COMMUNICATING ABOUT USE OF ROAD AGGREGATES

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Transit New Zealand Research Report No. 2

ISBN 0-478-04136-5
ISSN 1170-9405

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Bartley, F.G., Cornwell, W.L. 1991. Communicating about use of road aggregates. *Transit New Zealand Research Report No. 2.*

Keywords: aggregates, roading, communication

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ABSTRACT

A limited survey of roading practitioners was carried out to determine their opinions and needs with respect to communicating the findings of research about the properties of unbound aggregates. This survey was then used as a basis for the formulation of a strategy.

It was found that the needs of the different groups within the road construction industry varied. Methods of communication have to be tailored to suit each group.

The strategy comprises:

- Preparation of text to identify and describe the important aspects of pavement construction.
- Commission of video to record the requirements for a stable pavement, production of suitable aggregates, correct methods of construction, and criteria that control performance of a pavement.
- Fostering lectures, seminars, discussion groups, workshops and in-house training. Provide support staff, course material and videos as appropriate.

1. INTRODUCTION

Mineral aggregates are literally the base of the New Zealand transport system. They are the materials that separate the natural soil foundation of our roads from the tyres of our transport vehicles.

The engineering effort that has been and continues to be expended on the design and construction of road transport vehicles is enormous. The engineering input to the pavement system, by comparison, is minimal. It is probably true to say that 10 or 100 times more effort goes into the geometric layout of a new road compared with that spent on the design and selection of the materials that make up the pavement. It is also of concern that many of our road builders have learnt their construction skills by experience. Some have acquired good practices, others bad. The present state of the industry is such that when a skilled practitioner retires, most of that skill is lost for all time.

Transit New Zealand (TNZ) (formerly the National Roads Board (NRB) and including the Road Research Unit (RRU)) has spent a significant part of its research budget each year on investigation of the properties and use of pavement materials, particularly of

unbound mineral aggregate. It has accumulated an array of technical and practical information on aggregates which should be made available to the roading practitioner. More importantly it should disseminate this information so that designers can select pavement materials with more confidence and attention to their true cost, and contractors can use materials with greater care and skill. A greater awareness of this information will result in better utilisation of a valuable resource and better pavements for the dollars expended. The information is there, but a special effort is required to educate the roading practitioners. This report is intended for use specifically by Transit New Zealand.

2. PROJECT OBJECTIVE

The principal objective of the project is to formulate a strategy to communicate information to roading practitioners on the efficient use of mineral aggregates in the construction of roads.

3. METHODOLOGY

The project objective will be achieved by implementing the following steps:

1. Survey road practitioners to identify the current level of their knowledge and their likely needs in the future;

2. Assemble all relevant research data related to the production, placement and performance of aggregates used in road construction;

3. Prepare a text which clearly identifies and describes the important aspects of pavement construction particularly as they relate to the satisfactory performance of road pavements;

4. Communicate those aspects to the five principal groups involved in road construction. They are:

    (a) Pavement designers
    (b) Material suppliers
    (c) Road contractors
    (d) Contract supervisors
    (e) Student engineers and technicians;

5. Evaluate the effectiveness of the communications exercise and define what additional steps or changes are required to achieve the project objective.

This report describes the initial stage of the project during which a limited sample group of roading practitioners was surveyed to determine their opinions and their needs. This information was used as a basis for the strategy. The subsequent stages of the project will be a topic for a later report.

4. SURVEY OF ROADING PRACTITIONERS

4.1 Questionnaire

A selective telephone survey was carried out in the Auckland area to identify the current level of knowledge of roading practitioners and their likely needs in the future. The survey was made of the opinions of six roading consultants, one roading client representative, two local authority officers, one major aggregate supplier, and two roading contractors. The following questionnaire was used.

4.1.1 Introduction

Over the last few years Transit New Zealand has completed a series of research projects dealing with the production, placement and performance of a wide range of aggregate types and quality. The work has included field and test track* trials.

4.1.2 Questions

Q1. Are you conversant with the research of RRU projects carried out in the last 10 to 12 years?

Q2. Do you know if any of the research findings have been applied to any pavement design, or construction method for which you have been responsible?

Q3. Do you think there is a need for better communication in the field of aggregate research?

Q4. What would you consider to be the best method of communicating the research finding to:

(a) Senior management,
(b) Design and construction engineers,
(c) Student engineers.

Q5. Is there a need to convey research findings to field construction staff?

