert with cracks: KM1+025 L=3,6m Bxh=1,2x1,8

Site Sheets: Thanh Hoa

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

TỜ SỐ (Sheet No) 01 / 04

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
1000		E	1m	←-3,5m-		1,2m	E	↓ W	3	Gr	b	I
950	R	E	0,7m	←-3,0m-		1,5m	E	↓ W	3	Gr	b	I
900	R	E	1m	←-3,5m-		1,2m	E	↓ W	3	Gr	b	(
850	R	E	1m	←-3,9m-		1m	E	↓ W	3	Gr	b	I
800	R	E	1,3m	←-4,25m-		1m	E	↓ W	3	Gr	b	(
750	R	E	1,4m	←-4,2m-		1,3m	E	↓ W	3	Gr	b	(
700	R	E	1m	←-4,3m-		1,4m	E	←	3	Gr	b	I
650	R	E	1,2m	←-4,0m-		1,3m	E	↓ W	3	Gr	b	I
600	R	E	1,6m	←-4,2m-		1,3m	E	↓ W	3	Gr	b	I
550	R	E	1,2m	←-4,0m-		1,4m	E	↓ W	3	Gr	b	I
500	R	E	1,2m	←-4,1m-		1,5m	E	↓	3	Gr	b	I
450	R	E	1,2m	←-4,0m-		1,4m	E	←	3	Gr	b)
400	R	E	1,2m	←-4,2m-		1,6m	E	↓ W	3	Gr	b	I
350	R	E	1,2m	←-4,0m-		1,4m	E	↓ W	3	Gr	b	I
300	R	E	1,4m	←-4,0m-		1,2m	E	↓ W	3	Gr	b	I
250	R	E	1,4m	←-4,3m-		2m	E	↓ W	3	Gr	b	(
200	R	E	1,6m	←-4,3m-		3m	E	↓ W	3	Gr	b	(
150	R	E	1,2m	←-4,3m-		1,4m	E	↓ W	3	Gr	b	I
100	R	E	1,2m	←-4,0m-		1,6m	E	↓ W	3	Gr	b	I
50	R	E	1,5m	←-3,2m-		1,7m	E	↓ W	3	Gr	b	I

Tên đường (Road Name)	GPS đ.đầu (Start)	N 13°08.092'
Phú Vạn - Phú Lương		E 109°16.211'
Tuy Hòa - Phú Yên	GPS đ.cuối (End)	N 13°09.235'
		E 109°15.633'

Người K.S (Surveyor)	ITST Team 2	Ngày (Date):	08/01/2009
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Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cổng (Culvert)
- Đường (Road)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

- Mặt nước (Surface water)
- Ruộng lúa (Rice field)
- Rãnh (Ditch)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

The road has just been maintained & repaired. Đường vừa được duy tu & sửa chữa
 From Km 0 ---> Km 0+350: this section is flood when it is raining for 6h. Từ KM 0 ---> KM 0+350 mưa ngập đường 50cm, thời gian ngập 6h
 Road maintenance: placing crushed stone layer. Đường duy tu được rải cấp phối đá.

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 02 / 04

Lý trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
2000		E	2m	3,0m		1m	E		3	Gr	b	I
1950		E	1m	3,2m		1,5m	E		3	Gr	b	I
1900	R	E	1,5m	3,2m		2m	E		3	Gr	b	I
1850	R	E	1,5m	3,0m		1,2m	E		3	Gr	c	I
1800	R	E	1,3m	3,8m		2m	E	R	3	Gr	b	I
1750	R	E	1,5m	3,7m		2,7m	E		3	Gr	b	I
1700	R	E	1,2m	3,8m		1,3m	E		3	Gr	b	I
1650	R	E	1,5m	4,1m		1,5m	E		3	Gr	b	I
1600	R	E	1m	4,0m		1m	E		3	Gr	b	I
1550	R	E	1,2m	4,0m		1,5m	E		3	Gr	b	I
1500		E	1,3m	3,5m		1,4m	E		3	Gr	b	I
1450		E	1,1m	3,0m		1,2m	E		3	Gr	b	I
1400	R	E	1,5m	4,6m		2m	E		3	Gr	b	I
1350	R	E	1,25m	3,6m		1,4m	E		3	Gr	b	I
1300	R	E	1,2m	3,7m		1,5m	E		3	Gr	b	I
1250	R	E	3m	3,5m		1,4m	E		3	Gr	b	I
1200	R	E	1,7m	3,7m		1,1m	E		3	Gr	b	I
1150	R	E	1m	3,5m		1m	E		3	Gr	b	I
1100	R	E	1,3m	3,5m		1m	E		3	Gr	b	I
1050	R	E	2m	3,5m		1,3m	E		3	Gr	b	I

Tên đường (Road Name)	GPS đ.đầu (Start)	N 13°08.092'
Phú Vạn - Phú Lương	E 109°16.211'	
Tuy Hòa - Phú Yên	GPS đ.cuối (End)	N 13°09.235'
	E 109°15.633'	

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)
- W** Mặt nước (Surface water)
- R** Ruộng lúa (Rice field)
- Rãnh (Ditch)

- Công tác đất (E'Work)**
- E - Nền đắp (Embankment)
 - C - Nền đào (Cutting)
 - N - Không (None)

- Tình trạng đường (Condition)**
- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
 - 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
 - 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
 - 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
 - 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

KM 1+770 is causeway. KM 1+770 hiện tại là tràn đá xây
 KM 1+650 ----> 1+810: flood, under the water. KM 1+650 ----> 1+810 ngập lụt, có ngập nước

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 03 / 04

Ly trình (Chain)	Mô tả chung (General)	Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)	Công tác đất (E'Work)	Mô tả chung (General)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
3000	R	E	1m	3,5m	1m	E		 KM 2+870 cống Tường gạch	3	Gr	b	I
2950	R	E	1,1m	3,0m	1,2m	E			3	Gr	b	I
2900	R	E	1m	3,5m	2m	E			3	Gr	b	I
2850	R	E	1m	3,9m	1,2m	E			3	Gr	b	I
2800	R	E	2,5m	4,25m	m	E			3	Gr	b	I
2750		E	1m	4,2m	1m	E		 KM 2+620 Tường gạch	3	Gr	b	I
2700	W	E	1,2m	4,3m	1,2m	E			3	Gr	b	I
2650	W	E	1,4m	4,0m	1,2m	E			3	Gr	b	I
2600	R	E	2m	4,2m	1m	E			3	Gr	b	I
2550	R	E	3m	4,0m	1m	E			3	Gr	b	I
2500	R	E	2m	4,1m	2m	E		 Tường gạch	3	Gr	b	I
2450	R	E	1m	4,0m	2m	E			3	Gr	b	I
2400	R	E	1,6m	4,2m	1,6m	E			3	Gr	b	I
2350	R	E	2m	4,0m	1m	E			3	Gr	b	I
2300	R	E	1m	4,0m	m	E			3	Gr	b	I
2250	R	E	1,2m	4,3m	1m	E		 Tường gạch	3	Gr	b	I
2200	R	E	1,6m	4,3m	1,5m	E			3	Gr	b	I
2150	R	E	0,7m	4,3m	1m	E			3	Gr	b	I
2100	R	E	1,1m	4,0m	1m	E			3	Gr	b	I
2050	R	E	0,9m	3,2m	1m	E			3	Gr	b	I

Tên đường (Road Name)	Phủ Vạn - Phú Lương
	Tuy Hòa - Phú Yên

GPS đ.đầu (Start)	N 13°08.092'	E 109°16.211'
GPS đ.cuối (End)	N 13°09.235'	E 109°15.633'
Người K.S (Surveyor)	ITST Team 2	
Ngày (Date)	08/01/2009	

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)
- W** Mặt nước (Surface water)
- R** Ruộng lúa (Rice field)
- Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cáp phỏi, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Tình trạng Đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

KM 2+210 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+420 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+520 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+663 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+300 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+480 Dự kiến xây tràn bằng cống (Change causeway by culvert)
 KM 2+553 Dự kiến xây tràn bằng cống (Change causeway by culvert)

TRL-OtB

**MẪU KHẢO SÁT ĐƯỜNG THỬ NGHIỆM
(RRST-II Initial Road Survey)**

Tờ số (Sheet No) 04 / 04

Lý trình (Chain)	Mô tả chung (General)	Cấu trúc đường (Road Structure)					Mô tả chung (General)	Đặc tính đường (Road Characteristics)				
		Công tác đất (E'Work)	Lề đường Trái (Shoulder L)	Vệt xe bên Trái (WTL)	Vệt xe bên Phải (WTR)	Lề đường Phải (Shoulder R)		Công tác đất (E'Work)	Tình trạng đường (Condition)	Vật liệu (Material)	Đốc dọc (Gradient)	Cong bằng (Curve)
3013		E	1,2m	<---9,0m---	1,3m	E						
3000	R	E	1,2m	<---3,7m---	1,3m	E	Tường gạch	3	Gr	b	I	

Tên đường (Road Name)	Phú Vạn - Phú Lương
Tuy Hòa - Phú Yên	

GPS đ.đầu (Start)	N 13°08.092'
	E 109°16.211'
GPS đ.cuối (End)	N 13°09.235'
	E 109°15.633'
Người K.S (Surveyor)	ITST Team 2
Ngày (Date):	08/01/2009

Ký hiệu (LEGEND)

- Nhà (Houses)
- Cầu (Bridge)
- Cống (Culvert)
- Đường (Road)

- W Mặt nước (Surface water)
- R Ruộng lúa (Rice field)
- Rãnh (Ditch)

Công tác đất (E'Work)

- E - Nền đắp (Embankment)
- C - Nền đào (Cutting)
- N - Không (None)

Tình trạng đường (Condition)

- 1 - Rất tốt, xe 1 cầu (Excellent 2WD)
- 2 - Xe 1 cầu đi mùa khô (2WD in dry season)
- 3 - Trung bình, xe 2 cầu đi 4 mùa (Fair 4WD all weather)
- 4 - Xấu, xe 2 cầu đi mùa khô (Poor 4WD in Dry)
- 5 - Rất xấu - không đi được (Failed - Not passable)

Vật liệu (Material)

- E - Đất (Earth)
- S - Cát (Sand)
- Cl - Sét (Clay)
- Gr - Cấp phối, sỏi (Gravel-cobble)
- BS - Nhựa (Bitumen)

Đốc dọc (Gradient)

- a - <0%
- b - 0-2%
- c - 2-4%
- d - 4-6%
- e - 6-8%
- f - >8%

**RURAL TRANSPORT PROGRAMME 3:
TRIAL PREPERATION**

SEACAP 30

FINAL REPORT

June 2009

APPENDIX B – Laboratory Test Summaries

TỔNG HỢP KẾT QUẢ THÍ NGHIỆM - LABORATORY SUMMARY
TÍNH THÁI NGUYÊN - THAI NGUYEN PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip	
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95				
KM 0+00	100	100.00	99.10	97.30	94.64	91.53	72.81	66.80	33.21	8.69	5.90						36.1	23.3	12.8	
KM 0+250	100	93.00	90.70	81.36	69.62	55.74	40.27	37.96	22.48	7.76	6.46						23.0	15.8	7.2	
KM 0+500	100	94.80	93.10	84.96	77.23	68.11	57.52	54.18	26.45	4.75	3.48						22.0	14.9	7.1	
KM 0+550	100	100.00	100.00	96.14	94.55	91.16	88.52	87.12	62.12	31.24	23.47	1.72	18.1	5.8	5.0	4.0	37.0	23.8	13.2	
KM 0+750	100	100.00	89.90	75.58	65.15	52.71	41.05	38.11	20.59	6.32	5.69						34.2	22.2	12.0	
KM 1+00	100	95.10	92.10	86.33	82.40	79.85	63.52	56.89	25.59	14.33	11.38						36.5	23.3	13.2	
KM 1+250	100	100.00	95.80	85.22	73.94	62.34	49.15	46.91	29.41	10.34	7.64						22.2	15.1	7.1	
KM 1+500	100	88.50	83.00	74.10	63.74	49.69	40.99	39.11	20.94	6.51	5.38						23.0	15.4	7.6	
KM 1+550	100	100.00	100.00	96.76	91.88	85.81	77.78	75.70	48.04	26.64	21.44	1.77	17.3	7.2	6.1	4.6	22.6	15.3	7.3	
KM 1+750	100	100.00	100.00	94.15	87.00	70.18	56.61	53.76	33.76	12.59	10.00						21.9	14.7	7.2	
KM 2+00	100	100.00	100.00	95.13	88.13	70.60	48.41	45.01	25.67	4.92	4.10						34.3	23.8	10.5	
KM 2+250	100	100.00	100.00	94.58	87.67	75.37	60.69	58.29	34.81	4.86	2.33						34.9	25.7	9.2	
KM 2+500	100	96.30	93.40	81.63	66.53	48.54	36.46	34.47	19.80	7.76	5.63						22.7	15.6	7.1	
KM 2+750	100	100.00	93.70	91.70	83.06	70.99	56.98	46.12	27.46	12.51	9.65	1.81	17.7	7.5	6.4	4.8	22.5	15.5	7.0	
KM 3+00	100	100.00	95.00	88.74	82.38	73.26	66.73	64.97	52.57	17.66	12.40						23.1	15.7	7.4	
KM 3+250	100	100.00	100.00	94.84	91.64	88.07	84.40	83.29	59.18	36.17	30.86						30.7	19.4	11.3	
KM 3+300	100	93.00	91.70	84.40	79.34	75.41	70.07	68.59	49.20	34.57	27.99	1.83	15.9	8.0	7.2	6.0	40.6	24.4	16.2	
KM 3+500	100	82.80	76.40	59.39	48.45	40.36	38.34	37.46	23.35	15.85	12.89						32.9	22.2	10.7	
KM 3+750	100	92.50	92.50	80.24	74.63	73.62	71.32	69.47	51.61	28.80	24.35						25.9	18.7	7.2	
KM 4+00	100	77.40	71.50	61.72	53.34	48.37	44.47	44.16	29.46	21.90	18.97						29.2	18.5	10.7	
KM 4+050	100	91.20	89.90	76.01	58.15	44.34	41.69	41.21	34.69	5.56	4.21						22.9	15.8	7.1	

