Work Methodologies on Non National Roads

March 2004

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AN ROINN COMHSHAOIL, OIDHREACHTA AGUS RIALTAIS ÁITIÚIL
DEPARTMENT OF THE ENVIRONMENT, HERITAGE AND LOCAL GOVERNMENT

Work Methodologies on Non National Roads

The Department of the Environment, Heritage and Local Government

March 2004

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Foreword

In December 1997 the Department of the Taoiseach published a review of the efficiency and effectiveness of county councils' operations on non-national roads[1]. While recognising the quality of the maintenance and improvement work being carried out by councils, the review identified opportunities for improved performance. The review included the recommendation that the Department of the Environment and Local Government should prepare national guidelines or codes of practice for non-national roads.

A Working Group was established by the Department of the Environment and Local Government in February 1999 to pursue implementation of the recommendations of the efficiency review. At its inaugural meeting the Working Group (consisting of representatives from the Department, County Managers and County Engineers) agreed that a number of 'Best Work Practices' documents should be prepared which would draw on the experience of existing practitioners in the road maintenance and improvement area and facilitate the transfer of this experience to other county councils.

Six 'Best Practice' documents have issued to date:-

- Guidelines on the Depth of Overlay to be Used on Rural Non National Roads (May 1999)
- Guidelines on the Rehabilitation of Roads over Peat (May 2000)
- The Machinery Yard – A Value for Money Guide (May 2000)
- Guidelines and Tender Documentation for Road Marking Materials (July 2000)
- Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads (April 2002)
- Traffic Management Guidelines (May 2003) (jointly with Department of Transport and Dublin Transportation Office)

Having considered the recommendations of the Efficiency Review and the results of a subsequent survey into the use and role of direct labour and contract works on non-national roads projects, the Working Group decided that a Sub-Group should be setup to examine work methodologies on non-national roads and to identify current 'Best Practice' in this area.

The purpose of this report of the Sub-Group on Work Methodologies is to provide guidance to those involved in pavement strengthening works and small-scale realignments of both National and Non-National roads.

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[1] *A Review of the Efficiency of County Councils' Operations in the Non-National Roads Area*: KPMG Management Consultants: Department of the Taoiseach, December 1997.

The report consists of separate sections dealing with issues to be considered in contract procurement procedures, in the pre-planning of small or medium realignments, in pavement rehabilitation works and in quality control of road pavement materials. The report concludes with the results of a survey into typical materials, plant, work methods and practices in current use by Local Authorities.

Membership of Work Methodologies Sub-Group

Mr Tom Curran, Kerry Co Council
Mr John Morgan, Galway Co Council
Mr Niall McGuigan, Wexford Co Council
Mr Sean Davitt, NRA
Mr Martin Condon, DOEHLG
Mr John Devlin, DOEHLG

The Department of the Environment, Heritage and Local Government
December 2003

1. Procurement Procedures for Small to Medium Contracts for Services and Supplies

1.1 Introduction

Procurement procedures for small to medium size contracts are necessary to ensure transparency in the system when purchasing materials or services. Suppliers are reassured that they are competing on equal terms for the various contracts involved. The general public can see that competition is open and fair which ultimately is what both Government Departments and the E.U. require when funding projects. Better value for money is also likely given that increased competition should follow.

The procurement procedures which Local Authorities must follow are covered by three publications.

- The Department of Finance publication Public Procurement (Green Book 1994) with amendments issued from time to time by the Department.
  Part 1 National Guidelines.
  Part 2 EU and GATT Public Procurement regimes.

- The Department of the Environment and Local Government (Roads Division) Procurement Procedures. January 2001.

- The National Roads Authority's – N.R.A. Policy on Procurement Procedures.

All of these publications take into account current E.U. legislation which may be amended on an ongoing basis.

The most recent circular issued by the Department of the Environment and Local Government BC1/2002 EU Public Procurement Directives indicates that a revision of the thresholds will be carried out every two years.

The E.U. thresholds which apply to procurement are relatively high and it is procurement procedures and checks below these levels that are addressed here.

By implementing procedures which are too strict for small amounts a Local Authority may incur additional cost which is not justified given the overall sum involved or procedures that are so restrictive that they cause serious delay to carrying out the works in an efficient and orderly manner.

The procurement limits and procedures in Table 1.1 can be adjusted to local requirements and policies with regard to the opening signing and processing of tenders. These need to be borne in mind for auditing purposes.

1.2 Tender/Quotation Procedures

1. All requests for Tenders/Quotations must be in writing giving the latest time and date for receipt of Tenders etc.

2. Tender/Quotation documents must clearly set out the works to be priced with reference to the relevant standards, specifications, drawings etc. A bill of quantities must be included, with all works to be priced detailed.

3. A "Form of Tender" must be included to be filled and signed by the contractor.

4. When Tenders/Quotations are being opened the sealed envelopes must be stamped and the envelope signed by the persons opening the tenders/quotations. The envelope must be attached to each individual tender/quotation. Late tenders/quotations should be noted but must not be considered.

5. Tenders/Quotations received in area offices must be signed by two people (1 technical and 1 clerical staff), when opened.

6. Tenders/Quotations received in H.Q. must be signed by two Councillors and two Administration Staff. (Can vary according to standard practice in each local authority. Important to be consistent with adopted policy).

7. In assessing tenders/quotation all figures must be checked and corrected and tender totals signed by the checker, corrected figure to be signed.

8. All items in the bill must be priced otherwise the Tender/Quotation must be rejected.

9. In recommendation for approval, the following points must be outlined.
   (i) The total remaining allocation for the job.
   (ii) Procedures used in seeking tenders/quotations.
   (iii) Number of valid tenders/quotations received.
   (iv) Number of invalid/late tenders/quotations received (if any).
   (v) Summary of tenders/quotations received giving name and address of contractor/supplier and the total tender/quotation sum inclusive of VAT.
   (vi) List corrected and uncorrected tenders.
   (vii) Recommended Contractor/supplier and reason for recommendation.
   (viii) Statement that contractor/supplier has complied with all the necessary requirements e.g. C2/TC2 certificates, Health and Safety, Insurance, employee pension and sick pay scheme, etc)

10. The procedures for the various types and value of works are set out in Table 1.1. These procedures must be strictly adhered to. In all cases requiring E-tender procedures, all documents, advertisements etc should be vetted by the S.E.O. for the Unit.

Table 1.1: Procurement Procedures

Tenders/Quotations for Roads & Transportation Unit

Value of Works	Request for Tenders/Quotations	Documents Prepared By:	Tenders Opened By	Tenders Assessed By	Recommended For Approval By:	Approved By.
€ 0 - € 500	No quotation necessary provided budget holder is satisfied that value for money is obtained					
€ 501- € 5000	Min. 3 written quotations.	Area Staff	Area Office	Area Staff	Area Staff	E.E.
€ 5,001 - € 20,000	Min. 3 Written Quotations	Area Staff	Area Office	A.E/E.E.	E.E.	S.E.E.
€ 20,001 - € 50,000	Min. 6 Written Quotations	Area Staff	Area Office	A.E./E.E.	E.E.	S.E.E
€ 50,001 - € 300,000	Tender	S.E.E. (E.A) or Road Design	H.Q.	S.E.E. (E.A.) or Road Design	S.E.E. (E.A.) or Road Design	S.E. S.E.O.
€ 300,001 – EU Thresholds	Tender	S.E.E. Rd. Design	H.Q.	S.E.E. Rd. Design	S.E.	D.O.S.
Annual Tenders Stone	Tender	S.S.O. Roads &.Trans.	H.Q.	S.E.	S.E.	D.O.S.
Annual Tenders Binders (Supply and Spray/Delivery only)	Tender	S.S.O. Roads &.Trans.	H.Q.	S.E.E. Machinery	S.E.	D.O.S.
Annual Tenders Machinery	Tender	S.E.E. Machinery	H.Q.	S.E.E. Machinery	S.E	D.O.S.

A.E. Assistant Engineer
E.E. Executive Engineer (Area)
S.E.E. Senior Executive Engineer (Electoral Area)/ (Road Design)
S.S.O. Senior Staff Officer
S.E. Senior Engineer
S.E.O. Senior Executive Officer
D.O.S. Director of Services

2. Guidelines for Small or Medium Realignments

2.1 Introduction

The work undertaken by Local Authorities in the Non-National Roads Area for the Department of the Environment, Heritage and Local Government can be sub-divided into 3 main areas:

- Routine Maintenance
- Pavement Rehabilitation
- Small or Medium Realignments or Improvements

Road improvements because of their greater scale and because they generally give rise to activities such as earthworks and drainage not associated with maintenance or pavement rehabilitation are acknowledged as being more costly than the other types of work. However, in addition, because of the greater number of unknowns at the outset, road improvements are more likely to give rise to unforeseen cost increases and delays compared with maintenance or pavement rehabilitation. The delays or cost increases are most likely to arise from:

- Land Acquisition and associated accommodation works
- Archaeological remains along the line of the new road
- Difficult ground conditions
- Relocation of services

2.2 Land Acquisition

The acquisition of land for road realignments is an obvious necessity without which the works cannot commence. Because of the delays associated with acquiring land compulsorily road authorities generally attempt in the first instance to acquire the land by agreement with the landowner. However increasingly it has become more difficult to acquire land in this manner and this has led in some instances to deferment of schemes.