Q6. What would you consider the best method of communicating practical aspects of research to field staff?

Q7. (a) Are you satisfied with the present specification for aggregate production and placement for pavement, or
(b) Do you consider that TNZ M/4 and B/2 are too restrictive?

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* Accelerated Pavement Testing Facility, Canterbury

Q8. Do you consider the best training can be provided by:

(a) Your own organisation,
(b) Educational agencies (University etc.),
(c) Local Government training schemes,
(d) Road Training and Education Committee (RTEC)**,
(e) An Transit New Zealand-sponsored group,
(f) Or the above with Transit New Zealand technical assistance?

Q9. Did any of your group attend the recent lime stabilisation training seminar?

Q10. Was the video on lime stabilisation instructive?

Q11. Do you think that video tapes could be made to assist staff training on aggregate production, placing and performance?

Q12. Would you prefer to use videos in "in-house" training sessions run entirely by your organisation, or would you require some expertise from a specialist such as Transit New Zealand?

Q13. General comment.

4.2 Summary of Results

The results of the questionnaire are provided in Table 1. A summary of the responses to each question is as follows:

Q1. Research on aggregates is best known to those associated with the former RRU. In general, those associated with road construction know little about research projects, even local projects.

Q2. In general the results of research are not being applied. Those practitioners who are aware of research may not be in a position to apply it, while many in the road construction industry were not aware of the research.

Q3. Communication of road aggregate research needs to be improved.

Q4. (a) Those in the management group wish to know only the salient features;

(b) Design and construction engineers require a summary, with direction as to where to find the relevant papers;

** Disbanded 1990.

(c) Graduate engineers and technicians probably need detailed instruction on technical aspects.

Q5. Field construction staff need to be made aware of research findings relevant to their activities.

Q6. Practical seminars with specialist assistance offered the best method of training field staff. In-house courses were favoured.

Q7. (a) Present specifications and methods for aggregate production and placement for pavement are not satisfactory. Transit New Zealand specifications are generally included in tender documents but their use tends to vary depending on the attitude of the contract supervisor.

(b) TNZ specifications M/4 and B/2 were used for heavy duty pavements but frequently the requirements were relaxed by the supervisors when lower loadings were expected. The main concern was that the variability of a roading material was not known. The quality of a material was frequently assessed on a visual basis only.

It was generally considered that the present methods were too restrictive and that high grade deposits were being wasted. The inability of the specifier to assess quality resulted in the use of high grade material regardless of the situation. Quality control and knowledge of the material was generally considered to be very poor.

Q8. Seminars sponsored by Transit New Zealand were considered to be best, but formal instruction was favoured for university students, consultants and road construction gangs. Informal instruction was not favoured because it was generally given by unqualified advisors.

Q9. Five of the twelve people canvassed had attended the lime stabilisation seminar.

Q10. & Q11. The RRU video on lime stabilisation was considered to lack adequate technical information. The use of video as a means of instruction was, however, well received. It was also seen as a method for recording ideas of previous instructors and it was an easy method of passing on information. It was considered to be particularly appropriate for the education of road contractors. However, videos need to be of high quality, to feature local examples, and to cover a number of topics.

Q12. A specialist should be present at any training session.

Table 1. **Results of the Survey.**

Question		Consultant 1	Consultant 2	Consultant 3	Consultant 4	Consultant 5	Consultant 6	Contractor 1	Contractor 2	Local Authority 1	Local Authority 2	Aggregate Supplier 1	Client Rep 1
1		No	Yes	Yes, paper	No	Yes	Yes	No	No	Some	No	Yes, some	No
2		N/A	Yes	No	N/A	N/A	Yes	N/A	N/A	No	N/A	Unfortunately, no	N/A
3		Yes	Yes	Satisfactory now	Yes	Definite yes	Yes	Yes	Yes	No, OK	Yes	Definitely, yes	Yes
4	(a)	Written reviews	Written	Written reviews	Written synopsis	Written papers	Written, such as trade BRANZ	Written main points	Written	Written resume	IPENZ	Written precis	Written precis
	(b)	Seminars		Precis for senior management		Seminars		Written precis		On Job			Seminar
	(c)				Video - graduates						Education Institute		
5		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
6		Practical work instruction - on job training	On-job instruction	Visual training sessions	Small groups in work environs in-house	On-job specialist needed	In-house	On-job training by internal organisation		Simplified written manuals	Local workshop	Formal courses and on job training	Workshops
7		No	No	No, quarry control poor. TNZ too rigid where performance data required.	Yes, with some reservations	Yes	Perhaps	No	Need for big improvement	No, too restrictive. Waste of M/4	Major works, yes Minor works, no	No	Yes
8		TNZ-sponsored personnel	TNZ	TNZ-sponsored where possible	In-house training	Formal, such as RTEC	Not sure	Internal	Contractors training	In-house with specialist	TNZ-sponsored workshop	Institute Education TNZ Backing	Local government training scheme