Thai Nguyen Aggregate

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Sieve Size · 3									Km	LAA	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³
River gravel	100	100.00	100.00	76.22	56.43	45.22	36.21	24.48	18.35			2.68	1.40
0.5x1	100	100.00	100.00	100.00	100.00	100.00	100.00	42.51	9.02			2.67	1.41
1x2	100	100.00	100.00	93.06	39.86	10.14	1.85	0.14	0.08	0.64	6.37	2.69	1.45
2x4	100	100.00	100.00	69.57	18.35	6.08	1.79	0.76	0.23			2.68	1.44

Thai Nguyen-Sand

1	2	3	4	6	7	8	9	10	12
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	9.9	48.6	36.5	4.4	0.5	2.66	1.34	3.63

GM

P2.5+P1.25+P0.6+P0.3+P0.14/100

LABORATORY SUMMARY
CAO BANG PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95			
KM 0+010	100	100.00	100.00	90.91	83.85	76.93	66.22	64.42	54.64	16.85	9.42						43.1	26.6	16.5
KM 0+300	100	100.00	99.20	95.21	89.27	81.72	75.45	73.57	65.21	26.28	18.30						39.6	22.9	16.7
KM 0+350	100	100.00	100.00	97.95	86.75	79.61	75.36	67.45	59.64	23.94	18.43	1.62	21.9	5.2	4.9	4.3	45.1	28.3	16.8
KM 0+500	100	100.00	100.00	90.55	85.07	81.80	73.57	71.30	61.74	7.81	3.95						39.3	24.1	15.2
KM 0+750	100	100.00	93.50	81.03	72.63	67.62	62.72	61.43	47.33	4.42	2.84						30.8	21.7	9.1
KM 1+00	100	100.00	100.00	97.00	91.55	86.50	73.92	70.86	56.93										
KM 1+250	100	100.00	100.00	95.71	91.51	86.96	75.88	72.87	60.04	4.36	1.91						30.2	19.5	10.7
KM 1+500	100	100.00	95.32	81.97	74.32	69.25	55.02	50.69	37.19	7.66	4.52						32.0	21.8	10.2
KM 1+750	100	100.00	91.61	78.31	72.73	66.35	51.67	46.66	30.11	4.34	2.79	1.58	17.5	4.9	4.5	4.0	28.5	20.9	7.6
KM 2+00	100	100.00	97.53	90.46	87.59	79.03	48.08	41.82	26.30	9.92	4.84						35.9	24.3	11.6
KM 2+150	100	100.00	100.00	100.00	98.39	95.19	79.56	75.12	59.89	10.05	5.56	1.51	23.6	5.1	4.6	4.0	37.5	20.9	16.6
KM 2+250	100	100.00	89.46	72.83	65.84	58.74	45.82	41.38	26.88	3.84	2.47						44.0	27.0	17.0
KM 2+300	100	100.00	92.13	86.92	78.64	70.37	50.12	42.95	24.66	6.02	4.37	1.54	23.2	4.9	4.3	3.5	39.5	23.1	16.4
KM 2+500	100	100.00	93.69	87.98	82.27	76.64	61.03	56.73	40.53	5.01	3.22						28.5	21.1	7.4
KM 2+750	100	100.00	97.33	94.28	87.85	77.98	52.31	47.49	32.13	5.10	3.28						28.5	21.8	6.7
KM 3+00	100	100.00	100.00	93.85	89.65	84.24	69.97	67.90	58.28	19.20	15.32						33.5	23.7	9.8
KM 3+250	100	100.00	96.12	79.35	71.14	64.27	53.28	50.75	35.90	4.20	2.70						28.7	20.8	7.9
KM 3+350	100	100.00	96.87	81.74	73.91	67.09	55.60	52.92	39.50	7.08	5.51	1.65	20.1	5.4	4.6	3.6	33.4	21.4	12.0
KM 3+500	100	100.00	100.00	92.22	87.02	81.47	69.92	67.73	57.60	16.00	13.19						34.7	24.6	10.1
KM 3+750	100	100.00	100.00	99.09	95.98	92.72	89.45	88.59	85.09	13.58	8.21						45.0	28.1	16.9
KM 4+00	100	100.00	97.00	84.84	79.18	74.23	61.24	58.15	46.64	2.62	1.41						43.5	27.6	15.9
KM 4+250	100	100.00	100.00	92.50	88.17	83.17	70.05	67.70	50.50	8.78	5.69						44.3	28.2	16.1
KM 4+425	100	100.00	92.83	96.63	80.59	73.24	57.58	53.92	44.28	6.63	4.78	1.53	21.4	7.5	6.7	5.5	42.1	26.4	15.7

Cao Bang-Stone

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Sieve Size - D (mm) / Passing percentage - P (%)									Km	Los	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³
Sỏi Sông	100	100.00	96.28	78.28	45.55	24.82	14.63	2.06	0.60			2.70	1.42
0.5x1	100	100.00	100.00	100.00	100.00	100.00	100.00	38.20	21.85			2.68	1.43
2x4	100	100.00	100.00	73.99	23.54	5.61	1.53	0.60	0.21	0.65	5.98	2.69	1.46

Cao Bang-Sand

1	2	3	4	6	7	8	9	10	11
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	23.1	12.1	26.3	18.5	9.5	2.65	1.30	2.89

GM

P2.5+P1.25+P0.6+P0.3+P0.14/100

TỔNG HỢP KẾT QUẢ THÍ NGHIỆM - LABORATORY SUMMARY
TỈNH THÁI BÌNH - THAI BINH PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95			
KM 0+12	100	100.00	100.00	100.00	100.00	100.00	98.58	95.09	11.64			1.54	12.6	1.8	1.6	1.3			
KM 0+250	100	100.00	100.00	100.00	100.00	100.00	99.64	99.31	55.47	8.70	5.43						31.7	21.9	9.8
KM 0+338	100	100.00	100.00	100.00	100.00	100.00	99.55	98.33	62.15	9.21	5.94						31.7	21.7	10.0
KM 0+500	100	100.00	100.00	100.00	100.00	100.00	99.76	99.63	29.22										
KM 0+650	100	100.00	100.00	100.00	100.00	100.00	96.52	95.92	74.46	24.71	15.63						35.9	23.1	12.8
KM 0+750	100	100.00	100.00	100.00	100.00	100.00	99.14	96.84	82.84	36.37	23.93	1.73	20.1	5.7	5.0	4.1	42.8	25.9	16.9
KM 1+00	100	100.00	100.00	100.00	100.00	100.00	99.44	99.14	96.40	37.72	23.91						34.0	20.9	13.1
KM 1+200	100	100.00	100.00	100.00	100.00	100.00	99.08	98.84	86.08	35.61	21.87	1.70	19	5.9	5.2	4.1	37.8	22.1	15.7
KM 1+250	100	100.00	100.00	100.00	100.00	100.00	98.22	97.22	82.16	27.80	19.93						40.5	25.8	14.7
KM 1+500	100	100.00	100.00	100.00	100.00	100.00	97.50	96.94	85.10	39.12	27.41						42.6	25.9	16.7
KM 1+630	100	100.00	100.00	100.00	100.00	100.00	74.27	67.29	35.93	6.18	3.41						35.7	22.1	13.6

Thai Binh-Stone

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Sieve Size - D (mm) / Passing percentage - P (%)										Km	Los	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³	
1x2	100	100.00	100.00	82.20	33.69	14.71	10.60	9.11	8.84			2.69	1.44	
2x4	100	100.00	100.00	86.88	50.06	30.10	15.82	15.04	14.70	0.71	6.91	2.68	1.47	

Thai Binh-Sand

1	2	3	4	6	7	8	9	10	12
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	9.9	10.8	38.3	35.7	5.0	2.64	1.29	2.84
		0.0	0.0	0.0	13.9	69.6	2.65	1.32	-

Cement stabilized soils

1	2	3	4	5	6	7
				UCS (kPa) - 7day		Km
Sample	Sub-sample	Stabilised	% Stab	Dry	Wet	
	1	0	0	32.6	-	-
	2	Cement	2	52.3	26.1	0.50
	3	Cement	4	67.7	54.4	0.80
	4	Cement	6	218.1	176.7	0.81

TỔNG HỢP KẾT QUẢ THÍ NGHIỆM - LABORATORY SUMMARY
TÍNH THANH HÓA - THANH HOA PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip	
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95				
KM 0+030	100	100.00	100.00	93.04	83.04	71.07	51.96	49.99	36.13	18.69	13.82	1.71	12.2	5.9	5.2	4.2	35.9	21.1	14.8	
KM 0+250	100	100.00	99.10	96.82	95.23	93.99	90.41	84.90	49.70	20.21	16.79						38.0	23.7	14.3	
KM 0+500	100	100.00	100.00	92.23	81.07	67.71	49.50	47.62	34.42	17.80	13.17						37.0	23.0	14.0	
KM 0+750	100	100.00	100.00	100.00	100.00	100.00	96.80	96.34	93.52	21.30	20.06						37.0	21.9	15.1	
KM 1+00	100	100.00	98.60	88.02	74.18	62.48	46.41	43.92	33.52	15.95	11.25						34.2	22.0	12.2	
KM 1+719	100	95.70	88.40	71.64	52.72	34.95	21.56	19.92	11.83	2.61	1.79						28.9	21.8	7.1	
KM 1+750	100	90.00	86.50	69.35	51.59	34.27	23.69	22.64	17.73	7.75	5.61						36.0	23.1	12.9	
KM 2+00	100	81.70	72.80	55.00	41.92	30.26	19.17	18.02	13.10	6.09	4.62						34.2	21.0	13.2	
KM 2+066	100	82.60	78.90	67.19	56.08	43.65	28.06	25.50	17.28	10.12	7.97						35.7	23.2	12.5	
Phuong Doai quarry	100	100.00	99.00	91.61	74.88	42.66	36.03	35.64	33.57	29.33	24.55	1.81	17.7	11.5	10.2	8.3	40.4	24.1	16.3	
KM 0+00-N2	100	87.00	80.40	67.23	56.63	48.31	38.70	37.67	27.94	9.52	8.64						33.4	20.1	13.3	
KM 0+250-N2	100	100.00	96.90	89.45	84.15	80.02	68.40	67.00	58.80	27.12	19.41	1.61	23.8	6.0	5.0	3.4	38.6	22.9	15.7	
KM 0+500-N2	100	100.00	95.90	89.49	77.23	62.58	47.61	45.76	35.38	27.39	22.80						38.1	22.5	15.6	
KM 0+750-N2	100	92.10	88.60	69.16	53.77	38.44	25.77	24.21	17.26	7.31	5.19						33.3	20.2	13.1	
KM 1+00-N2	100	91.70	85.30	67.52	55.35	42.13	29.53	27.76	21.03	9.33	6.43						35.1	23.3	11.8	
KM 1+250-N2	100	91.00	83.10	72.10	61.87	51.10	44.45	43.34	28.65	12.91	10.38	1.80	17.9	5.5	4.8	3.8	36.3	22.7	13.6	
KM 1+389-N2	100	100.00	99.00	91.61	74.87	42.59	35.97	35.58	33.52	29.37	24.58						37.3	21.7	15.6	
Mỏ Phụng Đoài-2	100	98.30	98.30	88.47	78.08	66.27	52.84	51.39	43.43	28.45	23.64	1.71	18.4	6.0	5.2	3.9	38.9	23.4	15.5	

Thanh Hoa-Stone

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Sieve Size - D (mm) / Passing percentage - P (%)									Km	Los	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³
Km 0+500	100	85.78	68.30	49.22	37.77	30.77	19.63	9.50	3.69			2.69	1.45
Km 0+750	100	82.74	66.62	41.79	32.01	26.90	18.65	11.92	6.48			2.68	1.40
0.5x1	100	100.00	100.00	100.00	100.00	100.00	93.40	39.70	6.30			2.69	1.43
1x2	100	100.00	100.00	95.19	41.64	15.24	4.25	0.86	0.24	0.64	6.16	2.69	1.43
4x6	100	87.04	71.69	48.79	38.78	34.48	25.37	14.81	7.90			2.68	1.47

