Regional seminar for labour-based practitioners in the road sector in Sub-Saharan Africa

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Labour-based Technology –
A Review of Current Practice
Volume Two: Seminar Papers

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1 Papers related to labour-based work in South Africa

1.1 South African context and the lessons to be learned from Africa

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INTRODUCTION

Drawing on the theory and practice of labour-intensive construction and maintenance, it will be argued in this paper that in South Africa unemployment (and thus poverty) could be alleviated (but not solved), public works constructed, and individual and community capacities created, through a well planned national employment creation programme using labour-intensive methods for the construction and maintenance of public works.

The dimensions of various problems in South African will first be sketched and then the reasons for the success of the national programmes in Kenya and Botswana will be summarised. Implications for South Africa will be derived. Various endeavours to implement labour-intensive work in South Africa, especially on a large scale, will be briefly described and analysed in the light of the work elsewhere in Africa. The paper will close with an outline of the process that should be adopted for a national employment creation programme.

SOUTH AFRICAN CONTEXT

Unemployment

1 There has been some debate as to the term “labour-intensive”. Some authorities prefer to use “labour-based” as opposed to “labour-intensive”. They hold that labour-intensive implies that the work is done entirely by hands whereas “labour-based” allows the use of equipment when necessary. The author prefers the term “labour-intensive” for the sense that it conveys of the “intensive” use of labour, while not precluding the use of appropriate machinery. As far as the author is concerned the essential difference is not between these two terms but between both of them and “labour-extensive” where the emphasis is upon the size of the labour-force and scant concern for either product or productivity.
At least five aspects of unemployment in South Africa are disturbing. Firstly, the level is high and rising: from 7% in 1980 to 18% in 1991. Secondly, whereas in the early 1960s the formal sector had been able to absorb 81% of the annual net additions to the labour force, by the late 1980s this had shrunk to 8%. Thirdly, unemployment varies from region to region: 11% in the Cape Peninsula to an average of 29% in the former so-called "homelands". Even this latter figure does not capture the severity: in certain areas it has been estimated at 60%-70%. Fourthly, Wilson and Ramphele have given searing accounts of the deleterious effects on individuals of their being unemployed and research at the University of the Witwatersrand has shown that the combination of violence and unemployment has led to extreme levels of stress in the townships. Fifthly, examination of the unemployment problem reveals that the economy as a whole has become more capital-intensive. Between 1986 and 1990, for any additional expenditure, less than half the additional employment was created than during the period 1971 to 1980.

The importance of "job creation" has been acknowledged in many policy statements: it was one of the first items in the Development Policy of the ANC and featured prominently in the Report of the 1992 Economic Policy Conference of the Congress of South African Trade Unions (COSATU).

Undoubtedly one must look to political and social changes and to growth of the whole economy to solve the unemployment problem. However, not only is the South African economy either shrinking or barely growing but less employment is being created per unit of expenditure. Thus in addition to major emphasis upon policies to expand the economy, other policies are required to restructure current activities so as to create greater employment opportunities per unit of expenditure within existing budgetary constraints.

Housing and public works

Government is faced with explicit demands for housing and public works. In urban areas the demand for housing has been estimated at between 198 000 and 328 000 units per annum for the next ten years. Municipal public works (water supply, sewerage, streets, stormwater drainage, electricity, waste disposal) will be required for such housing. Equally, in many rural areas there is need for public works (dams, irrigation, roads).

The demand for public works is being made while other voices are warning that insufficient funding is being made available for the maintenance of the public works already in place. For example, in relation to constructed gravel roads in Natal it is only possible to keep "25% of the network" adequately gravelled. In relation to the whole of South Africa it has been estimated that R5,5 billion is necessary "just to get the network into an acceptable condition".

While the magnitude of the problem is daunting, the provision of housing and public works would be an opportunity to generate employment. The building of houses is already relatively labour-intensive. However, civil engineering is typically equipment-intensive and would not generate that many jobs unless it became labour-intensive.

Individual and community capacities in technical and institutional terms

The previous two sets of problems must be seen within the context of two particular legacies of apartheid. Firstly, the Bantu Education Act of 1953, together with other legislated prejudices, led to the downgrading of mathematics and science in "black" (used instead of "disadvantaged") education to the extent that in 1990, of 10 000 "black" school entrants, only one will be eligible to study engineering or medicine at university (by comparison the UK ratio has been estimated at 1:40). This means that the black community is sadly disadvantaged in technical terms and specific efforts are required to foster individual technical skills. A corollary is that it is likely that technical work will continue to involve the white technical fraternity for some time to come.

Secondly, the formal institutions nominally responsible for public works in black areas were either within the essentially white public sector or (i) without widespread legitimacy, (ii) inefficient and (iii) corrupt. Although there has been rapid development of CIVIC associations and links between the CIVICS and white local authorities, the historical lack of a technical capacity and the absence of effective institutions means that any proposals for public works should bear in mind (i) the existing vacuum and (ii) the need to create local capacities for decision making, programming, planning, construction, maintenance, monitoring, control, accountability and evaluation.

Within such a context it is, therefore, important that measures to address problems should consider the process as well as the product. The provision of housing and public works should be an opportunity not only to create employment but also individual skills (technical, administrative, managerial, commercial) and community capacity to engage in the whole process of the provision, administration and maintenance of public works.

The need to generate greater employment opportunities per unit of expenditure, construct and maintain housing and public works and foster individual skills and institutional capacities has just been outlined. From such a perspective it is worthwhile summarising the reasons for the success of the national programmes of labour-intensive construction and maintenance of rural roads that have been established elsewhere in Africa.

THE REASON FOR SUCCESS OF LABOUR-INTENSIVE ROAD CONSTRUCTION AND MAINTENANCE ELSEWHERE IN

Over the past twenty years labour-intensive road construction has progressed from being a hypothetical possibility to a practical reality. National programmes have been established in Kenya, Botswana, Ghana, Lesotho and Malawi; several pilot projects have been


carried out in Ethiopia, The Gambia, Mozambique, Tanzania and Zambia. These projects and programmes have usually been initiated by governments as part of their policies for rural development, and have included the creation of employment opportunities, the provision of infrastructure and the fostering of agriculture.

Although there are significant differences between the national programmes the similarities are sufficient to conclude that within different institutional and organisational frameworks, a wide range of techniques of labour-intensive road construction and maintenance have been extensively tried and tested over the past 21 years. Local variations have resulted in experience under climatic conditions varying from arid to tropical; terrain conditions varying from flat to mountainous; traffic conditions varying from ten to several hundred a day; standards varying from spot-improvement to engineered gravel roads and haulage varying from tipper truck to donkey cart - the latter in relation to a relatively high standard of construction. Institutional frameworks have varied from a Department of Roads within a Ministry of Transport to a Roads Unit within a District Council that was semi-autonomous from a Ministry of Local Government and Lands work has been implemented departmentally and by contractors. Workers have been employed on individual monthly contract or by contractors. In the early phases emphasis was upon the creation of employment opportunities for unskilled labour. Over time it became clear that the productivities achieved by organised labour could not be considered the result of unskilled work. Equally that to motivate labour to construct a sound product it is essential to train skilled supervisors who are technically and organisationally competent and that during training as much attention should be paid to character as competence.


Drawing upon experience and analysis of the programmes in Kenya and Botswana in particular, it is considered that the following are the main reasons for success: 20

(i) Programmes were long-term and national.

(ii) There was a sound intellectual assessment of the technical feasibility and economic efficiency of using labour-intensive methods: cognisance was taken of technological and institutional capacities.

(iii) Technical, institutional, organisation and socio-economic aspects received concentrated attention during preliminary work, continued through pilot projects, embryonic training programmes, and subsequent national programmes. Technical matters included design, standards of construction, specifications, tools and equipment, and methods of construction. Institutional matters included the decentralisation necessary for grassroots success and the centralisation necessary to plan and co-ordinate a large programme. Organisational aspects included management structures and systems (recording, reporting, controlling, monitoring and evaluation) and training. Socio-economic aspects included wage rates, conditions of employment, labour supply, role of women and social impact studies. Prior agreement was reached between the different parties with regard to wage rates, conditions of employment and the role and responsibilities of the community.

(iv) Strong organisations were established with good management systems; a balance was achieved between decentralisation and centralisation.

(v) Training was extensive and good at what it set out to do.

(vi) There was long-term political support.

(vii) There was long-term financial commitment.

(viii) On balance there was good co-ordination between the government, government departments, those administering the programme, local authorities, those providing technical assistance and donors. This was facilitated by objective external advice by the ILO.

And the corollary: they were not short-term emergency relief projects.

**IMPLICATIONS FOR SOUTH AFRICA**

What are the implications of the national programmes elsewhere in Africa for South Africa?

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Two broad sets of implications will be drawn, firstly related to labour-intensive construction, secondly to national public works programmes.

Firstly, the programmes in Kenya and Botswana have demonstrated that good quality, low-volume rural roads may be constructed and maintained by highly labour-intensive means: 5 to 7 times more employment being created per unit of expenditure. The increase was achieved by the identification of the type of work which could incorporate a significant increase of labour per unit of expenditure and then through extensive investigation of economically efficient implementation. Secondly, the potential was realised through the establishment of national programmes.

National programmes have been established through:

- the adoption of a long-term national perspective in which a programme is developed (Figure 1);
- attention to technical, institutional, administrative, organisational and socio-economic detail during the preparatory lead-in phase and throughout the programme;
- institution building at community, regional and national levels;
- extensive training at site, multi-site and national levels.

RECENT LABOUR-INTENSIVE CONSTRUCTION IN SOUTH AFRICA

Turning to actual developments in this field in South Africa: on his return to South Africa late in 1987, the author began to explore the extent to which the success of the programmes in Kenya and Botswana could be replicated in South Africa. Initially it was assumed that replication would only be feasible in rural areas because South Africa was far more industrialised and thus heavy equipment was readily available together with the operation and maintenance systems for achieving high productivity. Subsequent experience in South Africa has led to the conclusion that the degree of dislocation between the industrialised portions of South Africa and the remainder, means that the scope for labour-intensive methods is much greater than appeared at first sight, this view being strengthened by social and political factors.

Other conclusions have been derived from experience related to labour-intensive work in South Africa itself. Through extensive involvement in some projects, limited involvement in others and observation of the remainder, a broad perspective was gained of the recent development of labour-intensive construction in South Africa from its beginnings in a few brave initiatives to the present where hundreds of millions of Rand are being spent on so called labour-intensive work. The author will first provide a brief review and then focus upon the initiatives which have involved the greatest expenditure.

Initial projects and relatively small-scale developments

In the early to mid-1980s odd pilot projects of rural road construction were initiated in the Transkei and Kwazulu. These projects demonstrated that in South Africa labour-intensive methods could be used for low-volume rural road construction. However, none of these projects progressed beyond the construction of a short stretch of road. This is because they had been carried out on an ad hoc basis: the organisations responsible for the work were not linked into a regional or national institution, there was no programme for future work. Isolated pilot projects did not lead to programmes of construction.

During 1989 negotiations for a longer term programme were initiated in Kwazulu. Funded by the Development Bank of Southern Africa (DBSA) the Kwazulu Tribal Roads Maintenance Study was located within Kwazulu's institution responsible for Tribal Authorities with formal links to the Roads Branch of the Kwazulu Works Department (Roads Branch). The study led to the formation of the Kwazulu Tribal Road Upgrading and Maintenance Programme. Recently this has

   · At the time of writing 1 US dollar is worth approximately 3.5 South African Rand.
begun to develop along the lines of the programmes in Botswana and Kenya.\footnote{R.T. McCutcheon and R. Little, “Practical Guidelines for the Establishment of a Rural/Tribal Capacity to Construct and Maintain Roads by Labour-Intensive Methods”, Annual Transportation Convention 1991 Developing Areas 4D (Pretoria: ATC CSIR, 1991), 2.1-2.19.} The programme is now operational in over 20 Tribal Authorities and scheduled to expand to a further ten during the coming year and throughout all 230 over the next ten years.\footnote{· Personal Communication: C. Ware, Engineer, Kwazulu Department of Works to author, 1993.} Policy is in place, funding has been committed, suitable posts in the process of being established and formal training will begin later this year. While progress is encouraging it must be pointed out that it has taken several years to establish the programme and many problems have had to be surmounted.

Similar initiatives elsewhere have not yet taken root in relation to rural road construction.

However, in the Transkei, starting in 1986, innovative work has been carried out using labour-intensive methods for the construction of a wide range of municipal public works in Ilinge (water supply and reticulation, sewerage reticulation and treatment, stormwater drainage and streets). Furthermore under the overall guidance of a consultant, small contractors were established and trained.\footnote{J. Croswell, “Labour-based Construction at Ilinge, Republic of Transkei”, Labour-intensive: Practical Details for Success 31 October and 1 November 1989 (Johannesburg: University of the Witwatersrand Department of Civil Engineering/Continuing Engineering Education (CEE), October 1989), 14pp.} In 1987 the consultant responsible for these innovations became involved in the upgrading of the water mains for the Soweto City Engineer’s Department.\footnote{J. Croswell, “Proposal for the Construction of Certain Works at Soweto Using Labour-based Methods”, Croswell, September 1987, included in readings for Labour-Intensive Construction: Practical Details for Success 31 October and 1 November 1989 (Johannesburg: University of the Witwatersrand, Department of Civil Engineering/CEE, October 1989), 14pp.} Somewhat later this project became the Soweto Contractor Development Programme.\footnote{R.B. Watermeyer (ed.), Contractor Development in Labour-based Construction (Johannesburg: The Contractor Development Team, 1992).} In turn this has led to various small contractor development initiatives.\footnote{R.B. Watermeyer, “Community-based Construction: Mobilizing Communities to Construct their own Infrastructure”, Paper presented at the XXIst International Association of Housing}
has reported significant progress in relation to trenching for pipelines.31

This work has demonstrated that in South Africa labour-intensive methods may be used for a wide range of civil construction. In the case of replacement of water mains and pipeline trenching, it has been demonstrated that the quality, cost and speed are comparable to equipment-intensive methods. The work in Ilinge and Soweto has also shown that small contractors may be developed capable of using labour-intensive methods. The main weakness of the work in Ilinge and Soweto is that it was project based - there was no long-term programme (learning curve, training, overheads).32

Turning from projects to research for a moment: research in the Department of Civil and Environmental Engineering at the University of the Witwatersrand indicates that significant employment opportunities may be created through the use of labour-intensive methods in the earthworks component of civil construction in general and for surfaced roads in urban areas in particular. A cursory analysis of the extent to which labour-intensive methods might be used in the earthworks component of civil construction was carried out by the author.33 This analysis would need refinement before it could provide an objective basis for predicting the order of magnitude of work that could be created and thus set criteria for achievement. The cursory assessment of the earthworks component of civil construction work undertaken within a part of the public sector indicated that the number of people employed in civil construction could be doubled. If this analysis of only a part of the public sector were to hold true for the whole industry, there would be employment opportunities for not less than 100 000 people.


In 1991 Phillips investigated the viability of reintroducing waterbound macadam as a base-course material. He found that there was the possibility for a ten-fold increase in the proportion of labour diverted to the construction of the base-course. Depending upon the assumptions made there was a financial premium of about 10 to 70 per cent.\textsuperscript{34} As part of his PhD he has carried out more detailed research into the financial trade-off between cost and employment; depending upon assumptions made employment could be increased by a factor of 40 (4 000 per cent increase).\textsuperscript{35} Such a finding encourages further research (in particular in terms of a national economic perspective) and must be of interest to anyone who is deeply concerned about the levels of unemployment.

Further research is being carried out to determine the number of employment opportunities that could be created throughout the various sub-sectors of civil construction.\textsuperscript{36} However, one may be fairly confident that in relation to the road network, potential for an increase in the employment of labour per unit of expenditure exists in the following categories:

(i) rural roads: construction and maintenance of non-gazetted and tertiary roads;

\textsuperscript{34} · S. Phillips, "The Viability of Reintroducing Waterbound Macadam as a Base Course for Roads in South Africa Using Labour-based Construction Methods", (Johannesburg: University of the Witwatersrand, Department of Civil Engineering, Unpublished MSc (Eng.) Project Report 1992).


(ii) urban roads and storm water drainage; construction and maintenance of primary distributors: sub-base, base course and wearing course.

In the meantime several public authorities and development agencies have attempted to increase the use of labour-intensive methods by putting the onus upon the contractor. The contract documentation has contained exhortations to use these methods "wherever feasible" or "whenever possible". There has been a singular lack of effect. Such conscience salving exercises have not only failed to understand that the greater use of labour-intensive methods starts with the design but also that at present the contractor is bound into a socio-technical system based upon the use of equipment and this cannot be changed overnight.37 On the one hand the designs, specifications and documentation hardly exist; on the other, the industry does not have organisational structures, planning, procedures and supervisors to handle highly labour-intensive construction works. However, we will see below that the industry may be influenced to move in that direction but this has to be from a national perspective and not from that of one contractor engaged on a single contract.

Large-scale projects and programmes

While the above projects involved several millions of Rand we will now turn to those that deal in billions: the Special Employment Creation Programme, the Strategic Oil Funds and the Independent Development Trust's Sites and Services Programme.

The Special Employment Creation Programme (SECP) was launched in 1985: "to provide temporary relief to the unemployed but to refrain from giving them handouts, and to deploy them as productively as possible". This led to the commitment of large sums of money to so-called labour-intensive construction and maintenance. From April 1985 to June 1990 R719 million was spent on the Programme itself and R423 million on an allied Training Programme (but the training was not linked into the SECP). Funds were still being dispensed during the 1992/3 financial year. Thus well over a billion Rand has been spent through the Programme.

The entire Programme has not yet been systematically evaluated. However, various reports allow the following overall observations.38 The structure of expenditure meant that, in relation to the Programme itself, at best only half the money was allocated to the poor; in relation

37. McCutcheon (June 1993), op. cit. 12-30.
to the training component considerably less. In relation to projects with short term and temporary objectives:

- no permanent employment opportunities were created;
- no physical and social infrastructural assets were created;
- projects were not integrated into development programmes;
- projects were inadequately planned, designed, co-ordinated and implemented;
- institutional capacities were inadequate to deal with short-term programmes in addition to normal activities;
- in some instances permanent workers were replaced by temporary workers.

It has been reported that long-term projects did contribute to the creation of permanent employment opportunities and physical and social infrastructure. However, no evidence has been provided as to the balance of expenditure between the short-term and permanent aspects of the programme and there is no evidence that in the latter more employment was created per unit of expenditure. Thus, despite much bandying about of the phrase "labour-intensive", observation of several projects indicates that they were actually labour-extensive.39

Of greatest importance was the fact that this money was spent through at least 28 different institutions. Despite its title, the Special Employment Creation Programme was not a programme but mainly a number of poorly conceived, unplanned, uncoordinated projects. Its major weakness is that it was not a programme situated within a firm institutional base.40

In 1991 the South African Cabinet decided to allocate one billion Rand from the sale of strategic oil reserves to special programmes and projects which would benefit undeveloped areas in particular. The overall objective was to achieve the greatest possible degree of involvement, employment creation, meeting needs and stability through the most cost effective allocation of funds possible.41 The funds were allocated to various government departments and public sector authorities.

Once again, no scholarly review of the expenditure of the Strategic Oil Fund has been carried out. However, it is possible to discuss progress

with respect to roads to which approximately R250 million was allocated. Less than three months were allowed for proposals to be submitted, work had to begin within three months of approval. A preliminary survey has shown that R125 million was allocated to authorities who used it for conventional equipment-intensive projects. Of the remaining R125 million well over half is being carried out labour-extensively, while the attempts to carry out effective labour-intensive work are severely hampered by the lack of the prerequisites enumerated earlier. A more detailed study has been completed which shows that only seven percent of the expenditure was on work which could be accurately described as labour-intensive. Similarly, one of the objectives of the IDT's sites and services projects was to create employment opportunities through the use of labour-intensive methods - given the lack of lead-in time there was a similar lack in effective use of labour-intensive methods. The ineffectiveness in relation to labour-intensive construction was not the fault of the executing agencies, apart from the use of rhetoric, but with government which decided to spend several billion Rand with a lead-in time of 3-6 months. By contrast for a R100 million road project at least two years' planning and preparation would be allowed.

The above review reveals negative and positive aspects. The vast majority of the expenditure on job creation has been unsystematic and certainly has not made effective use of labour-intensive methods (no institution, no training). The majority of the so-called labour-intensive work has either been conventional construction (i.e. product with no extra employment created) or labour-intensive. However, developments in South Africa have shown that good quality, cost-effective and timely construction can be achieved for a range of work far greater than low-volume rural roads. Equally that contractors could play a role in the execution of the work, provided that preparatory work had been done: designs, specifications, contract documentation and the training of personnel. Further expansion of employment creation in public works is limited by the lack of a long-term perspective, national planning and institutional development. Over the past two years there have been some positive developments in this direction.


Recent large-scale initiatives: Towards a National Public Works Programme

During 1992 a National Consultative Forum on Drought (now the National Rural Development Forum) was initiated. The Forum decided to set up four Task Forces, one of which was the Employment Task Force. In turn this task force has explored short-term and long-term options. In relation to the long-term it has made recommendations as to the pre-investment work that needs to be carried out for a National Employment Creation Programme using Labour-intensive methods for the Construction and Maintenance of Public Infrastructure (water supply, sewerage, roads, stormwater drainage, erosion control, irrigation, electricity supply and other physical infrastructure). An intrinsic part of this proposal is the development of individual and institutional capacity (community, local, regional and national): extensive training is envisaged. While the full benefits of such work would be revealed in a long-term programme, the short term has not been ignored. The pre-investment work for this programme has been taken forward by the National Economic Forum (NEF). Under the auspices of its Technical Committee (NEFTC) a pre-investment study has been carried out. On the 29 June 1994 the results of the NEF study were accepted by the Cabinet of the Government of National Unity as the basis of the National Public Works Programme (NPWP). The NPWP will not be a "tack-on" programme: it will cover all public expenditure on infrastructure for which it is feasible to use labour-intensive techniques. In essence the NPWP consists of a process of labour-intensification and increased training and capacity building in the provision of infrastructure. The NPWP is a key component of the government’s Reconstruction and Development Programme (RDP).

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A second initiative is being championed by the National Committee for Labour-intensive Construction (NCLIC) and COSATU. Early in 1992 a member of the South African Federation of Civil Engineering Contractors (SAFCEC) realised that greater use of labour-intensive methods of construction could alleviate unemployment and bring more work into an industry that had been crippled by recession, cutback in government spending and civil war. Representatives of several civil engineering industry associations (SAFCEC, South African Institution of Civil Engineers, South African Association of Consulting Engineers, South African Road Federation) met and decided to convene a symposium on labour-intensive construction. The author was invited to take part in preparatory meetings and present a paper "Setting the Scene", and advised that if the group were intending to take the subject seriously they should invite COSATU to take part in the symposium. This led to a series of meetings between NCLIC (which by this time included the Institute of Municipal Engineers in South Africa) and COSATU. In part this has led to the Executive Director of SAFCEC defining the industry as labour-intensive. More importantly this has led to the drafting of a Framework Agreement. The Framework Agreement consists of over 40 items. While each is important, in the first item the industry commits itself:

1.1 To maximise the use of labour intensive systems of construction within public works programmes, with due regard to economics.

In turn COSATU has agreed to the linking of payment to production in public works. Both of these commitments have been made within the context of community involvement in the definition of what has to be constructed, where, and in the construction process itself (not just employment creation but also skills: i.e. as much emphasis upon process as product). Training is an intrinsic part of the Agreement. The Framework Agreement between NCLIC, COSATU and the South African National Civics Organisation (SANCO) was signed on 22 June 1993. Since then a National Coordinating Committee (NCC) has been formed, an Accreditation Board for Labour-intensive Construction (ABLIC) established, pilot projects have been initiated and a

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49. R.T. McCutcheon, "Setting the Scene" in NCLIC, ibid.
monitoring and evaluation process has been set in motion. The co-operation between the public sector, privately owned companies, the Trades Unions and civic organisations is interesting and unusual to say the least. The Framework Agreement is in the process of being renegotiated.

Are these not fundamental components of the long-term programme advocated by the Employment Task Force? Is this not the same as the long-term programme? Yes and No. All aspects of the Framework Agreement would be either critical or useful for the long-term programme. But the industry is currently equipment-intensive. Despite its assertion "to maximise the use of labour-intensive systems of construction ..." it cannot restructure itself overnight. This is explicitly acknowledged in the first item of the Framework Agreement by reference to "... with due regard to economics", supplemented by the examples provided by the industry to support this position which indicate that it has yet to appreciate the extent to which equipment can be replaced by labour.

However, it is considered that, for example, in road construction the Framework Agreement could lead to the proportion of cost going to labour increasing from 10% to 15% in the short term. For example, in relation to the N1 motorway between Johannesburg and Pretoria there were two options: 6% or 15% to labour. At that time the 6% option was chosen. The fact that there was a 15% option shows that within existing civil engineering practice it would be possible to generate employment opportunities. The author considers the Framework Agreement could lead to such developments. While not to be sneered at, it pales by comparison to the proportion of cost that could be achieved by labour-intensive methods (60%-70%). Nevertheless the author considers the language of the Framework Agreement is sound and as such this initiative would be an ally of the long-term programme: together with other sensible and organised short-term work it would form part of the lead-in phase thus creating some employment and public works, and responding to social needs and political demands.

52. It should be noted that this whole process marks a departure from most of the developments elsewhere in Africa. Except in Ghana where private contractors are being used the other major programmes are based upon the use of public sector supervision of casually employed labourers. While there is a great deal of public sector construction in South Africa (planning, supervision and construction) the Framework Agreement was initiated by the private contractors who usually bid for that work which is put out to tender by the public sector.

53. The Framework Agreement has now (December 1994) been formally incorporated into the National Public Works Programme.
CONCLUSION

In conclusion there are several implications for South Africa of labour-intensive work throughout Africa (i.e. including South Africa).

Specifically: Rural roads may be constructed and maintained by highly labour-intensive means: 5 to 7 times more employment being created per unit of expenditure. It is also possible to create a significant increase in employment opportunities per unit of expenditure across a wide range of civil construction including most municipal or urban engineering services and using contractors. Research at this university indicates that there is a high employment potential in urban road construction, for example.

The national programmes of rural road construction indicate how to establish a national employment creation programme for the construction of public works: the process resulting not only in greater employment but also in the generation of individual and community capacities in technical and institutional terms. National programmes have been established through:

- the adoption of a long-term national perspective in which a programme is developed;
- attention to technical, institutional, administrative, organisational and socio-economic detail during the preparatory lead-in phase and throughout the programme;
- institution building at community, regional and national levels;
- extensive training at site, multi-site and national levels.

In order for greater success to be achieved in the long run a four phased approach should be adopted:

1. Orientation.
2. Preparatory Work: Analyses and Design.

The above approach has to be located within an institutional framework: national, regional, local. A "lead-in" time is necessary. During this lead-in period phases 1 and 2 are carried out. Below the components of the different phases are listed.

Phase One

Education and agreement at national regional and local levels as to:

(i) Concepts and objectives: asset creation plus significant additional employment opportunities per unit of expenditure;

(ii) Nature of long-term "programmes";
(iii) Conditions of employment, wages and linking of payment to production.

Brief local and national authorities as to type, standard, funding and method of construction; the importance of training, institution (local and national), long-term political and financial commitment.

Agreement that labour-intensive public works programmes are not emergency or drought relief projects.

Draft long-term programme.

**Phase Two**

Analysis: institution (local and national); organisation; levels of funding; specific technical analyses; criteria for staff recruitment; identification of initial communities and training sites.

Preparatory work: design, specification, documentation; administrative, technical and training manuals; selection of trainees; briefing of communities; priorities.

Revise forward plans.

**Phase Three**

Orientation and training of trainers; start pilot projects and embryonic training programmes; revise training and national programmes; revise manuals and reporting systems prior to initiation of large-scale national programmes.

**Phase Four**

Expand initial training programmes within each sub-sector into a national programme. But the expansion should only be allowed to proceed in the following manner:

(i) at the rate at which the training programme can produce skilled site supervisors and managers (training must pay as much attention to character as technical competence);

(ii) to the degree to which local communities have the capacity to absorb the trained personnel;

(iii) to the degree to which the national institution is able to absorb the trained management personnel and maintain its overall planning, co-ordinating, monitoring and evaluation role.

Through the "programme" approach (as opposed to "project") the institution is established together with the human resources required to implement the work from site level through to national planning and co-ordination. This process means that overheads are high during Phases One to Three. However, once the preparatory work has been done and the institution established overheads revert to more normal
ratios. In Kenya, for example, the ratio of overheads to direct construction was 84:16 during the first three years (1974-76) but 16:84 over the whole period 1974-1985. Expenditure on training accounted for 1% of programme costs.\(^{54}\)

The four-phased approach, outlined above, is the result of many years of experience and analysis. This approach will mean that the considerable sums of money which have been allocated by government over the past ten years to so-called labour-intensive work will have a developmental impact as opposed to being emergency relief.

Although it has a proven track record that does not mean that it will be adopted in South Africa. The World Bank has recommended that where no previous experience exists a start-up period of at least three years should be considered.\(^{55}\) But in the present political climate even policy makers who are sympathetic towards labour-intensive construction are reluctant to face the reality of the need for a lead-in period. Policy makers who are only concerned with jobs and have little interest in product have even less appreciation of the need for a start-up period. It is recommended that the dilemma be resolved through (i) initiating a long-term employment creation programme\(^{56}\) and (ii) at the same time taking advantage of the Framework Agreement and other sensible, short-term initiatives for immediate impact.\(^{57}\) And that the programme is not treated as emergency-relief. In this way the process of labour-intensive construction could indeed make a contribution to alleviating unemployment and generating individual and community skills in technical and institutional terms. At least where the expenditure of public money is concerned - and 70 per cent of the funding for civil engineering is public money - to take the opportunity, provided by construction of public works, for people to be part of production.

**ACKNOWLEDGEMENTS**

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Figure 1: KENYA RURAL ACCESS PROGRAMME
ACCUMULATED LENGTH OF ROAD

SOURCE: Hagen 1985
1.2 The current context for labour-intensive construction in South Africa

J. A. Croswell, James Croswell Associates

SYNOPSIS

The reintroduction of labour-intensive construction methods began in South Africa approximately 12 years ago. A number of pioneering projects have been undertaken and this has led to a growing understanding about, and acceptance of, the approach. With a change in government, and a change in the priorities for development towards employment creating opportunities, a shift to a labour-based construction paradigm has gained momentum.

Rural access roads are an area where labour-intensive methods are reasonably easily introduced and have therefore achieved some early prominence. The construction of urban roads, associated with the need for rapid housing opportunity development, will undoubtedly become an important aspect of labour-intensive construction.

Government has recognised the need to establish rules for ordering labour-intensive construction and has decided to adopt the Framework Agreement as policy. The Reconstruction and Development Programme which has as key performance indicators the efficient creation of necessary assets, together with employment creation, will give the entire initiative impetus.

INTRODUCTION

The use of labour-intensive techniques had been developing slowly in Southern Africa for the past ten or twelve years. Many of the early projects were in a rural setting with some of them being in the urbanised rural areas. More recently, however, a labour-intensive approach has been accepted in urban areas and increasingly projects such as Soweto, Johannesburg; Soweto by the Sea, Port Elizabeth and Umlazi, Durban have been the predominant projects with regard to implementation of labour-intensive ideas. While the use of labour-intensive methods will no doubt expand and serve an ever increasing important role in the development of rural communities the application to urban infrastructure development is likely to be most influential and in particular the greatest source of employment opportunities.

With the acceptance of the Reconstruction and Development Programme (RDP), and more particularly the National Public Works Programme Utilising Labour-Intensive Construction Methods (NPWP), great impetus will be given to the methods and the opportunity for employment creation will be greatly expanded. In addition the opportunity for entrepreneurial development in the field of material supply and as small contractors is obvious.
CURRENT CONTEXT

The Framework Agreement for Public Works Projects Using Labour-Intensive Construction Systems was developed on a tripartite basis between Industry, Labour and Civil Society. It subsequently took on board certain Government Departments and has operated in this guise for approximately 18 months (December 1994). Valuable lessons have been learned during the pilot phase of several projects and numerous comments have now been tabled regarding the applicability of the Framework Agreement in the current circumstances.

What has changed since the signature of the Framework Agreement in June 1993 is that we have a new Government which has different priorities. It has been agreed that the New Framework Agreement should be integrated into Government and more particularly the Department of Public Works. In addition the RDP has been accepted as a framework for rectifying the inequities of the apartheid regime. These inequities are being carefully examined across the board, but we are perhaps only interested in the technical field and in economic opportunities surrounding labour-intensive construction.

The concept of labour intensive construction and the concomitant increase in the number of employment opportunities created per unit of expenditure is in line with the RDP key performance indicators (KPI's). It is, however, felt that far more proactive decisions need to be taken to facilitate the entry of previously disadvantaged groups into the system, not the least part of which is the contracting arena. It is possible through labour-intensive methods to provide accessible opportunities for small black contractors, but it is necessary to rearrange the current paradigm surrounding construction to ensure that the inaccessibility of the past is removed. Special provisions need to be considered to ensure that those who were previously excluded are now specifically encouraged to become part of the contracting system. During the period of restitution declared by the Government of National Unity very specific and carefully directed initiatives will undoubtedly favour emerging black contractors. This will be part of the cost of rectification of the inequities of the past. Notwithstanding the fact that the entry of new players is to be encouraged it is still necessary to ensure that standards are not compromised and that, in particular, labour is not exploited. The maintenance of quality of assets and of acceptable labour standards is imperative. This is particularly relevant in urban areas where expectations of the type and standard of essential services is high.

Many of the projects which will be put forward over the next few years will have as a priority the KPI's enunciated in terms of the RDP. This provides a window of opportunity to introduce new methods to a very wide range of operations which currently do not favour the enhanced creation of employment opportunity. The Framework Agreement must therefore strive to take this opportunity and to provide criteria and
guidelines to direct all involved towards the optimisation of the opportunities. It is proposed that certain criteria based on the RDP KPI’s will become essential elements of any labour-intensive project. It is further proposed that a series of guidelines or statements of good practice will be provided to assist those making decisions in maximising the employment creation opportunities arising from the expenditure.

Tremendous support will have to be provided for the emerging contractor in the field of finance and personnel and technical management. These skills will be drawn essentially from the current established contracting fraternity, especially in the urban context. The problems approach to support for emerging contractors in rural situations is somewhat more problematic. The Framework Agreement will set out to establish the ground rules for relationships which will ensure skills transfer and access to the necessary resources which have previously been denied to small black contractors.

The new Framework Agreement therefore assumes an altered approach both to emphasise the altered environment and to provide clear guidelines to enable everyone involved to make the correct decisions.

**LABOUR-INTENSIVE CONSTRUCTION**

Experience has shown that there is a need to differentiate between the various opportunities available for the use of labour-intensive construction. Depending on the circumstances the level of applicability, and the need for control, needs to be modified. In terms of the new Framework Agreement (which has not yet been finalised) three types of contracting are identified namely, community-based, labour-intensive and conventional contracting. Conventional construction is regarded as construction which would not normally lend itself to labour-intensive methods. The intention is that the greatest level of interest from the point of view of control and monitoring will be directed to labour-intensive construction. The more difficult area is community-based construction where it is envisaged that projects promoted, and essentially implemented, by communities will fall. The intention is that very few controls will be placed on these contracts from the point of view of wage and labour standards and that communities will be able to make whatever arrangements suit their circumstances to achieve project realisation. Obviously from a funding point of view a level of quality of product will have to be maintained and the involvement of professionals is inevitable. The concept of community-based construction has not been fully defined at the time of writing. However, it is felt that the controls and standards will evolve with time and they are not dealt with in great detail hereafter.
THE CONTRACTING ARENA

Assuming for the moment that we will deal exclusively with that band of projects which can be regarded as labour-intensive in terms of the definitions given above. There are several methods of implementation currently in force in South Africa and these will all be dealt with briefly.

- **Direct employment**

  Many funding authorities have the capacity and the desire to implement projects using what could be called a “force account” (also known in South Africa as Labour Pool Worker Programme Approach). The method of organisation of this work force varies and may include the creation of teams with team leaders, who assume a quasi-contractor role, or simply allow for each worker to work directly under the direction of support staff supplied by the promoter of the project. There is no concept of a true contractor, but each labourer effectively enters into a contract (possibly in terms of a draft contract document attached as Annex 1) which relates remuneration directly to productivity. The task base method of payment is a cornerstone of this approach. Involvement of outside professionals is at the discretion of the promoter of the project, but apart from the normal design and documentation function the professionals stand in as part of the support structure and not as contractors.

- **Small local contractors**

  There is tremendous pressure, particularly on the part of the National Association of Black Contractors and Allied Trades (NABCAT), for a greater percentage of contractual expenditure to be made accessible to small black contractors. It was felt that the Framework Agreement excluded these contractors in the past or at best did not provide specific access for them. The Framework Agreement is being redrafted and tender regulations are being examined to facilitate access of previously disadvantaged contractors. This is not to say that this level of contractor has not been used in the past. In the majority of the infrastructure development in Soweto use has been of local small black contractors who rely on a “project manager” to provide the support functions normally associated with larger contractors (Annex 2 illustrates a possible functional organogram for this scenario). One variation of this theme is the development team approach being utilised in Soweto where all role players in the development process operate in a concerted way to achieve the creation of the necessary asset. Variations on normal contract conditions are necessary to accommodate contractors who do not have required financial resources, but essentially the contractual relationship between
the contractor and the employer is as commonly expected in the contracting arena.