9	N/A Perhaps, not aware	Yes, but not own staff	Yes	No	No	No	Yes	No	Yes	Yes	No	No
10	N/A	N/A	Yes	N/A	N/A	N/A	Not memorable (advertising)	N/A			N/A	N/A
11	Yes - very good. Quick, simple, in-house	Provided quality is very good	Yes, short visual series and with knowledgeable person	Yes, written synopsis, video - for graduates	Yes	Yes, simple short serialised	Yes	Yes, practical aspects only	Yes, local flavour a must	Propaganda	Yes, Stockpiling/ sampling, testing	Yes, must be good
12	TNZ-tech input In-house	TNZ-tech input	In-house with technical sessions	In-house with TNZ assistance	In-house and TNZ specialist	Yes	Short/punchy	Formal in-house and specialist assistance	In-house	Yes, practical aspects series	In-house depends	Not really necessary
13	Construction industry particularly quarrying out of date Stabilisation of good material is frequently done	Wider range of material needs identification. Which/where/ why to be used			Accent on contract work by Works or Local Authority. requires an accent on practical training		TNZ are too rigid; initiative for development too restricted			Guide on materials. Nominated alternatives. Usage and handling		

Q13. A number of general comments referred to:

(a) The lack of practical knowledge of some practitioners and loss of good training personnel.

(b) The quarry industry was not up to date with the technology of road and pavement construction.

(c) Transit New Zealand requirements as inherited from NRB were a straightjacket, and a wider range of materials should be officially recognised.

(d) Type specifications were accepted as being the result of experimentation but they were considered to be remote from anything approaching premium quality. Roads with low traffic loadings do not require premium quality basecourse and the use of TNZ M/5 was a convenient way of overcoming the rigidity.

(e) A wider range of materials can be utilised when a higher degree of loading risk was acceptable. Consultants usually elect to go for a low degree of risk and to specify high grade materials when Transit New Zealand money was involved.

5. NEEDS OF ROADING PRACTITIONERS

The results of the survey do not necessarily reflect the attitudes and abilities of practitioners throughout New Zealand, but they do highlight a lamentable lack of knowledge in Auckland, a major region of the country.

There is therefore a real need to mount a programme to educate practitioners in all areas of the industry. The programme should provide:

(a) A description of research work carried out, the results and how they can be applied to current practice;

(b) Different forms of information for different groups, e.g. detailed information for students, summarised information for managers;

(c) The basis for an in-house seminar to be presented by an outside specialist;

(d) Video records of construction procedures to be used to supplement formal instruction.

6. HOW THE NEEDS CAN BE SATISFIED

Enhanced communication for transfer of information between research agencies such as Transit New Zealand and the roading practitioners is needed.

Five groups of users required individual treatment:

- Pavement designers and specifiers (particularly consultants),
- Road constructors (foremen, labourers, supervisors, technical support staff, estimators),
- Contract supervisors,
- Student engineers and technicians,
- Material suppliers.

Communication can be enhanced by use of:

- Text books, papers etc,
- Videos,
- Discussion groups,
- Workshops,
- On-site and/or in-house training,

or a combination of two or more of these methods.

Learning is a progressive process where the person receiving the instruction has to absorb and then digest the information provided. Different methods of instruction have to be used for different groups of practitioners. For the professionals (the designers and

specifiers), papers, formal lectures, videos, discussion groups and workshops are appropriate. The practical group (the road contractors) will find videos, discussion groups, workshops and on-site training more useful. Students, at both professional and technician level, will find lectures supplemented with videos, text books and papers the more useful methods. However, in all groups, on-the-job experience is needed to fully understand the technology. In Table 2 the methods of communication have been arranged in order of involvement of the recipient from "reading" or "listening" on the left to being fully involved in an on-site activity at the right.

Table 2. Methods of Communication.