Thanh Hoa-Sand

1	2	3	4	6	7	8	9	10	12
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	7.5	11.0	41.1	33.4	2.7	2.65	1.33	2.74
		0.5	0.6	5.2	32.0	48.6	2.65	1.35	-

GM

P2.5+P1.25+P0.6+P0.3+P0.14/100

TỔNG HỢP KẾT QUẢ THÍ NGHIỆM - LABORATORY SUMMARY
TỈNH PHÚ YÊN - PHU YEN PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip	
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95				
KM 0+00	100	89.10	81.50	64.10	53.09	42.86	30.15	27.26	20.84	5.25	4.15						35.0	22.6	12.4	
KM 0+250	100	89.90	81.30	70.53	63.20	55.07	38.73	34.07	19.03	6.39	3.74	1.83	19.2	5.4	4.8	3.8	33.6	21.6	12.0	
KM 0+500	100	87.10	86.60	81.00	74.63	66.22	43.92	39.28	26.40	19.82	18.25						37.9	23.1	14.8	
KM 0+750	100	98.40	95.70	86.24	80.30	70.68	43.12	35.95	16.44	4.57	2.41						33.1	24.4	8.7	
KM 1+00	100	100.00	99.00	95.29	92.49	88.69	61.32	53.07	27.25	7.99	5.43						35.3	23.3	12.0	
KM 1+250	100	95.20	87.70	74.11	61.55	44.55	29.35	25.93	14.63	5.63	4.08						34.8	22.5	12.3	
KM 1+500	100	92.80	90.20	78.23	69.75	59.60	34.96	30.23	17.74	5.07	2.22	1.84	19.9	6.7	5.7	4.2	32.5	23.6	8.9	
KM 1+750	100	93.70	88.00	77.74	68.86	60.57	34.25	30.15	19.12	12.84	7.50						33.7	20.7	13.0	
KM 2+00	100	93.90	92.50	83.09	72.92	59.00	40.71	38.55	31.19	19.57	16.73						36.8	23.0	13.8	
KM 2+250	100	100.00	100.00	97.31	89.58	74.42	40.41	35.04	20.45	4.42	2.83						29.3	21.4	7.9	
KM 2+500	100	95.10	92.60	83.50	73.51	60.86	52.26	49.41	32.30	9.30	5.58	1.86	18.7	6.2	5.4	4.2	36.7	23.6	13.1	
KM 2+750	100	96.20	93.40	87.97	83.82	76.64	46.72	42.11	27.40	17.38	14.54						36.9	20.9	16.0	
KM 3+00	100	100.00	98.60	79.62	73.07	65.38	51.48	48.81	38.84	12.76	9.31						36.2	21.9	14.3	
Mỏ An Hiệp	100	90.90	87.10	70.67	56.01	39.09	27.31	24.19	13.20	9.37	7.42	1.88	19.6	6.2	5.6	4.7	33.9	20.4	13.5	

Phu Yen-Stone

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Sieve Size - D (mm) / Passing percentage - P (%)									Km	Los	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³
4x6	100	100	49.29	0.08	0.08	0.08	0.08	0.08	0.08		5.84	2.67	1.45

Phu Yen-Sand

1	2	3	4	6	7	8	9	10	11
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	13.7	20.3	36.1	24.6	4.3	2.64	1.34	3.11

GM

P2.5+P1.25+P0.6+P0.3+P0.14/100

TỔNG HỢP KẾT QUẢ THÍ NGHIỆM - LABORATORY SUMMARY
TỈNH ĐIỆN BIÊN - DIEN BIEN PROVINCE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Sieve Size - D (mm) / Passing percentage - P (%)											MDD	OMC	CBR			WL	Wp	Ip
Chain	37.5	19.0	9.5	4.75	2.0	0.425	0.30	0.075	0.005	0.002	<0.002	g/cm ³		1	0.98	0.95			
KM 0+005	100	94.10	93.30	90.59	96.90	79.80	57.81	50.39	37.03	5.58	4.09						29.7	20.9	8.8
KM 0+250	100	100.00	98.70	92.65	76.94	60.59	49.77	45.66	25.26	5.47	3.80						29.8	22.5	7.3
KM 0+500	100	100.00	100.00	98.84	94.61	87.29	65.82	59.21	34.94	5.22	4.20						33.0	21.4	11.6
KM 0+450	100	94.30	92.30	90.03	87.06	84.29	69.67	67.72	58.56	30.46	23.79	1.58	17.7	5.2	4.4	3.2	38.6	23.2	15.4
KM 0+750	100	95.40	93.20	88.98	85.14	79.98	66.10	60.73	40.80	9.55	7.68						39.0	24.0	15.0
KM 1+00	100	100.00	97.50	94.89	91.95	89.12	80.17	76.66	57.20	11.52	8.55						37.2	24.2	13.0
KM 1+250	100	100.00	100.00	98.67	96.07	93.19	82.98	79.40	58.97	15.81	11.40						35.3	23.1	12.2
KM 1+500	100	100.00	100.00	95.85	93.99	91.79	81.94	79.62	55.68	18.31	14.93						34.8	22.5	12.3
KM 1+750	100	97.50	96.10	93.98	90.74	86.15	80.31	77.91	58.86	21.76	15.74						34.7	22.3	12.5
KM 2+00	100	100.00	100.00	95.47	93.45	91.24	83.04	80.85	58.72	17.32	13.00						36.5	23.6	12.9
KM 2+250	100	100.00	100.00	97.38	90.49	82.87	73.54	71.42	51.40	11.16	8.69						31.8	20.5	11.3
KM 2+500	100	100.00	100.00	95.65	88.39	81.85	78.95	78.15	69.26	11.38	8.89						37.5	23.3	14.2
KM 2+550	100	99.30	99.10	96.13	92.88	87.56	74.08	69.55	45.97	2.49	0.68	1.76	18.7	6.1	5.4	4.4	29.1	22.7	6.4
KM 2+750	100	97.70	95.80	87.26	81.80	76.01	62.08	60.22	52.38	22.70	17.33						38.0	23.0	15.0
KM 3+00	100	98.80	96.70	89.64	82.07	76.16	65.13	51.28	34.03	12.68	10.33						36.2	21.8	14.4
KM 3+250	100	100.00	100.00	98.70	98.70	83.72	62.47	56.61	34.53	11.37	8.81						36.9	22.2	14.7
KM 3+300	100	97.20	96.30	92.53	87.96	83.13	61.42	55.54	35.61	7.29	3.81	1.56	16.5	5.3	4.6	3.6	35.2	24.1	11.1
KM 3+500	100	100.00	100.00	98.53	96.82	95.43	70.44	66.76	38.26	18.33	15.43						37.6	23.0	14.6
KM 3+750	100	96.70	94.30	90.01	87.93	83.98	70.75	67.39	48.02	12.57	9.76						37.6	24.3	13.3
KM 4+00	100	95.40	94.30	87.58	83.80	81.30	65.59	62.05	52.19	17.29	11.61						35.1	21.6	13.5
KM 4+250	100	100.00	100.00	93.65	88.20	80.56	66.61	64.72	54.71	17.71	13.64						36.7	23.0	13.7
KM 4+380	100	94.30	92.30	90.03	87.06	84.29	69.67	67.72	58.56	30.46	23.79						38.2	22.1	16.1
KM 4+200	100	96.50	93.30	89.44	85.79	79.28	61.30	58.79	39.30	5.41	2.72	1.64	17.5	5.2	4.7	3.8	31.9	23.9	8.0

Dien Bien-Stone and river gravel

1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Sieve Size - D (mm) / Passing percentage - P (%)									Km	Los	Gs	γ_d
Sample	100	70	40	25	20	15	10	5	2.5		%	g/cm ³	g/cm ³
0.5x1	100	100	100	100	100	100	100	48.90	18.23			2.69	1.42
1x2	100	100	100	94.70	42.35	13.27	3.66	0.64	0.12			2.69	1.45
2x4	100	100	100	61.31	33.05	8.32	2.88	2.27	2.08	0.62	7.65	2.68	1.43
4x6	100	100	53.97	0.96	0.40	0.40	0.40	0.40	0.40			2.68	1.45
River gravel	100	100	100.00	100.00	100.00	84.38	57.79	52.10	51.43			2.68	1.46

Dien Bien-Sand

1	2	3	4	6	7	8	9	10	11
	Sieve Size - D (mm) / Passing percentage - P (%)						Gs	γ_d	Grading Modulus
Sample	5.0	2.5	1.25	0.6	0.315	0.14	g/cm ³	g/cm ³	%
	-	17.7	11.8	25.3	35.9	8.0	2.64	1.33	2.91
	-	24.0	13.4	26.0	27.6	8.2	2.64	1.31	3.15

GM

P2.5+P1.25+P0.6+P0.3+P0.14/100

**RURAL TRANSPORT PROGRAMME 3:
TRIAL PREPERATION**

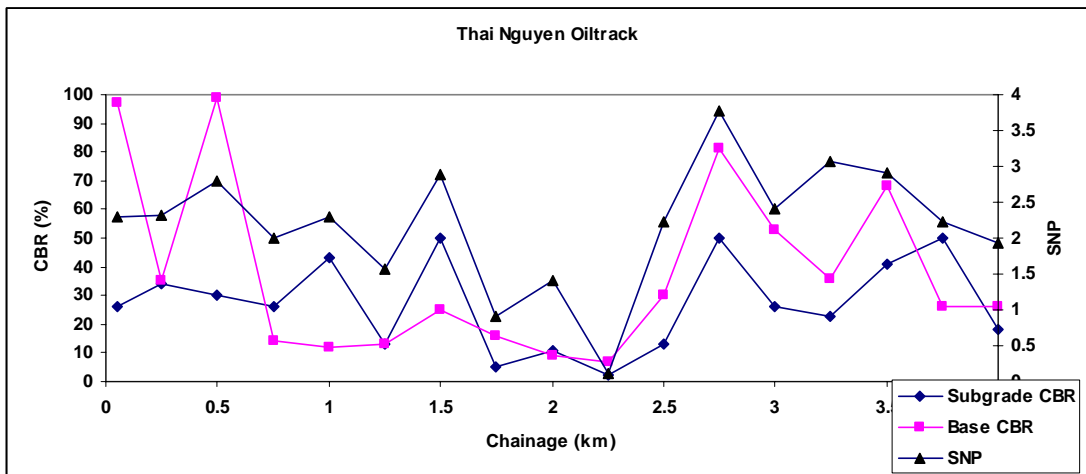
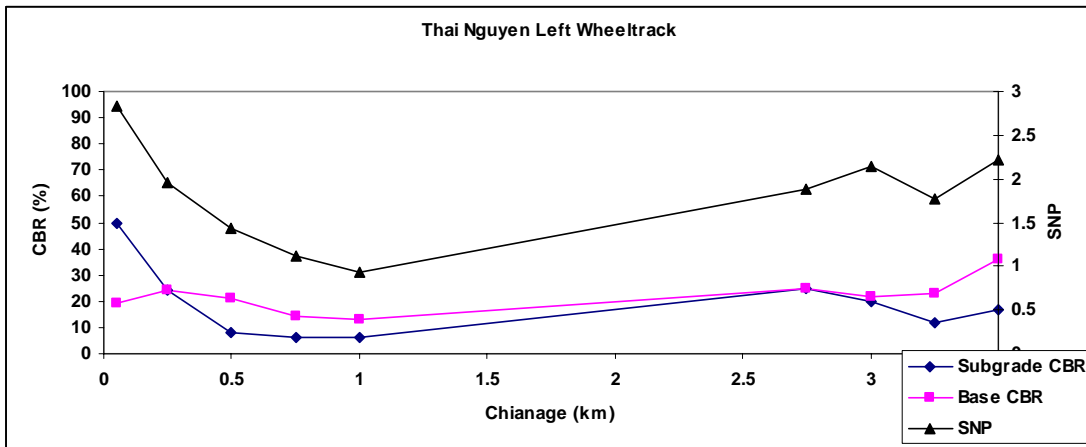
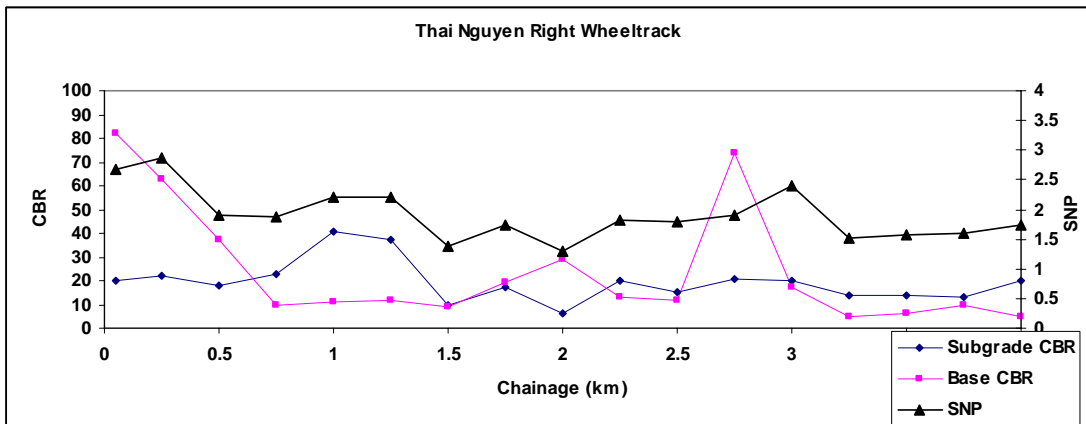
SEACAP 30