Local authorities cannot always acquire by agreement the lands needed to carry out their statutory powers in relation to non-national roads. For this reason they have, for a long time, enjoyed powers of compulsory acquisition of land which are usually effected under the Housing Act 1966. Where land is compulsorily acquired, compensation is assessed having regard to statutory rules and by principles laid down by the courts. The relevant legislation in this regard is the Land Clauses Act, 1845, the Acquisition of Land (Assessment of Compensation) act 1919 and the Fourth Schedule to the Local Government (Planning and Development) Act 1963.

In situations where it is possible to acquire the land by agreement, it is recommended that all the land necessary for the realignment schemes be acquired in the year prior to the commencement of construction. Construction should not commence on part of the site where land has been acquired in anticipation of successfully acquiring the remainder of the land.

Regardless of whether land is acquired by agreement or compulsorily it is very important that once land is acquired it should be taken into possession by the local authority and fenced. Failure to do so could result in the previous owner or another party gaining adverse possession of the land.

2.3 Archaeology

It is imperative that the archaeological impacts of any road scheme be addressed at the earliest possible stage to ensure that the costs associated with such works are estimated, to decide whether such costs make the proposed scheme uneconomic, and to ensure a cost effective and properly managed archaeological strategy is employed. If archaeology is not handled in a proficient manner, this could lead to unacceptable delays and associated costs.

It is National Policy and also reaffirmed in the Code of Practice agreed between the Minister for Arts, Heritage, Gaeltacht and the Islands and the NRA in 2000 that:

" Every effort must be made to avoid direct impacts on archaeology taking account of road design and safety implications, environmental and other costs".

To ensure this happens, the preliminary archaeological survey and assessment of the site should be carried out before the discussions on land acquisition with the landowner are commenced.

While the first option is to move the proposed realignment to avoid the archaeological site, the second option should be to preserve the archaeological remains. Where preservation in situ is not feasible, archaeological testing and excavation i.e. preservation by record, is the only alternative. This work should be carried out in a cost effective and comprehensive manner which should ensure that the necessary archaeological work is carried out and completed in advance of construction.

A similar situation pertains about the incidence of unmarked children's graves, which can give rise to local resistance if they are to be disturbed for new road works.

2.4 Ground Conditions

Cost escalation due to unforeseen ground conditions is a recurring cause of small or medium road realignment schemes exceeding budget. If the ground conditions are very difficult as can be the case where soft subsoil such as peat or alluvial silt or clay is encountered and excavation of such soils is the preferred option, the danger of unexpected increases in the quantities of excavation and fill materials is much greater than in normal ground conditions. As the fill material generally used in such situations

is generally rock which has to be imported, the cost of this work is much greater than with other types of earthworks. In these situations increases in quantities will greatly impact on the final cost of the scheme.

It is imperative that a proper site investigation is carried out to accurately determine the ground conditions that will arise on site and to take these into account in designing the scheme. In particular if soft subsoil conditions are encountered, full details of the soils and their properties should be ascertained. Excavation and back filling with rock is still the solution most favoured by many road engineers as it gives greatest certainty of long term performance of the road, but it is also likely to be the most costly construction option. Where the depth of soft soil exceeds 2 metres other options should be considered and costed before a final decision is taken on the technique to be employed. The option of stabilising soft soils by surcharging and leaving the soft soil insitu should be considered more often than is presently the case. The use of these options makes greater demands on engineering skill and may take longer to carry out on site but they will give greater certainty in terms of construction cost.

It is vitally important to seek expert geotechnical advice at an early stage of a scheme if unusual soil conditions are encountered. In some instances the solution to the problems posed by soft soils may involve careful loading of the soil to enable it to slowly build up the necessary strength for its intended purpose, but in other situations the use of an appropriate geotextile or geogrid may overcome the problem and allow construction to proceed at a normal rate. Either solution would be more cost effective than excavation of the problem soil and backfilling with rock fill or other granular material.

The Waste Management Act, 1996 as amended and associated Regulations place a framework on the management of waste, that may arise from road schemes. When subsoil or other material is surplus to requirements and is discarded, this material is waste and its management comes within the remit of the Waste Management Act, 1996. The associated costs with the recovery or disposal (including the landfill levy) of this material should be factored into any engineering solution. Where possible minimisation of the waste in the first instance followed by recovery is to be favoured in preference to disposal.

2.5 Public Utilities

The problems posed by the incidence of public utilities needs careful consideration at an early stage of the design of small or medium realignments and any relocation of such services should be properly planned as early as possible in the design and the cost of such work should be clearly established. The public utilities that are most likely to be encountered during the realignment of a road are telecommunications, electricity and water mains, and in urban areas sewerage schemes. With the extension of piped gas supplies to many areas it is likely that in future greater consideration will have to be given to gas mains and services. The question of who carries out the diversion of the services, the cost of such work, and who pays for all of the service diversions needs to be decided at an early stage of the project to allow the project to be fully costed and to facilitate proper planning of the works on site. The bodies or Statutory Undertakers who will be most effected by relocation of services are: -

- Eircom/Licensed Undertakers in the Telecommunications Sector
- Electricity Supply Board/Licenced Undertakers in the Electricity Sector
- Local Authority or Regional Water Supply Board responsible for water supply
- The Gas Board
- TV cable operators

It is desirable that the relocation of all underground services be completed in advance of pavement construction. All such works should be carried out in accordance with the document " Guidelines for the Opening, Backfilling and Reinstatement of Trenches in Public Roads" published by the Department of the Environment and Local Government in April 2002.

2.6 Documentation For Small/Medium Realignments

Sufficient documentation for a realignment scheme is necessary to quantify the scale of the works, to describe the manner in which the work is to be carried out, and to allow the works to be costed. The minimum documentation required is a set of drawings showing the extent of the works, including a plan of the works, a longitudinal section showing existing and proposed levels, typical cross sections, details of tie-ins, a specification, and a bill of quantities to enable the cost of the works to be estimated. The documentation should also include a full schedule of the accommodation works including details of driveway entrances. If the work is to be carried out by contract, in addition to the above drawings showing cross sections at set intervals, a form of tender, health and safety plan, and form of bond will be required.

The preparation of proper documentation is important as it will ensure that adequate planning has been put into the scheme, which should reduce the likelihood of unplanned extra work arising during construction and should allow more realistic estimation of the cost of the work at the earliest possible stage of the project. Without such documentation and the accompanying preparatory work it may be imprudent to proceed with an improvement scheme.

2.7 Guidelines For Small Or Medium Realignments: Final Review Checklist

(Where appropriate backup documentation should be on file as confirmation)

Please complete checklist by ticking the appropriate box.

Checklist Item	Yes	No
a) Is the Project Engineer satisfied that the drawings and specifications are complete?		
b) Is the Project Engineer satisfied that the drawings and specifications complement each other?		
c) Is the Project Engineer satisfied that the scheme design is complete and that scale of the proposed realignment matches the allocation, including reasonable contingency for unknowns?		
d) Has the Project Engineer sought and got approval from the funding authority for the scheme as finally prepared?		
e) Has all land necessary for the scheme been acquired and are all land issues that could prevent "Possession of the Site" agreed, including any easements necessary for the works?		
f) Are all accommodation works agreed with the owners, and designed, detailed and itemised (or alternatively dealt with)?		
g) Have environmental issues arising from the various Statutory Procedures (i.e. known archaeology, waste management issues, planning/environmental land zoning, EIS mitigation needs etc.) been dealt with to avoid unscheduled delays?		
h) Have site access routes been defined and has vehicle use on Public Roads been made clear?		
i) Has the location of underground services been checked physically and verified and consultations with all statutory authorities successfully completed?		
j) Has the cost of dealing with underground services and statutory undertakers affected by the road scheme been estimated realistically and included in the project cost?		
k) Has a site investigation been carried out and is all necessary earthworks design completed or are there any outstanding issues relating to the geotechnical/earthworks area of the scheme?		
l) Has all necessary investigations and designs for culverts or minor bridgeworks been carried out including consultations with interested parties?		
m) Have arrangements been made to supervise, manage, and control the proposed works, including a suitable material's testing regime and the provision of site staff?		
n) Has the Project Engineer made arrangements to have a safety audit carried out?		
o) Has the Project Engineer compiled a final report on the completed works for the funding authority giving details of the works carried out, any changes from the original proposal and the final outturn cost compared with the original estimate?		
p) Has the Project Engineer compiled a final report for the funding authority on the quality of the materials used in the works?		