- **Major contractors**

  As the use of labour-intensive construction has grown interest on the part of major contractors has also grown. The need to involve small local contractors, however, remains and therefore the procedures being adopted are that major contractors with adequate resources set themselves up to manage a range of small local contractors very much like the "project managers" mentioned above. The rationale for this is that major contractors have the resources, have the background and a clear understanding of the necessary contracting procedures to place them in a position to provide the necessary support for small local contractors. The relationship between the main contractor and the small local contractors is generally one of contractor to sub-contractor. Efforts are now being made to develop a joint venture approach to provide more empowerment to the small local contractor. There are, in addition, certain instances where major contractors are not creating a contractor/sub-contractor relationship, but are forming workers into teams in their direct employ on an individual contract basis to do certain defined parts of the works on the basis of tasks. Effectively this work is being done on a team task basis with the leader of the team being responsible for the performance of a group which he may or may not have the ability to choose. Despite the problems which have been, and no doubt will be, experienced relating to the involvement of conventional contractors in this field it is felt that in the short to medium term this route is likely to be the most effective as the skills and financial muscle required for infrastructure projects is firmly situated in the conventional construction arena.

- **Other forms of contracting**

  Several other forms of contracting have been tried out in South Africa, but will not be discussed in detail here. Perhaps the most significant are those which would use small contractors having themselves directly contracted with third party contract support organisations, another is a method whereby professionals (generally consulting engineers) accept broader responsibility for construction of the end product by way of plant hire and small contractor or force account management.

**Key performance indicators**

Although many who have been involved in a labour-intensive approach have identified certain objectives to be attained through the use of labour-intensive construction. These objectives, monitored by performance indicators, have largely been random in nature and
selected by the promoters or the professionals. As part of the RDP a series of key performance indicators (KPI's) have been developed to be a basis of appraisal of RDP projects. Although the core KPI's revolve around the more conventional engineering oriented issues there are several soft issues introduced which relate to community involvement and social issues. The RDP KPI's are as follows:

- **Progress against time**
  It is intended that any project will be prefaced by a business plan and that the progress and implementation will be measured against this plan, particularly in regard to time. This is regarded as a vital indicator as one of the fundamental criticisms of the labour-intensive approach is that it is incapable of incorporating a given time schedule.

- **Cost**
  Again in terms of the business plan an accurate track of the cost of a project is required. It is important to monitor the cost of a project particularly where the tendency for the costs associated with the labour-intensive portion thereof to be regarded as subject to some indeterminate premium. Where a social cost benefit is identified the cost thereof, if any, is to be budgeted for and monitored independently.

- **Quality**
  The third of the performance indicators which could be regarded as technical is that of the maintenance of quality. This will ensure the creation of appropriate assets within the constraints of the specification and budget.

- **Job creation**
  A vital element of the RDP is the creation of employment. This KPI, when properly applied, will provide vital information regarding the increase in the number of people employed per unit of expenditure on a particular project relative to conventional construction. Factors such as gender and age breakdown are also monitored as this information is required on a national basis by the RDP.

- **Reaching targeted groups**
  The intention of the RDP is to benefit the most needy in the first instance. This "targeting" needs to be monitored and reported upon in categories such as single women, rural unemployed, urban youth and residents in less formal settlements. The RDP has already set out to target the regions with the assessed greatest need.
• **Human resources development**

Reporting is required about the training and capacity building under headings such as construction specific skills, generic training and capacity building of communities. A careful check regarding the usefulness, appropriateness and adequacy of training will be maintained.

• **Community participation**

Indicators highlighting the level and effectiveness of community participation with regard to decisions at all stages of the project are required. The degree to which the decision making structures are representative and transparent is to be monitored.

At the same time that the RDP KPI's were being finalised the National Public Works Programme Task Team, which has been set up within the Department of Public Works and Land Tenure largely as a result of the National Economic Forum preinvestment investigation entitled *National Employment Creation Programme for the Provision of Public Infrastructure Using Labour-Intensive Methods*, identified a need to have a set of performance indicators relating to the Public Works Programme. Essentially the RDP KPI's were adopted by the National Public Works Programme Task Team as KPI's affecting NPWP projects. As a result they appear to be in the process of being assimilated as performance indicators for labour-intensive construction as a whole and they are being incorporated into the new Framework Agreement which it is intended to influence all labour-intensive construction in South Africa. In the Framework Agreement the KPI's are being expressed as essential criteria to be observed in all labour-intensive construction projects.

**Black contractor empowerment**

As mentioned above there is increasing pressure to facilitate the access of black contractors into the contracting field. It is felt that the most sensible point of entry will be via labour-intensive construction works where the requirement for capital equipment is specifically restricted. The difficulties experienced by small emerging contractors include the following:

• Lack of capital preventing contractors from being able to provide surety and working capital for even relatively small contracts.

• Lack of relevant experience. In particular specific experience in civil engineering construction and the management and technical expertise associated therewith is lacking.
• Insufficient appropriately sized contracts. Although this is an issue which can be resolved fairly easily by administrative decisions the fact remains that the size of contract forms a barrier to entry particularly when tight delivery schedules mitigate against the introduction of labour-intensive methods because of the time it may take to pass through the "learning curve".

These issues are being addressed on a broad front. The Framework Agreement is being re-assessed to make sure that barriers to entry are either removed or are fully motivated. Special provision for the waiving of the requirement regarding sureties and for prompt and frequent payment of moneys due will also facilitate entry. Development programmes for special training which introduces the emerging contractor or entrepreneur to business principles and to technical issues relating to construction are also receiving special attention. In particular all projects are to include a specific budget for training and this training is to be given as an entitlement for all involved. As far as contractor development is concerned, training relating to business development and management is also required. On a national basis a Training Task Team under the National Coordinating Committee for Labour-Intensive Construction has set up guidelines for the training that should be provided. This document is to be issued early in 1995.

The urban scene

As stated above many of the early projects using labour-intensive methods were started in rural areas. The reason for this is not absolutely clear, but contributing factors were the existence of suitable projects in these areas, the relative ease of convincing authorities to experiment with labour-intensive methods and the apparent abundance of labour. There was also a perception (subsequently disproved) that urban dwellers would be less inclined to undertake manual labour thereby depriving emerging contractors of their source of production. Many pilot projects were constructed in rural areas in the fields of access roads, water supply schemes, agricultural development projects, road reserve maintenance and other similar projects requiring relatively low skills.

Developments in urban areas

As stated above the use of labour-intensive methods had proliferated in rural areas and in some urbanised rural areas, but the use of labour-intensive methods in urban areas was on a very limited scale. Examples of waterbound macadam construction in KwaZulu Natal, chiefly in Durban and Pietermaritzburg, and the excavation of trenches for the installation of new electricity cabling in fully developed areas, for example Johannesburg and Randburg, were
generally carried out under what could be called a force account. The concept of introducing a labour-intensive approach involving community participation and the development of local entrepreneurs had not received attention.

In 1987 a proposal was put to the City Engineer of Soweto that certain works in Soweto be constructed using labour-based methods. The City Engineer had been contemplating the development of local contracting skills and agreed to recommend the implementation of a pilot project involving the installation of new secondary water mains to replace a reticulation system which was becoming unserviceable. A copy of their original submission is attached as Annex 3. The pilot project was undertaken on what is now regarded as a project management approach. The Consultants accepted the role of designers, construction managers, materials managers and trainers. The initial success of the pilot project led to an expansion of the programme to cover a period of some three years during which approximately 200 kms of secondary water mains were installed and commissioned at a cost of approximately R20 million. The programme was also expanded to involve other designers and eventually other project managers and it continues, on a somewhat scaled down basis, at the time of writing.

Several important issues were investigated and assumptions confirmed. In addition much experimentation with regard to team balancing, contract size and level of responsibility was undertaken and what could be regarded as an optimum arrangement for Soweto is now in place. Soweto have expanded the development team approach, which involves a formal contractor development programme, into road building.

Some interesting issues arose:

- Given the clear understanding of the task based system of payment more than sufficient labour was found to be available. There had been an initial fear that urbanised people would be unwilling to perform manual tasks, but a combination of high unemployment and the ability to earn according to personal effort encouraged a constant oversupply of available labour resources willing to be employed by the local small contractors. As an indication the task for excavation was set at 3,25 cu m and the task rate was initially set at R15,00.

- A number of entrepreneurs who had no previous exposure to either building or civil engineering carried out contracts to a value of approximately R500 000 (materials and labour) very successfully. Several of these contractors were able to win a further contract and of those contracts which were project managed by James Croswell Associates only one contractor failed (of 37). The failure of this contractor could almost entirely be contributed to a lack of ability to manage people.
These contractors had not progressed through any formal contractor training and were essentially "proved" on site.

- In general the necessary technical skills were learned very rapidly with the project manager providing technical support throughout the contract.

- Although there were instances of dishonesty where unsatisfactory work was covered up before inspection, in general the system, given the level of competence of the contractors involved, was satisfactory when completed. Instances where continuity was broken or where jointing was inadequate were very often only detected some time after the completion of contract because of the difficulty in charging the pipelines with water from the existing system. The need for remedial work after completion of the contracts did occur, but was of a limited nature.

- The instance of damage to existing services was relatively low. On average some form of service (electricity cables, the existing water connection, telephone cables or ducts) was intercepted at 11m intervals throughout the entire contract. The cost of repair to damage amounted to less than 3% of the contract value which is remarkably low. Had all the excavations been undertaken using mechanical means there is little doubt that a far greater percentage of the services which were encountered would have been damaged in some way. The advantage of hand excavation in such circumstances was proved beyond doubt. With one notable exception of extensive damage to a major electricity sub station arising from surges in the reticulation, damage was generally localised. In the latter instance adequate protection of the electricity reticulation system would have prevented the major portion of the damage which was caused. The damage would have been caused, in this instance, even if mechanical excavation had been used.

- Overall the cost of the installation of reticulation was some 30% less than using conventional construction methods. At the time conventional contractors demanded a premium for working within black areas and if this premium had been added the cost using conventional construction would have been of the order of 50% greater than actually incurred.

**Roads**

It is a strange dichotomy that while many roads which were constructed using labour-intensive methods, incorporating a waterbound macadam layer, have proved to be exceptionally durable the method has almost entirely fallen away. Following upon research (Phillips) waterbound macadam is being reintroduced on a limited scale. The use of waterbound macadam in urban areas, with some
interesting trial sections having been constructed in Soweto, has not yet progressed beyond an experimental stage. The budget allocation to road construction using these methods has been increased and it is likely that considerable lengths of road will be constructed in future.

What has been lacking is a thorough and scientific appraisal of the relevant cost of labour-intensive construction of roads. In this regard the National Department of Transport has commissioned an in-depth study of the entire construction cycle of a portion of a major national route to determine, from a large scale exercise, the premium, if any, applicable. This information is likely to become available towards the end of 1995.

In urban areas alternative forms of road construction which tend to greater labour intensity have been employed. In particular the use of segmented paving has proved both successful and cost effective in areas such as Mamelodi and Witbank. Unfortunately detailed information and costing has not been published. An added advantage of the use of segmented paving is that the manufacture of the blocks is often carried out in a labour-intensive way on site thereby increasing the overall payment of to local labour.

The use of labour-intensive methods for applying bituminous surfaces have been investigated and reported on in some detail by the South African Bitumen and Tar Association (SABITA) but large scale application has not yet been reported.

As far as less formal roads are concerned these have generally been restricted to rural areas and the first major road construction project using labour-intensive methods under the RDP has recently been commenced in Northern KwaZulu. The budget for these roads is approximately R11 million for the construction of some 70 kms of rural access roads.

**CONCLUSION**

Use of labour-intensive methods for the construction of roads has gradually gathered momentum. Given the impetus of the Reconstruction and Development Programme and the close attention which the National Public Works Programme Task Team is paying to the technical matters associated with a labour-intensive approach it is inevitable that more roads will be built both to provide the necessary assets, but more importantly, to provide employment. An adjustment of the current contracting paradigm is already becoming evident, but as yet the full range of adjustments to the regulations and bureaucracy controlling road construction has not yet been put in place. It is intended that the Framework Agreement, as amended, will be fully integrated into Government by mid 1995. This will go some way to encourage greater use of labour-intensive methods and particularly to assist in the realignment of the priorities of government line departments with regard to their expenditure. Already there are some
encouraging signs that road construction in particular is receiving special attention as a method of creating a large number of employment opportunities. In general an optimistic prognosis is possible.

SELECTED BIBLIOGRAPHY - SOUTH AFRICAN PUBLICATIONS

1. McCutcheon, R T et all (Feb 1993) DBSA Interim Guidelines for Labour-based Construction


Annex 1

LABOUR INTENSIVE CONSTRUCTION

Contract of Employment between the Person employing a task based worker and the task based worker as described in the Framework Agreement.

1 This is a contract between:

.................................................................
(the person responsible for employing a task based worker)

and

.................................................................
(the task based worker)

2 The tasks to be performed will be:

..................................................................................................
..................................................................................................
..................................................................................................

on the..................................................................................................(describe project)

3 The payment for a completed task is:

..................................................................................................
..................................................................................................
..................................................................................................

..................................................................................................
(describe amount to be paid for each completed task described in 2.
above and add any other benefits).

4 Where the task based worker is required to work on a statutory public holiday or Sunday the payment for a completed task will be double the amount stated in the previous paragraph.
5 Maximum hours of work

A task based worker may not work longer than:

(a) Nine and a quarter hours per day;
(b) Forty six hours per week;
(c) On more than six days per week;
(d) For more than five hours without an interval of at least thirty minutes;
(e) For a spread-over period of more than twelve hours

6 The task based worker will be paid on a........................................(state the day of the week) at a maximum interval of every two weeks.

7 The task based worker shall be given a statement with each payment on which is recorded:

7.1 The name of the contractor;
7.2 The task based worker's name;
7.3 The number of tasks completed by the task based worker;
7.4 The rate per task;
7.5 The details of any deductions made;
7.6 The actual amount paid to the task based worker and the period in respect of which payment is made.

8 The task based worker shall be entitled to payment where he is prevented from working by reasons within the control of the employer of the task based worker. (The task based worker shall be paid the rate for a completed task for every nine and one quarter hours for which the task worker is prevented from working).

9 No deduction shall be made from the task based worker's remuneration except where the task based worker consents in writing or unless the employer is permitted or required to do so by law or the order of any competent court.

10 The task based worker shall be supplied with all health and safety equipment required by the Occupation Health and Safety Act free of charge.
11 The employer of the task based worker must give the task based worker at least one week's notice of the termination of the contract. If this is not done, the task based worker must be paid earnings for five completed tasks.

12 It is expected that the task based worker will be able to work on this project until ..........(fill in end of project or completion of tasks). [NB: This is not a legal obligation but is included to advise the task based worker of the likely duration of employment].

13 The employer of a task based worker undertakes to observe the provisions of:

13.1 **Sections 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29 30, 31 and 32 of the Basic Conditions of Employment Act 3 of 1983**;

13.2 The Occupational Health and Safety Act of 1993;

13.3 The Workmen's Compensation Act 30 of 1941. *(After 1 March: the Compensation for Occupational Injuries and Diseases Act)*

........................................................  ..............................................

Employer of a task based worker  Task based worker

........................................................  ..............................................

Witness     Witness

Notes: Changes will have to be made for task based workers whose employment is not task based. Appropriate changes would have to be made to 2,3,8 and 11.
FIGURE 2

PROPOSED ORGANISATIONAL STRUCTURE
PROJECT MANAGEMENT
PROPOSAL FOR THE CONSTRUCTION OF CERTAIN WORKS
AT SOWETO USING LABOUR BASED METHODS

1. INTRODUCTION

The upgrading of civil engineering works and the provision of certain essential services in large parts of South Africa is a major ongoing problem. In parallel, South Africa suffers from severe unemployment, particularly at the unskilled level. The combination of the two problems into a single solution offers the symbiosis of the satisfaction of the needs of both provision of services and the provision of work opportunity. The concept is not unique, and has been applied with great success throughout the world, particularly in developing nations. Our Practice has for some time been an advocate of these methods, and is currently involved in a project for the provision and upgrading of services in the town of Ilinge in the Republic of the Transkei. An amount of approx. R5 million is to be expended over a period of approximately 3 years, in the provision of water, sewers and gravel surfaced roads. The project is, in a way, a pioneering one, as many theories and concepts are being tested in S.A. conditions, and productivity rates and other statistics relating directly to S.A. Conditions have been assembled. In addition experimentation as regards the contracting format have been tried and proved and invaluable experience with regard to the control of the Contract has been gained.

Based on our experience, we make the following proposals regarding the implementation of a Labour Based Contract in Soweto.

2. DESIGN & CONTROL

2.1 We believe that the appointment for a Labour Based Contract should be in the following form:

Design:

The design should be done bearing in mind the method of deconstruction and the sophistication of the Contractor that will be involved. The appointment for the design will otherwise be in terms of the same Model Form of Agreement pertaining to any other Contract.
Project Management

The method of construction being proposed involves the employment of a number of relatively un-sophisticated Contractors (to the exclusion of established and largely recognised Contractors) each undertaking a relatively small Contract under the guidance and supervision of qualified staff employed by the Project Manager. The services in regard to this portion of this work, should be remunerated at an agreed tariff.

Contract Management:

The normal relationship between the Consulting Engineer (Engineer), Project Manager and the Contractor, cannot exist under the circumstances which we recommend the work be undertaken. It is therefore necessary, that, what could be called a Managing Contractor, be appointed. This Managing Contractor would provide what would otherwise be the overhead and head office services of a large sophisticated Contractor, e.g. survey, inspection, time keeping and wages. For this purpose we recommend that the Project Manager employs a team to manage the Contract. Remuneration for this service would be in terms of normal arrangements usually applied in respect of site or other seconded staff. The proposed staffing structure is set out in Annex 1.

2.2 Plan of action:

2.2.1 Commence design bearing in mind the constraints of Labour Based Construction

2.2.2 Preparation of Contract Documents relevant to Labour Based Construction.

2.2.3 Initiate enquiries regarding interested persons who could become Contractors.

2.2.4 Arrange for a meeting of interested parties to explain the principle

2.2.5 Call for tenders for purchase of materials

2.2.6 Call for tenders on the abridged tender documents

2.2.7 Receive tenders and adjudicate in consultation with all Tenderers.

2.2.8 Make recommendation to Employer and subsequent appointment

2.2.9 Set out the works
2.2.10 Contract Management - keep twice daily check on attendance of Labour as well as their production (Production Clerk). Maintain attendance and wage records. Inspect trenching and bedding, draw from Municipal Store and deliver to site the necessary materials on a daily basis (Inspector who drives a specially equipped LDV). Prepare payment certificates on 2 week cycle. Arrange for make-up of wage packets and distribution thereof to individual labourers. Maintain stock checks.

3. SPECIAL REQUIREMENTS:

3.1 In light of the relatively small extent of the proposed works the contract would be split into 4 separate contracts to be awarded at 2 weekly intervals. This will provide an opportunity for the "learning curve" for all involved to be as efficient as possible. However, we do point out that experience has proved that the "learning curve" is relatively extended, and ideally the project should be on an ongoing basis so that experience gained can be ploughed back into future contracts.

3.2 All construction equipment (picks, shovels and wheelbarrows) should be bought by the Employer and lent to the individual Contractors against retention of Contract Payment which would be fully refunded on a return of equipment. Obviously individual Contractors would be at liberty to provide their own equipment, but experience has shown that poor equipment is motivating and counter productive and the purchase of new equipment for what is likely to be a "one off" contract, would be uneconomical. Used equipment could be retained by the Employer for future contracts with the possibility that it be bought by future Contractors who have the prospect of ongoing work of a similar nature.

4 TENDER PROCEDURES

4.1 Tenderers will be invited from any interest party able to assemble a team of Labourers (we have based the budget on teams of 18 labourers).

4.2 A meeting of prospective Tenderers will be called to explain the scope of the Contract, and in particular to give guidance as to the probable tender price. We have found from experience that unsophisticated Tenderers tend to have a very vague concept as to what the total
cost of the works would be, and as a result, a spread of several multiples of the lowest tender is possible. The amount of work involved, and the number of tasks it represents, and the recommended wage rate are explained to prospective Tenderers. No accurate budget figure for the proposed Contract is given to the Tenderers, but the Project Manager will, using past experience and the production rates and the production wage rates assumed, derive a "probable cost".

4.3 Tenders are required to complete the abridged tender document, but are not required to complete individual rates. However the project Manager reserves the right to distribute the lump sum tender over the various operations for control and payment purposes. The Tenderers are at liberty to make their own assumptions regarding production rates, and to enter the task rate at whatever rate they believe they can obtain Labourer services. These two items will effect either the tender rate or the "profit" which the Contractor can make on the Contract.

4.4 Tenders are received and opened publicly. The Project Manager's budget is declared, and all Tenderers share in the appraisal of the various tenders in comparison with the Project Management's budget. It is possible that the consensus would be that the Tender should be at a price different to the Project Manager's budget, and this would then be used in place of the Project Manager's budget, as the target tender sum.

4.5 The Tenderer with the tender closest to the Tender Sum, is recommended for appointment (it is possible because of the relatively short length of the proposed Project that discussion with the Tenderers will not be meaningful due to their lack of experience, and it may well be that the Project Manager's target price will not be queried.) It is stressed that it is highly unlikely that the lowest Tenderer will be awarded the Contract, as experience has shown that low tenders tend to arise either from ignorance, from over optimistic attitudes or simply by mistake, and no point can be served in attempting to force a Contractor to carry out work which the Project Manager knows is worth more than the tendered sum.

4.6 The Contract awarded is effectively one for labour only. The cost is made up by multiplying the probable production rate by the probable wage rate, and adding to the sum a mark-up for the Contractor. For the purposes of budget we add R50 per day which, in our estimation, assures the Contractor of this rate over the agreed
Contract period. The Contractor is at liberty to use different production rates, and possibly also different wage rates, and thereby while maintaining the same contract price, maximises his own profit.

4.7 Because experience has proved that the Contractor is unable to control the finances (and possibly unwilling to pay his Labourers) it is necessary for the Project Manager to handle the entire payment to the labourers. The Project Manager keeps a daily check on the production of each labourer, and then using the assumed task rate, as well as the wage declared by the Tenderer, the Project Manager prepares the individual wage packets. This ensures that the Labourers are paid, and maintains a good working spirit on the Contract.
1.3 Labour-based construction and the development of emerging contractors in South Africa

R.B. Watermeyer Soderlund & Schutte Inc

EXECUTIVE SUMMARY

Traditionally, the construction industry has been viewed as an industry which produces a high rate of employment per unit of expenditure. The industry as a result has attracted much interest and investment in efforts to create job opportunities. The civil engineering construction industry is, however, very reliant on heavy construction plant such as graders, bulldozers, excavators and the like and there is considerable room for substituting men for machines to increase employment opportunities.

In recent years South African civil engineering projects have been critically examined to see if more job opportunities can be created to provide relief to the masses of unemployed. As a result, the terms labour-intensive, labour-based and community-based construction have entered the vocabulary of South African engineers.

At the same time, engineering services and structures have been constructed by established contractors who have all the necessary resources required to execute projects, viz. labour, materials, machines and the necessary finances or access thereto to secure contracts. Small scale enterprises located within local communities have been excluded from participation by the very structure of the industry. Barriers to entry which effectively prevent local entrepreneurs or emerging building contractors from engaging in construction contracts, include lack of financial resources, inability to obtain credit, lack of credibility, lack of commercial, managerial, administrative and technical skills. In civil engineering projects, sureties, plant-based construction practices and tendering and contractual requirements effectively exclude all such involvement.

Labour-based construction can be closely linked to the targeting of employment opportunities. The question "How many employment opportunities are created?" is just as important as, "Who is to be employed, or which person will benefit from the construction process?"

Over the past few years, systems have been developed to support the emergence of entrepreneurs using labour-based construction methods within targeted communities. This form of construction may best be described as being community-based. Community-based construction may be defined as the use of labour-based technologies and labour-intensive methods on projects in which the community is, in addition, involved in the commercial, managerial and administrative aspects so as to maximise the amount of funds retained within the community and to transfer skills and competencies to the community.
The focus in community-based construction projects is on involving the community in the management and administration of labour-based construction projects, to promote the emergence of local contractors and to mobilise and utilise the resources of the community in an optimal manner.

In community-based projects, members of the community can also become involved in the operation of stores facilities, the support provided to local contractors, the transport of materials to local labour-only contractors, the manufacture of certain materials, the supply of minor materials, and security of the site.

Community-based construction has, however, enabled the necessary developmental support structures to be established. This, in turn, has led to the development of contractor development programmes for civil, electrical and building contractors, which enable emerging entrepreneurs to acquire and develop commercial, managerial and administrative skills while gaining credibility in commercial circles and assuming more contractual responsibility.

Certain restructuring of the industry will need to take place to enable small scale enterprises to have an adequate market share and to change the existing distribution of large, medium and small construction companies currently operating in South Africa. However, should the formal sector work together with the informal sector, contractors can develop together to the benefit of all.

Aspects of emerging practices and contractor development programmes are reviewed in the text.

**INTRODUCTION**

All civil engineering and building projects create a variety of job opportunities. Labour is required to manage and carry out the construction process, to handle materials and to operate and maintain the plant/machinery used. At the same time, opportunities are created for materials suppliers and manufacturers, financial institutions and professional firms. Indeed, construction projects offer meaningful employment opportunities to a wide spectrum of the labour force, ranging from unskilled workers to professionals. (Watermeyer, 1993a).

In recent years, following the successful implementation of job creation programmes in Kenya and Botswana, South African civil engineering projects have been critically examined to see if more job opportunities can be created to provide relief to the masses of unemployed. As a result, the terms labour-intensive, labour-based and, more recently, community-based construction have entered the vocabulary of South African engineers. At the same time, labour-based construction has been linked to the development of emerging contractors.
This paper reviews some of the current trends, thinking and practices in the construction industry.

**SOUTH AFRICAN CONSTRUCTION PRACTISE**

**Trends**

In recent years, the South African civil engineering industry has followed North American and European mechanisation trends and has favoured plant over manual labour. However, the ever rising cost of such plant and the ever increasing levels of poverty and underemployment have caused the industry to re-examine this policy. At the same time, funding bodies such as the IDT, the DBSA and the Department of Transport and forums such as the National Economic Forum have recognised the potential for job creation in the civil engineering industry should labour-intensive methods of construction be employed and have encouraged the industry to make more use of labour by making funds available for labour-intensive type projects.

Employer, professional and worker bodies representing the industry, namely, SAFCEC, SAACE, SAICE, IMIESA, SARF, COSATU and SANCO became signatories to a Framework Agreement for use on public works where labour-intensive and labour-based construction systems are employed. This framework agreement provides guidelines for the preparation of contract documentation, training systems and task-based payment systems and conditions of employment as well as criteria for the selection of persons for employment.

**Current practice**

The civil engineering industry in South Africa differs in many respects from the building industry. The building industry, particularly in the area of house construction, has developed and promoted the emergence of small contractors who may operate at one of three levels, viz., they may provide all the labour and materials to construct the complete house, or they may provide labour only, or they may provide labour only for a specific trade. Small contractors able to operate at one or more of these levels in the building industry can be found within a large number of communities in South Africa. This is not, however, true of the civil engineering industry (Watermeyer 1993 b). The current Wage Order which is issued in terms of the Labour Relations Act of 1961 and regulates employment conditions in the civil engineering industry, does not permit the use of task-based payments on projects. Consequently the agreement in principal on the introduction of a task-based payment system by the participating bodies in the Framework Agreement is of major significance to the industry.

Traditionally, engineering services and structures are constructed by established contractors, whose operations are highly mechanised. These contractors possess all the resources required to execute the
projects, viz., labour, materials, machines and money. They have the finance required for salaries and wages and the purchase of materials, the credibility in commercial circles to obtain sureties, to open accounts with suppliers and to hire plant, the managerial, commercial, technical and administrative skills required to secure and execute contracts. The bulk of their labour force is, normally, recruited from a specific area and, as a result, the community for which the service is constructed is, in the end, left with the service, but with little else, since a negligible percentage of the money spent on the project stays within the community (Watermeyer 1993a).

The barriers which prevent local entrepreneurs or small building contractors in a local community from engaging in civil engineering construction are (Watermeyer, 1993b; Watermeyer and Davis, 1993):

- Tendering and contractual requirements, such as the provision of sureties, the inclusion of penalty clauses and the tendering of rates.
- The prevalence of plant-based construction practices.
- The lack of financial resources to purchase materials, hire plant and tools and to pay wages.
- The lack of credibility in commercial circles.
- The lack of commercial, managerial and administrative skills.
- The discontinuity of work.
- The lack of technical competence.

A recent survey was conducted on behalf of the National Housing Forum into the barriers which prevent small scale enterprises from realising opportunities presented by the provision of housing (Watermeyer and Band, 1994). Different categories of opportunities were examined, viz. construction of houses, construction of infrastructure, manufacture of materials, construction of amenities, provision of transport, maintenance of services and buildings, selling and renting and the provision of professional services. The writers of the report, after analysing the responses to a questionnaire, concluded that:

- Lack of financial resources, with the exception of the selling and renting category, appears to be the main barriers to entry.
- Inability to obtain credit where purchase of materials is required is a major barrier to entry.
- Lack of credibility, with the exception of the categories for manufacture of materials appears to be a major barrier to entry.
- Lack of commercial, managerial and administrative skills, lack of technical knowledge and discontinuity of work, may be regarded as major barriers in most categories.
The writers of this report also remarked that in none of the categories was numeracy or literacy seen to be a major barrier, and that with the notable exception of the category for construction of houses, lack of technical knowledge/expertise is considered to be a major barrier.

**Emerging practices**

In South Africa, machines are available to facilitate most aspects of construction. Consequently, established construction practices in South Africa have become plant-based and projects are planned and designed around the plant available. As a consequence, labour-intensive and labour-based construction practices are approached differently to elsewhere in Africa.

Before embarking upon a particular construction project it is important to have a clear and fundamental understanding as to what is meant by the various terms and how each form of construction differs from each other. Plant-based, labour-intensive, labour-based and community-based construction may be defined as follows (Watermeyer and Band, 1993):

**Plant-based construction**

The effective employment of technologies in the implementation of projects which are designed to maximise the use of plant and minimise the size of the workforce.

**Labour-intensive construction**

The substitution of labour for construction plant in plant-based projects to achieve as great a component of labour on a project as is technically feasible, whilst achieving the standard of construction specified.

**Labour-based construction**

The effective employment of appropriate technologies and labour-intensive methods on projects which are specifically designed to maximise the involvement of a workforce recruited in a specific locality and the transfer of skills and competencies to that workforce.

**Community-based construction**

The use of labour-based technologies and labour-intensive methods on projects in which the community is, in addition, involved in the
commercial, managerial and administrative aspects so as to maximise
the amount of funds retained within community and to transfer skills
and competencies to the community.

There are fundamental differences between labour-intensive, labour-
based and community-based construction. Labour-intensive
construction is concerned with substituting labour for capital intensive
plant and as such is concerned with increasing the number of
employment opportunities per unit of expenditure. Labour-based
construction, however, incorporates a blend of labour and light
equipment. It uses labour-intensive construction methods but with the
aim of creating employment opportunities for work forces in targeted
localities, with a specific view to transfer skills and competencies to
that work force, i.e. it seeks to mobilise and utilise local labour
resources. Labour-intensive construction seeks to maximise the use of
labour; labour-based construction to optimise the use of labour.
Labour-intensive construction serves, in the short term, to increase the
number of unskilled jobs available and provides a measure of relief to
depressed communities. Labour-based construction, on the other hand,
benefits a community by not only creating employment opportunities
but also by facilitating the acquisition of technical skills. In
community-based construction projects, the focus is on involving the
community in the management and administration of labour-based
construction projects, to promote the emergence of local contractors
and to mobilise and utilise the resources of the community in an
optimal manner.

The goals and objectives of these forms of construction are very
different. The benefits accruing to a community depend upon the
construction method that is adopted.

With regard to targeting, labour-intensive construction is concerned
with the increase in the number of employment opportunities that are
created; labour-based construction with the earning capacity and
increase in spending on the local labour force and community-based
construction with the amount of project expenditure retained by the
community.

LABOUR-INTENSIVE AND LABOUR-BASED CONSTRUCTION

General

The ILO has been involved in a world employment programme since
1970 which has sought to substitute labour for capital in a cost
effective way. Its focus, however, has been on the construction of rural
roads. The ILO’s experience of Public Works Programme in Africa,
albeit multisectoral at the outset, is that these programmes camp
around the construction and maintenance of rural roads and
occasionally include irrigation works. Recently, the organisation has
been mobilising communities to work on their own needs in urban
areas where unlined open drains have been constructed to attend to stormwater problems (Morris 1994).

The roads which have been constructed in these rural road programmes are classified as low (less than 20 vehicles/day) and medium volume roads (up to 100 vehicles/day) (Morris 1994), e.g. in Kenya the typical design standards were 10-30 light and medium vehicles per day in all weather passage at a speed of 30 km/h (McCutcheon 1989). With regard to the irrigation projects, all pipelines were gravity (as opposed to pressure) pipelines (Morris 1994).

In South Africa, on the other hand, labour-based methods of construction have been employed on projects which include rural roads (Markman 1991, Boothway 1993, Scott 1993), low level bridges (Otte et al 1993), dams (Manson 1993), residential roads using waterbound macadam bases (Watermeyer 1992, Harrison 1993), block paved roads (Kelly 1993), water and sewerage reticulations for townships (Saxby 1993, Watermeyer 1993 a, b, Powers et al 1994), bituminous surfacing of roads (Powers et al 1994) and low voltage electrical reticulations (Watermeyer 1993 a, b).

Traditionally, the construction industry has been viewed as an industry which produces a high rate of employment per unit of expenditure. Labour-intensive methods of construction and labour-based technologies have been effective in improving upon these figures; e.g. in Soweto's Contractor Development Programme, the multiplier in employment opportunities has been found to be (Watermeyer et al 1994):

- excavate and backfill for water reticulation - 1.9
- excavate, lay pipes and backfill water reticulation - 1.4
- construct concrete block paved roads - 2.3
- construct waterbound macadam roads - 4.7

The average cost in South Africa to generate a man-hour of employment in the civil engineering industry currently amounts to R37. The building industry, on the other hand, is less machine orientated and, to a large extent, is labour-based by nature. In house construction, depending upon the standard of housing required, the cost per man-hour of employment generated lies between R19 and R28 (Watermeyer and Band 1994).

The current cost per man-hour of employment on projects involving the construction of water pipelines and surfaced roads in Soweto, where labour-based construction practices are employed, ranges from R17 to R19 (Watermeyer et al 1994). Labour-based construction practices have enabled the construction of township services to yield more employment opportunities per unit of expenditure than is the case for house construction.
Approaches to implementation

Labour-intensive construction methods and labour-based technologies are currently implemented in Southern Africa in one of 5 approaches or a combination thereof, (Watermeyer, 1992; McCutcheon et al 1992), viz:

- The Public Sector approach, whereby workers, predominantly labourers are trained and employed directly to perform specific tasks.
- The Conventional Contractor approach, whereby restrictions on the use of plant and training obligations are imposed on such contractors.
- The Managing Contractor approach whereby an experienced contractor contracts to administer, manage, finance, train and supply materials and equipment to nominated labour-based subcontractors.
- The Development Team approach, whereby professionals and specialists provide support to a labour-based contractor in administering and managing his contract, financing the contract, giving technical training, engaging specialist contractors and supplying materials and equipment.
- The Project Manager or Managing Consultant approach whereby a project manager in addition to providing conventional engineering services undertakes to manage labour-based contracting teams and thereby provide the support, materials, training and equipment required by such teams.

The contractual relationship between the participants involved in the above mentioned five basic approaches are illustrated in Figure 1.

If labour-intensive construction methods were cheaper than conventional plant-based methods to implement conventional contractors would have utilised such methods to obtain a competitive advantage in tendering on the open market. It is for this reason that the aforementioned approaches have been developed.

All the approaches have demonstrated that it is possible to implement labour-based and labour-intensive construction using the methodologies associated with the particular approach in given circumstances and with specific objectives in mind. However, in the Project Manager or Managing Consultant Approach, an approach which has been regarded by many to be an interim method, accountability cannot be adequately assigned as there are conflicts of interest and split responsibilities inherent in the contractual structures of such projects.
Figure 1: Approaches to Implementation
Each approach is structured to achieve distinctly different objectives and to deal with differing circumstances, both in rural and urban areas.

The Conventional Contractor approach can be used to employ targeted labour on projects. However, this approach does not develop or necessarily employ local small scale contractors in the construction process. On the other hand, the Managing Contractor and Development Team approaches make use of and develop local contractors and sub-contractors in the implementation of labour-intensive methods and labour-based technologies, and as such promote community-based construction. These two approaches can also be used to develop contractors in a contractor development programme. Both these approaches can be structured to adequately address the client's risk associated with engaging emerging contractors to construct infrastructure and the like.

**Wages and productivity**

Wages and productivity on projects in South Africa where labour-intensive methods and labour-based technologies have been employed, vary widely. Minimum wage levels range from R7-00 per day to about R43/day. Current legislation determines the minimum wage levels applicable to the formal sector of the industry (Watermeyer and Band 1994).