FINAL REPORT

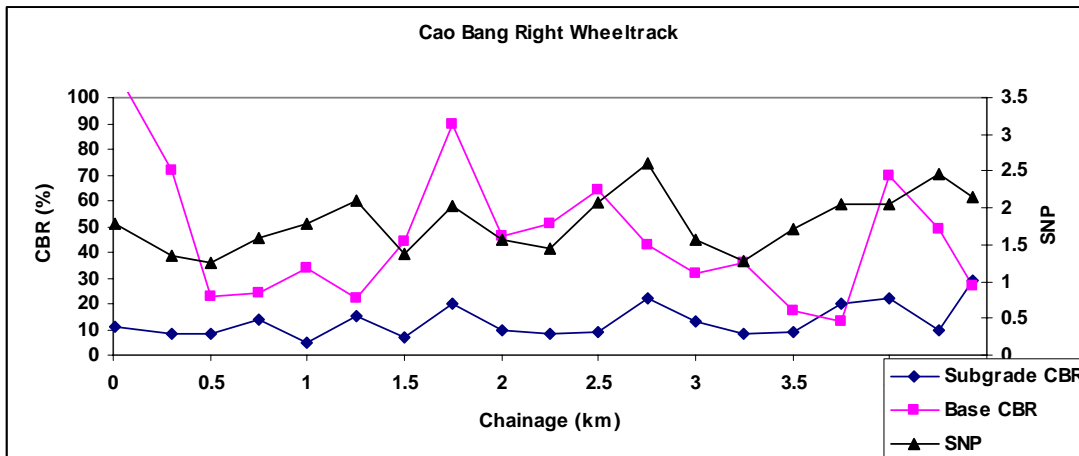
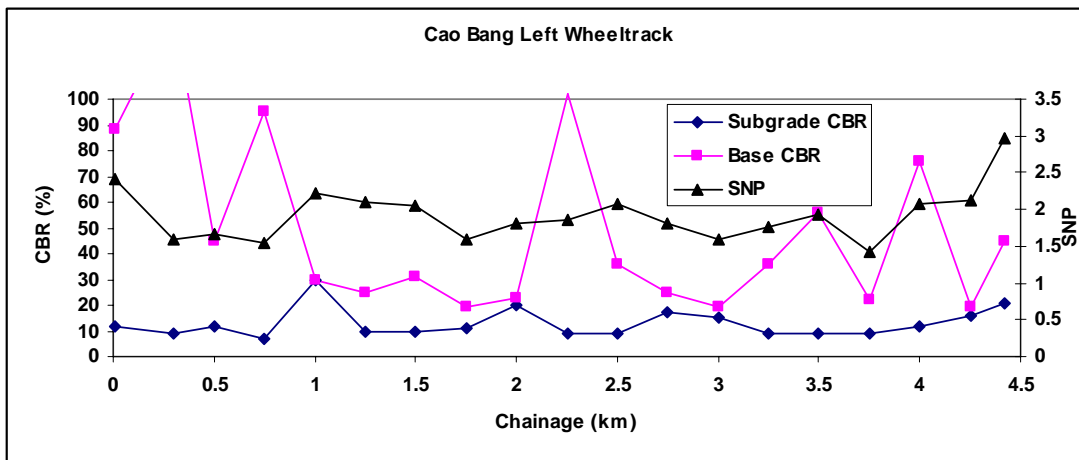
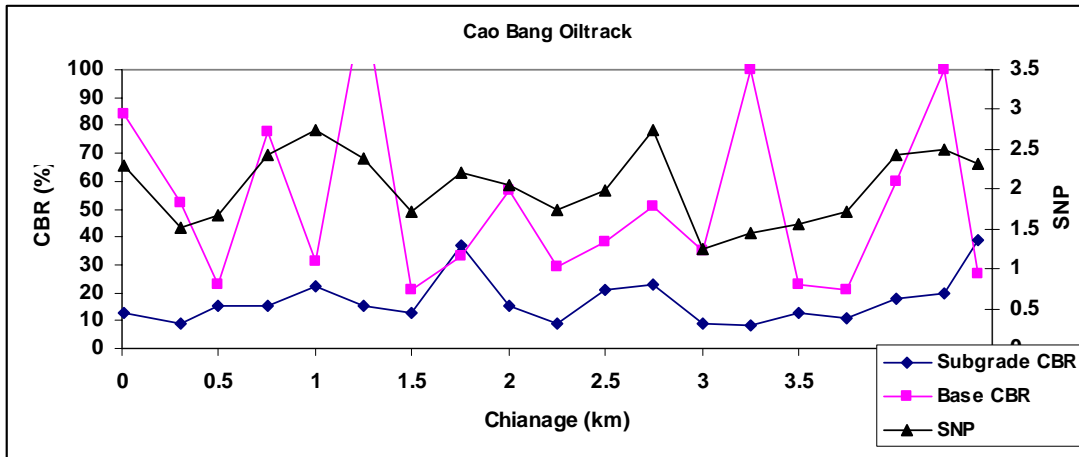
June 2009

APPENDIX C – Longitudinal DCP-CBR Profiles

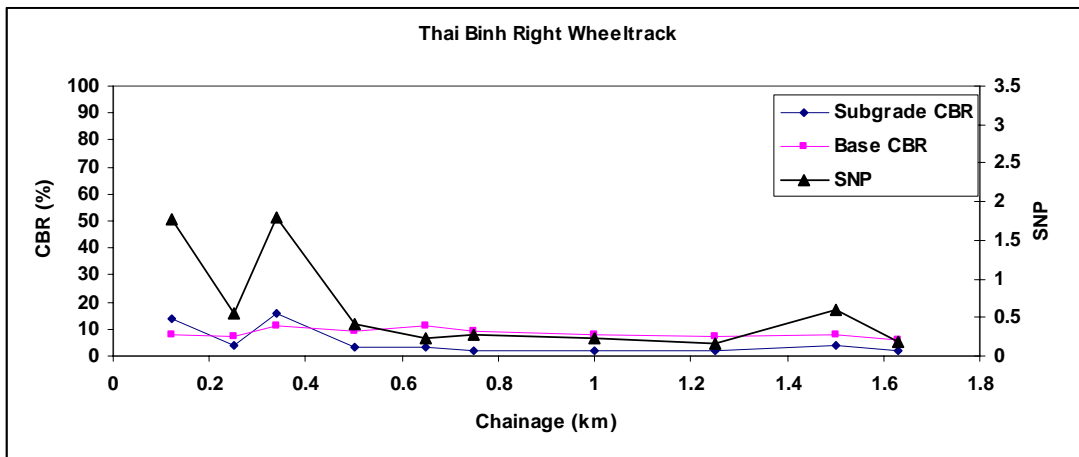
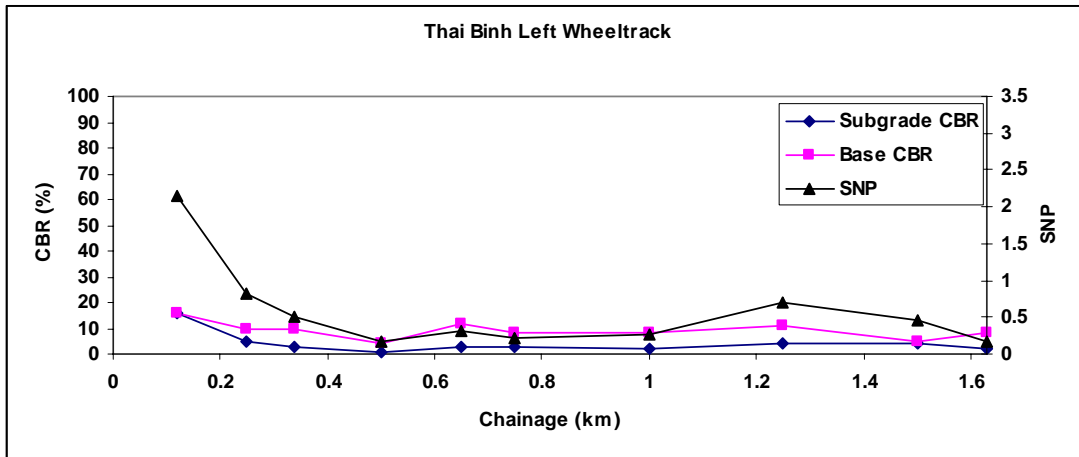
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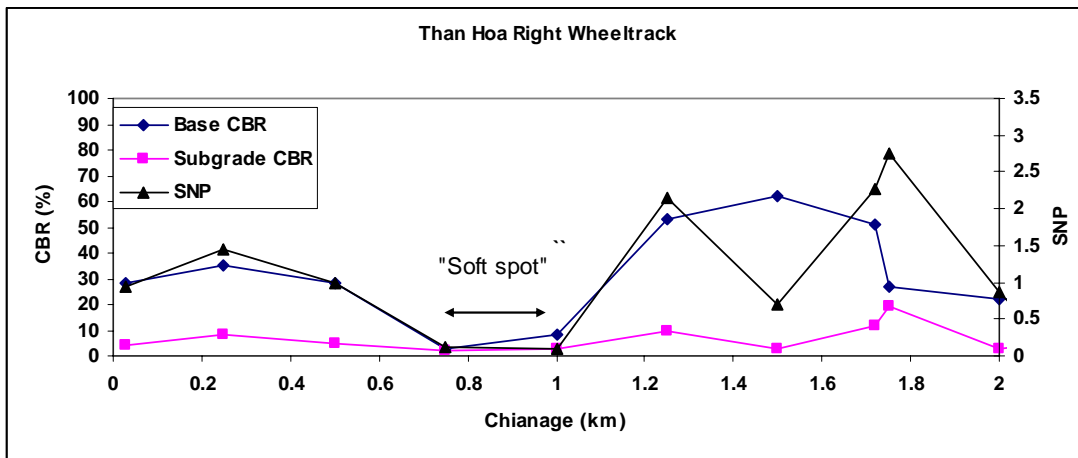
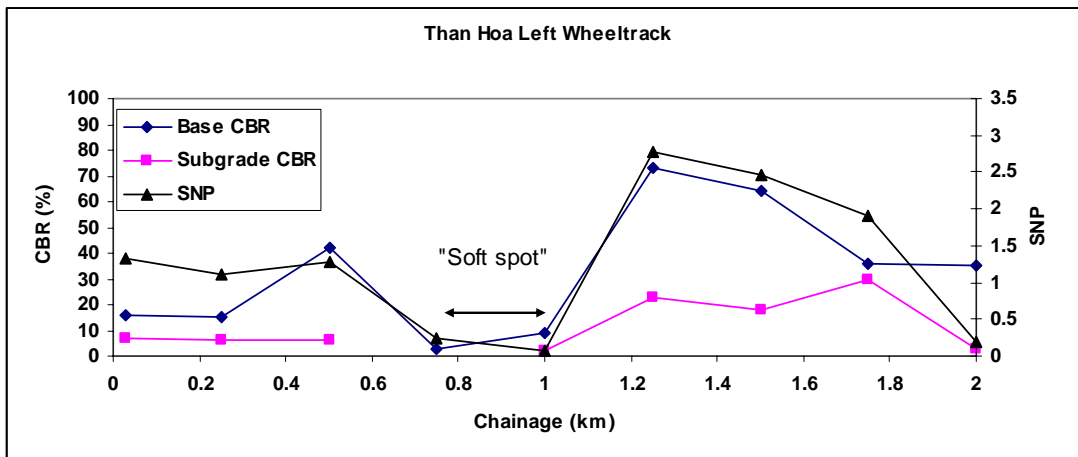
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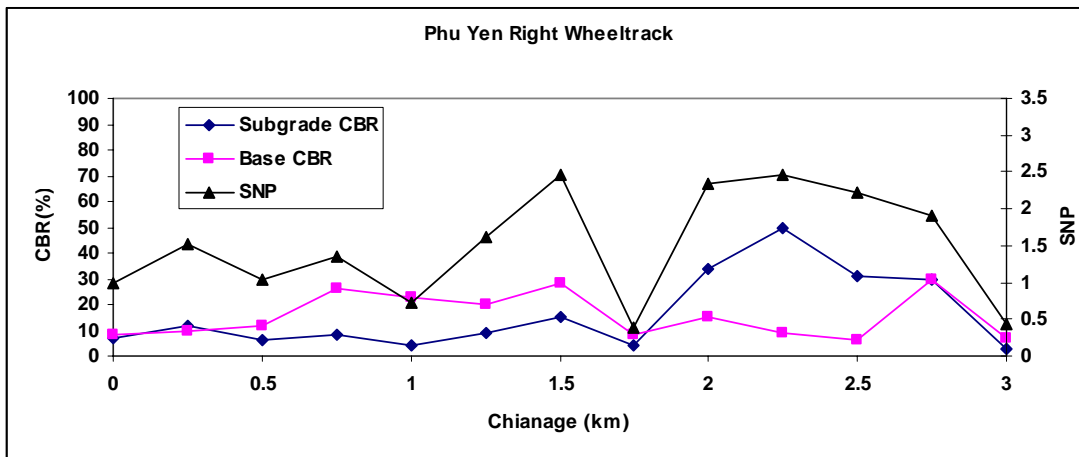
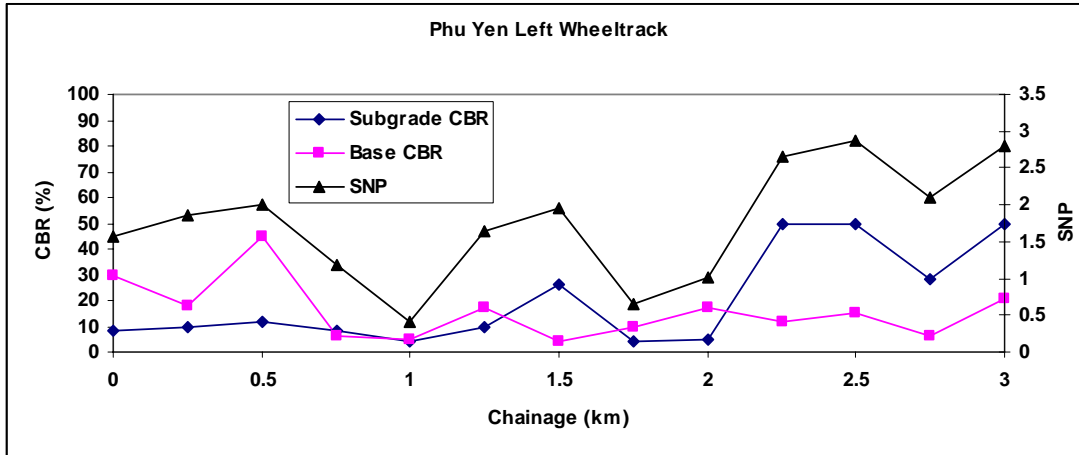
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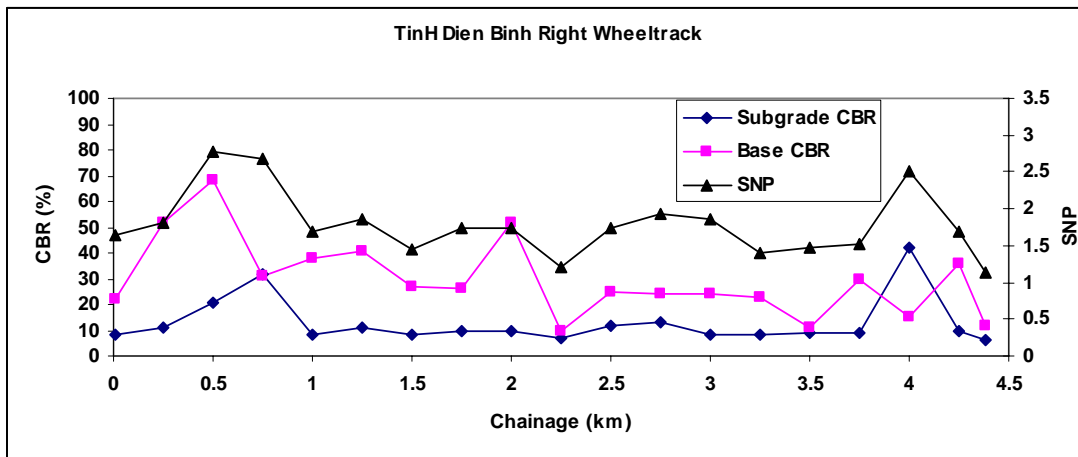
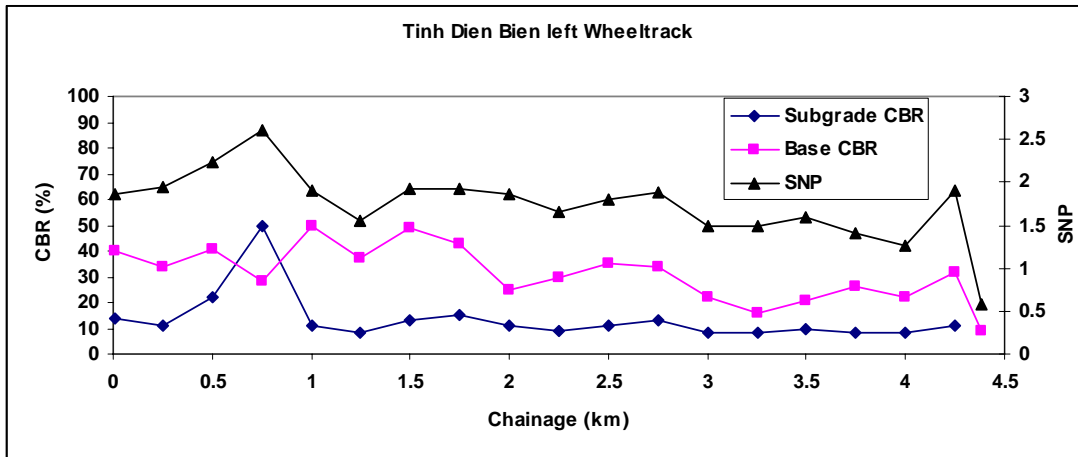
Site 4, Thanh Hoa