User Group	Papers	Lectures	Videos	Discussion Groups	Workshops
Designers/specifiers	✓	✓	✓	✓	✓
Road constructors			✓	✓	✓
Quarry operators	✓		✓	✓	
Student (graduate) engineers	✓	✓	✓		
Contract supervisors		✓	✓	✓	✓

7. SUGGESTED COMMUNICATION STRATEGY

The main components of the communication strategy are considered here.

7.1 Papers

Prepare, or encourage the preparation of, papers and articles describing criteria for the production of aggregates for pavement construction and the factors that influence the performance of road pavements.

7.2 Lectures

Complete lecture notes suitable for the education of:

(a) Pavement designers and specifiers,
(b) Material suppliers,
(c) Road contractors,
(d) Contract supervisors,
(e) Student engineers and technicians.

Provide lecture notes and support material to Schools of Engineering at Universities and Technical Institutes.

7.3 Videos

Prepare a set of videos to illustrate the requirements for:

(a) A stable pavement,
(b) Production of suitable aggregates,
(c) Correct methods of construction,
(d) Criteria that control performance of a pavement.

One video may satisfy the requirements of users but it is quite likely that four separate videos tailored to the requirements of each will be required.

7.4 Discussion Groups

Foster the discussion of pavement construction and associated problems, within the work place, e.g. contractor's yard, local authority depot, etc.

Discussions could be based on the videos mentioned above or as a "post-mortem" examination of a completed project.

7.5 Workshops

Foster workshops throughout the country using:

(a) Papers, articles, lecture notes, videos,
(b) Practical demonstrations,
(c) Group discussions.

7.6 In-house training

Foster on-the-job training of road constructors using trained constructors. The basis of the strategy should be as outlined in Section 6, by providing:

(a) Interesting succinct articles for professionals through their professional magazines and Transit New Zealand publications,

(b) Technical lectures or papers to professional groups,

(c) Technical instruction to engineering students through the Universities and Technical Institutes,

(d) Information and instruction to worker and technician groups through workshops.

8. ESTIMATE OF COSTS

The cost of preparing the material for the communication strategy is expected to be in the order of $70,000, made up as follows:

(a)	Preparation of basic text — a complete summary of the main items of information that will form the basis of the lecture notes, videos, etc. This will involve a relatively brief review of current overseas literature, the most recent research reports and the relevant RRU Bulletins, papers etc. 3 weeks	$12,000
(b)	Prepare a set of lecture notes, overhead foils, etc. to form the basis for any formal address to groups of professionals and students 2 weeks	$8,000
(c)	Prepare an outline script for video, brief a script writer, edit video script or scripts.	$5,000
(d)	Prepare script, organise equipment, crew, etc., shoot video and edit for 10 minute maximum run time.	$30,000
(e)	Modify original video into a form suitable for at least 2 other groups, e.g. road constructors.	$8,000
(f)	Liaise with video producer, arrange shooting locations, construction plant, etc.	$2,000
(g)	Prepare packages of material for use by Schools of Engineering, contractors and local authorities.	$5,000
	Total	**$70,000**

The major cost in this strategy is that related to the production of the video. Costs for this can vary from less than $1,000 per minute (running time) to over $5,000 per minute, excluding the cost of any special effects or demonstrations, e.g. use of construction plant and materials.

To maintain the interest of the audience, the length of the video should not exceed 10 minutes. Hence the cost of a good quality video would not be expected to exceed $50,000 and a figure of $30,000 has been used in our estimate.

It is expected that the video will include scenes of road construction processes. As it should be possible to arrange for these to be recorded on actual construction sites, no additional cost should be involved apart from that related to organising and co-ordinating the filming within the construction activities.

9. PROGRAMME

The written material should be prepared during the winter of 1991 with a view to filming the video during the 1991-92 construction season. Distribution of the material could follow in the autumn of 1992 and the first workshop could be held early winter 1992 with, say, five others at monthly intervals thereafter.

In-house discussion and the on-job training should follow the workshops with refresher courses at two-yearly intervals.

The whole programme should be reviewed after a maximum of six years with a view to updating the data and repeating the workshops after that.

10. LIST OF SPECIFICATIONS USED IN REPORT

Transit New Zealand 1985. Specification for crushed basecourse aggregate. *Transit New Zealand Specification M/4.*

Transit New Zealand 1987. Specification for construction of unbound granular pavement courses. *Transit New Zealand Specification B/2.*

Transit New Zealand. Specifications for approved regional basecourses. *Transit New Zealand Specification M/5.*