Productivity, on the other hand, is dependant on the method of payment to labourers and is highest where labourers are paid on a piecework basis, i.e. on the number of tasks completed in a day.

Productivity is also dependant, to a lesser extent, upon the following:

- skill of management.
- skill of labourers.
- wage levels.
- climatic conditions.
- supply of quality hand tools.
- physical conditions such as ground conditions, depth of excavations, etc.
- work ethic of labourers.

Excavation rates for pickable material on various projects in South Africa are reproduced in Table 1 (Watermeyer and Band, 1994). The very low productivities relate to "relief type projects" where wages were extremely low. On the other hand, on projects where emerging contractors have been encouraged to employ a task-based payment system and to base remuneration for tasks completed on the prevailing statutory minimum hourly rates, as is the case in Soweto's Contractor...
Development Programme, productivity is high. In Soweto, excavation rates for a 6 hour task are between 3 and 4 times higher than that achieved on projects funded by the sale of the strategic Oil Reserves and compare favourably with standard production rates suggested by the World Bank and that achieved in the Kenyan Rural Roads Programme (Watermeyer, 1993c).

### Table 1: Trends in excavation rates for pickable material in various projects.

<table>
<thead>
<tr>
<th>Project/Programme</th>
<th>Production rates for Excavation in Pickable Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soweto's Contractor Development Programme</td>
<td>2.8 to 3.2 m³/6 hour task</td>
</tr>
<tr>
<td>Kenyan Rural Roads Programme</td>
<td>3.0 m³/man day</td>
</tr>
<tr>
<td>Kwa Zulu road construction</td>
<td>0.7 to 1.0 m³/man day</td>
</tr>
<tr>
<td>Kwa Zulu road construction</td>
<td>0.3 to 1.1 m³/man day</td>
</tr>
<tr>
<td>Gazankulu and Venda</td>
<td>1.0 m³/person day</td>
</tr>
<tr>
<td>Ciskei</td>
<td>0.6 to 0.8 m³/man day</td>
</tr>
<tr>
<td>Ilinge</td>
<td>2.3 m³/man day</td>
</tr>
<tr>
<td>Ibhayi</td>
<td>6.0 m³/man/day</td>
</tr>
<tr>
<td>Siviele Konstruksie</td>
<td>5-12 m³/man day</td>
</tr>
<tr>
<td>SAFCEC - up to 1.0 m deep</td>
<td>2.5-5.0 m³/man day</td>
</tr>
<tr>
<td>SAFCEC - up to 1.5 m deep</td>
<td>1.1-4.0 m³/man day</td>
</tr>
<tr>
<td>World Bank standard</td>
<td>3.0 to 4.0 m³/man day</td>
</tr>
</tbody>
</table>

Activities such as excavation and backfilling by hand on projects involving the construction of roads and the installation of services create the most job opportunities. The approaches on projects to these two activities vary greatly, e.g., on certain projects it is obligatory to excavate trenches to a depth of up to 1.5 m in soft material by hand and thereafter to use conventional plant, whereas in Soweto an earthworks classification for 5 types of materials is used in terms of which no construction plant other than compressors are used to excavate non-pickable material. (see Table 2). Typical production rates, based on the authors' experience, for a 6 hour task, in soft materials where the depth of the excavation does not exceed 2.5m are presented in Table 3.

One of the major obstacles perceived by the formal civil engineering construction industry in the implementation of labour-intensive
methods of construction, are the provisions of the Wage Order issued in terms of the Labour Relation Act. This wage order prescribes a minimum wage level and permits employees to be remunerated on a piecework basis provided that such remuneration is not less than that which would have been paid, had the employee been remunerated on the basis of time worked. The wage order, however, does not apply to an employer who does not employ more than twenty employees at all times and whose annual turnover does not in any 12 month period exceed R 1,000,000.00. Thus in effect, small scale enterprises in many instances, are not required to remunerate employees in accordance with the prevailing minimum wage.

Table 2: Classification of materials.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft, class 1</td>
<td>Material which can be excavated by means of a suitable shovel without the use of a pick or other hand swung tool.</td>
</tr>
<tr>
<td>Soft, class 2</td>
<td>Material which can be readily excavated with the aid of a pick or other hand swung tool.</td>
</tr>
<tr>
<td>Soft, class 3</td>
<td>Material which can be excavated with difficulty with the aid of a pick or other hand swung tool.</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Material which is difficult to excavate by hand even with the aid of a crow bar and requires the assistance of pneumatic tools for economical removal.</td>
</tr>
<tr>
<td>Rock</td>
<td>Material which cannot be economically fragmented and loosened for removal by hand implements and pneumatic tools, except by drilling and blasting or the use of rock breaking equipment.</td>
</tr>
</tbody>
</table>

Table 3: Trench excavation rates for a 6 hour task.

<table>
<thead>
<tr>
<th>Excavation Type</th>
<th>Typical Production per 6 Hour Task for Depth Range (m3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 1,0</td>
</tr>
<tr>
<td>soft class 1</td>
<td>3,5</td>
</tr>
<tr>
<td>soft class 2</td>
<td>2,8</td>
</tr>
<tr>
<td>soft class 3</td>
<td>1,7</td>
</tr>
</tbody>
</table>

Organised industry has argued that labour-intensive construction methods are only cost effective where labourers are paid at wage levels below the minimum wage and are remunerated on the basis of tasks...
completed. In terms of the Framework Agreement, civil engineering contractors on projects which meet all the requirements relating to the selection of persons for employment, training and task-based payments, may remunerate labourers at wage levels below the prevailing minimum levels and on the basis of tasks completed. On the other hand, Watermeyer and Band (1994) in a report commissioned by the National Housing Forum, concluded that:

- Projects accredited in terms of the Framework Agreement will probably attract a premium of up to 15%.
- Projects implemented using the Conventional Contractor Approach, where labourers are paid sub minimum wages, attract highly variable tenders, the range being from small cost savings to significant cost premiums.
- Projects where local small scale emerging contractors have been employed have attracted little or no cost premiums and in some instance have realised significant savings.
- Wage rates have been highest where small scale emerging contractors have been engaged to implement labour-intensive methods and labour-based technologies on projects.

COMMUNITY BASED CONSTRUCTION

General

Community-based construction in a sensitive and non-imposing manner aims at the use of labour-based projects to promote the emergence of local entrepreneurs who, with adequate technical, commercial and financial support and instruction, can, in due course become fully fledged contractors/subcontractors, should they so desire. Community-based construction practices make use of technologies which optimise the use of labour and methods of construction which maximise the use of labour in a cost effective manner, and implement these employment intensive options in construction by means of small scale contractors.

In community-based projects, members of the community can also become involved in the:

- operation of stores facilities.
- support provided to local contractors e.g. administration, monitoring of progress.
- transport of materials to local labour-only contractors.
- manufacture of certain materials.
- supply of minor materials.
- security of the site.
and, in so doing, be meaningfully exposed to management and administrative activities and further benefit from the employment and entrepreneurial opportunities presented thereby.

If communities are to be engaged as contractors in construction, changes both in the construction method and construction process are required.

**Development support required**

Local entrepreneurs from underdeveloped communities cannot engage in construction without developmental support and the acquisition of external resources. The question which then arises is how should the support be rendered?

Various methods to implement labour-based technologies and labour-intensive methods and to facilitate the involvement of entrepreneurs from targeted communities are presented in the report commissioned by the National Housing Forum (Watermeyer and Band 1994). In this report, two approaches are recommended for engaging local contractors in civil and electrical construction projects, viz., the Managing Contractor and Development Team approaches. The Development Team approach ensures that the ownership of the project remains with the community and readily allows the community to participate in construction and materials management and other construction related activities. The Managing Contractor approach, on the other hand, is somewhat restricted in scope and permits the community only to own subcontracts. The contractor support mechanism between the two approaches are, however, similar. To illustrate the support mechanisms and to demonstrate how communities can be meaningfully engaged in as wide a scope of construction activities as possible, the Development Team approach will be used to illustrate the necessary developmental support required.

**The development team approach**

In the Development Team Approach, experienced and suitably qualified persons assist local community-based contractors with the administration and management of their contracts, offer technical training, engage specialist contractors, and supply the necessary materials and equipment. In addition, the development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc. Normally, the local contractor enters into a contract with the client/funding body and the development team is appointed on a fee basis directly by the client. The development team may be regarded as construction facilitators who arrange to provide resources that the contractor lacks. In a community-based project, the Development Team must ensure that
certain specific functions are carried out, normally by the following individuals who assume distinct responsibilities:

- The Design Engineer.
- The Engineer.
- The Construction Manager.
- The Materials Manager.

Experienced contractors, project managers or consulting engineers may perform the duties and assume the responsibilities of the Construction and Materials Managers. However, the design and supervision of the works, i.e., the duties and responsibilities of the Design Engineer and the Engineer must be undertaken by Professional Engineers or Technologists.

It should be noted that the Construction and Material Managers are appointed by the client on a fee basis in terms of a scale of fees. Thus the contractor is motivated by profit to successfully complete his contract whereas the Development Team is motivated by seeking to secure another appointment. Model forms of agreement have been written for the appointment of Construction and Materials Managers (Soderlund and Schutte, 1994).

The developmental support provided by the Construction and Materials Managers may be summarised as follows:

**Construction Manager**

- offer advice, practical assistance and training
- provides plant other than small tools
- arranges for specialist work
- arranges for payment of fortnightly/weekly wages
- transport of materials to site

**Materials Manager**

- provides all material

In terms of the model form of agreement, the Construction Manager is required to advise, assist and train on-the-job the contractor in the execution of his contracts and to this end shall make visits to the Site at such intervals as he deems appropriate during the various stages of construction in order to ensure that the Contractor makes satisfactory progress, shows technical competence in the execution of all aspects of the works and generally fulfils his contractual obligations. The Construction Manager shall procure the services of site staff, as necessary, to assist him and provide continuous support to the Contractor in order to ensure that the Client's objectives are achieved.
The Construction Manager cannot, however, ensure the performance of the Contractor, nor guarantee against any failure by the contractor to perform his work in accordance with the Contract (Soderlund and Schutte Inc, 1994).

The Construction Manager's function is therefore to minimise the client's contractual risk and to meet the client's objectives of having the works constructed to specification within a specified period and a given budget using community-based contractors and labour-based construction practices (Soderlund and Schutte Inc, 1994). Thus the client has the assurance that the local small contractor, by relying on the support provided by the Construction Manager, will have the necessary skills available to adequately complete the contract (Watermeyer and Band, 1994).

It should be noted that the Construction and Materials Manager carry professional indemnity insurance which can be called upon in the event of negligence on their part.

The support provided is flexible and can be varied depending upon the needs of the community, e.g., if the community is capable of procuring the materials, then there would be no need for a Material's Manager.

Community-based developments

The Managing Contractor and Development Team Approach are not the only way in which communities can become involved in construction projects. The range of options include (Watermeyer and Band, 1994):

- Labour Pool Worker Programme (NCLIC Framework Agreement type approach).
- Managing Contractor.
- Development Team Approach.
- Main Contractor.
- Contractor Team Approach.

Depending upon the community's requirements and the resources and expertise available, any combination of the above mentioned approaches can be utilised to facilitate community involvement as illustrated in Figure 2.

There are different emphases on community involvement and training opportunities in the aforementioned approaches to implementation, the differences are briefly listed hereunder (Watermeyer and Band, 1994).

Labour pool worker programme approach

- job creation.
- training of labour in the appropriate skills required to do a particular project.
- ownership of contract rests with main contractor.
Managing contractor approach
- training as for Labour Pool Worker Programme plus management training.
- ownership of contract as a whole rests with the main contractor but nominated emerging sub-contractors owns subcontracts.

Development team approach
- job creation and entrepreneurial development.
- involvement of community in contractor support systems, management of emerging contractors and materials supply, transport of materials and security of site.
- training as for Managing Contractor Approach and Labour Pool Worker Programme plus training in commercial and administrative aspects.
- emerging contractor has ownership of contract.

Main contractor approach
- assets creation.
- training of contractor's staff in the traditional manner.
- ownership of contract rests with the main contractor.

Contractor team approach
- job creation and small scale enterprise development.

Mentorship approach
- coaching and mentoring and emerging contractors.
- rendering assistance in the setting up of proven systems.
- enhancing business and management skills.

Joint venture
- business development.

Cost retained by the community
The amount of construction cost retained by the community gives an indication of the degree to which entrepreneurship and small scale enterprises are promoted in the community and is a direct measure of the benefit accrued by the community from the project as well as that of economic empowerment. (Watermeyer et al, 1994).

In community-based construction projects in Soweto, where materials are not manufactured by the community, the amount retained by the community varies from 37 to 50% depending upon the cost inputs relating to materials. This is achieved through the community’s involvement in the construction contracts (25-33%), transport of materials (2-9%), construction management (6-7%) and materials management (2-3%) (Watermeyer, et al, 1994). In house construction, the cost retained by the community by means of community-based construction practices can be in excess of 40% (Watermeyer and Band, 1994). Where communities engage in the manufacture of materials, these percentages will increase.
Building construction

Civil and electrical works

Figure 2: Approaches to facilitate a community's involvement in construction projects
CONTRACTOR DEVELOPMENT PROGRAMME

General

The employment of local entrepreneurs in community-based developments has led to the establishment of contractor development programmes. Details of such programmes have been published by Watermeyer (1992) in a manual on Soweto's Contractor Development Programme, Watermeyer and Band (1994) in a report commissioned by the National Housing Forum and Milne (1994) in a DBSA publication.

Watermeyer and Band (1994) suggest that a contractor development programme (CDP) should be based on the following convictions:

- An excellent bricklayer does not necessarily make a good contractor.
- A successful contractor must possess certain practical, theoretical and managerial knowledge in addition to individual flair (entrepreneurship).
- Professional management, supervision and training should be used to improve/transfer skills and to ensure satisfactory progress on projects.
- Commercial skills, which are an important factor in a contractor's success, should be taught.
- A skill is normally developed by repeating the same work on a repetitive basis.
- Participants with suitable experience should be allowed to enter the programme at their level of proficiency and not be forced to enter at a beginner level.
- Not all small scale enterprises will necessarily grow into medium and large scale enterprises.
- Participants should not be allowed to "camp" in the programme (i.e. operate solely on a continuous basis within the programme) and should be encouraged to leave and return to the programme from time to time.
- Certain small scale contractors may elect to operate as labour-only contractors/subcontractors and not express any desire to progress beyond this level of operation.
- The contract documentation employed should enable emerging contractors to become familiar with industry standards to enable them to ultimately compete in the formal sector of the economy.
• The selection of emerging contractors for participation in a CDP should be on the basis of open tenders.
• Development support provided should be aimed at enabling emerging contractors to operate in the formal sector of the economy.
• Credibility and financial security are earned through training and through successful, profitable, completion of projects.

They also suggest that a CDP should offer emerging contractors the opportunity to mature into a contractor/subcontractor who has all the resources to execute a project or portion thereof. Such a programme should therefore allow emerging contractors to develop:

• Commercial skills.
• Managerial and administrative skills.
• Credibility in commercial circles.
• Experience in pricing complete contracts while accepting increasingly greater risk and contractual responsibility.

The structure of a CDP should be such that the supporting structures and the associated construction processes, effectively eliminate the barriers to entry, for those entering the programme and reimposes these barriers as emerging contractors are developed within the programme. This should be done in such a manner so as to enable contractors leaving the programme to compete in the formal sector of the economy at their level of proficiency. At the same time, the CDP should encourage entrepreneurial flair, provide training to enhance business skills and enable participants to learn and mature through experience.

**Watermeyer's Contractor Development Programme in respect of civil and electrical contractors**

A CDP needs to be structured in levels of contract to enable emerging contractors who have different proficiencies, aspirations, business acumen and size of businesses, the opportunity to enter and exit the programme at various stages. At the same time, the levels of contract need to be structured in such a manner that those leaving at any level or stage, can function without developmental support in the formal industry, and those within the programme have reduced and appropriate developmental support at each successive level of contract, with increased contractual responsibility and risk.

Five levels of contract are proposed, viz.:

• Level 1: labour only.
• Level 2: labour plus transport of materials to site.
• Level 3: labour plus transport plus materials (assisted).
• Level 4: labour plus transport plus materials (unassisted).
• Level 5: labour plus transport plus materials plus full surety.

The contractual responsibilities and developmental support required for each level of contract is summarised in Table 4 and the proposed value and duration of contracts at each level is tabulated in Table 5.

The levels of contract can also be viewed as the re-introduction of the barriers to entry with each successive level of contract to ensure that emerging contractors can be integrated into the mainstream of the economy. This is demonstrated in Table 6.

The 5 levels provided for in the programme are structured in such a manner that a contractor, who has no resources when he enters the programme, can build up his resources while he learns tendering and contracting skills. This is generally achieved by putting profits back into his business. Credibility in commercial circles at the higher levels of contract can be established by successfully completing a number of lower level contracts.

Not all contractors will, necessarily, advance to Level 5 and some may only aspire to Level 2 or 3. The programme caters for all levels of contract and allows contractors to operate in a manner similar to that of the building industry. Competent contractors who operate at Level 2 could, for example, leave the programme and successfully operate as labour only subcontractors to established contractors, on other projects outside of the programme. The programme, by virtue of providing contract opportunities for all levels of work, will also provide emerging contractors with opportunities for continuity of work. The opportunities for contractors who leave the programme and the qualifications of those who enter the programme are depicted diagrammatically in Figure 3.
<table>
<thead>
<tr>
<th>Level of Contract</th>
<th>Type of Support</th>
<th>Contractor's Contractual Responsibilities</th>
<th>Degree of Developmental Support Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Mentor</td>
<td>Provide labour, materials and plant. Provide 5% surety. Engage specialist contractors. Finance all contractual obligations.</td>
<td>Conduct a tender workshop. Advise, coach, counsel, guide, teach, instruct and tutor the contractor. Render assistance in the setting up of proven systems to enhance management and business skills.</td>
</tr>
<tr>
<td>5</td>
<td>Mentor</td>
<td>As for level 4. Provide 10% surety.</td>
<td>As for level 4.</td>
</tr>
</tbody>
</table>
Figure 3: A Contractor Development Programme for Civil and Electrical Contractors
Table 5: The duration and value of contracts.

<table>
<thead>
<tr>
<th>Level of Contract</th>
<th>Typical Contract Duration</th>
<th>Typical Contract Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 to 4 months</td>
<td>&lt; R100 000¹</td>
</tr>
<tr>
<td>2</td>
<td>3 to 7 months</td>
<td>&lt; R250 000¹</td>
</tr>
<tr>
<td>3</td>
<td>6 to 9 months</td>
<td>&lt; R1 200 000</td>
</tr>
<tr>
<td>4</td>
<td>up to 12 months</td>
<td>&lt; R1 000 000</td>
</tr>
<tr>
<td>5</td>
<td>up to 18 months</td>
<td>&lt; R2 000 000</td>
</tr>
</tbody>
</table>

¹ Labour only

Table 6: Resources required by contractors at each successive level of contract.

<table>
<thead>
<tr>
<th>Level of Contract</th>
<th>Additional Resources Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Transport or access to transport. Finances for transport and the supply of minor materials.</td>
</tr>
<tr>
<td>3</td>
<td>Finances for fortnightly wages. Credit with materials suppliers.</td>
</tr>
<tr>
<td>4</td>
<td>Finances for wages. Credit for plant hire and purchase of materials. Access to a surety equal to about 5% of the value of the Works.</td>
</tr>
<tr>
<td>5</td>
<td>All the resources of a conventional contractor. Access to a surety equal to 10% of the Works.</td>
</tr>
</tbody>
</table>

Milne's Contractor Development Framework

Milne in the DBSA publication Guidelines for emerging contractor development defines five levels of contractor (see Table 7) being artisan assistant (Level 1), artisan (Level 2), emerging small contractor (Level 3), established small contractor (Level 4) and established large contractor (Level 5). Watermeyer and Band (1994), however, point out that this classification can be readily modified to include the sub-contracts arena i.e. artisan assistant (Level 1) and artisan (Level 2), as before, followed by "emerging small sub-contractor", (Level 3) "established small sub-contractor" (Level 4) and "established large sub-contractor". There is, however, an inference in this classification that a contractor or sub-contractor must have been an artisan first. This is not
usually the case with all the medium to large established contractors who currently exist. Accordingly, this classification is a misnomer.

Milne's contractor classification and framework is based on a presentation to the Small Contractor Action Forum during February 1990. The framework for contractor development, as shown in Table 7, is based on guiding principles which differ significantly from that proposed by Watermeyer and Band. Contract types, documentation and tender procedures at the lower levels of contract are very different from industry norms. The framework is also written around technical and managerial counselling and training at the lower levels of contract as opposed to proactive on site, continuous management support and "on the job training" provided for in Watermeyer's classification. Watermeyer's contractor classifications, on the other hand, was developed by the Soweto Project Team during 1991 and was first published in the final draft of the DBSA's guideline document and thereafter in the project team's manual entitled Contractor Development in Labour-Based Construction. The team identified 5 areas or components of civil construction viz. labour, transport, materials, plant and finance. These components were ranked in order of complexity and each level of contract was intended to introduce contractors to each of them in a progressive manner. During 1993, when the form of contractor support at the higher levels of contract were fully developed and documented, the levels of contractor at levels 3, 4 and 5 were modified to their present descriptions. It is important to note that the fact that both Watermeyer and Milne have chosen five levels of contractor categorisation is coincidental as the levels have considerably different meanings. These differences are highlighted in Table 8.
Table 7: Milne’s (DBSA) contractor classification and framework for Contractor Development for the construction industry.

<table>
<thead>
<tr>
<th>CONTRACTOR CLASSIFICATION</th>
<th>SKILLS</th>
<th>TENDER PROCEDURES</th>
<th>CONTRACT TYPE</th>
<th>DOCUMENTATION</th>
<th>PROJECT CLASSIFICATION</th>
<th>SUPPORT SERVICES</th>
<th>CONTROL MEASURES</th>
<th>CONTRACT VALUE* (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Labourer</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1 Assistant Artisan</td>
<td>- Numerate, literate - Limited technical &amp; trade skills - Trade skills</td>
<td>Request</td>
<td>Buying order</td>
<td>Simple instructions</td>
<td>Menial task</td>
<td>- Revolving credit - Managerial and technical counselling - Working capital and equipment</td>
<td>- Financial - Management - Materials - Quality - Progress</td>
<td>&lt;R 5 000</td>
</tr>
<tr>
<td>2 Artisan</td>
<td>- Advanced trade skills</td>
<td>Invite tenders</td>
<td>Agreement</td>
<td>Simple working drawings</td>
<td>Placement</td>
<td>-</td>
<td>&lt;R 25 000</td>
<td></td>
</tr>
<tr>
<td>3 Emerging small contractor</td>
<td>- Managerial ability</td>
<td>Prequalified open tenders</td>
<td>Minor works contract</td>
<td>Working drawings and materials lists</td>
<td>Single unit small contractor</td>
<td>-</td>
<td>&lt;R 100 000</td>
<td></td>
</tr>
<tr>
<td>4 Established small contractor</td>
<td>- Advanced management skills - Some commercial exposure</td>
<td>Open tenders</td>
<td>Contract without schedule and bill of quantities</td>
<td>Working drawings, specifications and materials list</td>
<td>Multi-unit medium contract</td>
<td>- Physical facilities - Marketing</td>
<td>&lt;R 300 000</td>
<td></td>
</tr>
<tr>
<td>5 Established large contractor</td>
<td>- Overall entrepreneurial</td>
<td>Open tenders</td>
<td>Contract with schedule and bill of quantities</td>
<td>Formal documentation with schedules and bill of quantities</td>
<td>Large contract</td>
<td>- Marketing</td>
<td>- Normal control</td>
<td>&lt;R 1 000 000</td>
</tr>
</tbody>
</table>

* Levels 1 to 2 are regarded as informal labour only contracts; Level 3 as informal/formal commercial labour and materials contracts; and Level 4 and 5 contracts as formal commercial labour and materials contracts.
* Milne estimates the time required for advancing from one level to the next to be 3 years.
* Labour and materials.
Table 8: Differences in levels of civil engineering contracts between that proposed by Milne and Watermeyer.

<table>
<thead>
<tr>
<th>Field of Operation</th>
<th>DBSA (Milne)</th>
<th>CDP (Watermeyer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Civil Works</td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>Artisan Assistant</td>
<td>Labour only contractor</td>
</tr>
<tr>
<td>Level 2</td>
<td>Artisan</td>
<td>Labour plus transport contractor</td>
</tr>
<tr>
<td>Level 3</td>
<td>Emerging small contractor</td>
<td>Labour plus transport plus materials</td>
</tr>
<tr>
<td>Level 4</td>
<td>Established small contractor</td>
<td>As level 3 plus limited sureties</td>
</tr>
<tr>
<td>Level 5</td>
<td>Established large contractor</td>
<td>As level 3 plus full sureties</td>
</tr>
</tbody>
</table>

Watermeyer and Band's Contractor Development Programme in respect of building construction

Building construction differs appreciably from civil engineering construction in respect of contractor development. The principal reason for this is that building construction is to a large extent reliant on the availability of competent sub-contractors. Many of the large formal contractors dig the excavations, pour the foundations and use sub-contractors to continue and complete the construction. Some contractors even employ sub-contractors to excavate and cast the foundations. The main contractor, therefore, frequently operates as a provider of materials for labour only sub-contracts and as a project manager who controls the programme and the budget, and provides foremen to check the quality of the work provided by sub-contractors. Contractors can be classified as falling into one of the following five categories:

- labour and materials contractors.
- labour only contractors.
- labour and materials sub-contractors.
- labour only sub-contractors.
- materials only managing contractors (nominal labour force).

Most reasonably sized projects comprise a combination of contractors, labour and materials sub-contractors and labour only sub-contractors.

In the Contractor Team Approach, individuals who assume responsibility for a trade (e.g., bricklayer, carpenter, plumber, painter, electrician, etc.) or aspect of the works (e.g., excavation) are brought together to form a construction team. Each team member operates as a sub-contractor in his own right and is remunerated on the basis of the accepted "market rate". Prices which are too low or too high are not
accepted. Certain rules are laid down to ensure that contractor teams complete projects on time, to the correct quality, and within budget.

The necessary support required on a project where the Contractor Team approach is adopted, is the overall site management and the management of the materials. These functions can be performed by one or two organisations, as appropriate. Such organisations may be either a main contractor or a company which has the appropriate skills. The functions of these two support groups are as follows:

- **Site management (Site Agent).**
  Responsibility for the overall management of the site, and to ensure parties adhere to the systems prescribed on a particular project.

- **Materials management.**
  Responsibility for procuring, storing and issuing materials to the respective contractor teams.

The development support which is provided in the Contractor Team Approach, is similar to that in respect of the Managing Contractor and Development Team Approach proposed for civil and electrical construction projects. The basis of the appointment of organisations to undertake responsibility for the site and materials management functions is dependent on the developing agents' requirements and organisational structures. Organisations can either contract to perform these functions or be appointed on a fee basis. Wherever possible, members of the local community should be trained to enable them to become involved with these functions to further increase the benefits accruing to a community.

Small scale entrepreneurs can develop along two distinct paths in this approach, viz.:

- **Sub-contractor**
  Each of the contractor team members have the opportunity to develop as sub-contractors in their own right. The building industry is dependent on the depth and strength of its sub-contractors and within each project where the Contractor Team Approach is used, there must be training in the management skills necessary for the sub-contractor to run his own business.

- **Contractor**
  Contractors develop along two routes in the Contractor Team Approach. One of the team leaders from a particular team can take over the role of contractor, if he demonstrates his leadership and organisational attributes to the rest of the team. With the necessary training and the experience gained on site, such contractors have the potential to develop into fully fledged contractors, (See Figure 2.) The remainder of his team can either continue to operate as sub-contractors or join the entrepreneur as a part of his management team.
The manner in which the both contractors and sub-contractors develop, is shown in Figure 2. This figure shows the various development routes which are possible for emerging sub-contractor and contractors. Not all entrepreneurs will aspire to become main contractors. Many large, medium and small formal sub-contractors, (labour only and labour and materials), have developed their organisations on the basis of one trade only and operate particularly successful businesses. It is therefore unrealistic to assume that the sole objective of such a programme is to produce main contractors. Nevertheless, the opportunity to do so must be built into the programme.

The approach indicated in Figure 2 shows the several courses of action open to those entering the house building arena as well as for those already operating within the industry.

Members of the community can enter projects as members of "contractor teams", labour-only sub-contractors or labour-only contractors. Individual members of "contractor teams" have the opportunity to become labour-only sub-contractors, labour only contractors, labour and materials sub-contractors, joint venture contractors or main contractors in their own right. Labour-only sub-contractors, on the other hand, (generally sub-contracted to the main contractor) have the opportunity to become contractor teams, labour and materials sub-contractors or labour-only contractors. Labour-only contractors have the opportunity to become contractor teams or become main contractors. Labour and material sub-contractors have the opportunity to become contractor teams, become joint venture contractors, or become main contractors. Joint venture contractors, in turn, have the opportunity to become main contractors.

Backward integration into the system is also possible. For example, a member of the contractor's staff may wish to start a labour-only sub-contract or join the contractor development programme, and so on. The programme affords housing projects the opportunity to maximise the development of human resources.

LOOKING AT THE FUTURE

Labour-intensive and labour-based methods of construction have a valid place in the South African construction industry and with the spiralling levels of unemployment will be used to create job opportunities. These methods will not replace plant-based methods but will co-exist with such practices.

Labour-based construction practices will probably become more cost competitive since current cost comparisons with conventional construction practices have been undertaken in a recessionary period where plant on most projects has been priced at unrealistically low levels. This trend may continue when current plant requires replacement. Any boom in the industry may result in a shortage of available plant and cause prices to rise sharply. Labour-intensive and
labour-based construction practices, if implemented on a large scale and linked to the development of small scale enterprises, could be effectively employed to maintain competition, to stabilise construction costs and to circumvent the purchase of plant by increasing production capacity.

Communities are expressing a strong desire to participate in the construction and maintenance of their own housing and infrastructure. Accordingly, the demand for community-based construction is going to increase, particularly as communities realise that they can construct their own infrastructure with the support of a developmental team. The cost of community-based construction practices will probably reduce as the level of competence in community-based contractors increases and the developmental support required is reduced. Community-based construction projects will also empower communities to take charge of their maintenance needs.

Certain restructuring of the industry will need to take place to enable small scale enterprises to have adequate market share and to change the distribution of the size of companies which are currently operating. Should the formal sector work together with the informal sector, contractors can develop together to benefit all.

REFERENCES


1.4 A practical application of the framework agreement

M. Stofberg, Power Construction

INTRODUCTION

Labour-intensive or labour-based construction have become the "buzz words" in the civil engineering industry in the 1990's.

Over the past three years or more, there has been an increasing desire or request for industry to increase the labour component of civil construction. This emerging desire was largely due to the unemployment level in the country, which has been reaching alarming numbers.

Labour-intensive construction may be defined as the economically efficient employment of as great a proportion of labour as is technically feasible to produce as high a standard of construction as demanded by the specifications and allowed by the funding available.

Labour-intensive construction is the optimum substitution of labour for equipment in the execution of civil engineering works. By comparison with conventional equipment-based methods, the use of labour-intensive methods results in the creation of a significant increase in employment opportunities per unit of expenditure.

As awareness of labour-intensive construction and its benefits to particular communities grew, there was a growing tendency for funding authorities to insist that construction work was undertaken using these methods. This led to a growing interest on the part of the contracting community who wished to become involved, but who suffered from a lack of normalisation of the approach and of the "rules" applicable to labour-intensive construction as it was being developed.

As the volume of work which was to be undertaken in a labour-intensive manner grew, the divergence of approaches increased and to some extent confusion and dissatisfaction on the part of all concerned parties arose.

The National Committee for Labour-Intensive Construction (NCLIC) was established to represent the interest of the formal industry including the contractors, design professionals and local authorities (South African Federation of Civil Engineering Contractors, South African Association of Consulting Engineers, South African Institution of Civil Engineers of South African Road Federation, the Institution of Municipal Engineers of South Africa). NCLIC initiated discussion with the Congress of South African Trade Unions (COSATU) and with the South African National Civic Organisation (SANCO) with a view to drawing up an agreement which would be a guideline for the further implementation of labour-intensive construction methods.
THE FRAMEWORK AGREEMENT
These negotiations led to preparation of the Framework Agreement for Public Works Projects Using Labour-Intensive Construction Systems" which was formally ratified by the subscribing parties on 22 June 1993.

NATIONAL CO-ORDINATING COMMITTEE
Initially there was a Co-ordinating Committee consisting of NCLIC, COSATU and SANCO. However, as stated earlier, any Government is a key role player into the allocation of the funds for infrastructural projects and therefore meetings were held with various Government Departments to encourage them to join the Co-ordinating Committee. The National Co-ordinating Committee (NCC) was formed and includes a representative from each of five Government Departments, namely, the Department of Transport, Department of Manpower, Department of Public Works, Department of Water Affairs and Forestry and the State Tender Board. (see Annex).

ACCREDITATION BOARD
It was decided by the NCC that a series of pilot projects should commence in various regions throughout the country both in rural and urban areas. In order to identify these projects, an interim Accreditation Board has been set up consisting of 5 representatives from NCLIC, 2 representatives from COSATU/SANCO, 1 representative from the Department of Manpower and 1 representative from the Development Bank of Southern Africa. (see Annex).

Projects to be constructed under the Framework Agreement must be approved by the Accreditation Board. The funders of a project must apply in the first instance to the Accreditation Board and give full particulars of the project details on prescribed application forms. Once the project has been accredited, it is envisaged that it will receive automatic exemption from certain aspects of the existing Wage Order for Civil Engineering projects, thus clearing the way to implement the task based system of payment and conditions of employment as set out in Annex IV of the Framework Agreement.

THE BLOEKOMBOS LABOUR-INTENSIVE CONSTRUCTION PROJECT AT BLOEKOMBOS KRAAIFONTEIN
Bloekombos is an informal settlement 1 km east of Kraaifontein with approximately 2,000 families.

Due to the difficulties associated with in-situ upgrading, it was decided to provide serviced plots on the 65 ha open land next to the existing informal settlement.

The funding body, WCPA and the consultants approached the community during June 1993 when the project was initiated.
The project was structured with full community involvement.

It was requested and agreed that the contract will be done on labour-intensive methods to create as many as possible job opportunities.

The project was structured to be carried out in terms of the Framework Agreement for public works projects using labour intensive construction methods.

Application for accreditation to the Accreditation Board was made and the Bloekombos project became the first accredited labour-intensive project in South Africa.

The aim of the project was to create job opportunities and training for approximately 450 people and to provide services, streets, water, waterborne sewerage system and electricity to 1885 erven.

The project consists of the following:

- Site clearance.
- Stormwater system.
- Water system.
- Construction of bitumen roads.
- Supply of electricity.

Contractors were appointed during November 1993. The total contract value of the project is R18 million. The construction period is 12 months and the planned completion date of the contract is the end of November 1994.

Currently the construction works is on schedule and the spending is within the approved budget.

**Succeses**

- Over 560 people have been trained in various skills during the contract and 520 people were employed during the construction phase of the project. These people earned an average of 1.5 times the agreed task rate per day.

  This contract therefore provided job opportunities for people who otherwise would have been unemployed. The money earned uplifted the community's standard of living. Families that were sharing houses now had the opportunity to occupy their own and those that were dependent on others are now independent.

- Through the training that was done the people acquired certain skills that would enable them to be utilised on the contracts as sub-contractors or as future maintenance units within Bloekombos development.
• Team leaders acquired supervisory and organisational skills.
• Through the task based payment system the people are made aware that remuneration is linked to productivity, e.g. the more they produce the more money they take home.
• Through the meetings and discussions that are held on site between worker representatives and management, the fact was emphasised that they, the workers, also have the opportunity to air their views.
• The people acquire basic numeracy training through the method of measurement and payment used on this project.
• On a normal contract approximately 80 people would be employed where on this project approximately 520 people were employed.
• Bank accounts were opened for the team leaders who paid the individuals in their teams with cheques giving them the opportunity to manage money.

PROBLEMS ENCOUNTERED
The Framework Agreement was never really field tested and certain shortcomings created problems e.g.:
1. Task based work was initially unacceptable to the workers.
2. Initial negotiations with the workers to determine task sizes.
5. UIF: People insisted to take part in the fund although they were temporary employed.
6. Disciplinary and grievance procedure.
1.5 Choice of technique analysis

S.D. Phillips, C.A. Pintusewitz and R.T. McCutcheon, Research Centre for Employment Creation in Construction, University of the Witwatersrand, Johannesburg

EXECUTIVE SUMMARY

Labour intensive construction involves the use of labour rather than machines, where technically and economically feasible. The authors have attempted to develop a methodology (Choice of Technique Analysis (COTA)) to enable the limits of technical and economic feasibility to be determined in a simple and consistent manner. The authors have developed COTA as a decision-making aid (a set of principles and a methodology) for government bodies charged with ensuring that publicly owned infrastructure is provided in a labour-intensive manner.

Such a methodology must be flexible and must incorporate a monitoring and feedback mechanism, in order that improvements in labour-intensive construction technology and practice can be taken into account. In addition, the inputs to cost calculations should be treated as variables, rather than as entities with fixed values, in order for the methodology to successfully model a changing environment.