Site 5, Phu Yen



Site 6, Dien Bien



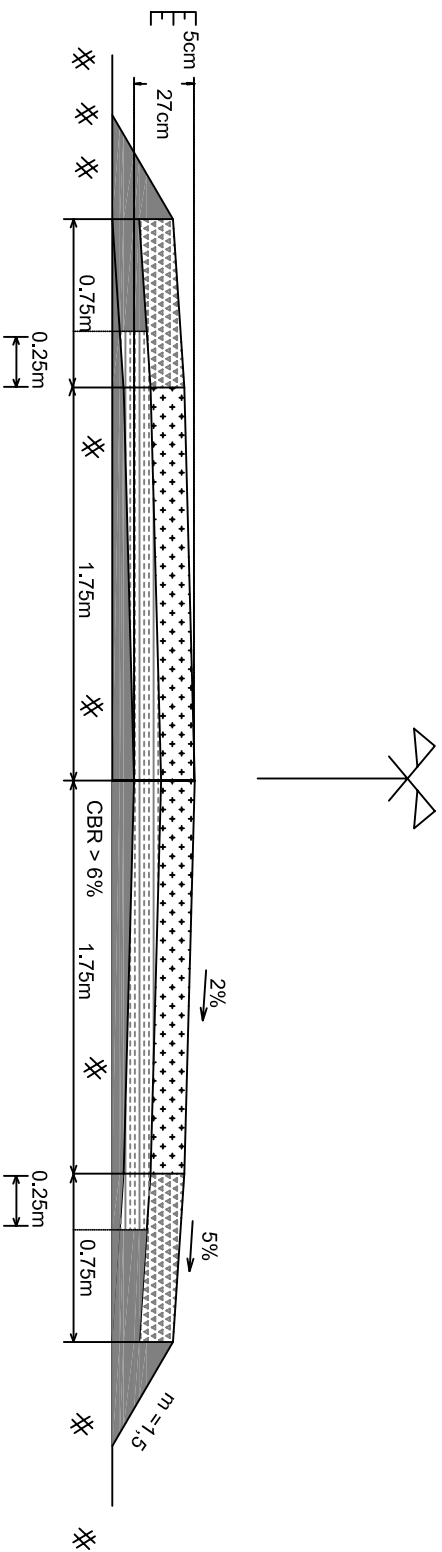
**RURAL TRANSPORT PROGRAMME 3:
TRIAL PREPERATION**

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APPENDIX D– Trial Pavement Cross Sections

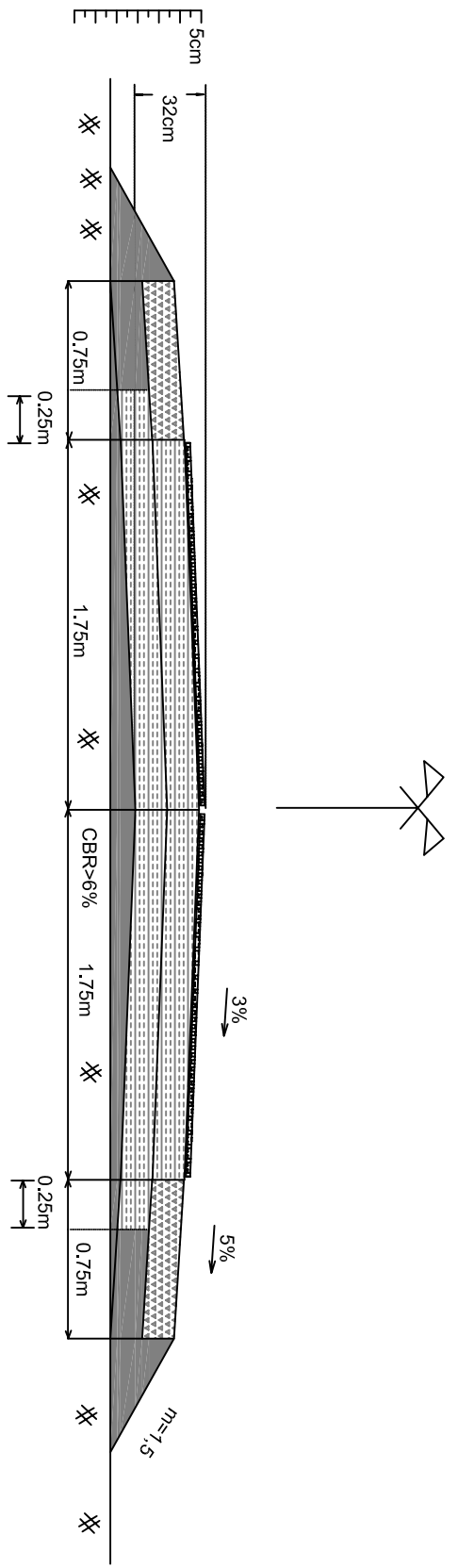


LEGEND:

	Un-reinforced concrete		Quarry-run
	Stabilised river gravel		Dry bound macadam
	Lime stabilised clay-gravel		Water bound macadam
	Otta seal		Double hot bitumen seal
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

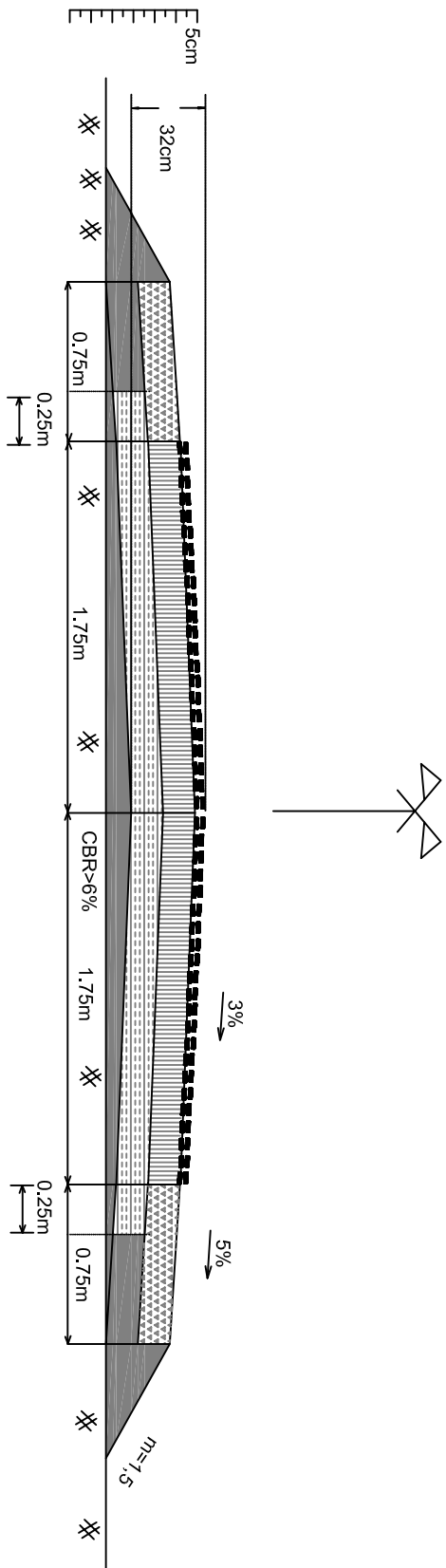


LEGEND:

	Un-reinforced concrete		Quarry-run
	Stabilised river gravel		Dry bound macadam
	Lime stabilised clay-gravel		Water bound macadam
	Ota seal		Single stone chip bitumen emulsion seal
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