3. Guidelines for Pavement Rehabilitation

3.1 Introduction

The work undertaken by Local Authorities in the Non-National Roads Area for the Department of the Environment, Heritage and Local Government can be broadly sub-divided into 3 main areas:

- Routine Maintenance
- Pavement Rehabilitation
- Small or Medium Realignments

This section lists the steps that should be taken in the preparation of a pavement rehabilitation scheme. While there is no clear dividing line between some forms of pavement maintenance and minor pavement improvement, " pavement maintenance" is generally defined as those activities designed to preserve the road pavement whereas "pavement rehabilitation" is considered to result in some improvement or strengthening of the pavement structure. Depending on the amount of improvement or strengthening planned, the difference in cost between the two activities can be considerable. Therefore if major pavement improvement is intended it is important to plan the works and see that all stages are properly planned if the works, which are generally carried out by contract, are to be executed in an efficient manner.

Pavement rehabilitation can be simple where minor improvement resulting in a relatively short extension of the pavement life (< 5 years) is intended, or it can be more elaborate where it is planned to extend the life of the pavement by about 20 years. In the former case it is more likely that an overlay, which may be a thin bituminous layer or a layer of crushed stone, generally following the vertical profile of the existing road, will be used. Where much longer pavement lives are planned, the possibility of improving the vertical alignment of the road, and also improving the pavement width, if necessary, should be seriously considered. Such improvements will add to the costs of the works, but will improve the serviceability and safety of the road.

If services (sewers, watermains, etc) extending under the carriageway of a road scheduled for pavement rehabilitation are to be provided or upgraded, then works associated with such services should be completed well in advance of (and preferably a year before) the pavement rehabilitation so that any settlement and movement in the existing road will have finished before overlay work commences.

3.2 Design Stages For Pavement Rehabilitation

The amount of design required for a pavement rehabilitation scheme will depend on the scale of the proposed works and the level of detail required in its delivery on site. If the works are to be constructed to design levels a topographical survey of the site will first have to be carried out. There are a number of benefits from adopting such an approach. Firstly the impact of the proposed works on existing roadside developments can be determined in advance, and especially the relationship between new road

levels and levels at existing developments and entrances. The amount of regulating material can be accurately estimated in advance, which greatly improves the prospect of the quantities and cost of the works being known at the design stage. A topographical survey will also allow the effect of improving the vertical profile to be investigated if such is considered desirable.

An assessment of the existing pavement strength should always be carried out at the design stage to ensure that the proposed overlay design will meet the intended design life for the future traffic. The normal approach is to carry out a Falling Weight Deflectometer (F.W.D.) survey to assess the strength of the existing pavement and its supporting layers. When this survey data is taken into consideration along with information of the existing pavement and the estimated future traffic an appropriate depth of overlay can be arrived at for a variety of overlay materials. This approach is recommended as it will on the one hand guard against under-design by adopting an unduly thin overlay which will fail prematurely, and protect against wasteful designs by adopting excessively thick overlays. Details of the approach to be adopted are given in the "Guidelines on the Depth of Overlay to be Used on Rural Non National Roads" published by the Department of the Environment and Local Government in May 1999.

The rehabilitation of pavements with peat foundations poses a different problem to road engineers, as the use of large overlay depths is unlikely in many instances to provide a suitable long-term solution. Where the existing pavement construction is very weak and is founded on a weak compressible subgrade such as peat, the use of geosynthetics such as geogrids to reinforce the pavement overlays should be considered. Details of the various techniques used in such situations are given in the "Guidelines on the Rehabilitation of Roads over Peat" published by the Department of the Environment and Local Government in May 2000. Recommendations are given in this document on the most appropriate techniques and materials to be used having regard to traffic, site conditions and cost, and such recommendations should be adopted in roads with weak foundations.

3.3 Documentation

The amount of documentation needed to ensure that pavement rehabilitation works are delivered as planned and to budget will depend on the scale and complexity of the works. If the works are small and the constraints are few as may be the case on a rural road with little roadside development, which will often be the case for non- national roads, a schedule of rates for the materials to be used, a plan showing the extent of the works and the mean overlay depth, will often be sufficient.

For larger schemes- generally over 1 km in length- and where varying depths of expensive bituminous materials will be used it may be prudent to prepare more extensive documentation with drawings showing existing and finished levels, a typical cross section and edge details at developments. The documentation should also include a bill of quantities, and safety statement.

The materials used in any pavement rehabilitation should comply with the NRA Specification for Road Works.

3.4 Quality Control Of Pavement Materials

For all pavement rehabilitation works adequate sampling and testing of the materials used is essential to ensure that the works are carried out in accordance with the relevant specifications. Monies spent on assuring the quality of road making materials will be repaid in the performance of the road and will ultimately have an important effect on the network. The appropriate amount of sampling and testing will depend on the volume and type of materials used. The tests required for different materials and suggested minimum sampling rates are given in Tables 4.3 and 4.4 of Section 4. For smaller schemes a minimum of one sample per material per day is desirable but for larger schemes sampling rates of 1 per 200 tons of material delivered may be more appropriate. If cold-mixed bituminous materials are to be used the results of recent strength tests performed on Duriez compression samples should be sought before material is used on site and it should be a contractual condition that the supplier produces similar test results of the mixed material to ensure that material delivered initially is satisfactory. Subsequent testing should be the responsibility of the supervising authority. For most work, a vital factor in assuring quality is the ready availability and frequent use of a materials testing facility capable of producing results at short notice. A preplanned programme stating the frequency and methods of testing to be adopted should be prepared, and such plans should indicate the action to be taken in the event of sample failure.

The quality assurance plan to be adopted by the road authority should ensure that the materials delivered to site are in compliance with the specifications for the works. The sampling rates and associated testing rates quoted in Table 4.4 of Section 4 provide useful guidance. Particular care is needed in the early stages of pavement rehabilitation works to confirm the quality of the supplied material if one is to avoid the sanction of removing non-compliant material at a later stage. When sufficient test results are available to confirm that the materials being supplied are compliant, the rate of testing may be reduced. The most sensible approach to quality control of pavement materials is to adjust the rate of sampling and testing to the degree of compliance established by earlier testing. On completion of the works there should be sufficient test results to show that all the pavement materials incorporated in the works complied with the relevant specifications.

While the works are in progress the supervising engineer should visit the site each day to ensure that quality control, level control and all necessary checks are being carried out.

When the works are completed the funding authority should seek a report on the scheme. In addition to the physical details of the completed works such as the length, width, pavement construction and financial outturn, the report should also include a summary of the tests performed on the materials and a set of typical test results for each material used. Such information is very important for record purposes especially if a database is kept of the road network and will be important in comparing the long-term performance of different maintenance techniques and materials.

3.5 Ancillary Works

The rehabilitation of a road pavement often gives rise to other ancillary works some of which are necessary from a safety viewpoint and some of which are desirable to ensure more satisfactory performance of the improved pavement. Priority must be given to the safety of the road user during the planning and execution of any pavement rehabilitation works, and the completed works should lead to an overall improvement in safety as well as serviceability.

As most pavement strengthening gives rise to an increase in level in the road, the adjacent verges will have to be raised accordingly. The material used for this work is the cheapest locally available suitable material- generally clay.

It is very desirable that where any significant pavement rehabilitation works are carried out consideration should also be given to improving drainage of the road pavement and existing earthworks. This may be simply to fully restore existing drainage paths/outfalls or outlets from the verge. In a small number of cases it may necessitate creating a new outfall for runoff from the road. Experience has shown that appropriate drainage works greatly improves the serviceability of the road and leads to prolonged pavement life.

Consideration should also be given to improving safety in locations where the pavement rehabilitation will give rise to increased speeds, especially on bends.

Delineation of roads should be consistent over the improved section of road and such measures as the signing and lining of roads will increase safety. In a limited number of sites it may also be advisable to erect new safety barrier in particularly vulnerable locations or where there has been a history of recent accidents.

3.6 Guidelines For Pavement Rehabilitation: Final Review Checklist

Please complete checklist by ticking the appropriate box.