The economic, social and political benefits of creating employment opportunities should be considered in the determination of economic feasibility. However, the cost comparisons in COTA have a more limited focus than those usually carried out in orthodox social cost benefit analysis - it is assumed that a decision has been made to build the infrastructure, and the analysis focuses on the relative costs and benefits of using different construction techniques.

The underlying principles are discussed, and thereafter a schematic representation of COTA is presented and explained in the paper.

INTRODUCTION

An incremental reorientation of public sector expenditure on infrastructure towards the use of more labour-intensive construction techniques over time would be a partial remedy to the problems of unemployment and poverty (McCutcheon, 1993). Choice of Technique Analysis (COTA) is an analytical tool to assist funding bodies to manage the complex process of increasing the labour intensity of construction techniques. The complexity of the process is due to the need to ensure that the increase in labour intensity in construction takes place without sacrificing the quality and cost of the assets produced. COTA is based on earlier work by the ILO (Costa et al, 1976:iv-18; Edmonds and de Veen, 1991:14; Garnier, 1982).
THE BASIC PRINCIPLES UNDERLYING COTA

An incremental approach to increasing labour intensity

In some types of public works, such as masonry stormwater and water crossing structures, construction techniques are conventionally (i.e. currently) highly labour-intensive. Thus labour-intensive construction of these types of works may be carried out without a prior period of technical development work, training, capacity building, and related institutional changes.

However, other types of public works, such as surfaced roads, are conventionally built using highly mechanised construction techniques. In order to ensure high quality and reasonable financial cost, labour-intensive construction of these types of works should be preceded by a process of technical development work (including the identification of appropriate designs), institutional change, training and capacity building. Thus, in a broad sense, the labour intensity of the construction industry should be increased incrementally, while the capacity of the industry to build more and more types of public works using cost-effective labour-intensive techniques is developed.

An incremental approach to increasing labour intensity may also be taken within each type of public works. For example, the construction process for surfaced roads may be broken down into many individual construction activities (for example, excavating earth, loading earth, and spreading earth). The financial and economic feasibility of labour-intensive construction depends partly on the labour productivity levels achieved. Labour productivity levels will be lower when the labour-intensive construction industry is in the early stages of its development (i.e. while training programmes and technical development work are in their early stages) than when it has reached maturity.

Thus, labour-intensive techniques would be financially or economically feasible (relative to machine intensive techniques) for fewer activities when the industry is in its infancy than when it has reached maturity. Similarly, labour-intensive techniques would meet the required quality standards in fewer activities when the industry is in its infancy than when the industry is mature. Thus, labour intensity should also increase incrementally in a narrower sense, that is within each type of public works, as the capacity of the industry to obtain higher labour productivity levels and quality standards in individual construction activities is developed.

The focus and aims of the cost calculations in COTA

Cost calculations, in which the cost of labour-intensive construction methods are compared to the cost of conventional machine intensive methods, form one element of COTA. It should be noted that there is a great deal of variation between the values of tenders for conventional
machine-intensive projects, and hence it is difficult to determine "average" machine intensive costs.

The difficulty of ascertaining "average" machine intensive costs is compounded by the existence of multiple design alternatives for machine intensive construction. For example, both concrete roads and crushed stone roads are appropriate for machine-intensive construction. However, the costs (both initial construction costs and maintenance costs) of concrete roads and crushed stone roads differ.

There are also usually multiple design alternatives for labour-intensive construction. For example, interlocking concrete blocks, natural gravel, and waterbound macadam are all appropriate road base course materials for labour-intensive construction. Thus, there is not a unique cost of machine-intensive construction against which a unique cost of labour-intensive construction can be compared. The cost calculations are therefore potentially highly complex. The authors consider that empirical testing of COTA should be carried in order to find solutions to this complexity problem.

The cost calculations in COTA can be made purely on the basis of financial costs, or they can include adjustments for "market distortions". However, in the authors' view, policy makers should aim to develop labour-intensive construction techniques such that, where possible, they become financially cheaper than machine-intensive construction techniques.

The cost calculations in COTA differ to those carried out in conventional cost benefit analysis (CBA). Whereas CBA attempts to compare the relative costs and benefits of diverse projects, the cost calculations in COTA are confined to the narrower question of the relative costs and benefits of using different sets of machine-labour combinations in a particular project. Thus, in contrast to CBA, COTA compares alternative choices of productive technique and does not attempt to analyse the whole economy.

We are not arguing that no attempt should be made to assess the relative costs and benefits of making different investments, for example of building a road in one area rather than another area. However, as far as the question of the choice of technique is concerned, it may be assumed that a decision regarding the choice of investment has been made prior to the analysis. This is a plausible assumption where departments and thus budgets and planning are segmented.

**The treatment of costs, cost adjustments, and productivities as variables**
Although the cost calculations in COTA and CBA use similar staged
takes to the analysis of costs and benefits, the method of
quantifying costs and benefits in COTA differs from that used in CBA.
There is profound disagreement among economists about the
appropriate manner to quantify social and economic costs and benefits.
The quantification problem has led to many alternative measures, and
no absolute or "correct" measurement may be identified. In addition,
quantification is only as good as the data on which it relies. Data in
South Africa is not only unreliable, but is often unavailable (this is a
common problem in developing countries).

The cost calculations in COTA are based on the idea that
quantification of socio-economic costs and benefits is inherently
subjective, based on excessive aggregation, and biased towards market
prices. The authors consider that an emphasis on quantification
results in financial questions being falsely prioritised over technical,
institutional, political and social issues.

Hence prices, benefits, cost adjustments and productivities are all
treated as variables in COTA, rather than as entities with fixed values.
For example, quantification of the social benefits of decreasing
unemployment is dependent on subjective perceptions of the
importance of the unemployment problem. In COTA quantification of
these social benefits is made on the basis of the policy priorities of
government and on the basis of empirical evidence from monitoring
and evaluation, rather than on the basis of the analyst's personal
perception of the importance of the unemployment problem. By
making the quantification of economic and social costs and benefits
explicitly dependent on the priorities of government (which is usually
the "client" in public works projects), the authors hope to move away
from arbitrary decision making regarding the limits to the socio-
economic feasibility of using labour rather than machines in
construction.

Sensitivity and scenario analyses can be used in COTA to highlight the
effects of changes in values of variables on the outcome of the cost
analysis. This enables the analyst to determine the relative
importance of the various factors affecting the costs of different
techniques. For example, the sensitivity and scenario analyses may
indicate that, for given ranges of the variables, labour productivity is
the most important factor affecting the relative costs of labour
intensive techniques and machine-intensive techniques for a particular
construction activity. This information can be used to inform policy

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1 In the first stage "financial" or "market" costs and benefits are calculated.
Thereafter adjustments are made for "market distortions" in an "economic
stage" (using shadow prices), adjustments are made for "social" benefits
(using the marginal utility of income) in a "social stage", and adjustments
are made for political priorities in a "political stage".
makers that institutional changes (such as the introduction of an improved supervisor training programme), which would result in higher labour productivity levels, are required in order to increase the feasibility of labour-intensive techniques.

A process of monitoring and evaluation is incorporated into the decision making process in COTA. This allows for learning by doing and incremental change. For example, monitoring of projects over time would pick up changes in labour productivity levels, which would result in changes to the values given to variables, which in turn would result in changes to the outcome of cost analyses.

Who should use COTA

COTA is a tool to assist government and other funding bodies in managing the process of increasing labour intensity in public works. In other words, COTA allows decision makers in government to reach systematic and consistent decisions, in accordance with their policy priorities, regarding the desirable degree of labour intensity of construction techniques. In addition it can provide useful information to aid the planning of a process of incrementally increasing labour intensity in public works (for example, through the use of sensitivity and scenario analyses).

Decision-making regarding the desirable degree of labour intensity of construction techniques is complex. For example, three factors which complicate cost comparisons between labour intensive and machine-intensive construction were mentioned earlier, i.e. the fact that different structural designs are appropriate for different construction techniques, the existence of multiple design alternatives for both labour-intensive and machine-intensive construction, and the large variation in the values of tenders for conventional machine-intensive construction²

In addition, thorough cost comparisons should involve comparisons of life cycle costs (including initial construction costs, maintenance costs and salvage values), as opposed to comparisons of initial construction costs only. However, different structural designs have different maintenance requirements and different salvage values.

For some projects, life-cycle cost comparisons involving all the possible design alternatives would be so complex as to render COTA unworkable in practice. The authors do not wish to create a large bureaucracy engaged in endless choice of technique analyses. However, empirical testing of COTA could throw light on possible ways of getting around the complexity problem.

² Widely varying tasks and widely varying labour productivity levels are further complicating factors.
For example, individual construction activities (such as excavation) could be analysed, as opposed to analysing entire construction projects. At a particular stage in the development of the labour-intensive construction industry in a particular province, certain average labour productivity levels may be achieved for excavation, depending on the hardness of the material to be excavated. Cost comparisons with machine-intensive techniques of excavation would give an indication of the socio-economic limits to the use of labour in excavation. Specific combinations of machines and labour could then be specified for various levels of hardness of material for projects involving excavation.

Care should be taken that the specification of the degree of labour intensity does not result in stifling of innovation in the construction industry. In this regard, it would be preferable to specify the construction activities in which machines should not be used, than to specify the kinds of labour-intensive techniques which should be used. For example, it could be specified that machines should not be used for excavation in material which is soft enough for hand excavation, and the industry would then be encouraged to develop innovative methods of hand excavation. For harder material, it could be specified that machines may be used for ripping before hand excavation. For very hard material, it could be specified that machines may be used for excavation.

The line function departments (at national and regional levels, and local governments) could therefore use COTA as a decision-making tool regarding the degree of labour intensity to be specified for projects (or sets of projects) in specific geographical or political regions at particular stages in the development of an efficient labour-intensive construction industry. In this respect, monitoring and evaluation are important in order to keep track of the state of development of the labour-intensive construction industry in different areas of the country. Monitoring and evaluation are also important in other respects, and these are discussed below.

**The importance of monitoring and evaluation**

COTA determines the limits of the technical and socio-economic feasibility of using labour rather than machines in construction. This analysis on its own is inadequate, and must be supplemented by monitoring and evaluation to inform future planning and implementation. The results and recommendations from ex-ante and ex-post (after the investment) research, including, for example, recommendations regarding the improvement of training programmes, must be implemented. In other words, monitoring and evaluation must result in institutional changes if the labour-intensive construction industry is to mature.
A SCHEMATIC REPRESENTATION OF COTA

Introduction to the schematic

A schematic representation of COTA is given in the overleaf. According to the schematic, COTA is divided into three parts. The first part (P1) covers the part of the decision-making process which involves determining the technical limits to using labour rather than machines for individual construction activities.

The second part (P2) covers the part of the decision-making process which involves making cost comparisons. The third part (P3) covers the part of the decision making process which involves monitoring and evaluation, or in other words, the feedback mechanism.

Discussion and elaboration of the schematic

The reference numbers below refer to those shown in the schematic.

PART 1 (P1)

Design for labour intensive construction and determination of the technical limits to using labour-intensive techniques for individual construction activities

The first part of the schematic (P1) represents a technical screening mechanism, which involves determining the technical limits to using labour-intensive techniques for individual construction activities. Over time the range of technically feasible labour-intensive construction would increase in response to technical development work, training, and institutional capacity building.

(P1) 1.1: Appropriate designs

Attempts to make designs which were produced with machine-intensive construction in mind more labour-intensive will often result in costly and poor quality products. If no appropriate labour-intensive designs are available, technical research is required to develop them.

(P1) 1.2: The technical feasibility of using labour-intensive techniques

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3 The rectangular blocks with solid outlines in the schematic represent identifiable steps in the decision-making process. The dotted line blocks are comment blocks. Oval shapes represent decisions. Thin arrows are used to indicate the flow of the decision-making process and thicker arrows are used to represent inputs and outputs of the cost calculations. Dotted arrows represent feedback, through new research, or the identification of quality and productivity improvements via monitoring.
The construction process should be broken down into distinct activities (such as excavate earth, load earth, haul earth, spread earth, and compact earth). The remainder of the first part of COTA involves a process of determining where machines are technically non-essential. For example, it is not possible to compact earth to the required density for roads using hand-tools, and hence machines must be used for this activity. Where there is disagreement among engineers about whether it is physically possible to use labour-intensive techniques for a particular activity, technical research should be carried out in order to resolve the issue.

(P1) 1.3: Standards: quality and construction time constraints

COTA is based on the assumption that all the technically feasible machine-labour combinations resulting from the choice of technique analysis would result in the same quality of product. In stage 1.3 of COTA, an assessment is made of whether labour-intensive construction techniques will meet the required quality standards for a particular construction activity. If the assessment indicates that labour-intensive construction techniques will not meet the required quality standards for that construction activity, then more machine-intensive techniques should be used for the activity.

The technical limits to using labour rather than machines are partly based on quality and construction time constraints. Quality and time constraints should be checked to see if they are appropriate for the project being analysed. If the constraints are binding and labour-intensive techniques cannot be developed such that they would meet the required standards in the time available before the project starts, then machine-intensive techniques should be used for the activity in question.

(P1) 1.3.1: Quality

As mentioned above, if it is not possible to achieve the required quality standards using labour for a particular activity, then machines, or a combination of labour and machines, should be used. However, existing labour-intensive techniques can be developed and improved. Hence it may be possible to develop improved labour-intensive techniques which can meet the required quality standards before the project commences.

(P1) 1.3.2: Time

COTA is based on the notion that labour-intensive construction should not result in unreasonable cost sacrifices. Long construction times may have significant cost implications. If the use of labour-intensive techniques would result in delays which would have significant and unacceptable cost implications, then machines or a combination of labour and machines should be used. Again, the speed of labour-intensive construction can be improved, for example, by improving
labour productivity, by improving the training of supervisors, or by increasing the number of labourers on site.

(P1) 1.4: Results of the technical screening process

The technical screening process identifies those activities for which it is technically feasible to use labour-intensive techniques, and those activities for which machines, or a combination of labour and machines, must be used. Thus the result of the technical screening process is the most labour-intensive set of construction techniques which is technically feasible.

PART 2 (P2):

Determining the limits to using labour-intensive techniques on the grounds of financial, economic, and social cost

In Part 2 the financial and socio-economic (and political) feasibility of the set of construction techniques produced as the outcome of Part 1 are assessed.

(P2) 2.1: Cost calculations

At this stage (P2) the construction process is examined as a whole, rather than as separate construction activities. The direct construction cost 4 of the most labour-intensive set of construction techniques which is technically feasible (the result of the technical screening process) is compared to the direct construction cost of conventional machine-intensive construction. In addition, economic, social, and political costs and benefits may be calculated 5.

(P2) 2.2: The decision rule

Having calculated relative costs, the next step is to come to a decision regarding the financial, economic and social feasibility of labour-intensive construction. In order to reach such a decision, a decision rule is required.

For example, a decision rule could be that decisions should be made on the basis of lowest financial or lowest "social" cost 6. Decision rules

4 Direct construction costs consist of labour, plant and materials costs.

5 The aim of calculating "economic, social, and political costs and benefits" is to take account of market distortions and costs and benefits not taken into account in purely financial cost comparisons, such as increasing the equity of income distribution.

6 The term "cost" here includes costs and benefits.
may have only one component or may involve consideration of several factors. For example, a decision rule could involve consideration of both financial cost and "social" cost, or more simply, of both financial cost and the number of person days of employment opportunities created. The comprehensiveness and complexity of a decision rule must be weighed against the need for simplicity (given data and administrative capacity constraints).

Care must be taken to ensure that decision rules do not result in choices that are incompatible with objectives. For example, cost per person month is a criteria for decision making which does not take the productivity of labour into account. Hence the use of lowest "cost per person month" as a decision rule can result in the encouragement of low productivity labour intensive construction.

The decision rule suggested in the schematic includes consideration of both life cycle financial costs and socio-economic costs (which may be considered in terms of adjusted financial costs or, more simply, in terms of the amount of employment created). In other words, both the financial and socio-economic costs of labour-intensive construction relative to those of machine-intensive construction must be acceptable in order for labour-intensive construction to be financially and socio-economically feasible. The actual values given to the decision rule depend in part on the policy priorities of the funding body. Policy priorities may be made explicit through the use of a transparent decision rule.

(P2) 2.3: The decision making process

Once the decision rule is specified, the next step is to establish the feasibility, in terms of socio-economic cost, of using labour-intensive techniques. Given a decision rule which compares both financial costs and socio-economic costs, four results of the cost calculations are possible.

The first possible result is that labour-intensive costs pass both the financial and socio-economic components of the decision rule (2.3.1 in page 96). In this case the most labour-intensive combination which is technically feasible is also financially, economically, and socially feasible.

In the second possible result, labour-intensive costs pass the financial component of the decision rule, but fail the socio-economic component (2.3.2). In this case it can be concluded that the project has only a token increase in labour intensity, and that machine-intensive construction would be more socio-economically feasible than labour-intensive construction.

The third possible result is that the labour-intensive costs fail the decision rule in terms of both financial and socio-economic costs (2.3.3). In this case, the labour-intensive construction process should
again be divided into activities, and the most expensive activities relative to machine-intensive construction should be identified. The labour intensity of the techniques used in these relatively expensive activities should then be reduced, and the cost calculations repeated. This process of reducing the labour intensity of the labour-intensive construction process should be continued until the labour intensive cost no longer fails both the financial and socio-economic components of the decision rule.

The fourth possibility is that labour-intensive construction will fail the financial component of the decision rule but pass the socio-economic component (2.3.4). In this case a similar process of reducing the labour intensity of relatively expensive labour-intensive construction activities is required, until labour-intensive construction passes both components of the decision rule.

(P2) 2.4: Specify the degree of labour intensity

Parts 1 and 2 (P1 and P2 on the schematic) of COTA resulted in the determination of the technical financial, economical, and social limits to using labour-intensive construction techniques. The resulting degree of labour intensity (for labour-intensive construction) should be specified in the tender documents. For example, on the basis of the results of the choice of technique analysis, the tender documents may specify that machines should be used for excavation at gravel borrow pits for a road construction project, but that loading and spreading of the gravel should be done by hand. Thereafter the tenders would be adjudicated in the normal way.

PART 3 (P3):

The implementation and monitoring process: a dynamic feedback mechanism

The third part of COTA (P3 on the schematic) covers the implementation of the project and subsequent monitoring and evaluation. The third part provides the link between the short term and the medium to long term, as the results of monitoring and evaluation influence future analysis. This implies that the three parts of COTA are interrelated, as future analysis is informed by the results of past projects. For example, monitoring of projects may pick up an increase in labour productivity levels, due to, for example, the effects of a new training programme. These improved productivity levels would then be used in future analyses. In this way, COTA allows for the notion of an incremental increase in labour intensity over time.

(P3) 3.1: Project implementation
The tender is awarded, and the project must be implemented with the degree of labour intensity specified by the funding body.

(P3) 3.2: The critical importance of evaluation and monitoring

Monitoring and evaluation are crucial in order to compare the values given to the variables in the cost calculations to what is actually achieved in practice. For example, if actual average labour productivity levels are lower than those predicted, then the work will be more financially expensive than was envisaged by the choice of technique analysis.

Thus an initial choice of technique analysis should not be seen as a final analysis. COTA should rather be viewed as a dynamic tool that can be used to link changing policy priorities to changing project characteristics (such as labour productivity and the availability of trained supervisors).
Choice Of Technique Analysis

1.1 Are Appropriate Designs Prepared For Labour Intensive Construction?
   - YES
   - NO

1.2 Is It Physically Possible To Use Labour Intensive Techniques For The Activity?
   - YES
   - NO

1.3 Would Labour Intensive Methods Meet The Standards?
   - NO
   - YES

1.3.1 Rectifiable Before The Project Begins?
   - Quality
   - Time

1.4 Labour Intensive
   - NO
   - YES

2.1 Cost Calculations

2.2 Does The Machine - Labour Combination Pass The Decision Rule?
   - YES
   - NO

2.3.1 Passes Socio-economic
   - Passes Financial

2.3.2 Fails Socio-economic
   - Passes Financial

2.3.3 Conventional Construction
   - Fails Socio-economic
   - Passes Socio-economic

2.3.4 Fails Financial

2.4 Specify Degree of Labour-intensity in Tender

3.1 Award of Tender, Project Implementation

3.2 Evaluation And Monitoring
RECOMMENDATIONS FOR FURTHER RESEARCH

This short summary has described an analytical tool to aid decision making with regard to the technical, financial, economic, social and institutional limits to increasing labour intensity in construction processes. COTA should be developed further through practical application. The aim of the development of COTA should be to produce a tool for managing an incremental process of increasing labour intensity in construction such that quality is not compromised, and such that costs are acceptable to decision makers.

ACKNOWLEDGEMENTS

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REFERENCES AND SHORT BIBLIOGRAPHY


2 Urban development

2.1 To what extent can NMT interventions be implemented using labour-based technologies and methods?

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INTRODUCTION

Reason for a mobility and non-motorised transport (NMT) action plan

Urban areas in Tanzania are growing rapidly due to a combination of factors. These include the unequal distribution of services, resource degradation and high population growth in rural areas, which cause people to migrate to cities, and population growth within the cities themselves. This rapid growth combined with inadequate resources overall means that social services are severely constrained. Amongst these services is transportation. Current estimates for the city of Dar es Salaam show that motorised transport is providing for less than 50 per cent of the daily trips of the residents. The average mobility of middle and low income households is estimated at 1.96 trips per person per day. It is not possible to increase the modal share of motorised transport due to serious resource constraints among which are capital, land availability and unaffordability of motorised vehicles by the majority of residents. On the other hand, it is very important that the level of mobility of the majority of residents be increased so that they can participate in wide ranging economic activities. Hence the need to plan for non-motorised transport so that it can play its role in the total transportation system.

Role of NMT studies and the Sub-Saharan Africa Transport Policy Programme (SSATP)

The SSATP is a broad based programme to improve transport efficiency and sustainability through policy reform. The programme is funded by donor agencies and supervised by the World Bank and the Economic Commission for Africa. The studies on NMT have been sponsored under this programme specifically to address issues related to greater and safer use of non-motorised transport modes in Africa's urban areas. The studies address all factors that constrain mobility in general and those that inhibit the use of non-motorised modes in particular. A review of urban transport policies in Dar es Salaam as well as regulations and institutional arrangements that have an effect
on the development of non-motorised transport modes have also been
carried out.

NMT studies in Tanzania

The NMT study in Tanzania was concentrated mainly in Dar es Salaam, although a quick survey of several upcountry towns was made in the initial assessment phase of the study. The study consisted of three main parts. The first part was concerned with the assessment of existing urban transport situation and user views. Data on the existing situation was obtained from past and ongoing studies as well as interviews with relevant officials. The users views were collected through "focus group" discussions involving a cross-section of Dar es Salaam adult residents including secondary school students.

The second part of the study consisted of a workshop which brought together users, providers and professionals working in the urban transport sector. The result of the workshop was to highlight key constraints to mobility that needed further research. The workshop also made recommendations on possible projects that can enhance the use of NMT. After the workshop two members of the study team visited India, Thailand and China to observe the role of non-motorised transport in urban areas.

The third part of the study was the design and execution of a household survey of a typical middle-low income residential district in Dar es Salaam and a corridor survey. The main purpose was to understand in more detail the travel behaviour of the residents and their mobility constraints.

Study findings

The study results point out the following constraints to mobility for the majority of Dar es Salaam residents.

Unaffordability of transport costs

From the Household survey results the average mobility for the survey population was found to be 1.96 trips per person per day. This value is very low and indicates that a lot of people are immobilised around their homes. Those going to work at fixed workplaces were found to make only one round trip per day and a large number walked to their destination. For the most important trip of the day 45 per cent of respondents walked all the way while 44 per cent used the bus.

Considering trip length, it was found that 57 per cent of all trips were less than 3 km showing the limited range of the pedestrian trip. One of the major reasons for this low mobility is that a large number of the residents of Dar es Salaam cannot afford the bus fare of about Tanzanian shillings 70/= per single trip, irrespective of length. Cycling can provide movement within the residential districts and
cater for most non-work trips as well as work trips if the workplace is located within a reasonable distance. But most residents cannot afford a bicycle which on the average costs about four times the monthly minimum wage.

Traffic conditions
The survey results indicate that the existing traffic conditions in Dar es Salaam have an overall negative effect on mobility. Fear of road accidents has made it difficult for one to use a bicycle on a trip downtown. This can be attributed partly to the fairly high speeds of motorised traffic in some areas and partly to poor driving behaviour especially of Daladala drivers. The same reasons have curtailed walking along the major corridors especially because of the difficulties and danger associated with crossing the road between intersections. Safety is the most important reason not to cycle on the main corridors or to consider cycling as a potential mode for such a trip.

Lack of infrastructure
The assessment of the users as to the quality of the route infrastructure indicate that most consider the condition of the road surface a hindrance to either walking or cycling. More serious in this regard is the absence of a continuous direct route for cycling or walking in many areas of Dar es Salaam. Another serious obstacle to walking and cycling is the obstruction of the few existing pedestrian and cycle lanes by parked cars or kiosks.

Perception and attitudes
The behaviour observed among the study population towards NMT is a product of their perception of this form of mobility and the attitude formation that result from it. There are certain perceptions about public transport that favour the use of NMT and these include:

- harassment in the Daladala type of buses.
- potential for accidents of the Daladala bus.
- the unreliability of the bus schedule.

On the other hand a number of perceptions exist which have contributed to a negative attitude towards NMT, they include:

- increased accident potential in mixed traffic.
- low action radius of cycling.

INTERVENTIONS PLANNED

A strategy for improving mobility
In order to improve the economic situation of the majority of Dar es Salaam residents, their mobility must be increased so as to enable them to undertake various income generating activities. The strategy that has been adopted has the following components:

- provision of public transport by both private and public companies on all major arterial and collector routes.
- movement inside residential districts to be provided by non-motorised transport mainly walking and cycling.
- walking and cycling to be the main mode for accessing public transport.
- restriction of the private car in the Central Business District and provision of priority bus lanes.

Based on the existing situation in Dar es Salaam, this strategy seems the most practical. This is because this strategy would in effect be improving on existing conditions. At the moment 50 per cent of the trips are made by walking all the way to the destination and if the walk to the transit stop is included it can be seen that walking accounts for a large portion of the trips made.

The logical improvement of the situation, is to reduce the walking journey time by improving the network quality and by upgrading the mode from walking to cycling. Walking is the backbone of mobility of the residents especially since public transport trips include a relatively long walking component.

Cycling could raise the action radius of a large low income population segment from less than 3 km to 6-8 kms. Cycling is three times faster than walking and three times cheaper than an efficient bus, and equally fast (door-to-door) for up to 45 minute trips. People currently using public transport could switch to cycling if their liquidity problem were solved.

**Priority interventions**

Given the constraints to mobility and the strategy that has been adopted, it is important to look at a set of interventions that can be adopted immediately. The selection of the interventions will be based on the criteria shown in table below:

<table>
<thead>
<tr>
<th>Table 1: Prioritisation criteria.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the intervention address current user priorities?</td>
</tr>
<tr>
<td>2. Does the intervention address current administrative priorities?</td>
</tr>
<tr>
<td>3. Can it be monitored and its success evaluated?</td>
</tr>
<tr>
<td>4. Is the technology for implementation available and affordable?</td>
</tr>
<tr>
<td>5. Is the intervention cost-effective?</td>
</tr>
</tbody>
</table>

The interventions listed in the table below can be adopted immediately based on the above prioritisation.
Table 2: Priority interventions.

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Unsafe Traffic Conditions</td>
<td>A Traffic management</td>
</tr>
<tr>
<td>- fear of walking or cycling due to possible road accidents</td>
<td>(1) traffic calming: reduce motorised traffic speed to 40/50 km/hr using proper design standards</td>
</tr>
<tr>
<td></td>
<td>(2) provide safe pedestrian, cyclist and carts crossing</td>
</tr>
<tr>
<td></td>
<td>(3) provide separate pedestrian and cycle lanes</td>
</tr>
<tr>
<td></td>
<td>(4) enforce traffic rules and behaviour in mixed traffic conditions</td>
</tr>
<tr>
<td>B Inadequate or poor route quality</td>
<td>B Route infrastructure improvement</td>
</tr>
<tr>
<td>- the conditions of the pedestrian/cyclist lanes is a hindrance to mobility. The surface is very poor, the route discontinuous with too many detours</td>
<td>(5) spot improvement of pavement structure for both motorised and pedestrian/cycle traffic</td>
</tr>
<tr>
<td></td>
<td>(6) construct new links to improve route connectivity</td>
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<td></td>
<td>(7) Eliminate sidewalk parking and petty trading structures</td>
</tr>
<tr>
<td></td>
<td>(8) Improve layout and location of bus stations and provide bicycle parking facilities</td>
</tr>
<tr>
<td>C Unaffordability of transport</td>
<td>C Improve Affordability</td>
</tr>
<tr>
<td>- inability to purchase a bicycle</td>
<td>(9) eliminate taxes and import duties on bicycles and bicycle parts</td>
</tr>
<tr>
<td>- cannot afford bus fare</td>
<td>(10) introduce credit purchase scheme by employers and other groups</td>
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INFRASTRUCTURAL INTERVENTIONS AND CONSTRUCTION ACTIVITIES

The proposed interventions will be implemented through a proposed pilot project during the 2nd phase of the NMT study. The approach of the implementation phase will be to try and work within the existing institutional framework so as to facilitate linkages between local government and NGOs. In the pilot areas, the first step will be to try and organise community participation in the planning and execution of the interventions. In addition efforts will be made to try and bring together various stakeholders including residents, professionals, police and others in planning the implementation of the various interventions.

In the implementation of infrastructure interventions it is proposed to use labour-based technologies and methods. In this regard external assistance will be sought. Below is a brief description of the proposed interventions where labour-based methods will be applied.

Traffic calming

(a) Problem: Due to the ineffectiveness of posted speed limits and the inadequacy of police control, it is suggested to use self enforcing physical measures wherever possible. Care should be taken to ensure that the speed limits are consistent with the nature and type of road.

(b) Proposed measures:

Road humps: A series of road humps increasing in height from 40 mm to 100 mm in height can be used gradually to slow down traffic in areas where cyclist/pedestrians predominate. The concept of road humps to reduce motorised traffic speed in Dar es Salaam is acceptable. However, their design and construction is often very poor resulting in their becoming ineffective or dangerous. In many cases they are too short and sharp and drivers at the risk of damaging their suspension system can drive over them, at high speeds.

Road narrowing: This concept can be used to induce lower speeds as traffic passes through residential neighbourhoods. The measure has not been extensively used in Dar es Salaam, but can be used to control speed.

(c) Major construction activities: A typical design of road hump is shown in Figure 1 and that of road narrowing in Figure 2. It can be seen that the design is such that it can be constructed using labour-based methods. The construction activities involved include

- excavation of the 500 mm width toe.
- cleaning and levelling of the base.
- manufacturing and erection of form work.
- placing and compaction of bituminous or concrete mix.
Figure 1  Road hump cross-section and dimensions

Figure 2  Road Narrowing
All these activities currently are being performed using labour-based activities on most construction projects in Tanzania.

**Pedestrian crossing**

(a) **Problem:** Crossing at intersections can be particularly hazardous, additionally in Dar es Salaam heavy crossing demand occurs away from intersections on most arterials where vehicle speeds are high. Poor judgement of approach speeds combined with the presence of obstructions such as parked vehicles have tended to increase the frequency of accidents at such locations. The provision of underpasses or overpasses have so far been deemed too expensive for implementation.

(b) **Proposed measures:** At intersection the simplest and cheapest method is a central refuge which allows pedestrians and cyclst to negotiate one traffic stream at a time. Central refuges should consist of physical islands incorporating bollards and lit by existing street lighting or supplementary floodlighting. The minimum width should be 1.8 m and for cyclist should be ramped to the street surface.

(c) **Construction activities:** Construction of a central refuge can be undertaken using labour-based construction method. The construction activities involved include:

- excavation.
- concreting.
- blockwalling.
- back filling.
- compaction.

**Separate pedestrian and cycle lanes**

(a) **Problem:** Like pedestrian, non-motorised vehicles are amongst the most vulnerable groups of road users as they are unprotected when in a mixed traffic flow situation. Consequently, any impact, even a small one, can result in serious injury to riders and passengers. On the other hand the presence of slow moving vehicles on the same carriageway creates hazardous working conditions as other vehicles are forced to slow down suddenly or tempted to overtake. Finally this lack of security and to a lesser extent, comfort has led to the fear of using bicycles in Dar es Salaam.

(b) **Proposed measures:** Different types of traffic need different facilities and NMT user should be segregated wherever possible from faster motorised vehicles.
• provide for separate lane for cyclist if possible as part of a network. Cycle lane should have a minimum of 2 m to allow two cyclist to ride abreast. Wider lanes are necessary to accommodate pedestrians. A narrow separation without a difference in level to the carriageway, offers little protection to cyclist. Therefore a dividing verge must be provided which can physically separate the cyclist from motorised traffic as such a concrete kerb of height 30 cm is proposed. The maximum width of a cycle lane should be 2.50 m, a wider lane looks like a collector road and can be used by motorised traffic.

• provide a separate lane for pedestrians where their volume justify.

(c) Construction activities include:
• excavation.
• hauling.
• material placing.
• compaction.
• concreting.

Spot improvement of route infrastructure

(a) Problem: Currently the majority of NMT users view the routes they use as being difficult. This difficulty is associated with the current condition of the routes which include among other things:
• broken surfaces with potholes and standing water.
• routes not being direct.
• obstruction on the routes.
• lack of road markings and signs.

(b) Proposed measures: Potholes that can unbalance two wheeled vehicles and cause cars to swerve suddenly must not be allowed to develop. Timely routine maintenance will take care of this problem. Attention should be paid to cross slopes when designing as well as when grading the road or lane so as to make sure that water flows away.

Drainage ditches must remain free of obstructions and retain their intended cross-sections and grades. Surface water should be able to drain away from the road.

Natural obstacles like sand or boulders should be quickly removed from the lanes.

Signs, marking and reflectors and other traffic control devices should be kept clear and visible.

(c) Construction activities:
• preparation of cold mix asphalt.
• asphalt priming.
• excavation of damaged section.
• filling potholes.
• compaction.
• clearing of sand and gravel.

Construction of new network links

(a) Problem: The NMT network in Dar es Salaam is discontinuous and has a lot of detours. Walking and cycling because of their sensitivity to travel time require a route that is direct. In addition the network should be comfortable and attractive.

(b) Proposed measure: The immediate solution is to construct the missing links so that some important routes are continuous from the major origin to destination.

(c) Construction activities involved: This intervention calls for very basic construction activities such as;
• excavation.
• levelling.
• hauling of materials.
• compaction.
• concreting, etc.

THE WAY AHEAD

Potential for labour-based technologies

The majority of urban areas in Tanzania are characterised by high unemployment and low incomes. The adoption of labour-based technologies and methods in implementing infrastructure projects will therefore lead to a number of socio-economic advantages. With regard to the Dar es Salaam pilot project areas the following advantages are foreseen:

Employment opportunities: The study findings indicate that the unemployment rate in the study area is about 20 per cent, in addition there is a significant number of self-employed people in activities that only occupy about 30-50 percent of their time. As such the use of labour-intensive approaches in the implementation of infrastructural projects will result in employment opportunities for the people in the area.

Increased incomes: A large portion of the adult population of the pilot area earn no income at all. This group include the unemployed as well as housewives and students. The use of labour in the implementation of infrastructure projects will result in increased income for the unemployed and women.

Project sustainability: Since labour-intensive projects use relatively simple technologies, it will be relatively easy for people to acquire the necessary skills. These will enable them to repair and maintain the infrastructure when necessary. As a result the community will become
self-reliant and the sustainability of the project as far as maintenance is concerned will be assured.

**Problems to be overcome**

In order to use labour-based technologies in the implementation of infrastructural projects, certain technical issues will have to be addressed. In the initial stages of implementation assistance will be sought to deal with the following:

**Quality of output:** There is need to guarantee that the quality of the constructed project is consistent with the standards that currently exist. The pilot project will need to develop appropriate planning, programming and control systems to make this possible. It is envisaged to train supervisory staff on site in how to effectively supervise the labour and make available adequate hand tools and light equipment.

**Quantity of output:** In some of the interventions such as the construction of pedestrian and cycle paths, the output requirement is considerable. The project staff will have to be trained in how to effectively organise, motivate and select quality tools so as to achieve a reasonable level of output.

**Project costs:** In the planning for the implementation of the interventions using labour-based technologies, it was assumed that these will result in lower project costs compared to conventional methods. Currently it is possible to pay wages of USD 1 per day on construction sites in the area. However, there is still need to demonstrate whether these lower wages results in lower project costs when everything is considered.
2.2 Alternative strategies for the provision of infrastructure in urban unplanned settlement areas: Are these strategies effective and how can they be supported and developed?

J. Tournée, ILO Consultant and J. Omwanza, ILO/ASIST

PROBLEMS

Infrastructure services in many urban centres are in a serious need of attention. The little services that there are, are usually concentrated in high income areas which are sparsely populated. Taking Nairobi as an example: Many of the roads are in a poor state of repair, and some have fallen into a state of complete disrepair. The majority of high population low income "informal settlement" residential areas are not served with a formal road network (Mathare, Kibera, Kawangware, Korogocho, to name just a few). Drainage which poses an immediate health hazard to the inhabitants in these areas is even worse. Most of the informal settlement are in areas with poor natural drainage and are prone to flooding. Solid waste collection and disposal is practically non-existent in these areas.