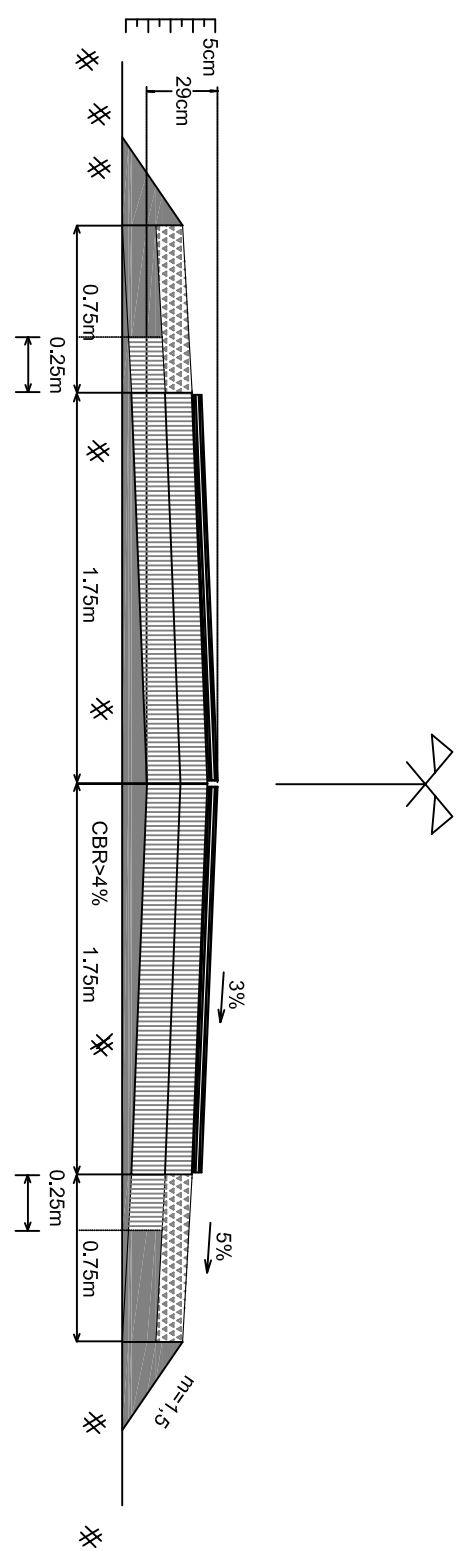


LEGEND:

	Un-reinforced concrete		Quarry-run
	Single stone chip bitumen emulsion seal		Dry bound macadam
	Lime stabilised clay-gravel		Water bound macadam
	Otta seal		Double hot bitumen seal
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

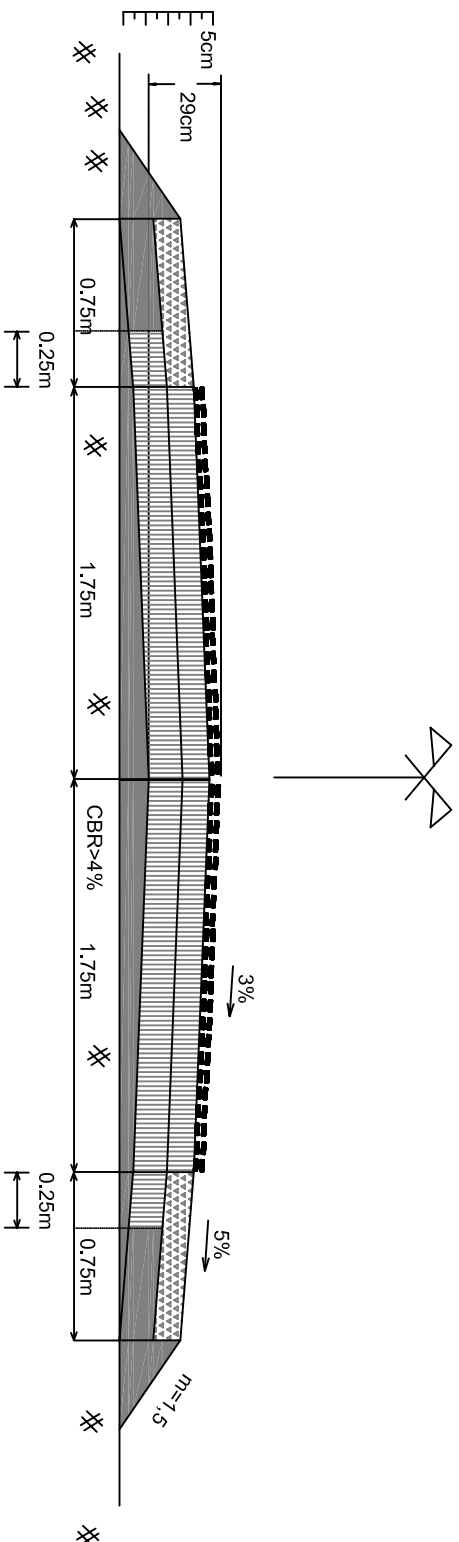


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

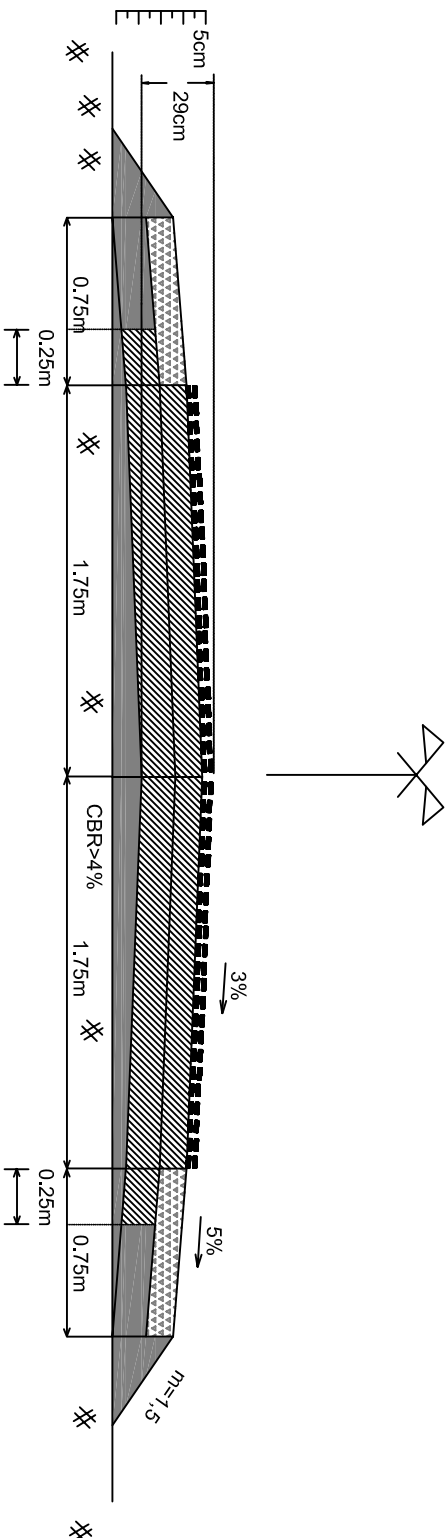


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

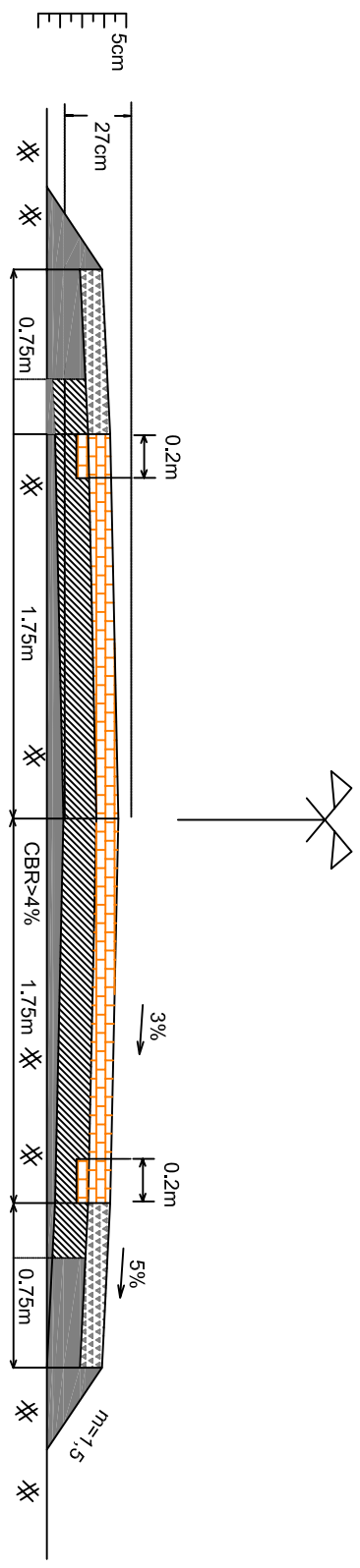


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

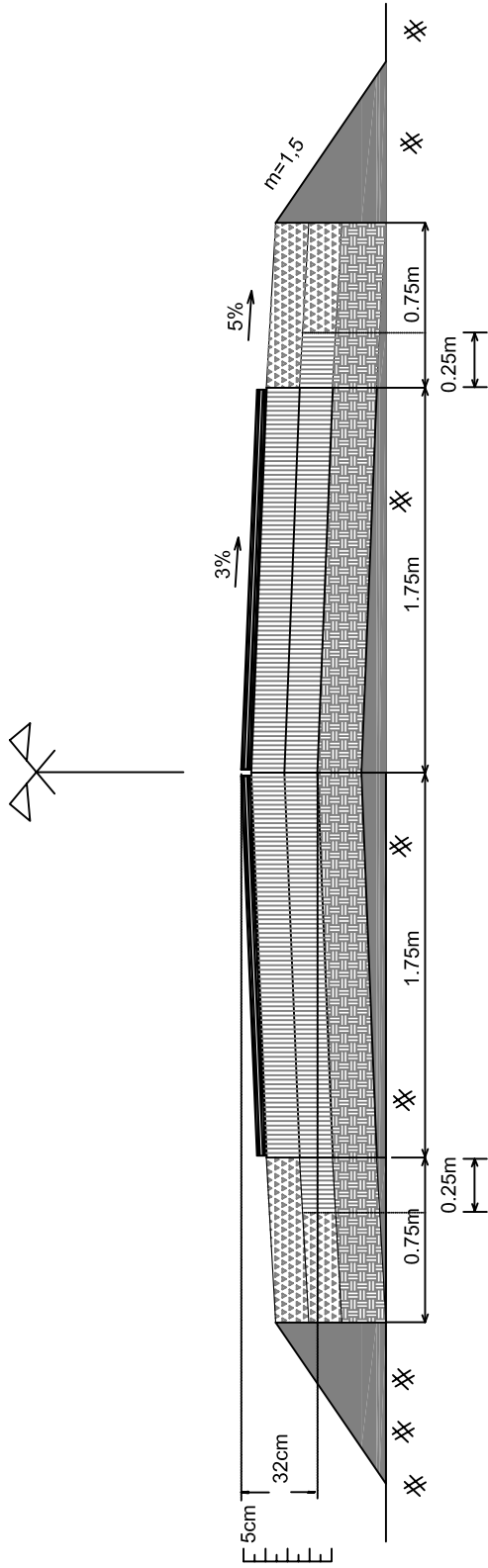


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

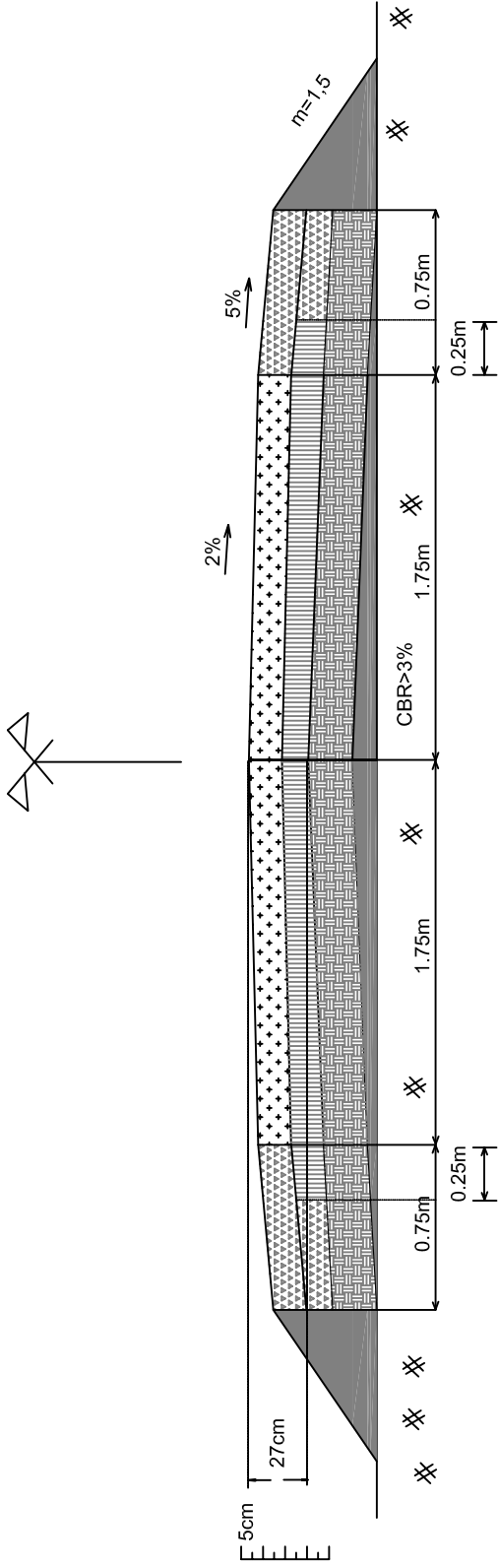


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Concrete brick		Improved Subgrade Layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>5% - eg use additional quarry run layer