Checklist Item	Yes	No
a) Is the Project Engineer satisfied that the section of road to be rehabilitated has been selected in an objective manner and that other sections of road should not be given priority?		
b) Can the proposed treatment be supported by objective measurements or survey results?		
c) Has a Falling Weight Deflectometer (F.W.D.) survey been carried out, with the associated report and recommendations giving overlay depths?		
d) Has the pavement strengthening proposal been based on an F.W.D. survey?		
e) Has a topographical survey of the section of road been carried out?		
f) Has the Project Engineer prepared the necessary documentation (drawings, specifications, bills of quantities) to allow the cost of the proposed works to be priced?		
g) Are all accommodation works agreed with the owners, and designed, detailed and itemised (or alternatively dealt with)?		
h) Have consultations with all necessary statutory undertakers been successfully completed, and has the location of underground services been checked physically and verified where such services will effect the proposed works?		
i) Has the cost of dealing with existing services and statutory undertakers been estimated realistically and included in the project cost?		
j) Have works associated with providing or upgrading any services been completed sufficiently far in advance to prevent settlement or movement in the existing road?		
k) Has the cost of all ancillary works, such as drainage improvement, verge treatment, delineation and other works been included in the estimate?		
l) Have arrangements been made to supervise, manage, and control the proposed works, including the provision of site staff and means to check the quality of all the pavement materials supplied?		
m) Has the Project Engineer made arrangements to carry out any necessary safety audits?		
n) Has the Project Engineer compiled a final report on the completed works for the funding authority giving details on the works carried out, the materials used, and the final outturn cost compared with the original estimate?		
o) Has the Project Engineer compiled a final report on the quality of the materials tested, with details of the sampling and testing rates employed for each material		

4. Quality Control of Roadmaking Materials in Pavement Rehabilation.

4.1 Introduction

Typically a road pavement is made up of three or four distinct layers:

Layer 1: Surfacing layer, generally a bituminous material on heavily trafficked roads, and surface dressing chippings on more lightly trafficked rural roads.
Layer 2: Road base or main structural layer. In heavily trafficked roads this layer is made from bituminous material, while on roads carrying light to medium traffic, unbound crushed stone is generally used.
Layer 3: Sub-base layer, generally constructed with crushed stone or gravel.
Layer 4: Natural soil foundation generally described as the sub-grade.

In many rural roads there would be no clear distinction between layers 2 and 3.

The ability of a road pavement to withstand the traffic loads over its design life is to a large extent dependent on the quality of the construction materials used. It cannot be emphasised enough, that if inferior materials are used, premature failure of the road will occur. Experience over the years has shown that roads that failed to reach their design life invariably contained substandard materials. Monies spent on assuring the quality of road making materials will be repaid in the performance of the road and regular and competent testing of materials should be an essential requirement for all pavement works.

In relation to the testing and quality assurance of road making materials a local authority must decide on the following:

1. The amount of testing needed for any particular material.
2. The volume of testing that should be carried out locally.
3. The volume of testing that should be carried out at other test facilities.
4. The need to seek accreditation for the local test facility.

4.2The Role of a Local Authority Test Facility in Testing Road Making Materials.

The volume of materials used annually in the construction and maintenance of roads in most local authorities is great, particularly in the large local authorities. Certain activities such as resurfacing or surface dressing of roads recur annually, as does the need to carry out minor improvement works. In addition larger road schemes occur occasionally, which need the support of laboratory test facilities. If such schemes are very large it has been normal practice to set up a facility on site to service such schemes.

In the case of all other schemes there is a need for the local authority to have in place such arrangements as will deliver the necessary information on the quality of the materials being used and such information should be provided in a timely and cost effective manner. The experience to date indicates that the best arrangement is to carry out most of the large volume testing at local level using the authority's own technicians, and to have the less frequent tests that need more specialist equipment or specialist technician training carried out at an external facility. The external facility can be a commercial laboratory, or a facility in a third level institute. Such an arrangement makes more efficient use of costly equipment in such external facilities as they can draw work from a larger catchment area than an individual local authority facility.

There are a number of advantages for a local authority having a local test facility. Test results should be made available more quickly to the engineering staff than if the samples have to be sent to an external facility. The proper working of a local authority laboratory leads to a greater understanding of the issues involved in quality assurance of materials and generally gives rise to more interest being taken by all the engineering staff involved in this area of work. It has often been noted that an increase in sampling and testing of such materials gives rise to an immediate improvement in the quality of the materials as suppliers know that a regime of testing is being put in place and there will be less scope for supplying sub- standard material in future.

The decision to seek accreditation for a local authority laboratory should be taken in the light of the uses to be made of the test results from the laboratory. Achieving and maintaining accreditation for a laboratory leads to an increase in costs. If the results are for the information of the Client (Local Authority) and it is not intended to use the results in any judicial setting such as arbitration, accreditation will not be essential.

4.3The Role of the Local Authority Technician in Testing Road Making Materials

Materials technicians in local authorities have a valuable role to play in:

- Sampling materials
- Testing materials
- Reporting test results to interested parties
- Keeping records of materials tested

Correct sampling of road making materials is a critical element of the quality control of such materials and is an important first step in establishing the quality of the material under scrutiny. The taking of representative samples of materials demands great skill and varies with the testing needs for each individual material. Guidance on sampling of road making materials, minimum sampling rates and the relevant specifications relating to the sampling and testing of road materials are listed in Tables 4.3 and 4.4.

It is suggested that initially local authority technicians should be trained in testing the large volume materials that are used annually by the authority. Such materials include

chippings for surface dressing, crushed stone used in pavements, and bituminous materials used in road surfacing and in the pavement layers.

Surface dressing chippings should be tested locally for grading (particle size), shape (flakiness) and dust content. Other tests on chippings that are related to the geology of the rock source, from which the chippings were crushed, should be sent to an external facility. Such specialist tests are carried out once or twice per year for each quarry.

Crushed stone, which is the largest volume material used by road authorities should be tested locally for grading, shape, and cleanliness as indicated by plasticity tests or liquid limit tests.

Bituminous materials should be tested for grading, and binder content. The latter test tells the amount of the bitumen in the material and this parameter is particularly important as a reduction in the specified quantity is likely to result in poor performance of the material in the road pavement.

The timely reporting of test results to the engineering staff in charge of works is very important so that any material that is inferior is rejected and removed from the works. Immediate test results can be used to ensure that any necessary changes in the production of the offending material are quickly implemented by the supplier. This is particularly important in the case of hot mixed bituminous materials where large volumes can be laid daily.

The recording of results of the materials used is an important activity, as it will provide important baseline data that can be consulted in assessing future performance of roads in a county.

4.3.1 Laboratory Equipment for the testing of road making materials.

The items of equipment that will be needed for the testing of the materials listed above are as follows:

Testing of Unbound Granular Material (Crushed stone, Gravel)

The following test equipment will be required to carry out testing of granular materials:

1. Drying Oven – 225Litre capacity.
2. Sample Dividers – Riffle Box.
3. Coarse Balance – Readable to 0.1g
4. Analytical Balance – Readable to 0.01g
5. Test Sieves.
6. Flakiness Gauges.
7. Sieve Shaker.
8. Cone Penetrometer.

Testing of Bituminous Materials:

The following tests should be carried out on all bituminous materials i.e. Hot Rolled Asphalt, Macadams, Thin layer surfacings, Pre coated and Surface dressing chippings.

- Grading
- Bitumen Content
- Shape/Flakiness Index.

The following test equipment will be required to carry out the tests on surfacing materials:

1. Drying Oven – 225Litre capacity.
2. Sample Dividers – Riffle Box.
3. Muffle Furnace – Ignition Method.
4. Test Sieves.
5. Flakiness Gauges.
6. Sieve Shaker.

The skid resistance of wearing course surfacings, whether the surfacing is Asphalt, Macadam, or Surface Dressing is crucial, and is dependent on the Polished Stone Value (PSV) of the coarse aggregate. This test is generally carried out at an external laboratory and it invariably takes weeks or sometimes months for results to made available. Aggregates with a high grit or sand content generally have high PSV's, while limestone that can become polished generally have low PSV's. To ensure that the aggregate is not limestone, a useful test is to immerse a portion of the coarse aggregate, after analysis, into a dilute solution (10%) of Hydrochloric Acid (HCl). If it is a limestone aggregate, there will be a high proportion of calcium carbonate present, which will react with the HCl producing carbon dioxide and thus a vigorous effervescence in the solution. Conversely, if it is a non-limestone, there will be little or no reaction when the aggregate is placed in the solution.

In addition to the above tests for surfacing materials, there are often certain physical requirements specified for the aggregate in the mix and where pre coated and surface dressing chippings are applied. These tests[2], which are generally conducted at external laboratories are as follows:

- Polished Stone Value (PSV) (see footnote)
- Aggregate Crushing Value (ACV) (see footnote)
- Aggregate Abrasion Value (AAV) (see footnote)

These particular test values are specific to the end use of the aggregate but it is essential that current test certificates are obtained to ensure that the chippings meet the specification requirements of the particular contract.