A few reasons leading to the failure in the provision of these services are:

Inappropriate urban by-laws

The laws that govern the provision of services are too stringent and do not give room for different alternatives. It is interesting to note the origins of the Nairobi by-laws. They were just picked from Blackburn, a town in Britain, and used unaltered except for the name which changed from Blackburn to Nairobi.

The methods employed in meeting these stringent conditions are also restrictive. For example, to tender for a job of constructing a sewerage line, one is required to prove the availability of very expensive equipment whereas what may be needed is a set of hand tools and the people to use them.

Inappropriate (incomplete) training

The institutions of learning, which educate the people charged with the responsibility of providing the services are all geared to the use of only one form of technology. They are all trained to think of heavy equipment without critically looking at other alternatives. It is desirable to have engineers, architects and all other people, charged with providing infrastructure services, especially in urban areas, to have a sense of technology choice imparted into them from the early years of their career.
Resources

The traditional design of services calls for high levels of inputs in terms of materials and equipment which are not easily affordable by under-financed municipal councils.

Planning

This is another area which needs serious attention. Many urban centres started as unplanned settlement areas. Even where plans were made for recognised urban centres either population growth was not given adequate consideration, or accurate forecasts were not available. The large increase in rural-urban migration in search of employment coupled with population growth has over-strained the available services resulting in rapid deterioration of existing services and non-provision of new services. This unforeseen situation has led to the growth of so called “informal settlements” in many urban centres in developing countries.

Lack of consultation with the users of the facilities to assess their needs is an important aspect which has not been considered in the past.

Initiatives to Find Alternative Solutions to the Problems

The Use of Community Participation in the Planning and Execution of Infrastructure Improvements - An Outline of the Approach Used in Colombo, Sri Lanka

Colombo was one of the first cities to formally encourage the involvement of communities in the provision of facilities and improvements to their immediate environment. The National Housing Development Authority (NHDA) assisted by UNCHS (HABITAT) developed the Community Action Planning (CAP) approach which focused on involving the communities in the planning and execution of infrastructure improvements.

The principles of CAP are as follows: A series of workshops for the community, a specific group of people in a defined geographical area, are held to discuss their most pressing infrastructural and environmental needs. Once these have been identified, the community forms a Community Development Council (CDC) to represent them. The CDC must be registered, with a legal standing, and open and operate a bank account. The first infrastructural improvement is identified and designed in collaboration with the CDC.

A contract is set up between the CDC and the responsible authority for the construction of this improvement (such as a re-designed well drainage is more radical).

• The use of mitre or turn out drains is rarely possible due to densely packed housing.

• Often unplanned settlements are in low lying areas or areas with drainage difficulties, therefore an accurate survey and assessment of the design is needed for each proposed drain
before the start of the project. There may be a need for a more rigorous pre-project planning phase than is allowed at present in the preparation of a project proposal.

- In many cases the provision of standard details alone is sufficient for construction and improvement of rural roads by a well trained foreman. However, in the urban situation this is often inadequate unless a qualified engineer is on site to make small adjustments to the standard details as is required.

- In urban areas there are few possibilities of getting rid of storm water. The drainage system must continually gather run-off and carry it to a suitable outfall point or existing drainage system. As a result drains must be set at accurate levels and the size of the drains will increase to larger and deeper sections than is normal for roadside ditches on rural roads.

- There are more obstacles in the path of the construction work in urban areas than in rural areas, even in unplanned settlements i.e. electric cables, telephone poles, water supply pipes and domestic connections. These obstacles may result in the need for alterations to the design during the construction phase.

- The design will also be affected by the future maintenance arrangements. Who will be responsible - the community, the municipal council? If the community are to be responsible for the maintenance, then the design must assure ease of access to drainage for maintenance purposes. Even if the municipal council is to be responsible for the maintenance, it is necessary to assess their capacity to carry out certain kinds of maintenance activity. Will they be able to clear long lines of drainage pipes, or will it be more practical to have open drains which can be desilted by a gang of workers with simple tools.

The above points may seem obvious to a municipal engineer, but they are significant in the transfer of technologies and methods of working from the rural setting to the urban setting.

**Employment generation in urban works programmes through efficient use of local resources**

A project bearing the above title was set up by UNDP and ILO to assist governments of Least Developed Countries in exploring ways to alleviate urban unemployment and poverty through the mobilisation of their natural and human resources for employment, when properly adapted to local conditions. With the emphasis on the use of local resources and employment generation, the project focused on encouraging the use of labour-based methods and appropriate
technologies in conjunction with community participation to improve urban infrastructure.

Proposals for pilot projects, one in Dar es Salaam - Hanna Nassif, and one in Kampala - Kalerwe, were two of the results of the Employment Generation Project.

CASE STUDIES OF THREE PROJECTS - PUSH, KALERWE AND HANNA NASSIF PILOT PROJECTS

PROJECT URBAN SELF-HELP (PUSH)

Project background

Zambia has one of the highest, if not the highest, urban population in Africa expressed as a percentage of total population. In 1988 the figure was well over fifty per cent. Seventy per cent of Zambians do not earn formal salaries and cannot afford even the lowest cost houses. Therefore, unplanned settlements have mushroomed around Lusaka and other major towns. The Second National Development Plan of the Government of Zambia recognised that although squatter settlements were unplanned they nevertheless represent assets in social and financial terms. Due to a lack of resources, the problems faced by the communities in the squatter areas could not be tackled by the municipal councils. Drainage, disposal of solid waste, and sanitation were identified as priority concerns of the communities.

The structural adjustment programme resulted in a dramatic rise in the cost of living. Those people most affected by the increase in prices were the urban poor. The World Food Programme (WFP) in Zambia prepared a quick action project to give food support to them. The work entailed the construction of storm water drains, access roads and footpaths, improvements to the water supply, sanitation and refuse removal.

The aim of PUSH was to offer opportunity for 3,000 workers (in the Lusaka area) to work and receive food rations for a family of five. Many of the head of households in the squatter areas were women and as the women in all households have responsibility for feeding the family, 98 per cent of the participants in the project were women.

Technically the project was supported by 3 UNV civil engineers and a part-time consultant from HABITAT. In addition ILO was approached to run training programmes on road and drainage construction for the engineers, technicians and community leaders. The municipal councils provided counterparts to the technical team and additional field workers in the health and community participation fields. In each compound (unplanned settlement area) an NGO was responsible for the execution of the project under the guidance of the main NGO, Human Settlements of Zambia (HUZA), and the WFP.
The project once started in Lusaka was then extended to Ndola and other "Copperbelt Towns". The results have been very positive in demonstrating what can be achieved when self-help efforts are properly directed technically and support given for the organisation. The title suggests that the work would be carried out on a self-help basis. In fact most works were paid for using food rations, however at week-ends some of the men from the compounds came forward to do excavation on a self-help basis and training was carried out for self-help maintenance.

**Technical aspects**

Using mostly standard details devised for rural roads and roadside drainage it was necessary to adapt them to suit the new environment. With a policy of minimum or nil demolition of property, the designs had to be flexible to site conditions.

Unlike some of the unplanned settlement areas in other countries, in Zambia most of the main accesses which had been laid out were still free from buildings and roads up to 5.5 m carriageway width were possible with drains on either side. In some of the narrower side roads it was necessary to design 3.5 m carriageways in cross-fall with one side drain. Due to the relatively good soil conditions in most of the compounds the drains were unlined, with some stone pitching in particular problem areas.

The project had been designed assuming outputs comparable with reasonably run rural road construction sites. In practice there were several reasons why the targets were not reasonable and why there was need for extra works. They are as follows:

- removal of refuse from the site which had been dumped over many years.
- the large number of vehicle crossings required across the side drains for entry in to business premises, churches, clinics, and private houses.
- the large number of pedestrian accesses needed across the side ditches and main drains.
- the need for larger cross-sections for the side ditches and main drains, as water cannot be taken away in mitre or turn out drains.
- the increase in the number of road junctions and thus in the provision of drifts and culverts.

For example one 225 m long road, needed 4 vehicle access drifts across the side ditches, 6 pedestrian accesses and one main drift or culvert at the junction with the main access road. This is a considerable increase on the rough estimate of 2 culverts per kilometre for a rural road.

The work was being "paid for" by food rations and all who came forward to work regardless of ability were employed. It was therefore difficult to achieve reasonable task rates. The women preferred
working in groups. Due to an early start to employment when not all technical details were finalised they were used to being given small tasks for large groups of workers.

Despite some difficulties, which are to be expected in adopting a new approach to urban upgrading, the achievements of the project are visible and have been very well received by communities, municipal councils and government alike. Recently traffic on a main route in Lusaka had to be temporarily diverted and many drivers found themselves on well constructed unpaved roads which had been improved under PUSH. The project started in 1991 and has been extended and is still carrying out improvements to unplanned settlement areas.

The use of community participation was central to the success of PUSH, but the community participation did not include the use of community contracts. All operational activities were controlled by the project staff.

**URBAN WORKS PROGRAMMES IN UGANDA - KALERWE COMMUNITY-BASED DRAINAGE UPGRADING PILOT PROJECT**

**Introduction**

This project was part of the UNDP financed inter-regional project called “Employment promotion in urban works programmes through the efficient use of local resources” outlined in section of Employment Generation in page 112. Kalerwe is in Kampala, the capital city of Uganda.

Kalerwe, the pilot project area, suffers from severe flooding, especially during the rain season. It was observed that the community was anxious to solve this problem by improving the existing drainage system. This resulted in the area being selected for a pilot project.

This project was started with the immediate objectives of:

- constructing a functioning and maintainable drainage system.
- establishing and testing methods of working suitable for community-based upgrading of drainage systems in unplanned settlement areas in a sustainable and replicable manner.
- creating capacity in the government institutions of an enabling approach to upgrading - to develop and test the capacity of the community contracting system.

The project started in mid 1993, slightly later than planned. A series of meetings, workshops and seminars were held to raise awareness within the community to the problems they face and possible solutions. From these meetings, a community development committee was elected to run the day to day operations of the project.
In Uganda, the urban communities are organised into Resistance Councils (RC) starting from zonal levels up to city council level; i.e. RC1 up to RC5. With this level of organisation, it was relatively easy for the community and the project to establish committees for the drainage works.

**Approach**

From the beginning, the Government of Uganda, through the Ministry of Finance and Economic Planning, and that of Lands, Housing and Urban Development were involved and their cooperation registered. The cooperation of the Kampala City Council was also sought and received.

There were two components to the construction part of the pilot project. The first was to construct a main drain through ten Resistance Council 1 (RC 1) zones in cooperation with the community comprising the ten zones. The second part of the project was to construct secondary and tertiary drains in one of the ten zones - Kibe zone. Different levels of community contribution were expected on the different classes of drains, amounting to 15 per cent on the secondary drains and 30 per cent on the tertiary drains, with only a very minimum contribution on the main drain. Contributions were planned in terms of free labour and a monetary contribution via a household levy for paying the contribution for the secondary and tertiary drains and especially for the community contractors for the maintenance of these drains.

Both a topographical and social surveys were done and designs prepared by a consultant. These designs were approved by the Kampala City Council. Community contract documents were prepared. The project operated on simplified contracts which were fully explained in workshops. The contracts were for labour only. All materials, transport and equipment was organised by the project team. An example of the simplified contracts is attached in Annex 1.

The planned work entailed a construction of 2.4 km of main drain, 1.5 km of secondary drains and 3.8 km of tertiary drains. The main drain has a cross-section (internal dimensions) of 2.1 m deep, 1.8 m base width and 3.5 m top width. Various options were considered for the construction to be used for the three drain types.

The alternative designs considered were:

- precast concrete slabs as lining elements.
- non-reinforced cast in-situ concrete lining.
- brick and plaster lining.
- factory prefabricated drainage lining elements.
- masonry lining.
no lining.

The soil conditions, silty lateritic clays, were insufficient reason on their own for the provision of a lining, however in the interests of creating a permanent improvement and for ease of maintenance it was decided that the drains should be lined. Stone pitching with weep holes was chosen as this type of lining could be constructed by the community and the materials were locally available. Community members were trained by experienced masons in the construction of the linings. The training was so successful that many of the newly trained masons were offered employment for similar work in other parts of Kampala.

The physical achievements of the project were 2.4 km of main drain, 3 of the 4 secondary drains were completed and materials had been supplied for the continued work by the community on the fourth secondary drain after the end of the project period.

The main drain was provided with crossing points and grills at regular intervals to trap debris which should be regularly removed to avoid blockage. This calls for an efficient maintenance system. Practical training demonstrations for maintenance were held, after the completion of the main drain, which covered:

- clearing and levelling of the banks.
- desilting and removal of debris.
- cleaning of the side linings and weep holes.

From this training, it is hoped that the maintenance committee formed will be able to manage and administer the community maintenance contracts adequately. At the end of the project negotiations were still underway to share the financial responsibility for maintaining the main drain between the city council and the community.

Due to an anticipated and observed problem of solid waste dumping in the drains, which would impair the flow of water, plans were underway to introduce composting of organic waste as an income generating activity to the community in collaboration with the small enterprise, informal sector unit of the ILO.

Conclusion

The pilot project had made, by international standards, exceptionally rapid progress in completing the main drain construction and the majority of the secondary drains. Due to the rather abrupt finish to the project, only one demonstration tertiary drain was completed. In addition to the physical progress, significant progress has been made in creating capacity within the community for the management and control of the works, including training for the maintenance of the drainage system.
Inhabitants were all along enthusiastic due to the open community participation methods used which instilled a sense of trust and ownership of the project. It was mostly men who were employed in the construction of the drains due to the nature of the work. However, women were well represented in the committees and at the workshops. The pilot project period was too short and ended abruptly; before the capacity of the community to manage the remaining part of the construction and the subsequent maintenance has been tested. Modalities for adoption and replication of the procedures by the local authority concerned have not been worked out and tested although they are aware of all the processes involved. Proposals have been prepared for additional works and further development of the cooperation between communities and local authorities which would be of undoubted benefit to the Kalerwe community and neighbouring communities. The extension to the pilot project is well supported by the Kampala City Council and the Ministry of Lands, Housing and Urban Development.

COMMUNITY-BASED URBAN SETTLEMENT UPGRADE - HANNA NASSIF PILOT PROJECT

Project background

This pilot project located in the unplanned settlement area of Hanna Nassif was formulated under the Employment Generation in Urban Works Project outlined in section of employment generation in page 112. A study of the area was carried out by the Ardhi Institute, the planning and architectural college of the University of Dar es Salaam. Storm water drainage emerged as the problem most in need of addressing including the problem of storm water mixing with sewage and rubbish to form unhygienic stagnant pools. This area had twice previously been earmarked for upgrading. The second upgrading plan included the demolition of 600 houses. Neither upgrading plan was implemented due to lack of funds.

The Hanna Nassif project was formed as a pilot project to test the community contract system in collaboration between ILO, HABITAT, UNV, and the community. Funds for the actual works have mostly come from the Ford Foundation and the European Development Fund. Despite the use of labour-based and appropriate technologies, the costs of major infrastructure works are beyond the means of the community alone.

The project objectives are:

- a pilot project on community-based, employment-intensive storm water drainage infrastructure upgrading of the Hanna Nassif informal settlement; creating in turn capacity within the
Dar es Salaam (DSM) City Council to respond to such community-based initiatives.

- the capacity for DSM City Council to continue to deal in a responsive enabling manner to community-based urban upgrading proposals be created and expanded.
- a support mechanism for community-based initiatives from Kinondoni (DSM City Council Zone) settlements, involving a network of community volunteers.

The proposed initial works for the pilot project were to improve the access tracks, construct storm water drains, and protection to drainage outfalls. Also included was allowance for demonstration ventilated improved pit latrines and possibly pour-flush toilets, and a component for community initiatives to deal with solid waste. In the process the community would be strengthened and able to act as contractors for the works. They would also be involved in the planning and design of the works.

**Contrasts with the Kalerwe Pilot Project**

Unlike the Kalerwe project this pilot project was more ambitious in what was expected of the community. Whereas in Kalerwe the Technical Support Team (TST) was responsible for all procurement of materials and tools, and the contracts issued were labour only contracts, in Hanna Nassif the community are responsible for all procurement and letting of petty contracts to artisans. They are supported by the TST but have to accept a far greater responsibility for financial control and procurement of materials. The CDC are legally formed as a trust and operate their own bank account into which the funds are paid. A construction committee is in place and is a sub-committee of the CDC and they are responsible for the day to day running of the contracts and the receiving of funds for each sub-contract.

ILO is the executing agency with a national execution team, they are assisted in the field of community participation by UNVs. Habitat are providing general support to Dar es Salaam City Council and particular support to some of the council members of the TST.

There were several delays in the signing of the project document and this resulted in a measure of disillusionment with in the community. Construction is now underway but progress has been slow due to design alterations and lack of engineering staff on site. The community contracting system is still undergoing changes and needs to be better organised. Despite commitments being given by the community, the parts of the work designated to be done by self-help has not been done by self-help. The idea of including self-help participation or monetary contributions was to maximise the amount of works that could be carried out with the external financial
assistance and to enhance the feelings of ownership in the improvements being implemented.

As a pilot project Hanna Nassif has highlighted many of the difficulties of dealing directly with communities, relying on support from city council staff (this has been very mixed) and using communities to implement what are technically demanding works. However, work is still progressing and it is hoped that lessons will be learnt in solving some of the problems outlined here. The project has also highlighted the need to identifying which types of construction work are suitable for community contracts in the sense of their direct participation, and which may be better left to contractors under the joint supervision of the community and the community technical advisers.

OTHER PROJECTS

Urban Slums Project - Nairobi

Urban Slums Project is a population, environment and health/family planning services project in the urban slum areas of Nairobi. It is funded by the United Nations Population Fund (UNFPA) and sponsored by the National Council for Population and Development. The implementing agency is the Public Health Department of the Nairobi City Council. The project started on a pilot basis in January 1993 and runs up to December 1995 although it is basically a family planning project, one of the objectives is to improve environmental health conditions, drainage canals and culverts through combined community efforts and the services of Nairobi City Council (NCC) in seven of Nairobi's largest slum communities in a sustainable manner.

Activities/approach

From the start all the interested parties were involved. The first phase of the project covers Kangemi and Kawangware areas. The community's awareness was first raised through meetings and seminars to the project, some members were selected for training in order to participate in environmental assessment. Different groups were interviewed and problems ranked. An action plan was drawn up and a village committee selected to carry out the action plan in collaboration with the Urban Slums Project. Garbage collection and drainage improvement were ranked highly. The sanitation works component of this project was thus started. These works include drainage of flood waters, construction of solid waste dumping structures, construction of VIP pit latrines, and construction of water supply points.

The project provides materials for use in the works and the community provides storage facilities and free labour for construction. NCC provided the designs and is involved in the technical supervision of the works. Artisans, particularly masons are employed from within the community and are paid by the project through the NCC.
Achievements

Kawangware:
• 2 refuse collection centre have been constructed.
• 1 water kiosk is under construction.
• 400 m of open drainage canal is under construction.

Kangemi:
1. 1 refuse collection centre has been constructed.
2. 1 water kiosk is under construction.
3. 300 m of open drainage canal is under construction.
4. 1 public toilet has been constructed.

Problems/difficulties

From interviews with the assistant coordinator of the project and a chairman of the Kangemi community committee, it was observed that the youth are not involved in the community work.

Some of the material, especially dressed stone for lining the drains are stolen. No watchman is employed to take care of them due to a desire to instil a complete sense of ownership to the community. It is left to the community to decide, contribute money and employ a watchman if they see it fit.

Unprecedented delays are frequently encountered due to uncovering of other services like water pipes, telephone cables and electricity cables. The departments concerned take some time before they come to relocate their services.

Another problem was the supply of tools. The community workers were initially supposed to come with their own hand tools. Unlike in the rural situation, most of the people do not own any tools. Urban slums project has realised the problem and have now opted to buy tools and supply them to the people.

Solid waste dumping structures are not being emptied by the city council. Some of those visited could hardly be seen since garbage had fully covered them.

No technically qualified person is deployed fully on the site to supervise the construction. This leads to delays whenever the community reaches a point where they need technical guidance. The staff in the USP have no technical know-how in construction, they are basically medical health workers. This courses a few problems in supervision though it fosters closer cooperation with the NCC to supply the technical know-how.

Conclusion
This project gives a very good example of community participation which can be recommended for emulation. The community has been fully involved in identifying their problems, drawing up and implementing their action plan. The groups formed for the purpose of income generation or members of the village committees could be trained to take up community contracts, maintenance of the works and future construction. However, this has not been considered and would only be possible if NCC creates a framework for the inclusion of community (labour-based contractors) in their contracting system.

Non-Motorised Transport Rehabilitation Pilot Project

Within the Urban Transport Component of the Sub-Saharan Africa Transport Programme (SSATP) of the World Bank studies have been conducted in major cities in Mali, Kenya, Tanzania, Burkina Faso and Senegal. Plans are underway to start pilot projects for the establishment of urban infrastructure which incorporates facilities for non-motorised transport, including footpaths, cycle tracks on top of the usual carriageway for motorised vehicles. In the provision of this, it is hoped to use labour-based methods.

It is reported in the proceedings of a workshop to discuss the findings of the above studies that a pilot project will be starting in the city of Nairobi by March 1995, but interviews carried out by the author indicate that liaison with all the interest parties is not well coordinated.

Kabiro Human Development Project

This is a project initiated by the Institute of Affairs (ICA), a non-governmental organisation, for the general improvement of the living standards of the inhabitants of a section of Kawangware (a slum area in Nairobi). The project is in an area which is prone to flooding during the rain season and has no access road. ICA, in collaboration with the community, has built a primary school, a village polytechnic and a clinic to serve the inhabitants.

ICA contacted ILO/ASIST to assist them in solving the access problem. Having realised the importance and appropriateness of labour-based methods, ASIST opted to use the labour-based technology and community participation which was already in place.

On a preliminary inspection of the project, the ASIST team found out that the underlying problem in the area is poor drainage. ICA was accordingly informed and plans are at an early stage in liaising with all the interested parties (city council, the community, ICA and the Urban Slums Project discussed above) to see how the problem can be solved.

Katwe Urban Slums Project
This is a UNDP/World Bank pilot project in Kampala, Uganda, concerned with low-cost water supply, sanitation and solid waste disposal in urban informal settlement areas with a key objective of development and implementation of participatory approaches that can be used by other External Support Agencies (ESA's) who wish to assist Uganda's development in this sector. The objectives and approach of this project are similar to that of the Urban Slums Project discussed in section on urban slums project starting in page 120 and the Kalerwe project discussed from page 115 onwards.

The Katwe Urban Pilot project was started in 1993 to demonstrate what can be done when communities are empowered to manage their own services. With support from the project it is expected that the communities in the Katwe Parish (the project area) will be able to show that they can be able to solve their own environmental problems through their own initiatives. That is, they will have planned and constructed affordable and appropriate basic facilities that will have measurably improved the situation while creating jobs and income.

The facilities being constructed include: water supply points (kiosks), storm water drainage systems, sanitation/latrines and toilet facilities and solid waste management systems. Due to the approach adopted by the Katwe Project physical progress was very limited but solid ground work has been made in strengthening the community.

**SUMMARY**

1. There is a need for a closer consideration of suitable designs and technologies for the providing of infrastructure in unplanned areas. Ideally a group of engineers with varying backgrounds should look at the solutions to providing appropriate designs for the works taking into consideration the restrictions of finance and land availability, varying soil conditions, and maintenance methods. The group of engineers could include; labour-based engineers, municipal engineers, drainage engineers, sanitation and water supply engineers. Town planners should be included in the group to give advice on the relaxation of planning standards for settlement areas.

2. Following on from the previous is the need to formalise aspects of the upgrading of unplanned settlement areas. There needs to be agreement with planning authorities on alternative planning regulations for certain areas of the town or city designated for the upgrading of unplanned settlement areas. The planning regulations should reflect the situation in the settlements and the scope of improvements that are practical. It should also address problems of land tenure.

3. If small contractors, or communities acting as contractors, are to be used in upgrading works then simplified contract documents are needed and those developed under pilot projects
should be used as a basis for formalising this type of contract with the relevant municipal authorities.

4. Resulting from paragraphs 2 and 3 may be the need to support not only the communities in the upgrading of their environment, but also assistance to the municipal authority to adapt and cooperate in these initiatives, institutionally and technically.

5. If this method of working is to be accepted by municipal authorities and housing ministries, then the quality of the finished product must be of a comparable standard or an improvement to the alternatives of using municipal direct labour or traditional contractors. To ensure that the quality of work is comparable it will be necessary to decide for each situation the division of the works into those activities which can be carried out directly by the community and those that must be assisted by competent artisans and contractors. There is a need to look at the greater involvement of the private sector in the provision of design, contract preparation, and supervision services, as well as in the fields of contracting and site organisation.

6. To ensure sustainability in community-based organisations, non-government organisations and councils must be involved in the pilot projects and eventually be in a position to continue the works with very little assistance from outside agencies. In many cities in the foreseeable future it will not be possible to carry out upgradings of unplanned settlement areas without some form of external financing for major works. This is a result of the pressures on councils to maintain the infrastructure in the planned areas of the cities and to halt deterioration in the level of services they provide. There is however scope for cost sharing between councils and the beneficiaries for more minor works.

7. With unemployment and under-employment increasing especially among the urban poor, any method that is used to improve unplanned settlement areas should maximise the use of labour and use the opportunity to create employment. Employment should therefore be a major consideration in the choice of technology used.

CONCLUSIONS

The experience in Zambia, Uganda, Tanzania and elsewhere has shown that there is greater scope for community involvement in the upgrading of unplanned settlement areas than is presently being utilised, and that the use of appropriate technology and labour-based techniques are of a positive benefit in this type of work. There still
remains a considerable amount of work to be done to improve on the systems for the implementation of upgrading works.

REFERENCES

4. Lyby E, Tournée J, Nnkya T: Employment generation in urban works programmes in Tanzania, Volume I.
Annex 1

GENERAL AGREEMENT
(COVERING SUB-CONTRACT NO. 1)

General agreement between the MFEP/UNDP Project No. UGA/92/000 here-in-after referred to as the "PROJECT" and the representatives of the local community within the project area and here-in-after referred to as the "COMMUNITY" whereby it is agreed that within the provision of the project document Kalerwe Community Based drainage upgrading pilot project the "PROJECT" summarily undertakes the mail responsibilities as at annex 7a hereby attached, and the "COMMUNITY" takes care of those as at Annex 7b also attached.

Signed and greed today 1st JULY 1993

REPRESENTATIVES OF THE LOCAL COMMUNITY

...........................................KATOOGO ZONE
...........................................ST FRANCIS ZONE
...........................................BUGALANI
...........................................BOKASSA
...........................................KALIMALI
...........................................KAWAALA
...........................................MAYINJA
...........................................KIGUNDU
...........................................SEBINA
...........................................KIBBE


Responsibilities of the "PROJ ECT"

i. **Financing**

The PROJ ECT is responsible for the supply of all materials, tools and equipment for the operations as defined in the project document and in accordance with the budget estimates for the main drainage channel from Gayaza Road to Kawaala. The "PROJ ECT" will further provide the wages for the paid-labour works so defined and in accordance with the detailed Agreements for the various tasks drawn and referred by the "PROJ ECT" and the Project Committee.

ii **Technical Assistance**

The "project" is responsible for the overall management of operations and the "PROJ ECT" will be responsible for the identification and provision of technical expertise which may otherwise not be within the community. To this effect the 'PROJ ECT' will arrange liaison with other ministries, parastatals and resource personnel for advice where necessary or appropriate.

Kampal City Council being the statutory body responsible for drainage in Kampala will certify the survey and designs of the project works.
Responsibilities of the "COMMUNITY"

The main responsibilities and functions of the "COMMUNITY" are:

1. To take responsibility for the project activities as beneficiaries in accordance with the project official design criteria covering social, economic and engineering guidelines.

2. To provide free-of-charge access and space for the construction and storage of materials, tools and equipment as may be required and requested by the "PROJECT" and required by the Project Committee.

3. To mobilise and provide both paid and voluntary labour as required and defined in any of the detailed Agreement and to ensure fair and equitable participation of all members of the community as drawn and agreed by the Project Committee and other main actors for the tasks to be undertaken.

4. To take responsibility for the day-to-day smooth running and timely execution of the detailed Agreements in accordance with the projects workplan targets so defined.

5. To undertake recurrent maintenance and repairs of the created assets under any of the detailed Agreements certified complete by the "PROJECT", Kampala City Council and Project Committee on signing a completion certificate.
DETAILED SUB-CONTRACT AGREEMENT NO.1

Detailed Sub-contract Agreement between the MFEP/UNDP Project No. UGA/92/006 hereinafter referred to as the "PROJECT", and the Project Committee here-in-after referred to as the "SUB-CONTRACTOR".

Whereas the "PROJECT" will provide for all the inputs as stipulate in the project document and as summarised in the "General Agreement" the SUB-CONTRACTOR hereby agree to carry out the specific tasks of CLEARING BANKS AND ACCESSES ALONG MAIN DRAIN COVERING KATOOGO ST. FRANCIS, BUGALANI AND KAWAALA ZONES - APPROX. 850M within the provisions of the project document No. UGA/92/006 with the details, responsibilities, and conditions as hereby attached at annex 7d to the satisfaction of the project.

Agreed and Signed Today 1st JULY 1993

PROJECT COMMITTEE MEMBERS
........................................... KATOOGO ZONE
........................................... ST FRANCIS ZONE
........................................... BUGALANI
........................................... BOKASSA
........................................... KALIMALI
........................................... KAWAALA
........................................... MAYINJA
........................................... KIGUNDU
........................................... SEBINA
........................................... KIBBE
...........................................

-------------------------------------
NATIONAL PROJECT DIRECTOR
UGA/92/006
TASK RESPONSIBILITIES AND CONDITIONS
FOR THE "SUB-CONTRACTOR"

The "SUB-CONTRACTOR" will carry out the main task of:
CLEARING BANKS & ACCESSES ALONG MAIN DRAIN AS
AT ANNEX 7c

With the following specific works:

a. Slash and clear both sides of Main drain (3m width on each side)
b. Collecting the slashed debris to specified locations for disposal

c. Creating access on one side of the main 1m wide and 1m off the main dain.
d. Clearing sites for stone and sand storage including access to these sites.

2 (i) For the works stipulated under item 1 above, the "PROJECT" will provide the following tools and equipment for which the "SUB-CONTRACTOR" will be fully responsible while carrying out the works.

a. Slashers 15
b. Hoes 10
c. Pangas 5
d. Spades 6
e. Rakes 5
f. Wheelbarrow
g. Hand axes 5
h. Bow saw 1
i. Forked hoes 5

In event that any tools, equipment and materials are misappropriated or lost, after being officially handed over to the beneficiaries, costs of replacement will be borne by the "SUB-CONTRACTOR".
Further, the "PROJECT" will provide in full or part deliveries the following materials against satisfactory work progress:

a. ________________________
b. ________________________
c. ________________________
d. ________________________
e. ________________________

The Main task noted under item 1 above will be completed not later than 6th July, 1993 and payments for the specific works will be made as stipulated below and against "Completion Certificates" endorsed by The Kampala City Council Official. The "PROJECT", however, reserves the right to reject in whole or in part for sub-standard work done by the "Sub-Contractor".

a. Item 1 (a) Ugshs. 17/= per M
b. Item 1 (b) Community contribution (unpaid)
c. Item 1 (c) Ugshs. 50/= per M

d. Item 1 (d) Community contribution (un-paid)
e. ________________________

In the event that the "PROJECT" rejects in whole or part for Sub-Standard work done by the "SUB-CONTRACTOR", no payments shall be effected for the rejected works and the "SUB-CONTRACTOR" shall undertake to do such works again at own expenses.

Total value of this contract:

i) Item 1(a):
   850m x 6m x 17/= 86,700/= 

ii) Item 1 (c):
   850m x 1m x 50/= 42,500/= 
   TOTAL 129,200/= 

Ugshs. One hundred twenty nine thousand, two hundred shillings only (129,200)
2.3 Evaluating the benefits of implementing labour-based construction in an urban community

R.B. Watermeyer, Soderlund & Schutte Inc

EXECUTIVE SUMMARY

Politicians, development organisations and communities in South Africa have come to realise that the building and construction industry can be used to provide employment and to empower specific or targeted communities. Various construction practices have emerged to address aspects of employment and empowerment. At the same time development support systems have evolved to provide professional assistance and the resources lacked by local contractors (entrepreneurs) to enable communities to construct their own housing, infrastructure and amenities and to acquire skills and competencies in commercial, administrative and managerial fields. The question that begs asking is how effective are the construction methods and technologies that are adopted and the aforementioned implementation approaches in benefiting a targeted community?

There is also a need to develop project evaluation criteria which may be used, in the first instance, to compare one technology or approach against another and thereafter one project against another using clearly defined statistics and a common approach to project evaluation.

Watermeyer et al (1994) have proposed a procedure to develop and appraise opportunities presented by construction projects. This procedure examines two types of opportunities, viz. employment and community opportunities. Opportunities in each of these categories are examined in detail and are optimised before being combined in a simple formula to index their contribution in these areas and to compare the effectiveness of a project's delivery with other projects.

In essence, this approach examines and evaluates the following items before combining them in a formula to establish a Project Index:

- The multiplier in employment opportunities.
- Expenditure per unit of employment generated.
- The amount of construction cost retained by the community.
- The cost of the proposed construction compared with that of conventional construction practices.
- The quality of the end product compared with that produced using conventional construction techniques.

The Project Index (PI) is in essence a combination of three ratios which relate to expenditure per unit of employment generated, construction cost retained by the community and cost of construction,
respectively. Each of these ratios in their own right index employment opportunities, community opportunities and cost premiums. Accordingly, this index may be used to evaluate a project’s contribution in respect of employment opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction. Projects which have a high PI present more development opportunities to a targeted community, than those having low ones.

Threshold PI’s can be set for specific project objectives and as such can be used as a basis to reject certain projects. The Project Index can also be used to monitor and measure the change in spending pattern on projects as levels of spending on targeted labour increase.

Threshold values for specific programme and project objectives are proposed. Projects within Soweto’s Contractor Development Programme are evaluated to illustrate the project evaluation process.

INTRODUCTION

In South Africa, politicians, developmental organisations and communities have come to realise that the building and construction industry can be used to provide employment and to empower specific or targeted communities. The African National Congress’s Reconstruction and Development Programme, the National Economic Forum’s Framework for a National Public Works Programme and the objectives of the Framework Agreement signed by COSATU, SANCO, SAFCEC, SAICE, SARF, IMIESA and SAACE clearly spell out to varying degrees what the construction industry is expected to deliver in this area. Generally, these expectations revolve around four development areas, viz. the development of small scale enterprises, skills, entrepreneurship and employment opportunities.

Various construction practices have emerged in South Africa to address aspects of employment and empowerment. Labour-intensive methods of construction have been developed and employed on projects which include rural roads, low level bridges, dams, residential roads using waterbound macadam bases, concrete block paved roads, water and sewer reticulation for townships, bituminous surfacing of roads and low voltage electrical reticulations (Watermeyer and Band, 1994). Labour-based technologies have also being developed to maximise the involvement of targeted labour in construction projects. At the same time, labour-intensive methods of construction and labour-based technologies are, in some instances, being linked to the development of small scale contractors, e.g., the objectives of the Soweto Contractor Development Programme are to create employment opportunities for Soweto residents, to stimulate the development of contractors from amongst the local Sowetan population and to retain as much as possible of the expenditure within Soweto. It may be said that these
practices are being used to alleviate poverty at one end of the spectrum and for affirmative action purposes at the other end.

Development support systems have also evolved to provide professional assistance and the resources lacked by local contractors (entrepreneurs) to enable communities to construct their own housing, infrastructure and amenities and to acquire skills and competencies in commercial, administrative and managerial fields. These support systems include (Watermeyer and Band, 1994):

- Development Team Approach.
- Managing Contractor Approach.
- Main Contractor Approach.
- Contractor Team Approach.
- Mentorship Approach.
- Joint Venture Approach.

All these systems to a greater or lesser extent aim to create employment opportunities for a community and to facilitate the involvement of that community in a project. The question that begs asking is how effective are the construction methods and technologies that are adopted and the aforementioned implementation approaches in benefiting a targeted community?

Currently, various statistics are being put forward to describe the success or otherwise of labour-based projects. These statistics are highly dependant on the method of measurement that is adopted. For example, Watermeyer and Band (1994), on the basis of information received from those engaged in the Western Cape Bloekombos project (Framework Agreement accredited labour-based project), report that the overall increase in the number of man-hours generated on the project as a whole is probably less than 250%. COSATU (1994), on the other hand, report that 522 people are employed there, as opposed to 85 if conventional construction methods had been used - an increase of 600%. Watermeyer and Band based their findings on the total number of employment opportunities generated including that associated with Preliminary and General items, the manufacture of materials and construction activities. COSATU, on the other hand, examined the increase in manual employment opportunities. There is accordingly a need to develop project evaluation criteria which may be used, in the first instance, to compare one technology or approach to implementation against another and thereafter one project against another using clearly defined statistics and a common approach to project evaluation. This paper seeks to provide and demonstrate such an approach. Terms shown in italic are explained in Annex 1.
EVALUATING PROJECTS

The approach

Watermeyer et al (1994) have proposed a procedure to develop and appraise opportunities presented by construction projects. This procedure examines two types of opportunities viz. employment and community opportunities. Opportunities in each of these categories are examined in detail and are optimised before being combined in a simple formula to index their contribution in these areas and to compare the effectiveness of a project's delivery with other projects.