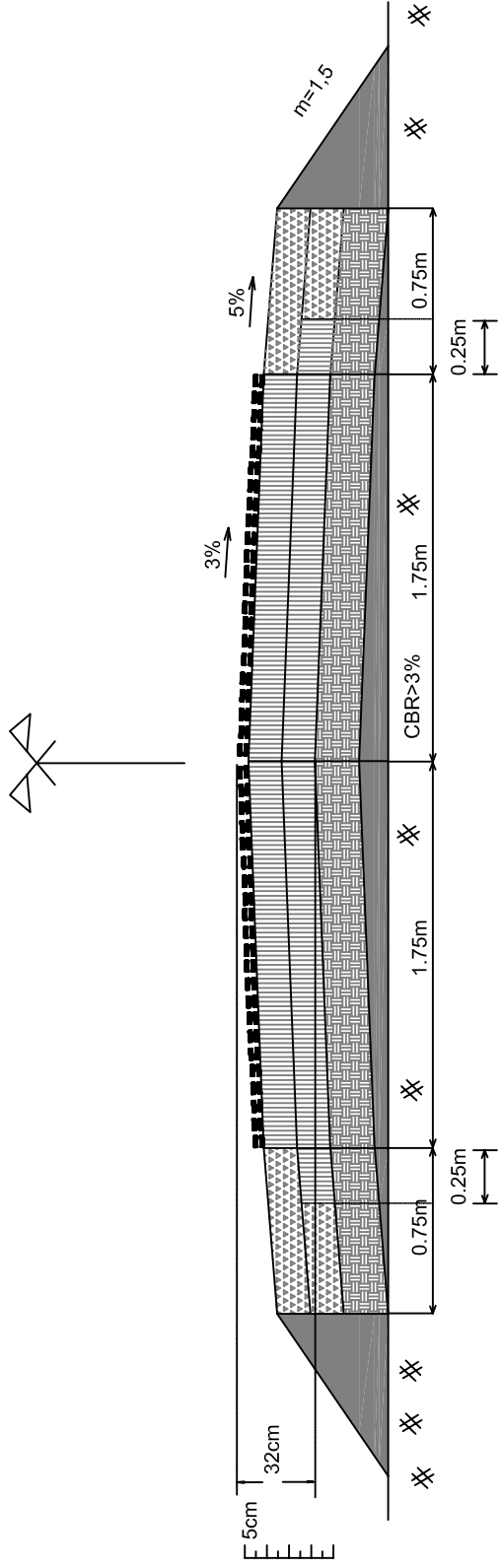


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Concrete brick		Improve Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR > 5% - eg use additional quarry run layer

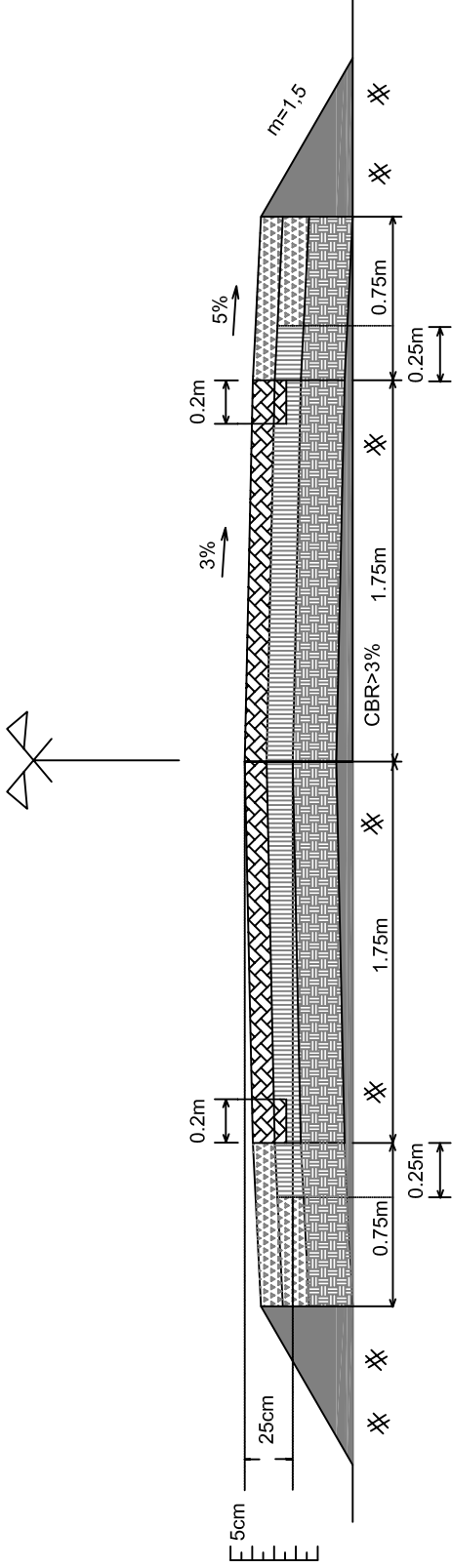


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Concrete brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>5% - eg use additional quarry run layer

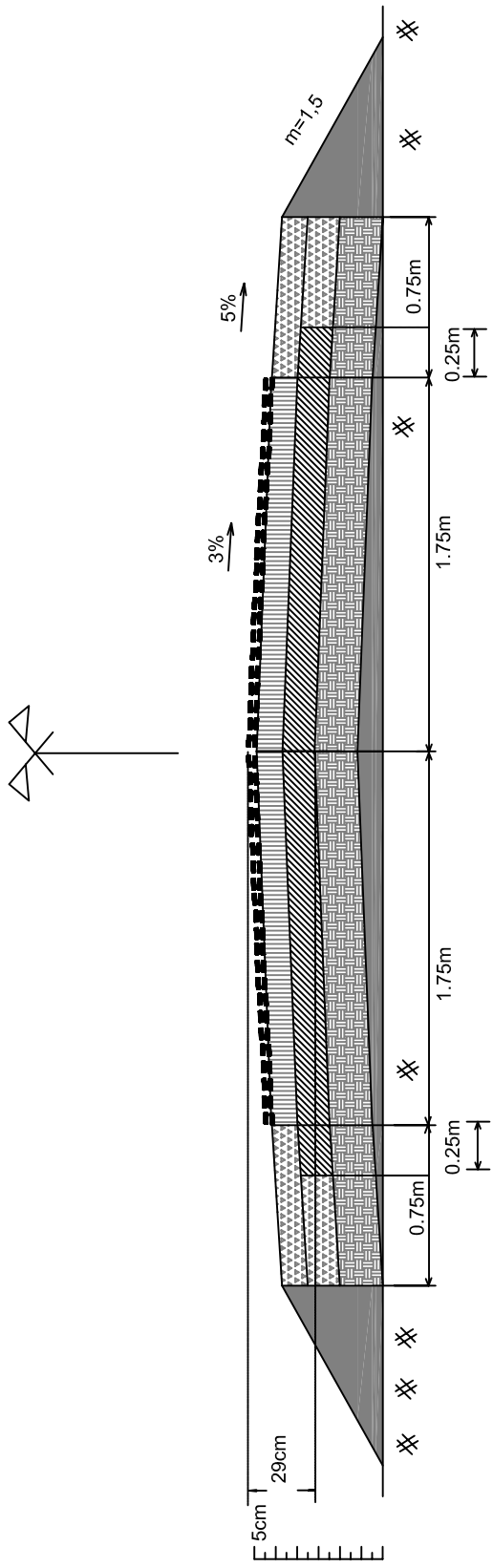


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Concrete brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>5% - eg use additional quarry run layer

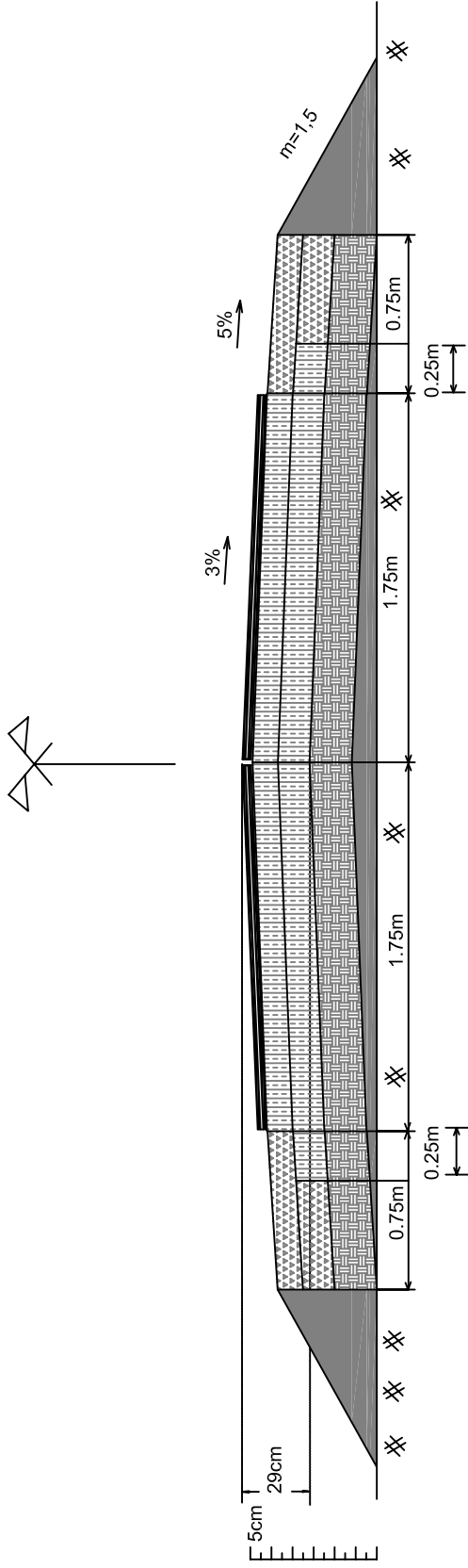


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>6% - eg use additional quarry run layer

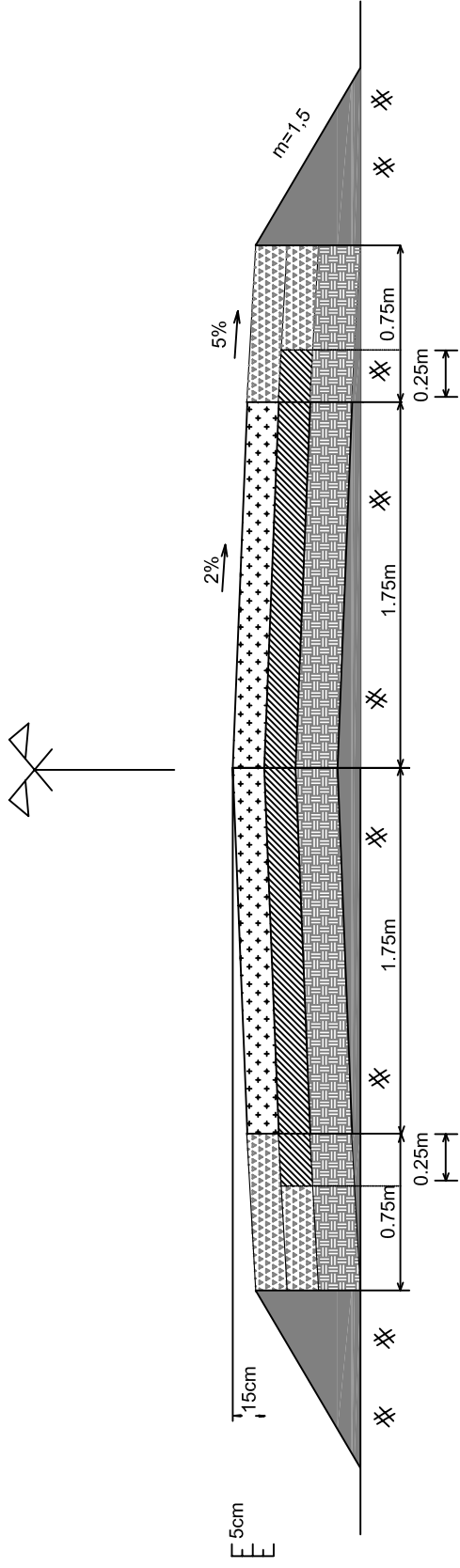


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>6% - eg use additional quarry run layer