[2] Tests should be carried out by an accredited Testing House

4.3.2 Density testing of road making materials.

The performance of most road making materials is influenced by their insitu density. Particular care should be taken to ensure that the materials in question receive adequate compaction and achieve minimum densities relative to the maximum densities that can be achieved for these materials in laboratory tests.

The compaction of most soils and unbound pavement materials is generally specified by stating the compaction methods by means of Tables 6/4 and 8/1 of the NRA Specification for Road Works but some supervising authorities supplement these compaction requirements by carrying out density tests on the compacted materials. The compaction of bituminous bound materials is specified in Clause 901 of the NRA Specification for Road Works, which specifies both the type of compaction plant to be used, and the Percentage of the Refusal Density achieved in a laboratory compaction procedure. In the case of cold mixed bituminous materials and cement bound pavement materials such as lean concrete, the minimum percentage of densities achieved in laboratory compaction tests are specified.

The testing of road making materials for density while important, is generally laborious. The test methods used are described in detail in the various standards relating to the particular material, but the two most common methods now employed are displacement methods and nuclear methods.

The traditional method of checking the insitu density of embankment soils by sand replacement methods is slow and laborious and is increasingly being replaced by the use of nuclear density methods, which are non-destructive and capable of much greater output.

The use of nuclear density gauges is controlled by the Radiological Protection Institute of Ireland who issue licences for the importation and use of such equipment. Of particular importance is the need to draw up and enforce radiation safety procedures covering the use of nuclear density gauges. Such procedures cover the use of the equipment in the laboratory and on site, the safe storage of the equipment and the naming of the qualified operators who may use the equipment. Such qualified operators must be given appropriate training in the use of the equipment and in radiation protection and be monitored in the radiation dosage absorbed while using such equipment.

4.4 Sampling of Road Making Materials.

4.4.1 Introduction to Sampling Methods

A Laboratory Sample is a sample capable of being submitted to a laboratory for testing and producing a meaningful result. All stages of sampling leading to the production of test portions require skill and care. The sample must be representative of the mass of material it is taken to represent i.e. lorry load or stockpile.

It is important to remember that a bad sample is worse than no sample at all. This is because action may be initiated on a result from a bad sample that once set down on paper appears very authoritative, but the information it supplies to the client is incorrect.

Correct sampling can be achieved by sampling in a prescribed manner as set out in the relevant British and/or European Standards. These standards will give instructions on how to sample, where to sample, and on what sampling method and tools to use.

The following is a brief outline of the procedures to follow when sampling the most common pavement strengthening materials used in this country i.e. granular unbound base and sub- base materials, surface dressing chippings and bituminous materials.

4.4.2 Sampling Unbound Granular Materials, Cold Mix Bituminous Materials and Surface Dressing Chippings.

Apparatus: A large scoop i.e. Holds about 3kgs of sample.
Plastic Sampling Bags, clean and impervious.
Sample divider i.e. Riffle Box with at least 50mm slots.
Tags or Labels and ties for securing bags.

Procedure: Obtain a bulk sample by collecting a sufficient number of increments (i.e.scoopfuls) to provide the required quantity of aggregate for the tests. The number of increments shall not be less than those given in Table 4.1.

Table 4.1. Minimum number of sampling increments.

Nominal size of aggregate	Minimum number of sampling increments	Minimum mass of sample (Kg)
28mm and larger	20	50
5mm to 28mm	10	25
5mm and smaller	10 (half scoops)	10

When sampling from stockpiles or heaps, which is the preferred location for sampling chippings and granular material, take the required number of increments from positions evenly distributed over the whole surface of the heap. When taking each increment remove as much surface material as possible, about 150mm, and then dig the scoop into the exposed material.

When sampling is complete ensure that bag is securely tied and labelled. It is very important to seal the bag well to stop the sample from drying out and/or losing fine material, which may effect the results of subsequent tests. The labelling should include reasonable detail on the sample i.e. Type of material, Manufacturer, Location, Date of sampling, Reference number (if appropriate) and name of sampler.

4.4.3 Sampling Bituminous Materials.

Apparatus: A sampling shovel. i.e. Holds about 7kgs of sample.
Sample Containers. Clean and manufactured from material with properties appropriate to type of material being sampled and for further treatment of that sample, e.g. transportation and reheating. Heavy duty cardboard boxes with lids and capable of holding sample weights of approximately 25 Kgs are typically used for this purpose.
Sample divider i.e. Riffle Box with at least 50mm slots.
Heat Resistant Gloves.

Procedure: Normally sampling will be carried out on site from either a lorry load of the material or from the aughers of the paving machine. For either of these sampling methods the minimum mass of each sample should be greater than or equal to the values in Table 4.2.

Table 4.2. Minimum mass of bulk samples.

Nominal size of aggregate (mm)	Minimum mass of bulk sample (Kg)
>20	24
<20	16
Note. The above minimum masses of samples are sufficient to provide a lab sample for both the supplier and the client.	

When sampling from lorries take four increments of approximately 7kg each from about 100mm below the surface of the material. Take increments as widely spaced as possible but not closer than 300mm to side of lorry.

When sampling from a paving machine take two increments of approximately 7kg from each side of the paver, a total of four increments. Take increments only when the augers are charged throughout their length. Take the increment by pushing the shovel into the material in front of the auger and removing it when full.

Combine the increments to form the bulk sample. Each sample should be clearly labelled and should include the following information:

1. The contract or job.
2. The supplier and location of mixing plant.
3. The delivery docket number, if possible.
4. Sample number
5. Sample location i.e. chainage.
6. Date and time of sampling
7. Material type and specification (if known).
8. Name of sampler.

Sample reduction for both granular and bituminous materials should be carried out using the riffle box in accordance with BS 812: Part 102: 1989. Bituminous samples, unless taken to testing lab immediately after sampling, will require heating prior to riffling. The material should be heated in oven at a temperature range of 120°C to 140°C. Do not leave the sample in the oven for more than 4 hours.

Table 4.3: Specifications to be used in the sampling and testing of Road Pavement Materials.

TEST	SPECIFICATION
Sampling Granular Materials	B.S. 812 Part 102:1989
Grading – sub-base material	B.S. 812 Part 103: 1989
Flakiness Index	B.S. 812 Part 105:1989
Liquid Limit	B.S. 1377 Part 2 : 1990
Sampling Bituminous Materials	B.S. 598 Part 100:1987
Grading/Bitumen Content-Ignition method	B.S. DD250: 1999

Table 4.4: Suggested Minimum Sampling Rates For Pavement Materials For Minor Road Works.

Material	Tests Required	Minimum Sampling Rate	Comments
Capping	Wet Grading	1 per week	
Cl.804, 806	Wet Grading	2-3 per week	Early testing & feedback important
	Moisture Content	Daily	
	Liquid Limit / Plasticity.	2 per week	
	Ten Percent fines Value (TFV)	Prior to use	
	Shape/ Flakiness	Monthly	
	Maximum Dry Density & Optimum Moisture Content	2 per year	
Roadbase	Grading, Binder Content	1 per 200T or 1 per day (min)	As above
Basecourse	Binder Penetration	Prior to use/per load	
	Percentage Refusal Density	Daily at start and then weekly.	
	Nuclear Density Gauge	Daily @ 50m on each strip.	
Hot Rolled Asphalt	Grading, Binder Content	1 per 200T or 1 per day (min)	As above
	Binder Penetration	Prior to use / per load.	
	Sand Grading	Prior to use / ex quarry.	
	Polished Stone Value (PSV)	2 per year ex quarry.	
Precoated Chippings	Binder Content, Grading, Shape/Flakiness Index	1 per stockpile.	
	Polished Stone Value (PSV)	2 per year ex quarry.	PSV test carried out on 10mm Size chips.
Surface Dressing Chippings	Grading, Shape/Flakiness Polished Stone Value (PSV)	1 per stockpile 2 per year	
	Aggregate Crushing Value (ACV)	2 per year	
	Aggregate Abrasion Value (AAV)	2 per year	

5. Work Practices Survey

5.1 Background

The Work Methodologies Sub-Group circulated a questionnaire to all local Authorities in October 2002 with a view to surveying and assessing typical

- materials,
- plant,
- work methods and practices

in current use by Irish Local Authorities for the maintenance and improvement of public roads. The questionnaire was structured to produce a snapshot of the national situation as of the year 2002.

5.2 Purpose

The primary purpose of the survey was to

- Provide an overview of materials, methods and plant in current use by Irish Local Authorities
- Identify Local Authority expertise and experience in various work methods
- Provide direction for the provision of training in best practice in road maintenance and improvement.
- Promote an awareness in Local Authorities of practices in other Authorities
- Enable individual Authorities to compare their work practices against those of other Authorities, to facilitate consideration of other work practices, or amendments to existing practices.