In essence, this approach examines and evaluates the following:

- The multiplier in employment opportunities.
- Expenditure per unit of employment generated.
- The amount of construction cost retained by the community.
- The cost of the proposed construction compared with that of conventional construction practices.
- The quality of the end product compared with that produced using conventional construction techniques.

Employment opportunities

Employment opportunities should be assessed in the following manner:

1) Establish the cost of construction and the estimated total number of man-hours generated using conventional construction technologies, methods and practices.

2) Explore possible multipliers in employment opportunities within elements of the project or specific activities which may arise from the employment of alternative construction technologies and methods.

3) Establish the cost of construction, the estimated total number of man-hours generated and the expenditure per unit of employment generated using the technologies and methods contemplated in 2.

4) Minimise any cost premium and maximise the employment opportunities associated with different combinations of technologies and methods.

5) Select the construction practice which comprises methods and technologies which attract low cost premiums and generate employment opportunities in the most cost effective manner.

6) Evaluate the quality of the end product provided by the selected construction practice and compare with that using conventional construction practices. If acceptable, accept the chosen construction practice.

The statistic generated in respect of expenditure per unit of employment generated may be used to evaluate the efficiency and effectiveness of
the employment generated and define the employment-intensiveness of a construction project. To allow comparisons to be made, Watermeyer et al (1994) suggest that all costs should be escalated or de-escalated, as appropriate, to the base month of July 1994.

Watermeyer et al (1994) point out that the average expenditure per unit of employment generated in the civil engineering industry as a whole, obtained from statistics published in the January 1994 edition of the Civil Engineering Contractor, adjusted for employment generated in respect of materials manufacture using Watermeyer and Band’s (1994) site labour to materials manufacture ratio, were approximately R27-50, R31-00 and R33-50 for the calendar years, 1991, 1992 and 1993 respectively. This translates to a July 1994 value of about R37/man-hour. Projects in Soweto's Contractor Development Programme, where labour-intensive methods of construction and labour-based technologies are employed, yield an average expenditure per unit of employment generated of around R17/man-hour (Watermeyer et al, 1994). Thus projects which yield an average expenditure per unit of employment generated of less than 50% of that of the industry as a whole, may be classified as being labour-based.

**Community opportunities**

Community opportunities should be assessed in the following manner:

1) Examine the construction process and identify which aspects of the project may be undertaken by the targeted community.

2) Establish the resources of the targeted community.

3) Explore the various construction options, e.g. Conventional Contractor Approach, Labour Pool Worker Programme Approach, Managing Contractor Approach and Development Team Approach, Contractor Team Approach and Joint Ventures, and estimate the associated cost of construction and the percentage of construction cost retained by the community with each option, taking full cognisance of the resources of the community.

4) Select the construction option which maximises the percentage of construction cost retained by the community.

The construction cost retained by the community on projects where the community contributes only its labour will equate to the labourer wage bill paid to members of the community i.e. the spending on targeted labour. Cost retained by the community provides a measure of aspects such as community involvement, affirmative action, redistribution of wealth, entrepreneurship and development. It is also a direct measure of economic empowerment.

On projects in the Western Cape of a site and service nature, which are currently operating in terms of the Framework Agreement, the
spending on targeted labour i.e., the construction cost retained by the community amounts to 12% (Watermeyer and Band 1994). The construction cost retained by the community in Soweto’s contractor development programme, has been found to vary between 37 (road construction) and 50% (plumbing) depending upon the type of contract. On a community-based pilot project in Sandton, involving the construction of water and sewer mains, this figure was found to be approximately 34% (Watermeyer et al, 1994).

Project Index

Watermeyer et al (1994) have established a Project Index (PI) to evaluate and compare projects against each other, viz.:

\[
PI = \frac{20}{EEE} + \frac{1.75 \times PCR}{100} + \frac{ECC}{EPC} \quad \ldots(1)
\]

where

- \( EEE \) = Estimated expenditure per unit of employment generated
- \( PCR \) = Percentage of construction cost retained by the community (Rand/man-hour) de-escalated to July 1994
- \( ECC \) = Estimated cost of conventional construction
- \( EPC \) = Estimated project construction costs

and

\[
ECC \leq \frac{1}{EPC} \quad \ldots(2)
\]

This index is in essence a combination of three ratios which relate to expenditure per unit of employment generated, construction cost retained by the community and cost of construction, respectively. Each of these ratios in their own right index employment opportunities, community opportunities and cost premiums. The PI, therefore, may be used to evaluate a project’s contribution in respect of employment opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction. Projects which have a high PI present more development opportunities to a targeted community than those having low ones. Threshold PI’s can be set for specific project objectives and as such can be used as a basis to reject or accept certain projects.

Watermeyer et al report the following PI’s:

Average PI for civil engineering industry as a whole assuming all labour by
Project indices can change, particularly where projects attract cost premiums. In this regard, Watermeyer (1993) points out that labour-based construction practices will probably become more cost competitive since current cost comparisons with conventional construction practices have been undertaken in a recessionary period where plant on most projects has been priced at unrealistically low levels.

The Project Index may also be used to monitor and measure the change in spending patterns on projects as levels of spending on targeted labour increase. Where projects within a programme attract cost premiums, Watermeyer et al, recommend that the programme as a whole be checked to ensure that a net "loss in physical assets" does not result. For a programme to have a positive delivery:

\[
\sum \frac{ECC_{PP}}{EPC} > PRP \quad \text{....3)}
\]

where \( PP \) = project provision

\( PRP \) = programme provision

Where this is not the case, the provision made in respect of individual projects may have to be revised or an acceptable amount of "loss in physical assets" for the programme as a whole, will need to be established.

**PROGRAMME AND PROJECT OBJECTIVES**

The upgrading of urban infrastructure and the provision of township services present a host of opportunities to communities in respect of employment opportunities, skills, entrepreneurship and small scale enterprises. To realise these development opportunities, however, programme and project objectives are required. Programme objectives from a community development perspective could be ideally described as being to structure and to execute construction projects using labour-based technologies and labour-intensive methods in such a manner that through the construction process:
• Employment and entrepreneurial opportunities are created for members of the community.
• Skills and competencies in technical, commercial, managerial and administrative areas are transferred to participants.
• The percentage of the construction cost retained by the community is maximised. (Watermeyer et al, 1994)

Project objectives, on the other hand, could be described as being to have the Works constructed to specification within a specified period and a given budget using community-based contractors and labour-based construction practices in such a manner that:
• Opportunities for employment and training are created for the local community.
• As much as possible of the project expenditure is retained by the community.
• Community-based contractors (local entrepreneurs) are developed from within the community.
• A sense of participation within the community is fostered.
• Members of the local community are, as far as is practicable, employed by the Construction and Materials Managers to assist them in the execution of their duties. (Soderlund & Schutte Inc, 1994)

The Project Index calculated in terms of equation (1) can be used to measure whether or not a project complies with these objectives should a threshold PI be established. Assigning values of 20, 25, 1 and 1.15 (15% premium paid for labour-based construction) in respect of EEE, PRC, ECC and EPC, a threshold PI of 2.3 would result. Thus projects having a PI below 2.3 should be regarded as failing to comply with the aforementioned programme and project objectives.

APPLYING THE APPROACH TO URBAN INFRASTRUCTURE

The Soweto City Engineers' Department has applied this approach to upgrading projects executed in terms of their Contractor Development Programme (Watermeyer et al, 1994). The results of their analysis are reproduced to illustrate the project evaluation process.

Tables 1 and 2 present the estimated man-hours associated with each activity in the road programme. These figures are based on actual statistics derived from previous contracts and preconstruction estimates and include the man-hours associated with the manufacture and transportation of materials to the site but exclude that associated with preliminary, and general items and management. Figures associated with plant-based and fully labour-based construction as derived by Watermeyer and Band (1994) are provided for comparative purposes. The projects in question realise 75% of the potential
employment available in respect of the waterbound macadam roads and 83% in respect of concrete block roads. This is due to Soweto's requirements for asphalt surfacing by conventional means and no on-site manufacture of materials.

The multiplier in employment opportunities in construction activities were found to be:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>excavate and backfill trenches for water reticulation</td>
<td>1.9</td>
</tr>
<tr>
<td>excavate, lay pipes and backfill water reticulation</td>
<td>1.4</td>
</tr>
<tr>
<td>construct waterbound macadam roads</td>
<td>4.7</td>
</tr>
<tr>
<td>construct concrete block paved roads</td>
<td>2.3</td>
</tr>
</tbody>
</table>

The estimated total number of man-hours generated in respect of materials, site labour and management for the various projects in Soweto are presented in Table 3. Table 4, on the other hand, presents the expenditure per unit of employment generated.

The percentage of construction costs retained by the community is presented in Table 5 and summarised in Table 6. It should be noted that the community is not only involved in the construction contract but also in the transport of materials from the store to the site and in the development support provided by the construction and materials managers. The percentage of the management fee retained by the community varies considerably between construction managers and ranges from 25 to 45% of the total construction fee inclusive of site charges, establishment costs and disbursements. The percentage retained in respect of materials management costs is approximately 25%.

It should be noted that amounts paid to specialist contractors, e.g., for reinstatement of paving, local materials supplies and vendors of diesel are not included in these figures. A significant percentage of these costs, however, remain in the community. The statistics presented in Tables 5 and 6 may, therefore, be regarded as being conservative.

Table 7 presents in tabular form the estimated costs in respect of the proposed community-based and equivalent conventional construction projects. No cost comparisons have, to date, been undertaken in respect of house connections (plumbing) as data for conventional contracts is not available.

PI's for the various projects in Soweto's Contractor Development Programme, in terms of equation (1) were found to be:
The provision in terms of the current CWRSC/DBSA loan agreement in respect of the projects which were evaluated were:

- Secondary watermains R9,0 million
- House connections R4,0 million
- Road construction R5,0 million

On these projects, the roadworks costs were found to be in the region of 15% more expensive than conventional construction whereas the secondary watermain costs were about 30% less expensive. Thus in effect, the monetary value of "physical assets" constructed in terms of the programme when compared to conventional construction methods would equal $9 \times \frac{130}{100} + 4 \times \frac{1}{10} + 5,0 \times \frac{115}{100} = 20,0$ million, a figure in excess of the allocated project amount of R18 million. Thus the programme has a positive delivery.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Type</th>
<th>Man-hours Required to Construct a Square Meter of Road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>layer-based</td>
<td>labour-based</td>
</tr>
<tr>
<td>Surfacing</td>
<td>20 mm</td>
<td>0,12</td>
</tr>
<tr>
<td>Base course</td>
<td>125 G2/WMB</td>
<td>0,17</td>
</tr>
<tr>
<td>Subbase</td>
<td>125 G6</td>
<td>0,13</td>
</tr>
<tr>
<td>Boxcut</td>
<td></td>
<td>0,20</td>
</tr>
<tr>
<td>Rip &amp; recompact subgrade</td>
<td></td>
<td>0,03</td>
</tr>
<tr>
<td>Kerbing</td>
<td>Mountable</td>
<td>0,44</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>1,09</td>
</tr>
</tbody>
</table>

Table 2: 5 m concrete block wide paved road.
<table>
<thead>
<tr>
<th>Layer</th>
<th>Type</th>
<th>Man-hours Required to Construct a Square Meter of Road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>plant-based</td>
</tr>
<tr>
<td>Surfacing</td>
<td>80 mm concrete block</td>
<td>0.93</td>
</tr>
<tr>
<td>Subbase</td>
<td>150 G6</td>
<td>0.16</td>
</tr>
<tr>
<td>Box cut</td>
<td></td>
<td>0.17</td>
</tr>
<tr>
<td>Rip &amp; recompact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>subgrade</td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>Kerbing</td>
<td>Mountable</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>1.73</strong></td>
</tr>
</tbody>
</table>

Table 3: Estimated number of man-hours generated in Soweto's CDP.

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Unit</th>
<th>Estimated Number of Man-hours/Unit (hours/unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road construction (waterbound macadam + stormwater)</td>
<td>m²</td>
<td>Materials: 0.5 Site Labour: 6.8 Management: 1.8 Total: 9.1</td>
</tr>
<tr>
<td>Road construction (concrete block paving + stormwater)</td>
<td>m²</td>
<td>Materials: 0.7 Site Labour: 8.0 Management: 1.8 Total: 10.5</td>
</tr>
<tr>
<td>Secondary Water Mains</td>
<td>m</td>
<td>Materials: 0.4 Site Labour: 5.9 Management: 0.9 Total: 8.2</td>
</tr>
<tr>
<td>House Connection</td>
<td>erf</td>
<td>Materials: 0.6 Site Labour: 31.4 Management: 6.0 Total: 38.0</td>
</tr>
</tbody>
</table>
**Table 4: Expenditure per unit of employment generated in Soweto's CDP.**

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Unit</th>
<th>Estimated Expenditure/Man-hour (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road construction (waterbound macadam)</td>
<td>m²</td>
<td>17,9</td>
</tr>
<tr>
<td>Road construction (concrete block paving)</td>
<td>m²</td>
<td>18,4</td>
</tr>
<tr>
<td>Secondary Water Mains</td>
<td>m</td>
<td>17,4</td>
</tr>
<tr>
<td>House connections (plumbing)</td>
<td>erf</td>
<td>17,1</td>
</tr>
</tbody>
</table>

**Table 5: Percentage of construction cost retained by the community in Soweto's CDP.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Road Construction</th>
<th>Secondary Water Mains</th>
<th>House Connections (Plumbing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour contract</td>
<td>26</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>Transport</td>
<td>2</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Materials Management</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Construction Management</td>
<td>7</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>37</strong></td>
<td><strong>39</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

**Table 6: Summary of percentage of construction costs retained by the community in Soweto's CDP.**

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Percentage Expressed in terms of Construction Costs (%)</th>
<th>Ration of Columns 2 and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road construction</td>
<td>37</td>
<td>1,3</td>
</tr>
<tr>
<td>Secondary water mains</td>
<td>39</td>
<td>1,5</td>
</tr>
<tr>
<td>House connections (plumbing)</td>
<td>50</td>
<td>1,4</td>
</tr>
</tbody>
</table>
Table 7: Cost comparisons between projects using proposed and conventional construction practices.

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Unit</th>
<th>Estimated Costs (Rand/Unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road construction</td>
<td>m²</td>
<td>R174, R147-165</td>
</tr>
<tr>
<td>Secondary water mains</td>
<td>m</td>
<td>R145, R188 - R209</td>
</tr>
<tr>
<td>House connections (plumbing)</td>
<td>erf</td>
<td>R670, none available</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**

The Project Index developed in this paper may be used to evaluate a projects’ contribution in respect of employment and community opportunities and to compare one project against another, irrespective of whether or not such projects incorporate labour-intensive methods of construction. This is possible since the Project Index is a number arrived at by summatng three expressions which, in their own right, index employment opportunities, community opportunities and cost premiums, respectively. Projects which have a high Project Index present more development opportunities to a targeted community than those having low ones.

**REFERENCES**

Annex 1:

EXPLANATION OF TERMS

Multiplier in employment opportunities

The multiplier in employment opportunities may be defined as the ratio of the average total number of man-hours generated in the construction of a specified structure or service using labour-based technologies to that using plant-based technologies. This ratio should include the number of man-hours involved in the manufacture of materials, but exclude that associated with Preliminary and General items. This multiplier in effect gives an indication of the increase in the total employment opportunities generated by the selection of specific technologies. As such, this multiplier can be assessed by examining a specified sample length, area or unit, as appropriate, of the structure or service under consideration.

Expenditure per unit of employment generated

The expenditure per unit of employment generated should be based on the total employment opportunities which are generated in the construction of a structure or service and the total construction cost excluding VAT but including any management fees directly related to construction activities. Employment opportunities should, therefore, be expressed in man-hours and include all the hours associated with Preliminary and General items, the manufacture of materials and construction activities. These statistics provide some indication of the cost effectiveness of the employment generated by the adopted technology.

Cost of construction

The cost of construction should include all costs pertaining to construction including any management and on-the-job training support costs provided to emerging contractors. Conventional professional fees relating to design and contract administration should, however, be excluded from such costs.

Construction cost retained by the community

The amount of the construction cost which is retained by the community gives an indication of the degree to which entrepreneurship and small scale enterprises is promoted in the community and is as such, one direct measure of economic empowerment within a community.
2.4 Labour-intensive infrastructure development in the urban informal sector: ILO's strategies and programmes for urban poverty alleviation on an inter-regional level

S.K. Miller, Development Policies Branch, ILO Geneva

INTRODUCTION: URBANISATION, UNEMPLOYMENT AND POVERTY

J. Tournée and J. Omwanza's paper presents an excellent analysis of case studies showing the need for, results of and difficulties associated with labour-intensive and community-based approaches for urban infrastructure development in unplanned settlements. Rather than repeat their analysis, I would like to present briefly what the ILO is doing and planning on a global scale in this field; and to suggest possible linkages with the ILO ASIST programme including the extension of its mandate to cover the urban sector. To begin, I would like to present some of the conceptual issues related to labour-intensive approaches in the urban sector.

Most of us know the history of ILO's association with employment-intensive infrastructure development programmes whether undertaken in the framework of the Labour-intensive Special Public Works Programmes, or the Construction Technology Programme. Throughout the 1980s these programmes targeted almost exclusively rural areas of least developed countries. In fact, one of the often-stated objectives of these programmes was to stem rural-urban migration. The premise was that labour-intensive infrastructure development would improve the productivity of rural agriculture and thereby support sustainable rural employment creation through injecting cash incomes and improving rural living conditions.

While I would not dispute the basic validity of this approach, labour-intensive rural infrastructure development programmes certainly have not been sufficient to slow down the pace of urbanisation. This paper makes no pretext at analysing the root causes of rural-urban migration in developing countries, nor the most appropriate policy responses. This has been a major theme of development literature over the past thirty years. Rather I would like to begin with a simple observation that urbanisation, and the urbanisation of poverty is a fact of life that will not go away. The ILO publication "From Want to Work," describes the situation as follows:

A persistent argument for not supporting urban improvement is to say that people should rather stay in the countryside. Unfortunately, it is too late. They have already moved to town.

In 1950, about 30 per cent of the world's population lived in urban areas. At present, only thirty-five years later, this figure has increased to 45 per cent, and in only ten years from now, it is estimated that the
world will be 50 per cent urban. In much development literature, the urban population is seen to be relatively affluent with access to superior infrastructure and services, as well as to formal sector employment, and high wages. However, this situation is changing rapidly, and appears to be overtaken by the urbanisation of poverty.

In many African cities, urban drainage, road and housing infrastructure networks are serving populations far exceeding their original designs, and in many cases, no major improvements or extensions of these networks have been undertaken over the past thirty years. The situation is even worse in the unplanned squatter settlements mushrooming on the outskirts of, and even within, planned settlements. Here even the most basic forms of infrastructure and services are virtually non-existent. Rather than measuring urban poverty in terms simply of incomes, lack of access to urban infrastructure appears to be both a cause and a symptom of urban poverty.

The past decade of structural adjustment programmes in Africa has been associated with sharp cutbacks in spending on urban infrastructure. Although these structural adjustment programmes have therefore had a generally negative effect on employment and living conditions for the urban poor, they have provided an additional impetus to explore the feasibility of labour-intensive and local resource-based approaches, this in a context where international assistance is increasingly rare and where efficient utilisation of local labour and resources therefore becomes a necessity.

Labour-intensive and community-based urban infrastructure development requires strategies which are specifically designed for the urban sector. Tournée and Omwanza have presented many of the engineering and technical constraints specific to unplanned settlements, including the requirement to adapt designs to house location in order to avoid demolition, the tricky question of drainage in low-lying and relatively level settlements, etc.

Techniques and forms of community participation are also different in urban areas, where urban populations are heterogeneous and therefore are less easily mobilised around themes of common interest. For example, urban residents may be mainly interested in evacuating flood water from their house's doorstep, even if this means channelling it on to the doorsteps of their neighbours. And as the Kalerwe drainage project in Uganda has shown us, urban drainage is often closely linked to the question of garbage disposal, sanitation, and accessibility.

Therefore urban infrastructure development is closely linked to other issues which both complicate policy and operational responses, but also provide new opportunities for integrated approaches to address urban poverty. I would like to highlight briefly some of these potential links, before discussing what the ILO, in partnership with other actors, is trying to do about them in operational terms.
COMMUNITY-BASED UPGRADE AND LAND TENURE

One linkage is between community-based infrastructure development and land tenure issues. In an exploratory mission to the Philippines, the mission identified different types of land tenure situations confronting the urban poor. One type was classified as danger zones. These areas included squatters living along railroad tracks and canals, close to and even on top of mammoth garbage dumps, and even within the perimeter of an international airport. In such cases, clearly some form of relocation appears to be the only solution. Nevertheless, relocation often means separating the poor from their only source of income or employment, even if this means scavenging through garbage, and therefore relocation usually fails unless solutions are found to provide sustainable incomes to those being relocated.

Other land tenure situations, where squatters have no legal title, but over the years have acquired some semblance of right to occupy the land, begin to open the door to community-based approaches to upgrading of these settlements. Community involvement in improving its own living environment usually requires a certain amount of security in land tenure. Only then will the urban poor be convinced that their investment in time and scarce resources to improve their neighbourhood will not be destroyed by the bulldozers of urban planners and developers. Therefore land tenure security is an important issue to address at the planning stage of any labour-intensive and community-based upgrading programme. This question is often less important in rural areas where land is less scarce and where traditional land tenure systems usually ensure security for even the poorer segments of society. Also once previously neglected land is improved, property prices go up; and the poor run the risk of being forced out, or bought out, of neighbourhoods in which they have invested their resources to improve.

INFRASTRUCTURE DEVELOPMENT AND THE URBAN INFORMAL SECTOR

Another issue concerns the links between labour-intensive infrastructure development and the so-called urban informal sector. The ILO has decades of experience in research and action programmes relating to the urban informal sector. Some of this work involves small and micro-enterprise development. Such so-called "micro enterprises" range from a women selling fried fish on a street corner, to a producer of cement blocks, to a motorbike mechanic operating on the street corner. Larger but still very small-scale enterprises involve carpenters working out of their houses, small construction firms, neighbourhood health clinics, etc. Whereas it is desirable to promote employment and incomes in promising and productive micro-enterprises, another side of the urban informal sector includes unhealthy and unsafe working conditions, child labour, exploitation by unscrupulous employers or middlemen, etc. For the ILO, this is the dilemma of the urban informal sector. Whereas clearly the formal sector cannot provide the
employment opportunities needed by the poor, the ILO should not, with one hand, be promoting the forms of exploitative and unacceptable employment which it is trying to combat with the other.

However, labour-intensive urban infrastructure development and improving both employment, incomes and working conditions appear to go hand in hand in one of the rare win-win development strategies. First of all, the incomes which the urban poor earn as construction workers in labour-intensive upgrading schemes can subsequently help the same workers to invest in such small-scale business and income generating activities, including required capital investments. Also, infrastructure upgrading improves the productivity and working conditions for existing and new enterprises which operate out of poor and unplanned urban settlements. Road and footpath accessibility, proper drainage and sanitation all make a positive contribution to sustainable employment creation in these settlements. Therefore, there is scope for improving the conceptual and operational linkages between employment intensive infrastructure development and programmes to promote the urban informal sector since at least within the ILO these programmes appeared to be operated in the past as two autonomous and unrelated interventions.

AN OVERVIEW OF ILO'S URBAN SECTOR LABOUR-BASED AND INFORMAL SECTOR PROGRAMMES

At this point, I will summarise some elements of ILO's involvement in urban labour-intensive infrastructure development projects as one means of providing operational responses to the problem of urban poverty as discussed above.

In 1987, I participated in an exploratory mission to Kinshasa, Zaïre to identify an urban 'Special Public Works Programme'. UNDP also requested that this mission be carried out in collaboration with the United Nations Centre for Human Settlements - Habitat, based in Nairobi. This programme went through a detailed formulation process, and by the time construction activities were ready to begin, the project had to be closed down due to the political situation in Zaire. Nevertheless, the project provided one model of community-based urban infrastructure development. The types of works envisaged, as in the projects mentioned by Tournée and Omwanza, were construction of access roads, including limited sections of street paving, erosion control and flood protection. This project also provided a first example of ILO's collaboration with UNCHS-Habitat in the framework of an operational programme. The negotiation of this project with government authorities was a particularly delicate matter since a number of local and senior level officials were trying to get control over both the identification and selection of projects as well as the construction enterprises to be awarded the contracts. Such interference ran counter to the community-based approach with which the project was designed.
ILO's programme of labour-intensive urban infrastructure development has been supported by a series of two UNDP-funded inter-regional projects which have been referred to by Tournée and Omwanza. This first project, Employment Generation in Urban Works Programmes through efficient use of local resources, not only formulated the Kalerwe (Uganda) and Hanna Nassif (Tanzania) projects, but also carried out research studies, organised a workshop in Nairobi and produced the publication, From Want to Work. The approach developed is not limited to labour-intensive infrastructure development, but includes other complementary strategies to create employment and alleviate poverty through local resources. Therefore the issues of solid waste management, of increasing the productivity and incomes of workers in the urban informal sector and of micro-enterprise development were also addressed by this project.

**UN system interagency collaboration within the urban sector**

The second inter-regional project continues to address these issues, but in a collaborative framework involving also UNCHS-Habitat and the United Nations Volunteers Organisation. This project has carried out joint missions (involving officials and consultants from the Headquarters of the three agencies) to five countries (Bolivia, Colombia, Indonesia, Philippines and Tanzania). Other forms of collaboration are also envisaged in Nicaragua, Namibia, Uganda, Bangladesh and Vietnam.

Such UN-system interagency collaboration would appear to avoid duplication, and increase impact by bringing to bear the expertise of three UN agencies, each within the domain of its respective comparative advantage. For example, the land tenure issues discussed above fall more likely within the mandate of UNCHS-Habitat rather than within that of the ILO. Likewise, the United Nations Volunteers has considerable resources and experience in community participation which is invaluable for local involvement in upgrading unplanned settlements.

However, at the same time, in practice simple communications, coordination and joint planning and implementation have often been time consuming and cumbersome. Although the need for concerted effort in this field is greater than ever, we have yet to work out the best institutional mechanisms for "getting our act together" within the framework of the UN-system bureaucracy.
I would now like to briefly mention labour-based development activities which are taking place in the Francophone countries of West Africa where demand is growing for community-based and labour-intensive upgrading schemes. Here, modelled partially after the Bolivian Social Fund, the World Bank and other donors have been funding special employment and infrastructure programmes in hopes of mitigating some of the negative impacts of structural adjustment programmes. The first such programme, AGETIP, was developed in Senegal, and now similar programmes are underway in Niger, Mali, Burkina Faso and Benin; whereas related programmes are being planned for other countries outside West Africa such as Madagascar and Tanzania.

Whereas these initiatives were positive in focusing attention to social problems in these countries, our approach towards them was cautious in that they carried the danger of falling into the trap of "make-work" programmes from which the ILO has been trying to disassociate itself over the past decade. In view of the urgency of the unemployment situation, the international community and government officials were looking for a "quick fix" solution to keep the lid on social unrest. Many of those who had been in the past criticising labour-intensive approaches as synonymous with poor quality and low productivity, were now turning to a characterised version of the approach to deal with what was all of a sudden seen as a social crisis.

Although the ILO at first had an "arm's length" relationship with these programmes, involving an evaluation of the Senegal programme as well as advisory missions to Senegal, Niger and Mali, we are now studying with the World Bank a collaborative programme to help make these programmes truly labour-based, not only in name, but also in practice. At present, projects where labour costs are only around 20 per cent of total costs are termed labour-intensive, and we think they can do better, without sacrificing quality and cost-effectiveness.

Another area where the ILO, based on the hard work of participants at this meeting, has useful experience is in the area of small contractor training programmes. Whereas the West Africa special employment programmes have been successful in quick delivery of infrastructure thanks to the use of streamlined contracting procedures which bypass the government bureaucracy and cut through red tape, they still have a long way to go in developing truly labour-based contracting procedures and technologies. Furthermore, many of the programmes are weak on community-based planning and project selection, an area which I have already discussed. An ILO support package to these programmes, in collaboration with the World Bank and other donors such as the European Union, is one way then to "piggy-back" our technical assistance onto already identified investment resources in order to increase their impact on employment creation and poverty alleviation.
In fact, we are exploring the possibility of creating a type of Francophone ASIST project, possibly with an institutional home in a regional engineering university in Ouagadougou, which could support labour-based programmes in West Africa. The mandate of such a support project would possibly be broader than ASIST's current mandate, by supporting urban as well as rural works, and multi-sectoral as well as sector programmes. By this I mean that other forms of infrastructure, in addition to roads, would be supported, including anti-erosion works, irrigation, afforestation, small dams, etc. Also, specific advisory services could be provided in the field of community participation.

I would also like to mention another possibility for ILO to deepen its capacity in urban sector labour-based infrastructure programmes. It would be extremely useful if a full time advisory post could be created within the ASIST Office in Nairobi. Such an advisor could provide much needed support to the various initiatives in the East Africa sub-region which were mentioned by Tournée and Omwanza. Also the Nairobi location would be ideal since it would permit close collaboration with UNCHS-Habitat, with its headquarters in Nairobi, in the framework of the Urban Poverty Partnership programme and other joint initiatives.

**LINKING DEMONSTRATION PROJECTS TO EMPLOYMENT AND SHELTER POLICIES**

Urban unemployment has been identified as a top priority by mayors of cities around the world during a Colloquium on Social Development held at the United Nations in New York last August. Labour-intensive urban development provides one practical and concrete step which can be taken to help solve the problem of urban unemployment. I believe that any inter-regional programme should be built on the foundation of country-level demonstration projects of the kind discussed by Tournée and Omwanza. In order to have a significant impact on urban unemployment and poverty, we must carefully nurture, evaluate and improve such demonstration projects, since concrete results are the best means of influencing policy makers to adopt new approaches. “Seeing is believing,” should be the ILO’s maxim as it strives to provide policy advice on employment creation and poverty alleviation to urban technical and planning officers.

In the hopes of expanding and promoting the approach to donors, we are now, on the basis of the two inter-regional projects, designing a Programme known as the Urban Poverty Partnership. The design process has included a number of informal consultations with donors, a programming workshop held in the Hague in December 1993, and an evaluation, now underway, of ILO’s activities being undertaken in the urban sector. The report of the Hague Workshop and the UPP Programme Document are available for this meeting.
The ILO’s collaboration with UNCHS-Habitat has a number of facets, including a joint publication entitled Shelter Provision and Employment Generation which explores in great detail the upstream and downstream linkages between improved shelter and employment. Shelter here refers not only to housing, but also to the whole range of infrastructure and services which form the urban living and often working environment. The fact that in the urban unplanned settlements, the home is also often the workplace, is just one illustration of the close relationship between shelter and the world of work. It is for this reason that the ILO has in recent years strengthened and broadened its programme of collaboration with UNCHS-Habitat. In fact, this booklet will be a joint contribution of the two UN agencies to the World Summit on Social Development to be held in Copenhagen next March.

About a year after the Social Summit, another world summit will be held in Ankara, Turkey. This will be the Second United Nations Conference on Human Settlements, also known as HABITAT II, or the Cities Summit. The ILO, within its mandate, is collaborating with UNCHS-Habitat in preparing for this summit. At present, we are exploring the possibility of organising regional workshops on the changing structure of urban employment, in order to arrive at a comparison of how the world’s cities have evolved twenty years after the first UN Conference on Human Settlements which was held in Vancouver in 1976. However, as we participate in these various world forums dealing with problems of urban unemployment and poverty, we should never lose sight of the valuable experiences of our field programmes which provide us with the experiences on which all of our policies should be founded. In the world of the UN system there is unfortunately a habit of making lofty speeches and commitments in such world forums, without giving enough attention to the management and resource implications of how to put these ideas into practice in a complex and imperfect world. I strongly feel that the down-to-earth discussions taking place in this meeting of practitioners of labour-based programmes is one way of doing something about employment creation, rather than merely talking about it.
3 Education and training

3.1 Training in labour-based roadworks for Kenya’s expanding national programmes and international courses

B.G. Ariga and D.W. Jennings, Ministry of Public Works and Housing, Kenya

TRAINING FOR NATIONAL LABOUR-BASED PROGRAMMES KENYA

History

Labour-based roadworks in Kenya began in 1974 in 4 selected districts of this diverse country. The districts were selected to provide sites representative of all regions being considered for inclusion in a larger programme. They were representative in respect of topographical, climatic and socio-economic factors.

These districts were:
- Nyeri for highland, wet, regions
- Kwale for coastal region
- South Nyanza for Lake Victoria regions
- West Pokot for the semi-arid regions

During the period 1974 to 1976 the pilot projects in these districts worked independently. There was a lot of expatriate input and Kenyan engineers in the programme were very few. Experienced qualified Kenyan engineers were still very few in the country and could easily influence their own appointments. Labour-based work was seen as a second class form of engineering, still having an aura of relief work. This left the way open for various donor employed expatriate engineers to run the pilot units with a very free hand. The controlling Ministry, Roads Department realised that work methods, techniques, and procedures in the various districts needed to be standardised, if the programme was to be put into effect on a national scale. The results so far had been very encouraging and a national programme of labour-based road construction and improvement was foreseen. This national programme became known as the Rural Access Roads Programme (RARP).

The objective of standardising the works led to the formation of a training site in one of the initial districts. The district chosen was Nyeri. Standard methods and procedures were agreed upon and put into practice on the Nyeri sites. The Nyeri sites were then used as demonstration sites for these standard methods. Out of these beginnings, the labour-based training unit was born. It was quickly realised that one essential feature for national success of this type of
programme was to involve the national engineers. As the programme
grew all new engineers coming into the programme were attached to
the training unit before being appointed to implementing units in
other districts.

As the programme expanded the training unit was moved to Kisii
district. A small purpose built temporary facility was constructed at
Suneka with the help of Swiss funding and more formalised training
for the programme began. Still the original objective for standardising
the working methods and procedures remained top priority, now also
training was aimed at maximising efficiency within the programme.

RARP was so successful, both in terms of its own objectives, and in
terms of national political enthusiasm that labour-based methods were
brought onto the classified road network in 1985 with the creation of
the Minor Roads Programme (MRP). To cope with the training for
MRP a more permanent training centre was built at Kisii. This
complex is the present day Kisii Training School (KTS) training centre
where all labour-based roads training for Kenya is carried out and the
ILO international courses have been conducted. A map of the districts
covered by the programmes is attached overleaf.

Throughout the period since the first training unit was set up in Nyeri
these sites have been used as technology development and research
sites. Technology development in Kenya programmes has gone hand in
hand with training.

Achievements

Training

Through the period since it's inception in 1976 the labour-based
training unit has succeeded in training all the staff of RARP and of
MRP. These staff include the engineers, both nationals and
expatriates, all the roads supervisory staff, the plant operators,
drivers, mechanics and administration staff from both stores and
accounts. The details are attached as Annex 1. For both programmes
this has resulted in a full standardisation of methods and procedures.
This can be seen as one moves from one end of Kenya to the other
looking at the roads within the two programmes. Standards are
maintained throughout the country. The Minor Roads Programme
works in some 34 of Kenya's 50 districts. In any of these districts both
rural and minor roads within the programme can be immediately
recognised by their size, shape, and drainage arrangements, and the
fact that they are maintained to a motorable standard. This common
standard is evidence of the achievements of the training unit in its
first objective. The fact that standards are maintained throughout the
country is mainly due to the efforts of the training unit.
The training unit has been so successful in fulfilling this first objective that now it is very difficult to change the procedures followed by the site staff within the programme. This is evidenced by the effort required to introduce the New Maintenance System in 1989. The introduction of this system took some three years, and implementation training by both the unit staff and a team of training consultants from Europe.

The second objective, that of maximising efficiency, is much more difficult to apportion. The questions to be asked are: (i) has efficiency in the client programme changed? and (ii) how much of this change is due to training?

An attempt at answering the first question can be made through the programmes own reporting system. A real change in efficiency due to training should show up in the reported man-day/km figures or in other productivity figures. However, there are so many factors affecting these productivity figures that to say any portion of change is due to training received, would be subjective assumption. Training alone will not lead to increased efficiency. Training is a prerequisite for efficiency. If all environmental factors are correct, (management, organisation, motivation) maximum efficiency will be achieved, provided the staff are well trained.

Certainly the success of the RARP and MRP programmes in Kenya would not have been possible without the achievements in training, from the training unit at KTS.

Rural populations throughout Kenya know the labour-based road programmes simply as "rural roads" and know that it is under these programmes that they find temporary employment. During the rainy seasons knowledgeable motorists in the rural areas seek out the "rural roads" for access to their destinations, and avoid the secondary roads, whose condition is often uncertain.

Technology development

The training unit has always been the centre for trials of new methods and procedures within the labour-based programmes in Kenya. This has meant that discoveries could be immediately incorporated into the training syllabi. Over the years the unit has been closely involved with developments in the methods for dealing with steep gradients, roads with existing camber, sunken sections, alternative surfaces, compaction (or rather non-compaction) and continuous trials are still going on in this subject.

Among the notable successes for the training unit in the area of technology development is the development of the "full road template" for use in areas of existing camber. This development has given an average saving of 250 man-days per km for the task of reshaping on a minor road cross-section (5.4 m carriageway), and a 400 man-day saving for full construction of a similar road.