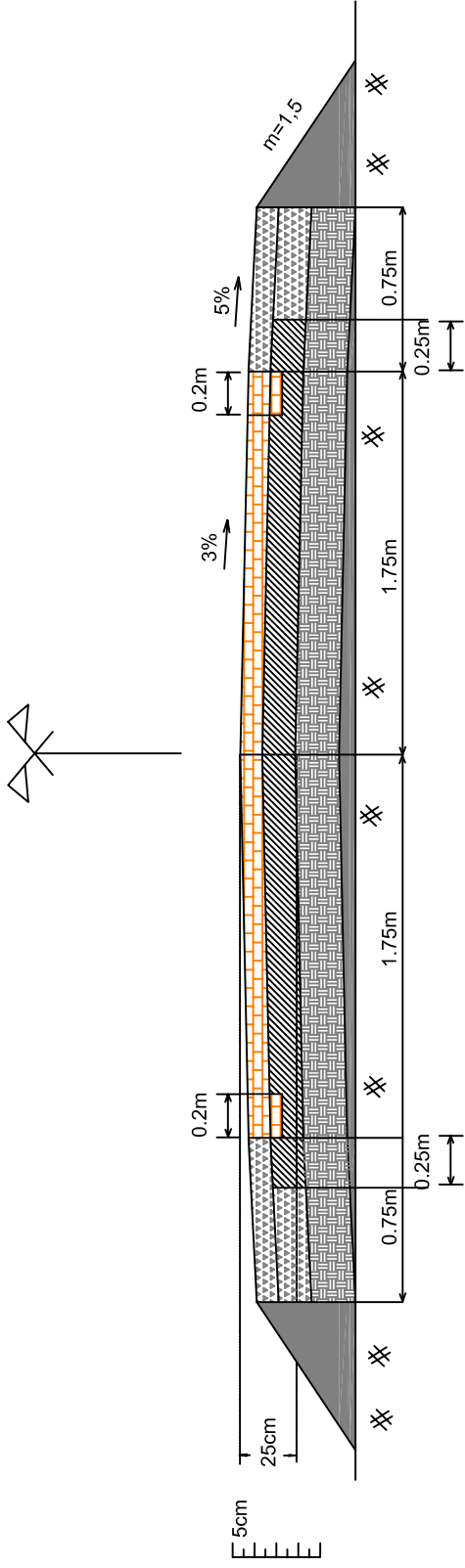


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>6% - eg use additional quarry run layer

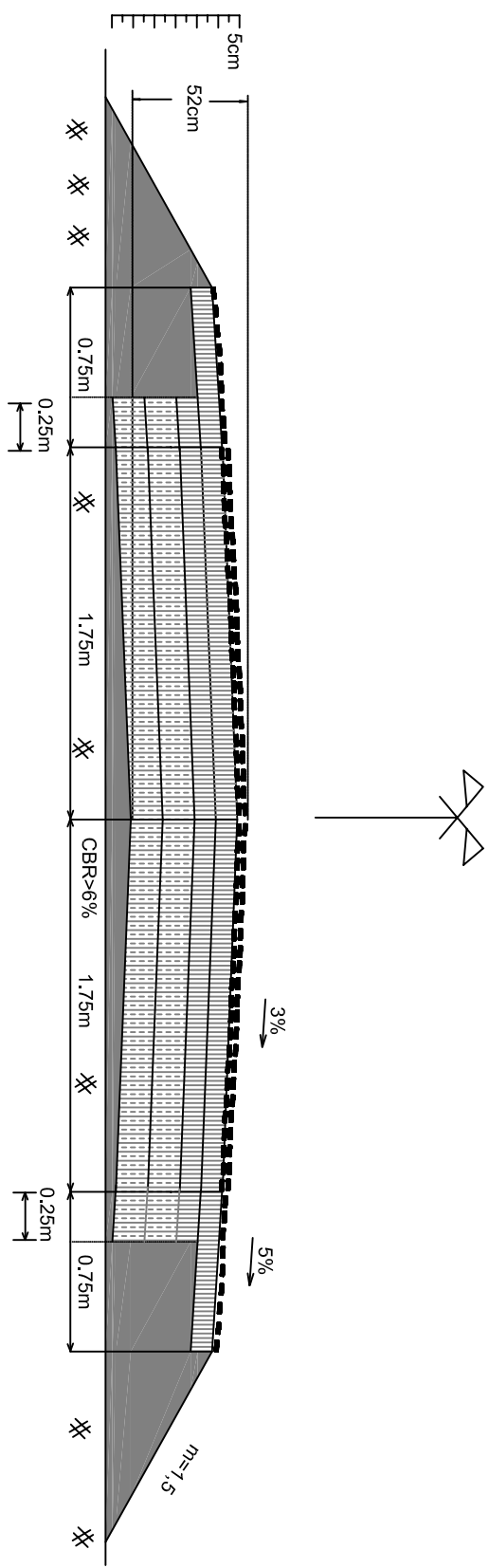


LEGEND:

	Un-reinforced concrete		Quarry-run
	Double hot bitumen seal		Dry bound macadam
	Cement stabilised sand		Water bound macadam
	Burnt clay brick		Improved Subgrade layer
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment
2. Subgrade to be improved to a minimum thickness of 200mm at CBR>6% - eg use additional quarry run layer

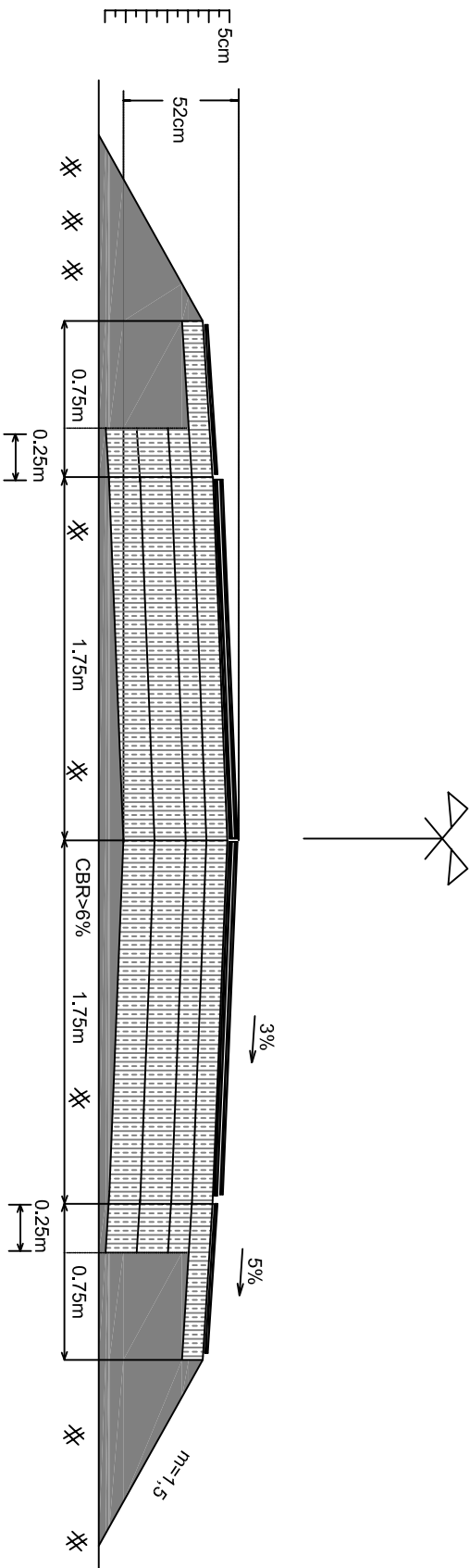


LEGEND:

	Un-reinforced concrete		Quarry-run
	Dry bound macadam		Double hot bitumen seal
	Water bound macadam		Single stone chip hot bitumen emulsion seal
	River gravel		Double stone chip bitumen emulsion seal
	Fill soil		

NOTES:

1. Side ditch drainage is essential where road is not on embankment

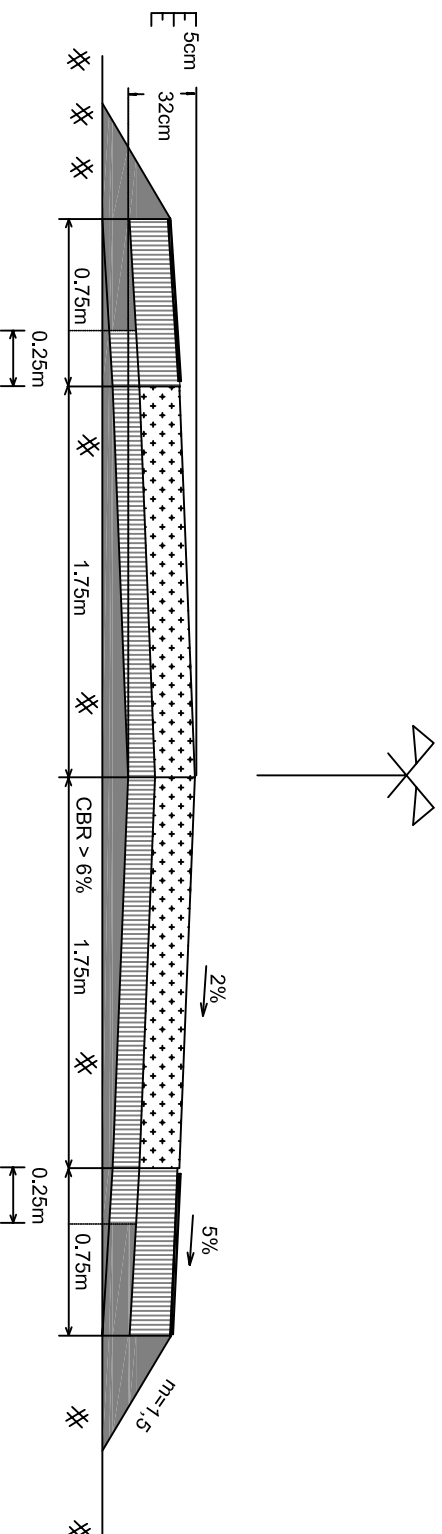


LEGEND:

	Un-reinforced concrete		Quarry-run
	Dry bound macadam		Double hot bitumen seal
	Water bound macadam		Single stone chip hot bitumen seal
	River gravel		Single stone chip bitumen emulsion seal
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment

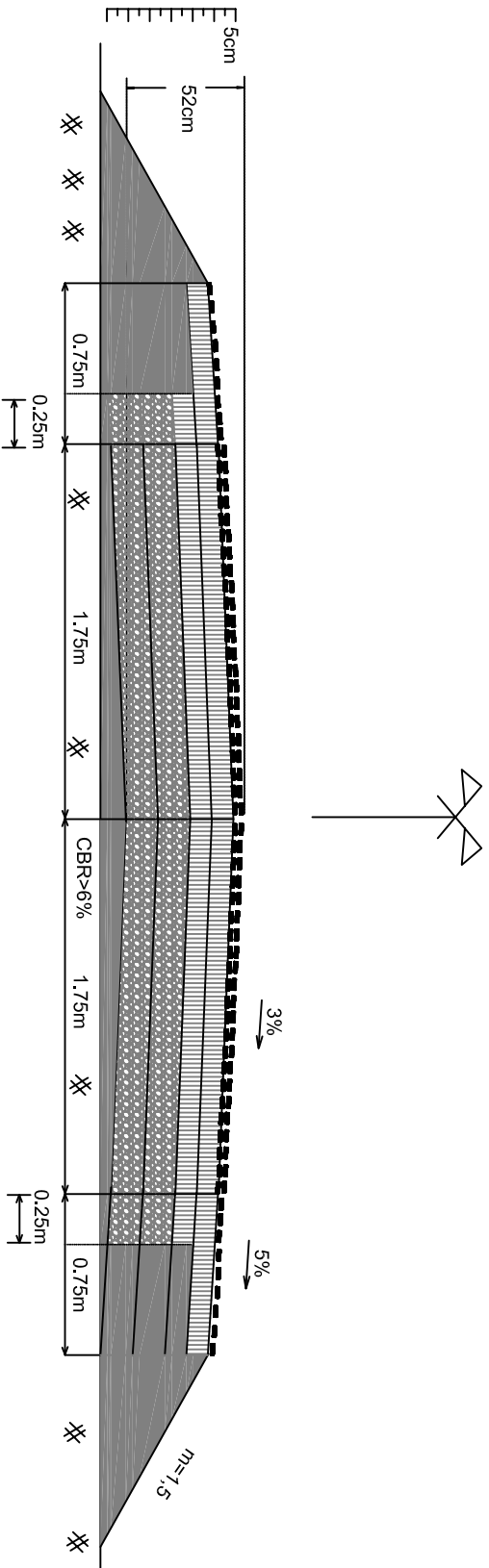


LEGEND:

	Un-reinforced concrete		Quarry-run
	Dry bound macadam		Double hot bitumen seal
	Water bound macadam		Single stone chip bitumen seal
	River gravel		Single stone chip bitumen emulsion seal
	Fill soil		Double stone chip bitumen emulsion seal

NOTES:

1. Side ditch drainage is essential where road is not on embankment



LEGEND:

	Un-reinforced concrete		Quarry-run
	Dry bound macadam		Double hot bitumen seal
	Water bound macadam		Single stone chip bitumen emulsion seal
	River gravel		Double stone chip bitumen emulsion seal
	Fill soil		

NOTES:

1. Side ditch drainage is essential where road is not on embankment