5.3 Scope of Survey

The questionnaire was issued to 27 Local Authorities. Replies were received from 20 Local Authorities, three of which were urban in nature.

5.4 Survey Results

Some of the more relevant information returned is summarized in the eleven tables attached, under the headings:

- Principle strengthening materials used
- Typical (plant) outputs
- Basecourse Dense Bitumen Macadam usage
- Clause 804 usage
- Clause 810/806 usage
- Surface dressing over Clause 804/806/810
- Surface dressing over bituminous layers
- Surface dressing methods used
- Surface dressing plant used
- Use of poly-modified bitumen and high psv chippings in surface dressing
- Patching units: types and numbers in use

5.5 Interpretation of Results

At the foot of each table, the results have, where relevant and feasible, been summarized into maximum, minimum and median values in order to allow the participating Local Authorities to compare their practices with those of other Authorities. In addition, some remarks have been inserted at the foot of each table where considered relevant.

No subjective comment has been passed in the remarks sections as to the qualitative aspect of any figure, method or equipment quoted by any Authority. By the same token, the relative importance of each result has not been indicated. Measuring a parameter (e.g. chipping size) does not necessarily give it more relevance to a successful operation than an unmeasured parameter (e.g. traffic control, drainage).

A parameter (such as binder rate of spread) may have value for money implications (cost per sq.m.) as well as quality implications (effectiveness as a binder).

5.6 Attachments

The following documents are included in an Appendix:

- Questionnaire guidelines as circulated
- Questionnaire as circulated (with sample completed questionnaire)

5.7 Further Information

Should further information be required on any aspect of the survey, contact:

Niall McGuigan
Director of Transportation and Water Services
Wexford County Council
County Hall
Wexford
Tel: 053-42211x301 Fax: 053-23234 e-mail: niall.mcguigan@wexfordcoco.ie

Table 5.1: Principle strengthening materials used

(Principle material: the uppermost carpet, omitting the surface dressing (if any); DBM, HRA, Cl 804, Stabilised Wetmix, etc.)

Urban LA's shaded

L.A. Ref.	Percentage of total strengthening								
	804	806/810	Basecourse DBM	HRA	SMA	Stab. Wetmix	Other	Total	Remarks
1			5	5		90		100	
2	83		16		1			100	
3	62	5	32	1				100	
4		77	23					100	
5		100						100	
6	84	2	14					100	
7			70				30	100	
8	68		26	5	1			100	
9	96	2	2					100	
10	60	30	10					100	
11	73		10			17		100	
12		28	72					100	
13	73	10	2	1		6	1	93	?
14	85		15					100	
15	4			96				100	
16							100	100	Novochip over mesh/concrete slab or DBM/HRA over cracked/seated slab
17			10		90			100	
18	90	6	2				2	100	
19		32	32	2	2		32	100	'Other' is grave emulsion
20	60		40					100	
Max (of those using)	96	100	72						
Min (of those using)	4	2	2						
Median (of those using)	73	19	15						

Remarks

One LA used a significant amount of grave emulsion

Table 5.2: Typical Outputs
Urban LA's shaded

L.A. Ref.	Tonnes per day						1,000's of litres/day	
	Grader			Paver			Sprayers	
	DBM's	Stabilised Wetmix	Granular materials	DBM's	Stabilised Wetmix	Granular materials	Typical	Max
1				500	800			
2			650	750	1000			
3			500	700		1000		
4			500	450				
5						1500	55	75
6			300	400		500	40	50
7			800	750		800	50	63
8			250	750		750	60	95
9			750	700			60	95
10							40	60
11			300	800	700	700	32	54
12				650	750		44	60
13			340		255		29	37
14			450	750	750			
15								
16								
17				300				
18			500	550			35	50
19			500	400			30	54
20			900	700		825	86	103
Max			900	800	1000	1500	86	103
Min			250	300	255	500	29	37
Median			**500**	**700**	**750**	**800**	**42**	**60**

Remarks

The returns for the sprayers are generally total outputs from one or more sprayers

The returns for the other machines are per machine

The lowest paver output is from an LA with a high urban content where output may be affected more by street fixtures, junctions etc.

Median target outputs (for rural areas) are:

500t/d grader output, granular materials

700t/d paver output, dbm
750t/d paver output, stabilised wetmix
800t/d paver output, granular materials

Tabel 5.3: Basecourse DBM usage
Urban LA's shaded

L.A. Ref.	DBM use as %age of programme	Materials		Transport		Laying		Labour	
		% Own	% Bought	% Own	% Contract	% Paver	% Grader	% Own	% Contract
1	5		100		100	100			100
2	16		100		100	100			100
3	32		100		100	100			100
4	23		100		100	100			100
5									
6	14		100		100	100			100
7	70		100		100	100			100
8	26		100		100	100			100
9	2		100		100	100			100
10	10		100		100	100			100
11	10		100		100	100			100
12	72		100	70	30	100		99	1
13	2		100		100	100		50	50
14	15		100		100	100			100
15									
16									
17	10		100		100	100			100
18	2		100		100	100			100
19	32		100		100	100			100
20	40		100		100	100			100
Max (of those using 810)	72			70	100				
Min (of those using 810)	2			70	30				
Median (of those using 810)	15			70	100				

Remarks
17 LA's (85%) of the 20 LA's used DBM basecourse to some extent as the uppermost carpet in the strengthening layer.
Only 2 LA's laid any DBM by direct labour.

Table 5.4: Clause 804 usage
Urban LA's shaded

L.A. Ref.	Cl 804 use as %age of programme	Materials		Transport		Laying		Labour	
		% Own	% Bought	% Own	% Contract	% Paver	% Grader	% Own	% Contract
1									
2	83	0	100	60	40	0	100	100	0
3	62	0	100	40	60	0	100	100	0
4									
5									
6	84	0	100	25	75	0	100	100	0
7									
8	68	0	100	0	100	90	10	10	90
9	96	0	100	5	95	4	96	100	
10	60	0	100	20	80	0	100	100	0
11	73	0	100	50	50	80	20	90	10
12									
13	73	0	100	55	45	0	100	100	0
14	85	0	100	0	100	20	80	85	15
15	4	0	100	0	100	100	0	0	100
16									
17									
18	90	0	100	0	100		100	100	0
19									
20	60	0	100	0	100	28	80	100	0
Max (of those using 804)	96			60	100	100	100		
Min (of those using 804)	4			0	40	0	0		
Median (of those using 804)	73			12.5	87.5	4	98		

Remarks
6 (33%) of the 18 rural LA's did not use 804
No LA produced their own 804
Most LA's lay most or all of their 804 by grader
95% of Cl 804 is transported by contract lorries; 100% by contract in 5 of the LA's.

Table 5.5: Clause806/ 810 usage
Urban LA's shaded

L.A. Ref.	Cl 810 use as %age of programme	Materials		Transport		Laying		Labour	
		% Own	% Bought	% Own	% Contract	% Paver	% Grader	% Own	% Contract
1									
2									
3	5		100	0	100	100	0	0	100
4	77		100	75	25		100	100	
5	*100*		*100*		*100*	*100*		*0*	*100*
6	2		100	0	100	100	0	0	100
7									
8									
9	2		100	0	100	0	100	100	
10	30		100	10	90	100			100
11									
12	28		100	70	30	100		100	
13	10		100	0	100	0	100	100	
14									
15									
16									
17									
18	6		100		100		100	100	
19	32		100	10	90	100	0	30	70
20									
Max (of those using 810)	100			75	100	100	100	100	100
Min (of those using 810)	2			0	25	0	0	0	70
Median (of those using 810)	**19**			**5**	**100**	**100**	**100**	**100**	**100**

Remarks
LA Ref No 5 figures refer to Cl 806 which was exclusively used, and laid by paver, for their strengthening programme.
10 (50%) of the 20 LA's used Cl 810/806 to some extent; average usage was 19% of all materials.
Roughly half of the Cl 810/806 users laid it by paver and half by grader.