Roads programme achievements

The Rural Access Roads and Minor Roads Programmes have achieved wide success and fame within Kenya. Together these programmes have constructed and improved a total of 12,000 km of access and feeder roads in the most agriculturally productive regions of the country. At their height they were providing 20,000 man-years of employment per year to the rural population in areas of high population, and under-employment. Land use patterns in these areas have been affected, and a change from subsistence to cash crops noted.\(^2\)

Kenya through the Ministry of Public Works and Housing has managed to run a huge programme of labour-based roadworks covering the majority of the country for the last twenty years. The programme has built up a cadre of experienced engineers. Labour-based work in Kenya is no longer considered as a sub-standard form of engineering, but is recognised by all engineers in the Ministry as the way to the top. Road building skills utilising labour-based methods have been transferred to the local communities at grass roots level. Many other local roads ("Harambee roads") have been constructed by the communities on self-help basis using the same technology.

Productivities within the programme have been maintained, not only throughout the country but also throughout the many years of the programme. Productivity figures fluctuate greatly from year to year but overall a trend can be observed. MRP figures over a ten year period show full gravel road construction in 1984 to be 2797 man-days per km and in 1993, 2630 man-days per km.

The other key success of these programmes has been the increase of political awareness among the country's leaders, of the potential of labour-based methods, not only to build roads and provide jobs but also to win votes.

The beneficiaries from the training for these programmes have been both direct and indirect. Directly, the programmes and trained individuals have been able to carry out their jobs to a high level of success. Indirectly, the local, rural communities have benefited from access to markets for cash crops, jobs, and increased services. Other Ministries have benefited from easier access to the communities (health, education etc.). The communities served have undergone a

\(^2\) Impact study RARP 1984, and MRP (Danida) 1990
general increase in economic activity over the period of the two programmes.  

Certainly a large part of all these successes was due to the vast amount of training that went on and continues within the field of labour-based roadworks in Kenya.

Analysis

What made the training for the Kenya labour-based programmes a success? We consider that there are five main factors that contributed to the achievement of training for these works in Kenya.

1. Well trained and experienced training staff

The trainers for the programme were all experienced in labour-based methods and trained as trainers both before taking up the job and during in-service courses at KTS.

2. The fact that the training authority has also been in direct control of a practical roadworks unit

This has meant that the trainers have continual practical experience. They have first hand knowledge of the problems and difficulties that the trainees are having or will face in the field. The training then is geared towards the practical, real job. Even in terms of management and administration topics the training deals with the real world and not only the policy, or theory, according to the implementation plan. This link to the practical site work, and district management is seen as the most important factor for training success.

3. The fact that all levels of staff are trained by the same authority

The labour-based training unit (KTS) of the Department of Staff Training (DST) has been responsible for the training of all staff for these roads programmes. This means that everybody involved in the programme from the headquarters engineer through the provincial supervisory staff right down to the tractor driver on site has been trained by KTS. This gives the trainers a full and clear picture of what is going on within the programme and where adjustments to the syllabus need to be made. How each member of staff relates to another is seen practically by the trainers and problems can be solved through the training process.

4. Continual revision of content and refresher courses
The training needs of the individuals within the programme and of the organisation do not remain static. There has been continual revision of the training content as new problems arose or new solutions were discovered. After the initial round of training for MRP it was found that further supervisory training with the same syllabus was having little effect. This led to a major review of training together with the client programme management and the introduction of "problem solving" refresher courses, for all grades of site supervisors. This type review and re-planning of the training together with the client authority is considered an essential feature of training success. In this programme major reviews using ZOPP (objective oriented planning) techniques were conducted regularly - at least on a two year cycle.

5. Technology development linked to the training centre

The field trials of most of the technology research for the roads programmes were carried out at the training centre and under the authority of the training unit. This meant that the link between training and technology development was string and immediate. New items could be incorporated into training straight away. Enabling the training to react to change, and keep trainers at the forefront of the technology.

Future

The success of the labour-based programmes in Kenya have led to political and technical acceptance of the technology. This in turn has led to the increase in the use of the technology within the Roads Department. Now it is the Ministry's policy to expand further the use of the technology in the road sector. A strategy known as Roads 2000 will attempt to introduce labour-based maintenance onto the whole network of classified roads in Kenya. The labour-based methods will be backed up by appropriate equipment for carriageway work on heavily trafficked roads and in areas of low population density.

This ambitious strategy will require a huge amount of training and re-training of the roads supervisory staff both former RARP and MRP staff and others who have never been involved in labour-based works before. This provides a new challenge to DST and KTS. A challenge which will mean retaining the achievements of the past and at the same time changing the very methods and procedures which have been instilled into the programme staff and work force. A challenge indeed.

INTERNATIONAL COURSES

History

During the period of the Rural Access Roads Programme, requests for training from other neighbouring countries were being received by the
training unit. Some of these requests were fulfilled and various individuals mainly from Tanzania were accepted onto RARP courses. This was a useful experience for these individuals but did not go far in meeting the training needs of the developing labour-based roads programmes in these countries. When the KTS training centre for MRP was being planned and designed capacity for a small number of site supervisors from other countries was foreseen.

From 1985 KTS dealt with a number of requests for specific training courses for "gang leaders" from a number of projects and programmes from neighbouring countries. These courses were conducted at KTS in Kisii and a few courses were conducted by KTS trainers in the project countries, mainly Tanzania. Details of the international participants are attached as Annex 2.

In 1988 the ILO with Swiss funding developed and ran an international course for engineers at KTS. This course was based on the Kenyan engineers course and had the added features of topics on inception of a labour-based programme and further information on projects from other countries. From this first pilot course an international course for engineers and managers was formulated. The ILO continued to run more of these courses at KTS over the next two years, using the KTS staff, consultants and lecturers from both ILO and Kenya Government programmes.

In 1990, the Swiss funded ILO project for training and information services "TIPS" and the SIDA and NORAD funded ILO project for advisory support to projects in Sub-Saharan Africa "TAS" were joined together under a new project management structure based at Nairobi and known as ASIST.

ASIST has conducted international courses each year at KTS for engineers and managers of labour-based roads projects and for senior technicians and trainers. Under the ASIST project senior managers were also to receive familiarisation study tours of projects including visits to MRP in Kenya. This has indeed taken place.

KTS now takes responsibility for the administration of these courses. ILO remains responsible for the marketing and the quality control of the course. Lecturers for the course are still drawn from KTS, ILO, and Kenya programmes. Efforts to include lecturers from other country programmes have proved prohibitively expensive. It is desirable to use country programme lecturers were funding can be made available.

KTS continues to run courses for "gang leaders" and has conducted training for a number of site supervisors from Tanzania, and Uganda.

**Achievements**

Initially training in this international environment was just a reaction to specific requests. It was a challenge which KTS was keen to test itself against although the training itself had no clearly stated
objective. It was seen as a help to neighbours, providing them with the basic means of beginning labour-based works themselves.

International training at KTS has been going on for the past ten years. The growth of this type of training and the increasing demand for it, is an indication of success.

Later with the collaboration with ILO projects, the objectives for the training were clearly stated. These objectives were two:

- to increase the use of labour-based methods within the region.
- to increase efficiency of the programmes using the technology within the region.

The numbers of the various levels of staff trained at KTS is included as Annex 2. More and more countries are taking up the use of labour-based methods for roadworks. The ASIST objective is being reached. To attribute this achievement solely to the training conducted at KTS is not possible. Certainly, once a department in any country makes the initial step to introduce labour-based techniques into its operations, a visit by senior management to a successful programme will help to create support. Measurement of any increase in efficiency is difficult. Even if it could be measured, apportioning part of that increase to the training carried out at KTS would be impossible.

Both ILO and KTS itself will be attempting to evaluate the training in the next 2 years. The results of this evaluation will be keenly awaited.

Let us here state one example of the effect of these courses on projects and individuals. Mr. Sebuliba was on attachment to Kenya DST from Uganda in 1992. He was programmed to review maintenance procedures of the Kenyan Roads Department. While he was in Kenya one of the ILO international courses was due to start. This was the first trainers course. Permission and funding was sought for him to join the course and both were found. Mr. Sebuliba had no previous experience of labour-based works. He successfully completed the course. Today Mr. Sebuliba is the training engineer for the Labour-based Road Maintenance Project under Ministry of Works in Uganda.

Analysis

There are some fundamental elements of the international training at KTS which have influenced its success.

Firstly, the emphasis of all the courses at KTS is practical. The curricula developed for the international courses stresses the practical issues involved in running a labour-based site, and project. It covers all aspects of the real job. This practical curriculum together with the availability of training sites under KTS control, ensures the practical nature of the course. The course curricula and content also ensures proper engineering standards of design, material specifications, cost efficiency and high productivity are emphasised during the course.
Choice of technology and criteria for that choice are essential tools for the engineer in this region. The course content also emphasises these points.

A pool of some 25 lecturers experienced in labour-based management are available for KTS to draw upon for each course. These lecturers are draw from ILO, KTS, MRP, and Kenyan private and public sectors. These individuals have also received further training in participatory training techniques, (ILO course in Naro Moru) which increases their versatility. A more experienced team of training staff for this subject would be difficult to find anywhere.

The fact that the courses are encouraged and fully supported by the Kenya Government and the Ministry of Public Works in particular has eased the administration procedures. This fact has also opened a wealth of practical sites, all over Kenya, to course participants.

ILO support and input to the training process and to the administrative function has been crucial. Not only have ILO personnel been part of the lecturing team, but the direct links to regional projects both for marketing and content variations has been equally important.

The back up of the formal training courses with study tours has added an important dimension to the training. Study tours have helped senior managers perceive the possibilities of labour-based works in their own countries. Study tours have also made managers more amenable to suggestions of training courses for their staff within the same programme.

The main benefits from this programme of international training have been the labour-based projects and programmes in the region. The benefits are two. For new projects there is a shorter learning curve. A project can be up to peak efficiency in a much shorter time than if they had to learn the hard way. An ongoing project benefits from the broadening of their staff and the cross fertilisation of technology. Not everybody needs to re-invent the wheel. The Zimbabwe project for instance already started using the full road profile, developed at KTS, from the beginning, saving many man-days. The Kenya MRP contractor project has used the principles developed in the Ghana Feeder Roads Programme. The sharing of ideas and experiences through the training courses and other interactions benefits all projects in the region.

**Future**

The ILO/ASIST project is due to end in 1996. KTS is already in a position to continue to run the courses. There are however some points to consider. It has proved very difficult to maintain a rate of 3 courses per year. This has meant that at least one person is employed full time.
throughout the year on marketing and fee chasing matters. ASIST has up to date taken on this task. DST will need to consider reducing the number of courses or employing a full time marketing manager, for the international courses.

Fees seem difficult to collect. Even with the ILO links to the projects, a substantial amount of course fees are still outstanding. Some date back to 1992. The only reason courses are continuing is that SDC has advanced money to KTS and ASIST to finance the running of courses while awaiting outstanding course fees. There will be a need for a longer lead time for future courses and fees paid in advance.

There is a need for firm links with ILO for future course marketing. This may mean the Area Offices or the Multi-Disciplinary Teams. Neither of these bodies is based in Nairobi.

There are resources in Kenya capable of continuing to run these international courses. The potential is there. DST/KTS are willing to take on this further challenge. Clearly there are issues to be resolved. The tradition of holding international courses at KTS is well established. The resources are available. The commitment of the people involved at all levels is high. There can be no doubt that international courses based in Kenya will continue to meet the ever growing demand.

A chart of SDC involvement and major events in the KTS project, and visions of the future is attached as Annex 3.
TRAINING CARRIED OUT BY KTS FOR NATIONAL KENYAN PROGRAMMES

<table>
<thead>
<tr>
<th>Year</th>
<th>Engineers</th>
<th>Technicians</th>
<th>&quot;FOG&quot;</th>
<th>Mech</th>
<th>Op</th>
<th>Adm</th>
<th>Total</th>
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<td>272</td>
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<td>3776</td>
<td>1594</td>
<td>1065</td>
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Training in Kisii Training School 1985-94 per Interest Group:

- "FOG": 41%
- Engineers: 3%
- Technicians: 18%
- Mech: 17%
- Op: 10%
- Adm: 10%
- Op: 11%
### ANNEX 2

#### TRAINING CARRIED OUT BY KTS FOR INTERNATIONAL COURSES

<table>
<thead>
<tr>
<th>Country</th>
<th>Technician</th>
<th>Engineer</th>
<th>&quot;FOG&quot;</th>
<th>Trainer</th>
<th>TOTAL</th>
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<td>34</td>
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</tbody>
</table>

**TOTAL** | 225         | 721      | 205   | 54      | 1205  

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**International Training Carried out by KTS**

- **Technician**: 19%  
- **Engineer**: 60%  
- **"FOG"**: 17%  
- **Trainer**: 4%
3.2 Training needs assessment - planning a training programme

J. Markland, Feeder Roads Programme, Mozambique

INTRODUCTION

The success of any labour-based road construction project is the result of a team effort. Each member of the construction team has a part to play in ensuring the smooth-running of the project. When a training programme is being planned, for either a new or for an existing project, the needs of each of the members of this team must be considered, and training prepared so that they may all work effectively together. This paper describes the steps which need to be taken in order to plan such a programme.

The author is currently working as training adviser to the Feeder Roads Programme (FRP) in Mozambique and this paper describes a review of training needs which is being carried out. Twenty labour-based construction brigades are now operational in nine of Mozambique's ten provinces, with plans for expansion to forty brigades over the next three years. Training has been an important element since the start of ILO's involvement with labour-based road construction in Mozambique. Formal training has concentrated on staff at supervisor level with courses closely based on the ILO Training of Supervisors Manual.

The proposed programme expansion and the need to integrate the FRP training needs within an overall training programme which is being established within the National Directorate of Roads and Bridges (DNEP) meant that a review of training needs was desirable.

A key part of this review is to consider each of the different staff grades in the construction team: training is necessary for those members of the team who lack the abilities to perform some or all of their duties efficiently and correctly.

The main objectives of this review, or training needs assessment, are as follows:

- Identify the skills necessary to perform each of the jobs that make up the construction team.
- Determine the level of existing skills of the present staff.
- Prepare course programmes based on the skills necessary to perform each of the jobs and the existing skill levels of the students.
- Determine the numbers of staff at each grade to be trained.
The training needs assessment may be seen as a series of steps which achieve these objectives. Each step in the process of assessment is described in more detail in the sections which follow.

**DEFINING THE CONSTRUCTION TEAM**

The essential first step in the training needs assessment is the production of an organisational chart for the project. This chart should show the relationship between each of the grades of staff and defines the flow of responsibility. All the members of the construction team should be included. In most cases this chart will already exist, as it will have been used in the establishment of the project.

In the case of Mozambique the majority of labour-based construction is carried out by companies (ECMEP's) based in each of the provinces. When they were set up, these companies performed only machine-based construction. This often influenced the organisational structure which was adopted, and had resulted in different job titles and structures being used from province to province. Some rationalisation of these differences was necessary to enable a country-wide training programme to be developed.

It is important that this organisational structure is defined and understood by all parties before the assessment advances beyond this first stage so that everyone is aware who is to be trained, and what they should be capable of doing on completion of that training.

The organisational chart for a typical ECMEP is shown in Annex 1.

Once an organisational chart has been produced and agreed with those working on the project, the next step is to define the responsibilities of each of the staff grades by producing job descriptions for all grades of staff who appear in the organisational chart. As in the case of the organisational chart, job descriptions may already be available.

Some typical job descriptions for staff working on the Mozambican Feeder Roads Programme are given in Annex 2.

The job description should list all the duties and responsibilities of the staff member. It is important that the list is complete, and it may be necessary to amend it as a result of visits to the sites. Care should be taken to identify administrative and reporting functions as well as the basic engineering tasks. For example, the failure to requisite supplies of fuel on time can be just as expensive as poor organisation of the workforce.

**IDENTIFYING THE NECESSARY SKILLS**

The job descriptions define the tasks which are to be performed by each grade of staff. The next step in the training needs assessment is to define what skills are necessary to perform those tasks effectively.
The skills which appear in this second list are the learning objectives for that grade of staff. Examples are given in Annex 3.

The production of the learning objectives from the job description is straightforward for technical operations as all that is required is to note down the skill needed to perform that task. However tasks which are managerial or decision-making in character require more careful consideration because in addition to knowledge of the task, background information and attitudes are also important factors. The learning objectives must therefore include relevant background information and the desired skills to be used in solving problems. When dealing with skills outside your own area of experience, consult with colleagues who have specialist knowledge of those skills.

The listing of learning objectives is made easier if they are grouped under a series of main and sub-headings. The following are recommended:

Labour-based construction;
- Reasons for the adoption of labour-based construction.
- Management methods which are specific to labour-based work.

Labour-based construction operations.

Administration
- Personnel Management.
- Financial Management.
- Asset Management.

Construction technology;
- The contract system.
- Technical.
- Site management.

Each of the learning objectives then becomes the topic for a module or part-module of a course.

There are two advantages to the use of this method of breaking down skills. Firstly, it enables a logical series of course modules to be produced from the learning objectives, and secondly, subjects which may be taught as part of a more general construction training programme are easily identified and isolated. The use of such a classification enables a structured training programme to be produced.

**ASSESSMENT OF EXISTING SKILLS**

To produce a training programme which is relevant, economic and maintains the interest of the participants, courses must be designed such that the starting point of the course corresponds to the level of the trainee at the start of the course.
Many of the personnel who pass through the training programme will be working on a labour-based or mechanised construction project. Their practical experience must be used in the learning process. Incorrect working practices and bad habits should be identified and the motivation for correcting them provided.

These factors mean that an assessment of the staff who are to pass through the programme is necessary. The following items need to be considered during this assessment:

Level of existing skills;
- The abilities of each staff member in relation to the requirements to do their job.
- Particular areas in which staff, or their managers, identify a need for major training input.

Priorities in terms of skills and staff grade;
- Which are the most-needed courses?
- Which grades of staff are most in need of training?

There are several possible techniques which may be used to carry out this assessment. However, the author has found the most valuable is the overall impression which is gained when a site is visited.

Overall impression of work being done; some points to look for are:
- Are all the labourers busy?
- Is the plant being used efficiently?
- Are the tasks set out for the next day?
- Quality of the finished product.

Questions to the staff:
- Select a few key questions which are asked as part of a general conversation with an individual staff member. Be sure to explain the reason for your visit and put the person at ease before asking the questions. For example, a supervisor could be asked how many labourers were present that day. When asked about what safety precautions should be taken, a tractor driver should tell you that no one should ride on the mudguards.

Observe the staff while working:
- A checklist of duties for each staff grade is useful. Also, check to see whether reporting forms or records are being kept correctly.
You may find that junior staff have a good knowledge of what they are supposed to do, but fail to put this into practice. This is an indication that they are not being properly supervised.

It is essential that staff responsible for training visit the construction sites during this assessment process. The engineers involved in the day to day running of the sites should also be involved in the detailed assessments, as they will have a good knowledge of the capacities of individual staff members. The trainers will be able to give a more general overview in terms of quality of work compared with elsewhere in the country and region.

These visits are also a useful opportunity to meet senior staff and find out what they see as the priorities for training. Ideas about the training programme can also be discussed and valuable improvements are often developed. The more input staff have into the final plan, the more likely they are to work for its success.

**Development of Courses**

Course development follows from the production of the learning objectives and the skills assessment. Whilst the list of different courses for each staff grade is defined automatically by the learning objectives, the detailed course material will be determined by the existing skills of the staff.

As there will generally be a wide range of initial skills and also to allow for the training of new recruits, it is sensible to prepare course material to cope with a fairly low initial level. The trainer will then have the flexibility to use material as required during lessons without having to produce new material. Special areas of weakness such as basic mathematics can be covered in individual courses.

**Assessment of Numbers to be Trained**

In order to plan the physical and financial requirements for a training programme, it is necessary to determine the numbers of each grade of staff who will attend each course. The first step in this process is to obtain records of existing staff. The numbers of staff actually required for the project may be calculated from the organisational chart.

The following points need to be taken into account:

- The numbers of existing staff, by grade.
- The numbers of additional staff to make up the difference between existing staff and requirements estimated from the organisational chart.
- Possibility of filling vacant posts by internal promotion or recruitment, with time scale.
- Plans for future expansion.
CONCLUSIONS

The planning of a training programme can be achieved by the adoption of a methodical approach to the determination of training needs and the assessment of existing staff.

The definition of the organisational structure and job descriptions for the construction team is the first step.

Identification of the skills necessary to carry out each of the jobs enables a list of learning objectives to be produced, and these objectives then form the plan of courses.
Annex 2

HEAD OF DISTRICT ROADS DEPARTMENT

- Be capable of leading the District Roads Department, being responsible to the Director of the ECMEP.
- Responsible for controlling the production and quality of work done by the Construction Brigades.
- Responsible for preparing tenders and work plans, as well as financial planning, for the District Roads Department.
- Responsible for management of income and expenditure for the District Roads Department.
- Responsible for coordination between the District Roads Department and the other departments within the ECMEP.
- Responsible for planning the procurement of materials and equipment necessary for the running of the Construction Brigades.
- Coordination of the management of equipment with the Equipment Department.
- Responsible for checking the monthly valuation of work before it is sent to the client.
- Responsible for leadership, coordination, discipline, and control of District roads Department personnel.
- Train subordinate staff by regular supervision of their work.

SUPERVISOR 'B'

- Be capable of managing a workforce of 100 labourers with the assistance of gangers, being responsible to the Site Foreman.
- Calculate and mark out daily tasks for the workforce.
- Keep records of daily production.
- Ensure that labourers complete their tasks.
- Responsible for the control of materials and equipment used by the labourers who were being supervised.
- Supervise the construction culverts and other small drainage structures.
- Be capable of marking out vertical and horizontal alignments in normal terrain with some help from a superior.
- Be capable of choosing and setting out the camber or crossfall for the road.
- Be capable of identifying suitable soils for use in construction.
- Responsible for leadership, coordination, discipline, and control of the personnel in their team, resolving the majority of problems which arise without assistance from superiors.
- Train subordinate staff by regular supervision of their work.
Annex 3

LEARNING OBJECTIVES

Feeder Roads Programme
Training Needs Assessment

HEAD OF DISTRICT ROADS DEPARTMENT

Labour-based Construction
- Reasons for use of labour based methods
- Labour based technology
- Organisation of a Construction Brigade
- Organisation of maintenance systems

Administration
- Personnel Management
  Employment legislation  Supervision of subordinates
  Control of discipline  Training
  Personnel  Motivation
  Control of Health and Safety  Communication within a company

- Financial Management
  Planning of budgets
  Balancing of income and expenditure
  Control

- Asset Management
  Equipment purchase procedures
  Control of material and equipment
  Storage of materials and equipment

Construction Technology
- Contracts
  Contract documents
  Calculation of unit rates; direct and indirect costs
  Preparation of budgets and tenders
  Commitments of a company under a contract
  Submission of monthly valuations
  Payment process

- Site Management
  Planning and programming of construction
  Production levels
  Quality control
  Problem solving
LEARNING OBJECTIVES

Feeder Roads Programme
Training Needs Assessment

SUPERVISOR 'B'

Labour-based Construction

- Reasons for use of labour based construction
- Operations: Task system
  Site clearance
  Earthworks
  Gravelling

Administration

- Personnel management
  Recording attendance
  Discipline
  Health and Safety
  Leadership
  Training
  Motivation
- Asset Management
  Care of tools and equipment
  Construction of camp

Construction Technology

- Contracts:
  Basic principles
  Item descriptions
  Measurement
  Role of the Fiscal

- Technical
  Basic arithmetic
  Drainage and structures
  Surveying
  Soil mechanics
  Concrete and masonry

- Site Management
  Programmes
  Choice and distribution of tasks
  Organisation of workers
  Production reports
## FRP TRAINING COURSES

<table>
<thead>
<tr>
<th>STAFF GRADE</th>
<th>COURSE TITLE</th>
<th>TYPE</th>
<th>CONTENTS</th>
<th>SYLLABUS</th>
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<th>TEACHING</th>
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<td>Control of Health and Safety</td>
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<td>Asset Management</td>
<td>Short Course</td>
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<td>ILO</td>
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<td>PAT-1</td>
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<td>Storage of materials and equipment</td>
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<td>Contract documents</td>
<td>ILO</td>
<td>ILO</td>
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<td>Calculation of unit rates; direct and indirect costs</td>
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<td>Commitments of a company under a contract</td>
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<td>Submission of monthly valuations</td>
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<td>Payment process</td>
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<td>Site Management</td>
<td>Short Course</td>
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<td>Quality control</td>
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<td></td>
<td></td>
<td>Problem solving</td>
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# FRP TRAINING COURSES

<table>
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<tr>
<th>Supervisor</th>
<th>Labour Based</th>
<th>Medium Term</th>
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<tr>
<td>( ~100 students )</td>
<td>Construction</td>
<td>Course</td>
<td>15 weeks</td>
<td>Task system</td>
<td>Site clearance</td>
<td>Earthworks</td>
</tr>
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</table>

| Management of Personnel (1) | GEP-5 | Recording attendance | Discipline | Health and Safety | ILO | TD | TD |
| Management of Personnel (2) | GEP-6 | Leadership | Motivation | Training | ILO | TD | TD |
| Camp | PAT-4 | Care of tools and equipment | Construction of camp | ILO | ILO | TD |
| Contracts | CON-4 | Basic principles | Item descriptions | Measurement | Role of the Fiscal | ILO | TD | TD |
| Technical | TEC-3 | Basic arithmetic | Drainage and structures | Surveying | Soil mechanics | Concrete and masonry | ILO | ILO | TD |
| Site Management | EXE-4 | Programmes | Choice and distribution of tasks | Organization of workers | Production reports | ILO | ILO | TD |
3.3 Training of emerging contractors in labour-based construction

N.G. Band, Project Management Techniques

EXECUTIVE SUMMARY

There is a vast need for the training of participants in the construction industry in South Africa to ensure that it will be able to meet the demands that will be placed upon it during the period of reconstruction and development.

"The Reconstruction and Development Programme - A Policy Framework (RDP)", published by the African National Congress, describes the South African Government's policy towards, amongst other things, the construction industry and a National Public Works Programme. Key aspects of the RDP include:

- job creation.
- the development of black owned businesses.
- the development of small-scale enterprises.
- skills transfer.
- human resource development.

One way in which these aspects can be addressed in the construction industry is through the training of emerging contractors in labour-based construction.

Whilst the development of emerging contractors complies with the RDP, the author also believes it to be essential to the construction industry's ability to produce what is required of it to address the country's needs.

The paper describes the manner in which emerging contractors are being trained in South Africa in line with the RDP. It assumes that the projects, or parts of projects on which these emerging contractors are employed, are suitable for labour-based construction and concentrates solely on the training aspects.

INTRODUCTION

During 1994, the African National Congress published "The Reconstruction and Development Programme - A Policy Framework" (RDP), which highlights the manner in which South Africa must be developed. The RDP is an integrated, coherent socio-economic policy framework. It seeks to mobilise all our people and our country's resources toward the final eradication of apartheid and the building of a democratic, non-racial and non-sexist future (cl 1.1.1).
There are many proposals, strategies and policy programmes contained in the RDP. These can be grouped into five major policy programmes that are linked to one another. The five key programmes are:

- meeting basic needs.
- developing human resources.
- building the economy.
- democratising the state and society.
- implementing the RDP (cl 1.4.1).

The RDP suggests that one of the first priorities in meeting basic needs is to provide jobs (cl 1.4.2). With regard to construction, it suggests that our people must be involved in these programmes by being made part of the decision-making on where infrastructure is located, by being employed in its construction and by being empowered to manage and administer these large-scale programmes ...(cl 1.4.3) ... infrastructural programmes must take into account the implications for micro enterprises (cl 4.4.7.10).

The RDP makes specific reference to public works and states that programmes of this nature should:

- involve communities in the process so that they are empowered (cl 2.3.6).
- create assets which are technically sound (cl 2.3.6).
- not abuse labour standards (cl 2.3.9).
- give priority to job creation and training (cl 2.3.9).
- encourage and support self-employment through small and medium enterprise creation to ensure sustainability of skills (cl 2.3.9).

The RDP suggests that a housing programme should:

- incorporate the development of small, medium sized and micro enterprises owned and run by black people (cl 2.5.6).
- introduce support mechanisms in order to maximise the use of local materials (cl 2.5.19).
- involve beneficiary communities at all levels of decision-making and in the implementation of their projects (cl 2.5.21.).
- benefit the beneficiary community in matters such as employment, training and award of contracts (cl 2.5.21).

It is therefore highly desirable that construction projects should be structured in such a manner as to meet the following supplementary objectives, insofar as the local community is concerned:

- The community should, from the outset, be involved in all relevant decision making.
- The maximum number of jobs should be created.
- Entrepreneurship should be actively promoted.
- Skills should be transferred to the community.
- The amount of project funds retained within the community should be as great as possible.
• The community should as far as possible be actively involved in all aspects of project implementation.

There are, of course, certain constraints applicable to any project, irrespective of the supplementary benefits that may otherwise accrue to the community. These are the following:

• The project must be completed on time.
• Project expenditure must be within budget.
• The finished product must meet specified quality standards.

Fortunately, it has proved possible, by the use of carefully structured community-based development projects, to meet the objectives set out above, whilst also conforming to the constraints.

In the implementation of any project then, the following project objectives could be considered to be prerequisites of the RDP to be complied with:

1. To involve the community at all levels of decision-making and in the implementation of the project.

2. To have the project designed and structured in such a manner that:
   • the number of jobs created on the project are maximised in an optimal manner for the beneficiary community.
   • entrepreneurial opportunities are generated in an optimal manner for members of the beneficiary community.
   • skills and competencies in technical, commercial, managerial and administrative areas are transferred to participants.
   • the percentage of construction cost retained by the beneficiary community is optimised.
   • members of the beneficiary community are, where possible and practicable, employed in the construction management of the project.

3. To have the project constructed to specification, within a specified period and a given budget.

There are a multitude of aspects that need to be considered, that interact with each other, when implementing the RDP. This paper will address specifically the aspect of the training of emerging contractors in labour-based construction. It will define the need to train the emerging contractors, following which it will describe the training material that has been produced and provide examples of the manner in which this training has been carried out.
Its intention is not to promote training of emerging contractors above labour-pool worker initiatives, main contractor initiatives etc., but to position it as an important and necessary link in the implementation chain of the RDP.

THE NEED TO TRAIN EMERGING CONTRACTORS

**Emerging contractors**

The term "emerging contractors" may conjure up different perceptions in peoples minds. Accordingly we will attempt to describe what is meant by the term when it is referred to in this paper.

Emerging contractors:
- will generally be black.
- would originate from a variety of sources that would include:
  - those operating as contractors at the present time but with constraints and barriers in the way of development.
  - those operating in the informal sector as contractors, with a wish to enter the mainstream of the economy.
  - community representatives who wish to be involved in construction projects.
- must have a will and a desire to succeed.

The construction industry in South Africa, as in all parts of the world, involves contractors and sub-contractors. The strength of the construction industry is dependent on the strength and ability of both its contractors and its sub-contractors. The training required of emerging sub-contractors is similar to that required for emerging contractors. In this paper the term "emerging contractors" will include emerging sub-contractors.

**Barriers to entry**

A recent survey\(^2\) of a cross section of participants in the construction industry identified the barriers to entry facing emerging contractors in the construction of infrastructure (civil works) as shown in Table 1.

It can be noted that the first three most important barriers relate to finance. Lack of commercial, managerial and administrative skills, lack of technical expertise, tendering of rates, and lack of credibility, all directly related to training, account for approximately 42% of the remaining barriers. It is further suggested that the contractors would be in a better position to obtain credit and build up financial resources with the correct training.
Table 1: Barriers to Entry or Development of Emerging Contractors.

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Barrier to Entry</th>
<th>Percentage Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provision of sureties</td>
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<td>Lack of financial resources</td>
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<td>3</td>
<td>Inability to obtain credit</td>
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<tr>
<td>4</td>
<td>Lack of commercial, managerial &amp; administrative skills</td>
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</tr>
<tr>
<td>4</td>
<td>Lack of technical expertise</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Tendering of rates</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Lack of labour only contracts</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Lack of credibility</td>
<td>5</td>
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<tr>
<td>9</td>
<td>Prevalence of plant-based construction practices</td>
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<tr>
<td>9</td>
<td>Contract duration</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Compliance with Safety Act</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Discrimination against small-scale enterprises</td>
<td>3</td>
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<tr>
<td>13</td>
<td>Complexity of contracts</td>
<td>2</td>
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<tr>
<td>13</td>
<td>Discontinuity of work</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Requirements for specialised equipment</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Lack of subcontracting opportunities</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Transport</td>
<td>2</td>
</tr>
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<td>18</td>
<td>Inclusion of penalty clauses</td>
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<td>Lack of subcontracting opportunities</td>
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<td>Technical specifications</td>
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<td>Size of contracts</td>
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<td>18</td>
<td>Numeracy</td>
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<td>Literacy</td>
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The RDP

As referred to extensively in section 1, the development of small-scale enterprises, human resource development and job creation are of paramount importance. Thus, the need to train emerging contractors to be able to develop and sustain small-scale enterprises cannot be doubted.

Volume of work

Last but not least is the belief that the country's construction industry needs the development of emerging contractors to be able to address the task ahead.

The training

Type of training required

The type of training required is that which will allow the participants the opportunity to acquire sustainable managerial, commercial and administrative skills.

In the 1980's, over one hundred million Rand was spent in Soweto on the installation of services. The large contractors moved in, and the project was a success from the point of view that it was completed on time, within budget and to the required quality (Kerzner's three absolutes of project management). At the end of the project however, the vast majority of the people who worked on the construction were unable to find continuing employment and unemployment soon returned to the original levels.

The lack of work opportunities in addition in this instant was an important factor, but this will not be the case in the future with the implementation of construction projects within the RDP. It is proposed that in terms of the RDP, a project should be evaluated on their compliance with Band's five absolutes of project management that a project is completed:

- on time.
- within budget.
- to the required quality.
- maximising the transference of skills and competencies to the community.
- maximising the amount of project funds retained within the community.

The training required for the emerging contractors should cover the development and retention of sustainable competencies in managerial, commercial and administrative skills to enable them to enter, compete and succeed in the mainstream of the economy as small or medium-scale construction enterprises.
Training material

In order for the training to be effective it should cover the various aspects of managing a construction project, and managing a construction business. It would include tendering and estimating, planning and quality control, management of finances and manpower, establishment of a business etc.

As an example, one course that has been accredited with the Civil Engineering Industries Training Scheme (CEITS) for use on labour-intensive projects comprises the material as shown in Table 2. This material has been developed specifically for the training of emerging contractors and has been developed after interviews and discussions with over 650 such contractors.

Training methodology

The training methodology preferred for such training is Competency Based Modular Training (CBMT). This method of training is to a large extent learner controlled. When used in modular format it teaches the student what they don't know and doesn't waste their time instructing students in what they already know.

The training material must be easily transportable, and must be able to be conducted in a room large enough to seat the order of 30 people, whether it be a galvanised iron structure in a rural or informal settlement area, or a council office in an urban area. This is important as it is often necessary to train contractors on site so that they don't have to leave their jobs and travel to attend the training.

Trainers

It is important to ensure that the trainers being utilised on the training courses are of an acceptable standard and mentoring and counselling of these trainers must ensure that they comply with the requirements of the training methodology and are fully conversant with the course material.
<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
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<td><strong>PREPARATION UNIT</strong></td>
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<td>Use of a calculator</td>
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<td>Use of a scale rule</td>
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<td>Common construction terminology</td>
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<td>Area and volume calculation</td>
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<td><strong>ESTIMATING &amp; TENDERING</strong></td>
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<td>A1</td>
<td>Marketing the Services of your Company</td>
<td>Identifying target market</td>
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<td>Packaging and pricing</td>
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<td>Advertising products and services</td>
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<td>Selling</td>
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<td>A2</td>
<td>Seek and Collect Tender Documents</td>
<td>Seek tender documents</td>
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<td>Select tender documents</td>
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<td>Collect tender documents</td>
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<td>Tender Checklist</td>
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<td>A3</td>
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<td>Locating for site</td>
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<td>Procedure for site investigation</td>
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<td>Assessing site and site checklist</td>
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<td>A4</td>
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<td>Calculations</td>
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<td>Preparing a consolidated schedule of finishes from quantities of work</td>
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<td>A5</td>
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<td>Excavations</td>
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<td>Pipe laying</td>
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<td>Form work</td>
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<td>Reinforcing</td>
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<td>Brickwork</td>
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<td>Plastering</td>
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<td>A6</td>
<td>Calculating Overheads, Escalation and Profits</td>
<td>Preliminary and General work</td>
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<td>Overheads</td>
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<td>Profits</td>
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<td>Escalation</td>
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<td>A7</td>
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<td>Completion of Formal Tender Documents</td>
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<td>Submission of Formal Tender Documents</td>
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<td>Completion and Submission of Informal Tender Documents</td>
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<td>PLANNING</td>
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<td>B1</td>
<td>Pre-tender Planning</td>
<td>Elements of project planning, Methods of project financing, Planning and financial aspects of a contract</td>
</tr>
<tr>
<td>B2</td>
<td>Planning Contract Activities</td>
<td>Activity Lists, including positioning and size of camp, Organise P’s and G’s, Material and Accommodation, Signage, Water and Electricity, Communications and Security, Insurance and Equipment, Suppliers and Sub-contractors etc.,</td>
</tr>
<tr>
<td>B4</td>
<td>Execute Contract Programme</td>
<td>Maintain contract programme, Update contract programme, Re-programme contract programme</td>
</tr>
<tr>
<td>C</td>
<td>EXECUTING THE CONTRACT</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Managing Finance for the Contract</td>
<td>Importance of cash flow, Certification, Allowables, Payments</td>
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<td>C2</td>
<td>Management of Materials</td>
<td>Materials ordering, Materials storage, Issuing of materials, Quality and conformance to specifications</td>
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<td>C3</td>
<td>Administer Record Systems</td>
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<td>C4</td>
<td>Management of Manpower</td>
<td>Selection / Recruitment of staff, Site staff records / administration, Productivity, Communication and delegation</td>
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<td>C5</td>
<td>Completion and Hand-over</td>
<td>Snag List, Site clearance and evaluation</td>
</tr>
</tbody>
</table>
CASE STUDIES

General

There have been a number of ways in which emerging contractors have been trained on labour-based projects in South Africa, and these will be briefly described hereunder.