Table 5.6: Dressing over Clause 804/806/810
Urban LA's shaded

L.A. Ref.	1st dressing			2nd dressing			Delay between dressings (weeks)	Small chip first?	Who decides Rate of Sp?
	Binder rate l/sq.m	Chip size mm	Polymod binder?	Binder rate l/sq.m	Chip size mm	Polymod binder?			
1									Eng
2	2.1	14		1.7	14		8-10	x	Eng/Tech
3	2.1	14		1.6	10		0	0	Eng
4	2.15	14		1.7	10		0	0	Eng
5	2.35	14		1.85	10		0	0	Eng/Tech
6	2.15	14		1.55	10		0	0	Eng/GSS
7									Eng/GSS
8	2.1	10-14		1.95	10		4-6	0	Eng
9	2.15	10		1.8	16	y	6-10	1	Eng
10	2	12		1.5	10		0	0	Eng/GSS
11	2.35	14		2.1	14		0	x	Eng/GSS
12	2.05	6		1.8	10		0	1	Eng/Tech
13	2.1	15		1.25	12		0	0	Eng/GSS
14	2.1	10		1.8	14		6-8	1	Eng/GSS
15									
16									
17									Eng
18	2.45	10		1.75	14		8-10	1	Eng
19	2.0	10		1.9	10		1 - 2	x	Eng
20	2.2	12		1.8	10		0	0	Lab
Max	2.45			2.1					
Min	2			1.25					
Median	**2.1**			**1.8**					

Remarks

Surface Dressing Guidelines are available in DOELG 'Surface Dressing' (1981) and IATA 'Guidelines for Surface Dressing in Ireland' (2003). Both publications may be reviewed in the near future.

Of 20 returns, 5 LA's (25%) did not use Cl.804/810/806 for strengthening; only 2 of these are rural LA's.

Only one LA uses polymodified bitumen for any surface dressing over Cl 804/810

Of 15 users of Cl.804/810, 8 LA's (53%) use a larger chip for the first dressing. 4 LA's (27%) use a smaller chip for the first dressing.

3 LA's use same size chips for both dressings; either 2x10mm or 2x14mm.

The most common chip size application is 14mm first dressing followed by 10mm second dressing.

Of 15 users of Cl.804/810, 6 LA's (40%) leave the second dressing for several weeks after the first.

Of the 6 LA's who put off the second dressing for some weeks, 1 LA uses a larger chip for the first dressing; 3 use the same size chip for both dressings.

Out of 20 LA's, 8 (40%) use engineer only to determine rates of spread etc, 6 (30%) use Engineer/GSS , & 3 (15%) use engineer/technician.

Note: Where range of rates of spread are given by a LA, the average rate is quoted.

Table 5.7: Dressing Rates over Bituminous layers
Urban LA's shaded

L.A. Ref.	DBM (Close texture)					DBM (Open texture)					Stabilised Wetmix				
	1st dressing		2nd dressing			1st dressing		2nd dressing			1st dressing		2nd dressing		
	Rate of Spread l/sqm	Chip size mm	Rate of Spread l/sqm	Chip size mm	Polymod bit?	Rate of Spread l/sqm	Chip size mm	Rate of Spread l/sqm	Chip size mm	Polymod bit?	Rate of Spread l/sqm	Chip size mm	Rate of Spread l/sqm	Chip size mm	Polymod bit?
1	1.3	10			y						2.5	10			
2	1.27	8			y	1.5	8			y	1.75	14	1.4	10	
3	1.4	10			y	1.7	10			y					
4						1.85	10			y					
5															
6	1.98	14			y	1.98	14			y					
7	1.27	10	1.27	14	y	2.1	10	1.27	14						
8	1.5	10			y	1.6	10			y					
9	1.3	10			y										
10	1.35	14		10	y										
11											2.1	10			
12	1.9	10													
13											0.63	14	1.4	10	y
14	2.2	14				2	14				2.4	10			
15															
16															
17		10			y										
18															
19	1.9	10			y	1.8	10			y					
20	1.5	10			y	1.7	10			y					
Max	2.20					2.10					2.50				
Min	1.27					1.50					0.63				
Median	**1.45**					**1.80**					**2.10**				

Remarks
Surface Dressing Guidelines are available in DOELG 'Surface Dressing' (1981) and IATA 'Guidelines for Surface Dressing in Ireland' (2003). Both publications may be reviewed in the near future.
Of 13 LA's dressing over DBM, 11 LA's (85%) use polymodified bitumen binder.
Only 1 out of 4 (25%) LA's dressing stabilised wetmix uses polymodified bitumen binder.
Only 2 LA's double surface dress DBM. One uses a small chip first, the other a larger chip first.

Table 5.8: Surface dressing methods
Urban LA's shaded

L.A. Ref.	Single dressing	Pad coat & single dressing	Racked in single dressing	Double dressing	Sandwich dressing	Other
1	100					
2	90			10		
3	100					
4	100					
5	100					
6	30			70		
7	100					
8	96			2	2	
9	95				5	
10	100					
11	100					
12	96		1	3		
13	64		27	9		
14	95		5			
15						
16						
17	100					
18	95		5			
19	90		10			
20	90		7		7	

Remarks
Surface Dressing Guidelines are available in DOELG 'Surface Dressing' (1981) and IATA 'Guidelines for Surface Dressing in Ireland' (2003). Both publications may be reviewed in the near future.
Figures are probably ambiguous as only some LA's included dressing over strengthening but this is not important.
The point of this table is to identify the range of surface dressing methods carried out by LA's.
Single, racked in, double and sandwich dressings were carried out by LA's.

Table 5.9: Surface dressing plant used
Urban LA's shaded

L.A. Ref.	Percentage of use										Capacity (litres)	
	Gritters			Lorries (payload)				Rollers			Sprayers	
	Lorry mounted gritter	Lorry tailgate	Phoenix	<12t	>12t<15t	>15t<20t	>20t<25t	PTR	Steel	Steel/ tyres	Fixed bar	Ext'ble bar
1			100	100				100				18,000
2			100	100				100				18,000 13,500
3		23	77			65	35	100				12,700 17,300
4			100	100						100		13,200, 9,000
5			100			66	34	100			7,000	20,500, 17,500
6	x		x	100					85	15	9,000, 13,500	
7			100			100		x		x	7,000	18,000
8			100	6				100				18,000
9			100			100		80	20			18000, 17,000
10		80	20	80		20					x	x
11		100		100				x		x	18,000	18,000
12			100		100			100				
13	5		95	x	x	x		x		x		8,250
14	x		x	x		x				100	8,000	15,000
15												
16												
17	x		x		100			100				3,000
18	90		10	100						100	7,000	
19	x	x	x	25			75	x	x		10,000	18,000
20			100	100				100			7,950	18,000

Remarks
Surface Dressing Guidelines are available in DOELG 'Surface Dressing' (1981) and IATA 'Guidelines for Surface Dressing in Ireland' (2003). Both publications may be reviewed in the near future.
x Indicates usage where the percentage use is not known.
12t lorries are quite common. These are inefficiently sized, though useful for smaller, tighter jobs.
At least one LA is replacing many 12t lorries in their fleet with 16t and 24t lorries.

Table 5.10: Use of poly-modified bitumen & High PSV chips
Urban LA's shaded

L.A. Ref.	By material type						By road type							
	804		Stab wm		DBM		NP		NS		Reg		Co	
	PMB	HPSV	PMB	HPSV	PMB	HPSV	PMB	HPSV	PMB	HPSV	PMB	HPSV	PMB	HPSV
1			N		Y						Y/n	Y	N	Y
2	N		N		Y		Y	Y	Y	Y	y/N	N	N	N
3	N				Y		Y	Y	Y	Y	Y	Y	N	y/N
4	N				Y			Y		Y		Y		Y
5	N						Y	Y	Y	Y	Y/N	Y	N	Y/N
6	N				Y		Y	Y	Y	Y	Y/N	Y	N	N
7					Y						Y/n	Y	N	Y
8					Y		Y	Y	Y	Y	y/N	Y	y/N	y/N
9	N				Y		Y	Y	Y	Y	Y/N	Y	N	Y
10	N				Y		Y/N	Y			Y/N	Y	N	y/N
11	N		N		N						Y	Y	N	N
12	N				N		Y	Y	Y	Y	Y/N	Y	N	Y
13	N		Y		Y		Y	Y	Y	Y	Y/N	Y	Y	Y
14	N		N		N		Y	Y	Y	Y	Y/N	Y	N	N
15														
16					Y								Y	Y
17														
18	N								N	Y	N	Y	N	Y
19	N		N		Y		Y	Y	Y	Y	Y	Y	N	Y
20	N				Y		Y	Y	Y	Y	Y	Y	N	N

Remarks
Surface Dressing Guidelines are available in DOELG 'Surface Dressing' (1981) and IATA 'Guidelines for Surface Dressing in Ireland' (2003). Both publications may be reviewed in the near future.
High PSV chips and Poly-modified bitumen used on virtually all National Routes
High PSV chips used on most Regional roads but often with ordinary bit emulsion
High PSV chips were used on County Roads by 13 (65%) of the 20 LA's
Where high PSV chips are used on Regional and Co Roads,
this often indicates widespread indigenous high psv stone.

Key

Info on bitumen type Vs material type not requested.
Y/N: Roughly 50/50 used/not used
Y/n: Mostly Used
y/N: Mostly Not Used

Table 5.11: Patching Units
Urban LA's shaded

L.A. Ref.	Velocity Patcher	Hotbox	Custom-built lorry	Custom-built pick-up	Trailed Unit	Other	Total	Kms NN Roads	Remarks
1	1		6		1		8	1,964	
2	2		3	*2(*)*	30		37	3,119	Pick-ups hired part time in winter
3	2	1		*1(*)*			4	1,997	
4					15		15	2,481	Pulled by scut trucks
5			4	5			9	2,700	
6	1		3				4	2,559	
7	2		3				5	2,374	Custom-built lorries infrequently used
8	3	1		*2(*)*			6	2,906	
9	6		4		1		11	3,392	
10	*1(*)*			*4(*)*			5	2,093	
11			1		2			1,946	
12	1				13		14	2,850	
13	5		1	*2(*)*			8	4,257	
14	2		5	*7(*)*	6		20	6,055	
15	2			*2 + 1(*)*			4		
16							0		
17							0	596	Contractor excavates/planes and rebuilds in 804 & DBM
18	6						6	3,610	
19	1		5					4,516	
20	3		1				4	2,867	

(*) Note: Italicised numbers indicate hired-in units. Most pick-ups are hired in.

Appendix A: Guidelines For Completion Of Survey Form

Road Improvement And Maintenance: National Survey Of Methods And Materials

Note: This Is A Desk Exercise: Use Approximate Figures

.PART 1: STRENGTHENING

Part 1a: Sq metres of strengthening carried out in 2002

Obtain the areas from your *2002 non-national roadworks programme*. This is the basis many of the subsequent returns.

If you choose to make the return for both a County and a Borough/City Council, include the figures from both Authorities.

Part 1b: Typical outputs

Give your estimated typical outputs. If you can't estimate, leave it out.

Part 1c: Principle strengthening material

Put in your estimate of these percentages; Wexford took a look at the 3 programmes in Part 1a, and carried out rough calculations which took about 10 minutes.

The principle strengthening material is the uppermost carpet omitting the surface dressing (if any); DBM, asphalt, Cl 804, Stabilised wetmix etc.

Part 1d: Surface Dressing the Strengthened Pavement

This does not relate to your general surface dressing programme: that is part of the next section.

PART 2:SURFACE DRESSING

Square metres laid in 2002:

Include surface restoration as well as restoration maintenance from your *annual non-national road improvement programme*

Plant:

Try to obtain the rated capacity of the lorries if poss.

Binder usage:

This is the only part of the form that includes specific reference to National Routes.

Surface dressing methods used:

Include works on National Routes here, we want to get an idea of the varieties of dressings used as a whole.

PART 4: PATCHING PLANT

Custom built lorry unit indicates a typical lorry area patcher with heated tank, storage for chips, lance, etc.

Custom built pick-up unit is similar but the pick-up probably has a rated capacity of about 3.5t.

Trailed unit indicates a single axle heated bitumen tank and lance unit only, to be towed by a pick-up/lorry/dumper.

PART 5 GENERAL AND ASSISTANCE

Please add explanatory comments as you see fit. If you have any queries, contact the Wexford County Council contact Noel O'Driscoll (Tel 053-42211x321, noel.odriscoll@wexfordcoco.ie) or myself at niall.mcguigan@wexfordcoco.ie or 053-42211x301.

ANONYMITY

The return will be used to collate information on general practices in the country, as part of a study on local authority work methodologies. Individual authorities will not be identified, except for Wexford County Council who are offering their return sheet warts and all as an example of the type of return wished for.

RETURN DATE AND ADDRESSEE

Please complete and return this sheet in hard copy or by email to Niall McGuigan by Tuesday 12th November 2002

Niall McGuigan, DoS Transp. & Water Services, Wexford County Council, County Hall, Wexford
niall.mcguigan@wexfordcoco.ie
Tel: 053-42211x301 Fax: 053-23234

ROAD IMPROVEMENT AND MAINTENANCE: NATIONAL METHOD AND MATERIAL SURVEY

LOCAL AUTHORITY: Wexford County Council & Borough Council

PART 1: STRENGTHENING

1.a Square metres of strengthening carried out in 2002:

Strengthening programme:	462,000	Sq.m.	
EU Co-funded programme:	54,000	Sq.m.	
Block grants:	6,000	Sq.m.	
Total:	522,000	Sq.m.	= 100% (A)

1.b Typical Outputs:

Material	Typical outputs (Tonnes/day)	
	Grader	Paver
DBM's & asphalts		750 tonnes
Stab. wetmix/foammix		1,000 tonnes
Granular matserials	600-700 tonnes	

1.c Principle Strengthening Material

Material	% of A	% of (B) laid by:		% of (B) made with part/all:		%of (B) transported by:		%of (B) laid by:	
	(B)	Paver	Grader	L.A. materials	Bought in mats	Direct labour	Contract	Direct labour	Contract
804	83%		100		100	60	40	100	0
810									
Basecourse macadam	16%	100			100	0	100	0	100
HRA									
SMA	1%				100		100		100
Stabilised wetmix									
Foamix									
Other									

1d: Surface Dressing the Strengthened Pavement (Litres/sq. m. = 5.437 ÷ Sq. yds/gall.)

Surface Dressing over:	Typical 1st dressing			Typical 2nd dressing			Typical time between dressings (ie direct follow on or xx weeks later)	Seasonal allowances	
	Binder		Chips (mm)	Binder		Chips (mm)		Not before	Not after
	Rate l/sqm	Poly mod.? (Y/N)		Rate l/sqm	Poly mod.? (Y/N)				
Cl. 804/810	2 – 2.2	N			N	14	8 – 10 weeks	Feb	Nov
Stab. W'mix/foammix	1.7 – 1.8	N			N	14	1 – 2 weeks	Mar	Oct
14mm DBM (close text.)	1.2 – 1.35	Y	8						
14mm DBM (open text.)	1.45-1.55	Y	8					May	Aug
Other:									
Other:									

ROAD IMPROVEMENT AND MAINTENANCE: NATIONAL METHOD AND MATERIAL SURVEY

PART 2: SURFACE DRESSING LOCAL AUTHORITY: Wexford County & Borough Councils Square meters laid in 2002: 1,030,900

(Excluding dressing over strengthening materials and excluding surface restoration: surface dressing grant only.)

PLANT	%age Usage	
	Own plant	Contract plant
Lorry mounted gritter		
Lorry tailgate		
Phoenix type gritter	100	
Other (specify)		
Lorries (indicate rated capacity if possible:		
<12t	100	
>12<15t		
>15t<20t		
>20t<25t		
Steel wheel roller		
Pneumatic roller	100	
Steel/rubber tyre roller		
Tankers/sprayers::		

No.	Cap (l)	Fixed bar	Ext'ble bar		
1	18,000		Y		
1	13,500		Y		

BINDER USAGE	% usage	
	Emulsion	Poly modified
NP		100
NS		100
Reg	80	20
County	100	
CHIPS USAGE	% usage	
	Low psv	High psv
NP		100
NS		100
Reg	100	
Co	100	

OUTPUTS

Typical output (l/day):	45,000 – 49,500
Max output (l/day):	63,000

SURFACE DRESSING METHODS USED

Method	% of total
Single dressing	100
Pad coat + single dressing.	
Racked in dress'g	
Double dressing	
Sandwich dressing	

ROAD IMPROVEMENT AND MAINTENANCE: NATIONAL METHOD AND MATERIAL SURVEY

PART 3: QUALITY CONTROL

LOCAL AUTHORITY: Wexford County & Borough Councils

a) Who determines the rates of applications (e.g. Area engineer, GSS)?

GSS

b) What testing is routinely carried out on:

Chips quality	Grading, ACV, Flakiness index, but not regular testing.
Chips rate of spread	None
Bitumen	Sample each load but only test if problematic
Asphalts/macadams	Rarely: %age bitumen, grading.
Granular 804/810	Grading
Existing road surface	None
Tar sprayer bar	(In yard) calibration tests and (on site) cone tests

PART 4: PATCHING PLANT

Local Authority: Wexford County and Borough Councils

Please indicate the numbers of each type of plant operated in your authority:

Type of patching unit	Number operated	Comments
1 Velocity Patcher	N/a	
One-man unit	1	Purchased 2002
Two-man unit	1	
2 Custom-built lorry unit	3	
3 Custom-built pick-up unit	2	Hired part time
4 Trailed unit (heated tank)	30	
5 Heated body macadam repair unit	0	
6 Other (specify):		

PART 5: GENERAL

OTHER COMMENTS:		
CONTACT NAME: Noel O'Driscoll	e-mail:noel.odriscoll@wexfordcoco.ie	Tel. No:053-42211x321