Community contractors

The name "community contractors" has been given to those members of the community who have had little or no previous contracting experience, who come together firstly to be trained and then to implement projects, initially within their own communities. The representative community bodies are requested to forward prospective candidates for inclusion on the project, and/or leaflets are distributed within the community asking those interested to attend a meeting regarding the project.

The number of those interested varies depending on the area and size of the community (in Duduza there were 160 applicants). The number initially has to be reduced to about 20 people who will receive the training. This "selection" is done in a transparent way by a series of training and testing procedures.

Once the aspiring contractors have been selected they undergo a training and implementation process which comprises:

- training in contracting numeracy.
- training in tendering.
- tendering on a pilot project.
- implementation of a pilot project.
- training in planning and execution of a contract during the pilot project.
- tendering on contracts.
- award of contracts.
- mentoring by construction manager.

This method of approach has been successfully tried and tested, and has been implemented in several areas including Soshanguve, Atteridgeville, Meadowlands, Ibhayi etc.

In the community contractor route, the documentation used is similar to the traditional contract route. The contracts however are smaller, the penalties lower and the sureties reduced or removed. Although the documents are similar, they are intentionally made far more "user friendly".
Managing contractor

In the managing contractor approach the client puts out a tender that is aimed at attracting tenders from the larger more formal contractors. The contractors bid, "on a level playing field", with a provisional sum amount in the tender for attendance on nominated labour only sub-contractors. Also included in the bill is a provisional sum for training. In the tender document the tenderer is advised that he will be required to employ labour only sub-contractors as required by the client. The tender document also contains rates for the tenderers to price for supply and delivery of materials to within 100 m of the nominated labour-based contractors.

Whilst the tendering is in progress, the "nominated sub-contractors" are being trained by the preferred training organisation.

Once again, the aspirant contractors are selected from the community by a process similar to that for the selection of the community contractors. The sub-contractors training includes, in the first instance, training in productivity and tendering. The trainees will tender on predetermined aspects of the project and the successful "tenderer" will be expected to sign a nominated sub-contract document with the main contractor. Thereafter, the nominated sub-contractor will be assisted by the main contractor and/or the training organisation appointed.

On a project in Motherwell, one contract included nine such nominated sub-contractors.

Joint ventures

The training required on a joint venture between a formal main contractor and emerging contractors requires training in two main areas. Firstly, the training of the emerging contractors and secondly the mentoring of the main contractors staff on the understanding of the method of operation.

A R45 million joint venture in Mabopane is underway with the emerging contractors receiving formal training from a training organisation and mentorship training from the contractor himself who in turn is assisted by the training organisation.

Contractor Development Programme approach

Both of the above two routes can be described as project specific. The Contractor Development Programme approach is suitable for use in areas where there is a regular flow of contracts, for example in Soweto. The basic overview of the programme is that the contractors progress through various levels as shown in Table 3.

Table 3: Contractor Development approach.

<table>
<thead>
<tr>
<th>Level</th>
<th>Contract Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Labour only (provides small tools)</td>
</tr>
<tr>
<td>2</td>
<td>Labour and transport (provides small tools and consumables)</td>
</tr>
<tr>
<td>3</td>
<td>Labour, transport, materials (assistance given in acquiring credit)</td>
</tr>
<tr>
<td>4</td>
<td>As 3 plus the provision of a limited surety</td>
</tr>
</tbody>
</table>
5 As 3 plus the financing of all contractual requirements including a full surety.

The full training requirements, possibly as shown in Table 2 are split amongst the various levels. Those wishing to enter the scheme at Level 1 will be allowed to attend the training that will be given to ensure compliance of the "trainees" with the skills and competencies required to successfully run a Level 1 contract.

During the Level 1 contract, the emerging contractor can be taught the skills for him/her to be able to successfully operate a Level 2 contract and so on.

At Levels 1, 2 and 3 the contractor has the assistance of a construction manager and a materials manager whilst at Levels 4 and 5, a mentor is appointed to assist.

Classroom training

In several areas, the emerging contractors are trained on a regular basis also as with the Contractor Development Programme, on a non-project specific basis. For example, in Gazankulu, Venda, KaNgwane, KwaNdebele etc., training is given one day a week to the emerging contractors, whilst "crash" courses have been given in Alexandra and Soweto where the students are trained every day for about 2,5 months.

Sandwich courses

Underway at the present time is the development of sandwich courses where emerging contractors can train for a period before taking up employment with a main contractor who will mentor the trainee in the skills he has been trained in. He will then return to formal training, before going back to the main contractor who will once again coach him in the necessary practical aspects of what is expected of the contractor on a construction site.

Summary

There are several approaches that may be considered prior to the implementation of training on site within the two main sub-divisions of project specific and non-project specific.

Consideration should accordingly be given to the structuring of contractor training to ensure that it will comply with the requirements of the relevant contract documentation that will be used on a project or within an area. Conversely, the contract documentation must be written in such a way that allows the inclusion of the preferred method of training.

Any training embarked upon by whichever approach must have the commitment of:

- the community.
- the client.
- the contractors.
- the consultants.
Failure to achieve commitment from any one of the above groups could result in the failure of the scheme. No training programme should be allowed to proceed without the necessary commitment of all parties.

CONCLUSION

In South Africa there is a need to train emerging contractors in the skills required for them to operate successfully in the mainstream of the economy. This need is in compliance with the requirements of the RDP which calls for:

- job creation.
- skill transfer.
- development of black owned business.
- development of small-scale enterprises.

The development and training of emerging contractors is not the panacea to the construction needs of the country but is an essential element within the Reconstruction and Development Programme. This paper has described how such development is being carried out successfully in several areas in South Africa.

BIBLIOGRAPHY

3.4 Labour-based training in Ciskei: problems and pitfalls of providing training with non-accredited institutions

W.A. O’Leary, Van Wyk & Louw Inc and S.W. van der Merwe, Department of Public Works and Roads, Ciskei Administration

EXECUTIVE SUMMARY

This paper discusses some of the aspects of skills training related to an ongoing project in the Eastern Cape Province of South Africa. The paper highlights the particular problems encountered by the client and project manager in compiling a workable training programme acceptable to the training providers and to the Department of Labour. Some of the lessons learned so far on the project are included.

INTRODUCTION

Van Wyk & Louw Inc are the project manager for the construction of approximately 100 culverts and small bridges in the area of South Africa previously known as the Independent Homeland of Ciskei (now part of the province of the Eastern Cape). There are two phases of the project with approximately 50 culverts to each phase. Nine consultants have been appointed to implement construction works and the client is the Department of Public Works (Ciskei administration). All structures are to be constructed using labour-based methods. Application for accreditation of the project has been sought through the Accreditation Board for Labour-Intensive Construction (ABLIC) and Interim Accreditation has been granted on the bridges in the far north of the Ciskei. Our principal objective with regards to training was to ensure that all persons employed for construction work would receive accredited training.

WHAT IS ACCREDITED TRAINING?

Accredited training constitutes acceptance by the Civil Engineering Industry Training Scheme (CEITS) of the course material and the training provider, recognition of which is provided in the form of Certificates of Accreditation (see Annex 1). Accreditation of the training process must not be confused with the accreditation of the project, which is the responsibility of the ABLIC. A document has, in recent months, been issued by CEITS explaining the process of accreditation of training on labour-intensive projects so that the process should be seen as an important, though relatively new, step forward in recognising the importance of training. Each trainee is issued with his or her own log book and the training provider enters all modules which the trainee has successfully completed into the log book. In this way, each trainee can build up a series of credits and later embark on a career path in civil engineering as a Grade III supervisor or artisan (see Annex 2).
TRAINING PROVIDERS

South Africa is endowed with many learning centres and training institutions. There are some 22 centres countrywide that offer skills training related to the civil engineering industry. For the project in the Ciskei, two local institutions were available to provide modular training skills necessary for the project. One of the institutions was accredited by CEITS, the other was not.

PROBLEMS OF APPOINTING A TRAINING PROVIDER

At the early stages of the project, there was little or no indication that any problems would occur, since, on the surface, it appeared as though it was a straightforward case of accepting the accredited institution to do all the training in phase 1 of the project, and merely advising the non-accredited institution to secure accreditation in readiness for the training effort in phase 2 of the project. This seemed the correct route to follow, particularly as the non-accredited institution showed no interest in providing information on their facilities, while the other institution was providing the information requested and showing strong interest in serving our training needs. But bearing in mind that these events were taking place shortly after the Transitional Government took office, and that old practises and structures were falling away, it was probably inevitable that change was in the air. The scenario changed somewhat over the course of a few months in the following manner:

• Firstly, our client was beginning to get a positive feedback from a certain area of Ciskei where the non-accredited institution was carrying out training on another civils project. Our client pointed out that the head-office of this institution was based in Ciskei, whereas the accredited institution's head-office was not. It was important to develop training resources within the region, he said.

• With this in mind, project manager Van Wyk & Louw prepared a draft training programme that basically gave the non-accredited institution 25% of the skills training inputs required.

• From a zero base to 25% of the training inputs was a major improvement for the non-accredited institution. However, during subsequent meetings it became clear that discussions on training at national level were pointing towards splitting up the country into certain geographic areas and appointing the various training centres to operate within their allocated region. The non-accredited institution clearly felt that, as they were located in the Ciskei and the other institution's head office was not, any training needs should be carried out by themselves. Moreover, they were now an accredited training centre with the Building Industry Federation of South Africa (BIFSA) and were now training successfully on a civils project in the region. We should have no reason to doubt their credentials and we were welcome to visit their training headquarters and to judge for ourselves as to the adequacy of their facilities.
Meanwhile, the accredited training institution had heard of the arguments that were being put forward by the opposition and expressed their concern that, at the eleventh hour, we were now considering utilising the services of a training institution that was not accredited with CEITS and had shown no motivation for taking an active role in the skills training requirement.

In our efforts to try and appease all parties, and following lengthy negotiations the situation was a stalemate:

- the non-accredited institution wanted a larger slice of the training cake than was being offered.
- the accredited institution wanted the whole training cake, or, at least, the lions share of it.
- the client and project manager could not plan the skills training programme until there was a consensus.

The end result after much soul searching and many platitudes, was that the skills training was virtually split 50/50 between the two institutions, whilst the entrepreneurial training, involving the training of small contractors, was given to the accredited institution.

Whilst it could be argued that the training should be awarded on the basis of the most competitive price tendered by the institutions, the Department of Labour have a fixed tariff of fees which are payable to organisations which operate under contract for the delivery of training. Under these auspices, there is little scope for price competition between the various training organisations.

THE ROLE OF THE DEPARTMENT OF LABOUR

The Department of Labour is a Government ministry with a section dealing principally with manpower training. Only a small proportion of their training deals with skills training related to the civil engineering industry. The principal advantage of dealing with the Department of Labour is that substantial funds have been allocated for training from the National Economic Forum and other sources.

On the project in Ciskei, approximately 5% of project funds were allocated separately for training purposes from the National Economic Forum, which grant was made available through the Department of Labour. Van Wyk & Louw were asked to prepare a training programme complete with budget based upon a maximum of 800 persons from the local communities to be trained in skills related to the project. Of this 800, up to 50 persons would be selected to go for advanced training which would enable them to consider a possible career in civil engineering. Overall budget costs were estimated at approximately 10% of construction cost, although some 3.5% of this related to a fencing project in the same area. Provided the training adhered to the Department's rules and regulations, which include:

- that the training skills courses of the Department are utilised;
- that each training institution must sign a contract;
- that all candidates for training must be unemployed and each person will receive a daily stipend during the training.
then the Department will generally fund any shortfall in the training budget, provided sufficient funds are available.

The main problem was the requirement to use the Department's own courses, which were often over elaborate and did not adequately cover the skills elements required for the project. After much study and debate, it was agreed that certain elements of a particular course could be transferred to another course, thereby forming a hybrid course which contained the appropriate skills training modules needed for the project (see Annexes 3 and 4 for illustration).

Another problem encountered was that the hybrid skills course would normally have required ten days to complete, but this was compressed into a five day course. It was considered appropriate to allow all members of a community working on a project an opportunity to gain some skills training, rather than have only a select few trained for longer periods.

HOW DID THE CLIENT EXPERIENCE THE PROCESS

General comments
The Department of Public Works appointed a project manager and nine consulting engineering firms because of:

- A shortage of skilled management in the section.
- The necessity to execute the programme on a fast track.
- The need to expose a major portion of the industry to labour-based work.

In doing this we argued that the programme would have the best chance of a speedy start as well as continued momentum. This proved to be correct but also created inherent problems.

Since all the projects had to start more or less at the same time it was our intention that all the training should be done prior to the start of construction. All the project leaders required instructors from the training institutions during the same month which was far in excess of what the institutions could provide. This was seen as a challenge rather than a problem and proposals to resolve the matter were discussed at length with the training centres.

Each consultant was to provide an experienced foreman that would be educated in how to train people. He would then do the training during the construction of the structure. This was however not acceptable to the Department of Labour. As client had to abide by this ruling but having had considerable much experience in this regard it was difficult for us to accept that a few days of training prior to the project would really make such a difference to productivity.

The Department has, during the past two years, completed similar projects with great success. Training was carried out on the job during those projects. To date, there is no evidence to suggest that productivity is improved by training ahead of the construction process.

A logbook keeping track of all the training modules completed prior to a project with no practical experience of applying the knowledge gained after training will have little influence on an employer contemplating appointing a person. Our own Department...
would be more interested in a logbook indicating actual completion of the work (practical experience), incorporating the bearers ability to apply his skills and his/her attitude at, and attendance of work.

Organising the training

From the client’s view point, organising the training proved to be extremely time-consuming and tedious. There was bureaucracy in our own Department, there were restrictions in the Department of Labour’s training programmes, there were arguments and discussions with the training centres about who should do what, and then there were the consultants who all had different ideas about training. It was virtually impossible to please everyone and still remain within budget.

Formal development of contractors

The training of small contractors, which was a requirement of the DBSA loan agreement, is proving even more troublesome than the skills training. Formal advertising of the training yielded very few applicants and it might be that our only option is to invite applications from existing small businesses in the area.

Training vis-à-vis construction programme

Without doubt, training has caused considerable delay to the construction programme. I ask the question: “which comes first - training or construction?”. As a Government Department, we are expected to provide a service to the general public in the upkeep and maintenance of our region’s road network. The requirement of training now compromises our position to deliver the goods on time and within budget. As a client, we view training merely as a by-product of the construction process and, therefore, training should be kept separate from the project site.

ANALYSIS OF TRAINING

Training is currently on going on this phase of the project and any conclusions as to the success of the training effort to date would be premature. So far, there is little to choose between the two training providers and both appear to be performing satisfactorily. The true test of success will only manifest itself at a later date when the community workers have been laid off from the project. At that point some important questions need to be addressed, such as:

- Did the community workers receive all the credits that were due to them after the training?
- Have the community workers been properly counselled about the options that are open to them with regard to further training or for gaining employment elsewhere?
- Are the workers using their newly acquired skills to gain employment?
- Are the skills acquired recognised within the industry?
• Have their skills improved their quality of life?

If the answers to the above questions are "yes" in all cases, then the local people will be more empowered to do things for themselves than before the project started. Only in this way can true meaning be brought to that well known saying: "GIVE A MAN A FISH AND YOU FEED HIM FOR A DAY; TEACH A MAN TO FISH AND YOU FEED HIM FOR LIFE!"

LESSONS TO BE LEARNED

From our knowledge of the project and the information and feedback known to date, the following lessons are considered appropriate:

• Consultants should play an active role in preparing training requirements. It is not enough to simply appoint an organisation or institute to do the training and hope for the best.

• There should be more consultation with communities regarding training needs. On the northern culverts in Ciskei, the skills training was carried out towards the end of the project and many of the community workers had already learned many of the skills during construction. These people could simply have been tested by the training provider and awarded credits as necessary. Another form of training could then have been negotiated with the community.

• Where more than one training provider is involved in a project, it is advisable to try and apportion the work equitably bearing in mind the facilities at each organisation, the number of qualified trainers available etc. Competition between training providers can prove beneficial, as on the Ciskei project, but price alone should not be the only criteria on which to apportion the workload.

Corollary:

The question is often asked "accredited training - why bother?" To be fair, the question is generally asked by consultants or contractors who see little benefit and a whole heap of responsibility piled on their shoulders for little reward. In truth, the benefit can only be seen in the communities that are served by client, consultant, and contractor alike, and where those communities have received appropriate life skills, project related skills and a sprinkling of entrepreneurial spirit in their midst, the subsequent empowerment and development of that community should be seen as reward in itself and cannot be measured in financial terms alone.
Certificate of Accreditation

The
Civil Engineering Industry Training Scheme
(Administered by the Civil Engineering Industry Training Board)

Hereby accredits the undermentioned course

______________________________

Data Bank reference no. ________________________________

Originated by: ________________________________

For use by: ________________________________

in the Labour Intensive Sector of
the Civil Engineering Industry

Director: ________________________________

Date of Accreditation: ________________________________

(This Certificate is valid until 31 December 1996)
Certificate of Accreditation

SAFCEC

The
Civil Engineering Industry Training Scheme
(Administered by the Civil Engineering Industry Training Board)
Hereby accredits provider

Ref. no. ________________________________

To conduct training in the Labour Intensive Sector
of the
Civil Engineering Industry
in the following courses

_____________________________________

_____________________________________

_____________________________________

_____________________________________

Director: ________________________________

Date of Accreditation: ________________________________

(This Certificate is valid until 31 December 1996)
Number is also the Data Reference number.)
Notes

1. Labour intensive training does not follow a career path but rather comprises a collection of skills which can be credits to further development in the formal sector or can provide the basis for entry to entrepreneurial development.

2. Supplementary skills are those which do not fall into the formal sector career path but which are necessary in the informal labour intensive industry (e.g. kerbmarking, installation of W.C. etc).

The above expands on the "Labour Intensive Skills" block on CEITS artisan career path.
Annex 3

TECHNICAL TRAINING - UNSKILLED

TT2: CONCRETE HANDLING (FINISHING) COURSE - 5 DAYS

Max Ratio: 1:12
For all community workers on a project

From the "Construction Reinforcing Hand (Basic)" course:
(Department of Labour): F 01 0904
1. Off-loading & stacking steel
4. Fixing reinforcing
5. Erecting shuttering
6. Stripping Shuttering
8. Preparing Surfaces to be concreted
9. Placing concrete with a wheel-barrow
12. Compacting reinforced concrete with a poker vibrator
13. Carrying out minor excavations
14. Operating a plate vibrator
15. Mixing mortar by hand  3 days

From the "Paving, slab laying and concrete handling" course: F01 0923
5. Striking concrete off with a straight edge
7. Wood-floating concrete
9. Setting a fish line to level  1 day

From the "Bricklaying and Blocklaying (Limited Skills)" course: B 01 1127
10. Building a block wall without the use of profiles
11. Building a blockwork corner in stretcher bond  1 day
Annex 4

DEPARTMENT OF MANPOWER

1994

TRAINING CATEGORY : Formal Sector
COURSE TITLE : Construction Reinforcing Hand (Basic)
COURSE DURATION : 10 days
MAXIMUM RATIO : 12
COURSE GUIDE CODE : F 01 0904
TRAINING AUTHORITY : CEITS

OVERALL OBJECTIVE

At the end of the training session the trainee will be able to perform the tasks of a reinforcing hand (basic) as listed below.

ENTRY REQUIREMENTS

Selected adult persons who are able to read and write

LIST OF TASKS/ACTIVITIES

1. Offloading and stacking steel
2. Cleaning steel
3. Straightening coils
4. Fixing reinforcing
5. Erecting shuttering
6. Stripping shuttering
7. Off loading and stacking scaffolding materials
8. Preparing surfaces to be concreted
9. Placing concrete with a wheelbarrow
10. Placing concrete with a chute
11. Placing concrete with a crane skip
12. Compacting reinforced concrete with a poker vibrator
13. Carrying out minor excavations
14. Operating a plate vibrator
15. Mixing mortar by hand
PERFORMANCE TESTS

Given the tools, equipment, material and the site the trainee will demonstrate his/her ability to:

1. offload and stack steel received in such a way that steel is not bumped against any object and that it is placed in the required positions for use, bundled and labelled;
2. clean steel using wire brushes, rags and detergents, in such a way that no trace of loose rust, loose mill scale and grease is found on the steel;
3. straighten coils of reinforcing rods using anchors and winches in such a way that is completed safely with no damage to others;
4. fix reinforcing in such a way that main bars, distribution steel and spacers are tied in specified positions, using the appropriate types/numbers of ties;
5. erect shutters in form works shuttering in such a way that it is plumb, level and checked against drawing on completion;
6. strip shuttering in such a way that the laid down safety procedures are followed, cleaning, oiling and stacking ready for re-use;
7. offload scaffolding material by hand, assist in the offloading using mechanical equipment, in such a way that the material is stacked, inspected and cleaned in the designated area;
8. prepare a surface to be concreted in such a way that it is cleaned, wetted and provided with a slurry layer;
9. place concrete with a wheelbarrow in such a way that a load is obtained, transported and offloaded without any wastage;
10. place concrete with a chute in such a way that the concrete is evenly poured and the chute is cleaned;
11. place concrete with a crane skip in such a way that the concrete is evenly placed and the skip is despatched;
12. compact ±0,5m³ of reinforced concrete using a poker vibrator fitted with a 25mm poker in such a way that full compaction is obtained;
13. carry out minor excavations to trenches, column bases and small foundations in such a way that no hazards are caused and the work is completed safely;
14. compact various types of soils on level ground, next to curbs and in minor excavations in such a way as to complete the work with the correct overlap and number of passes;
15. mix mortar using a spade in such a way that the required amount of materials is used, the required amount of water is used and an even colour is obtained with no streaks and/or lumps in the final mortar mixture.
DEPARTMENT OF MANPOWER
1994

TRAINING CATEGORY : Formal Sector
COURSE TITLE : Paving, Slablaying and Concrete Handling
COURSE DURATION : 9 days
MAXIMUM RATIO : 14
COURSE GUIDE CODE : F 01 0923

OVERALL OBJECTIVE

At the end of the training session the trainee will be able to finish concrete work and lay paving bricks and pre-cast slabs using different tools.

ENTRY REQUIREMENTS

Selected persons with good eyesight and can read, write and measure

LIST OF TASKS/ACTIVITIES

1. Carrying out pre-operating checks on internal combustion engines
2. Carrying out pre-operating checks on electric motors
3. Carrying out pre-starting checks on internal combustion engines
4. Carrying out starting and stopping procedures
5. Striking concrete off with a straight edge
6. Striking concrete off with a screed beam vibrator
7. Wood-floating concrete
8. Trowelling with a power float (internal combustion engine)
9. Setting a fishline to level
10. Preparing ground to receive paving
11. Preparing surface to receive paving bricks or slabs
12. Laying paving bricks
13. Laying pre-cast slabs
14. Cutting bricks/pre-cast slabs using hand tools
15. Cutting bricks/pre-cast slabs using a power saw
16. Mixing jointing mortar
17. Pointing joints
PERFORMANCE TESTS

Given the necessary equipment and material the trainee will demonstrate his/her ability to:

1. Carry out pre-operating checks on an internal combustion engine (petrol) in such a way that its fuel and oil levels are corrected, all visible nuts and bolts are checked and corrective action is taken when leaks are found;
2. carry out pre-operating checks on an electric motor in such a way that all plugs, covers and switches are checked and the motor starts and stops easily;
3. carry out pre-starting checks on an internal combustion engine (petrol) in such a way that all its manoeuvring controls are checked and corrected if necessary and its ignition components are checked;
4. carry out starting and stopping procedure on an internal combustion engine by starting the engine, allowing it to run for a prescribed period and then stopping;
5. strike concrete off in such a way that a smooth, even surface is formed;
6. strike concrete off with a screed beam vibrator in such a way that all hollow spots are filled, all surface irregularities are smoothed and a smooth, even surface is formed;
7. wood float concrete in such a way that all large stones are removed, holes are filled and a smooth even surface is obtained with all bleed water removed;
8. trowel with a power float in such a way that a smooth, even surface is obtained without any irregularities;
9. set a fishline to level on a section of a kerb run in such a way that it accurately shows the level according to which kerb must be laid;
10. prepare ground in a marked out area in such a way that it is excavated, backfilled and compacted in readiness for paving;
11. prepare a given surface in such a way that it is ready to receive paving bricks or slabs;
12. lay paving bricks into grid in such a way that the paving bricks are laid in symmetrical rows;
13. lay pre-cast slabs on a prepared surface in such a way that they are lined up in accordance with one another and form a uniform level surface;
14. cut bricks and/or pre-cast concrete slabs with hand tools in such a way that they fit into the measured gaps within a tolerance of 4mm;
15. cut bricks/pre-cast slabs with a power saw in such a way that they fit the measured gap within a tolerance of 4mm;
16. mix mortar for jointing in such a way that all the materials are correctly measured out and mixed together;
17. point joints in brick or pre-cast slabs using wet or dry mortar in such a way that the joints are raked out, the jointing is spread and the bricks/pre-cast slabs are cleaned.
1994

TRAINING CATEGORY : Formal Sector
COURSE TITLE : Bricklaying and Blocklaying
               (Limited skills)
COURSE DURATION : 45 days
MAXIMUM RATIO : 14
COURSE GUIDE CODE : B01 1127
TRAINING AUTHORITY : Building Industries Training Board

OVERALL OBJECTIVE

At the end of the training session the trainee will be able to lay bricks and blocks in the construction of a building

ENTRY REQUIREMENTS

Selected persons who are able to read, write and measure

LIST OF TASKS/ACTIVITIES

1. Erecting and dismantling scaffolding
2. Interpreting basic drawings
3. Mixing of Mortar
4. Laying bricks between two columns
5. Building a half brick corner in stretcher bond
6. Building a full brick corner in stretcher bond
7. Building foundation brick work on existing foundations
8. Building a right-angled half brick wall with "T"-junction
9. Building a manhole with corbelling
10. Building a block wall without the use of profiles
11. Building a blockwork corner in stretcher bond
12. Building a block wall with door and window frame. (Lintel and sill to be included)

PERFORMANCE TESTS
The trainee must be able to complete the performance tests as prescribed by the BITB. A trainee's TPC's must be registered with BITB. Given the necessary equipment, material and tools the trainee will demonstrate his/her ability to:

1. 1.1 erect and dismantle a trestle scaffold ±2m long x ±1.8m high with a working platform not exceeding 4 planks
   1.2 set up and using an extension ladder
   1.3 set up a step ladder
   1.4 erect and dismantle a two bay 4m x 1.219m x 2m high system scaffold including positioning of scaffold boards, guard rails, toe boards and ladder access;

2. interpret basic building drawings by identifying given information;

3. mix dagha to the right proportions of ingredients

4. lay bricks between two columns

5. build a half brick corner in stretcher bond

6. build a full brick corner in stretcher bond;

7. build foundation brickwork on existing foundations

8. build a right-angled half brick wall with a "T" junction;

9. build a manhole with corbelling;

10. build a block wall without the use of profiles;

11. build a blockwork corner in stretcher bond;

12. build a block wall with door and window frames
3.5 Small scale contractor training programme in Lesotho

C.E. Berentsen, Contractor Training Programme, Lesotho

INTRODUCTION

Despite its notable successes - or perhaps because of them - maintenance of gravel roads in rural areas by labour-based methods has been on the receiving end of a lot of criticism for several years, most of it misplaced.

- Much of this criticism is based on a misunderstanding of what the concept and proper execution of labour-based roadworks really is, and much of the rest reflects a limited assessment of its significance.

- The first camp are those who persist in only equating the unit rates of man-days and/or cost per km of roads completed with similar units of works by heavy machinery, avoiding the issue of location of the roads and consequently available local resources, level of introduced technology, classification/service of the roads in question and the aspect of employment creation through productive employment.

- The second set of critics concede that labour-based works often is effective, but dismiss it as merely a tactical method of employment creation.

Those who have been engaged in labour-based roadworks in Sub-Saharan Africa and Asia for some time know that this technology, when followed correctly in areas with favourably conditions, is a viable and well proven mechanism for more than just creating jobs.

The method of training personnel, whether casual labourers or project coordinators on a higher level of technical and financial responsibilities, can vary from country to country, and often from road to road, pending local conditions or even the duties of the persons who are being trained.

An issue which has been discussed among the relatively small family of labour-based "gurus" and their followers for some time, is whether this type of works should solely be performed under the auspices of local Governments, by small-scale independent contractors or a combination of the two.

To-day there is no hard and fast rule for which route to follow, but it is undoubtedly a need to expand in the direction of the second alternative, in particular in regions where unemployment is high, and likewise the interest of private enterprise.

The introduction of small-scale contractors in labour-based road maintenance and construction will not only create a healthy
competition to stale bureaucratic governmental procedures, but also enhance an expansion and improvement of the technology at a different level and still fulfill the aspirations of job creation.

This short paper will briefly cover three aspects of training small-scale contractors in labour-based road maintenance in Lesotho, a training developed under a World Bank sponsored and ILO coordinated programme for the Lesotho Government through the Ministry of Works, a programme which started in 1993, and presently is at a point of training a second batch of contractors, expected to graduate in October of this year.

The following frequently questioned, and important components of the training, will be covered as developed under the Lesotho course:

i) Selection procedures of trainees (future contractors)

ii) Training programme and material

iii) Work after course completion

TRAINING OF CONTRACTORS IN LESOTHO

Background information on LCU

Lesotho Labour Construction Unit (LCU) was established within the Ministry of Works in 1977. The LCU has later been given status as a full Department within the Ministry, with the responsibility for upgrading and maintenance of about 2500 km of rural roads since 1988. The LCU subsequently formulated a 20 year work plan of road construction, upgrading and maintenance which aims at achieving the following:

- Improved rural road communication.
- Larger scale employment of rural people.
- Increased and improved agricultural produce.
- Increased social services (e.g. health centres, shops etc.).

To date, the LCU has upgraded 800 km to a maintainable standard, and is upgrading roads at a rate of more than 75 km per year. Currently LCU has employed approximately 2000 workers, of which about 20% are women.

Objectives of LCU

The principal objective of the LCU is to provide functional rural road communication, in order to improve the socio-economic conditions of rural people of Lesotho.

The second objective is to promote the use of efficient labour-based construction and maintenance methods in the country, and thus create both assets and employment.
Project background

From the World Bank's first identification mission to Lesotho in mid-1991, when the team considered proposals for a five year Infrastructure Rehabilitation Project, until the official start up of the training programme of small-scale (private) contractors in labour-based road maintenance, it took less than two years.

As a result of an appraisal mission by the Bank in November-91, and a reconfirmation by LCU the Government's desire to promote small-scale contractors on labour-based maintenance, ILO was commissioned to prepare a study of the domestic contracting industry. As a result of this study, a proposal for IDA's assistance to the Government of Lesotho was prepared: 'Entrepreneurship Development For Labour-based Road Maintenance'. This proposal was submitted to the World Bank early 1992.

A delegation by Lesotho Government officials visited Washington D.C. in May 1992 to negotiate a Development Credit Agreement with the Bank. This was followed by ILO's second involvement in the project through a formal request by Government of Lesotho to assist in the first part of the Infrastructure Rehabilitation Project. This was a 24 months assignment under the Infrastructure Engineering Project, during which the ILO should provide specialist personnel to produce lecture material, provide lecturing, co-ordinate the procurement of equipment and manage the training of 15 local small-scale contractors in labour-based road maintenance. After the signing of a Letter of Agreement between the Government of Lesotho and ILO, and the receipt of World Bank funds, the official start up of the Small-scale Contractor Training Programme was April 1, 1993.

After a slightly slow start in completion of draft training material and selection of a nominal group of qualified trainees as the first batch of students, the programme progressed through a combination of theoretical and practical training sessions.

In December 1993, 12 trainees received their certificates in routine maintenance and decided to continue with the next and more demanding section of regravelling (periodic maintenance). In July 1994, after completion of further theory and 3-4 months tendered contracts, 8 of the first batch of trainees also graduated in regravelling.

I) Selection procedures of trainees (future contractors)

The main three lessons learned from the programme of the first batch were as follows:

1. All training material must be complete, at least in a final draft, prior to course start up.
2. It is imperative to design and follow a systematic and thorough selection procedure of the trainee candidates, in order to choose a sound and homogenous group.
3. A wide variety of experienced trainers combined with local expertise must follow the course through all facets of practical and theoretical training, but in a
natural progression to prepare the trainees for the difficult combination of field work and sound business practice by the time they are awarded the first contract.

In order to meet the second requirement, and hopefully guarantee a full graduation of the entire second batch, the preparation for the recruitment, which took approximately four months, started already prior to the graduation of batch 1.

<table>
<thead>
<tr>
<th>Advertise in Radio and Newspapers</th>
<th>2-4 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications by Firms and Individuals</td>
<td>4-6 weeks</td>
</tr>
<tr>
<td>(60-80 candidates)</td>
<td></td>
</tr>
<tr>
<td>Review and Screen Applicants:</td>
<td>2-3 weeks</td>
</tr>
<tr>
<td>Workshop and Test:</td>
<td>1 day</td>
</tr>
<tr>
<td>(30-40 short listed)</td>
<td></td>
</tr>
<tr>
<td>Screen and Review Test Results:</td>
<td>1-2 weeks</td>
</tr>
<tr>
<td>Invite for Personal Interview:</td>
<td>(14-16 Applicants)</td>
</tr>
<tr>
<td>Verification of Information and Final Selection:</td>
<td>2-3 weeks</td>
</tr>
<tr>
<td>(Short listed) Trainees Pay Non-Refundable Admission Fee:</td>
<td>(12 Trainees)</td>
</tr>
<tr>
<td>12 Months Contractor Course Starts</td>
<td></td>
</tr>
</tbody>
</table>

Through the above sequence, coordinated by the entire technical LCU staff, a group of 12 very committed candidates have taken a full year off from their regular businesses and have so far successfully completed all aspects of the initial 3 months of intense theoretical and practical training in routine maintenance, regravelling works and business aspects of labour-based road maintenance.

ii) Training programme and material

Although the selected group of trainees are both of a fairly equal background and experience, and all share a keen interest and dedication to the programme, a well-designed training schedule with a progressive syllabus and relevant, quality lecture material is imperative for a course of this nature to succeed.

The following is the programme, revised from 1993's first batch of trainees, and used for LCU's second batch of contractors:
Training material

The 12 months training course is basically conducted in accordance with the two following manuals, produced by ILO and consultants: IYCB (Improve Your Construction Business). This set of books contain three units, each split in a handbook and a workbook:

1. Pricing and Bidding.
2. Site Management.

This package of lecture material has been developed by ILO over a period of 3-4 years, and is therefore neither specifically tailor made to the LCU Small-scale Contractor Training Programme, nor do the exercises refer to road projects.

Modifications and additional exercises were therefore prepared before and during the training to cover case studies also beyond the more business oriented concepts.

ROMAR (Routine Maintenance and Regravelling)

This draft of training manual, also split in a handbook and workbook module was designed prior to and during the teaching of batch 1 of trainees in a very rough outline, and completed in draft form prior to start up of batch 2. All exercises are tailor made for labour-based road maintenance, and some with local emphasis. Mainly national Basotho engineers are responsible for the exercises in the ROMAR package.

This manual is broken down in the following ten chapters:

- Roads, Their Purpose, Terminology and Standards.
- Appropriate Road Construction and Maintenance Technology.
- Soil Mechanics.
- Equipment and Tools.
- Introduction to Labour-Based Road Construction.
- Road Maintenance.
- Routine Maintenance.
- Regravelling.
- Pricing and Bidding.
- Management of People.

The ROMAR manuals are expected to be edited and bound by the completion of batch 2 training.
As a result of this training programme, a Trainers Guide will also be compiled in a draft form for future use and reference to LCU and other similar projects.

This Guide will be split in three main sections, and is intended to tie together the use of the IYCB and the ROMAR modules:

- How to lecture following IYCB and ROMAR training manuals.
- Project procedures and contract management.
- Exercises.

iii) Work after course completion

The types, sizes and location of contracts to be awarded to the graduated contractors are very much governed by a supply and demand condition; not only as far as supply and demand of contractors are concerned, as the training can easily be adjusted, but more with respect to available funds.

So far, the routine maintenance contracts have been paid from Government funds in Lesotho, while the regravelling contracts have been funded by donors.

Based on a yearly average estimate of 105 km new constructed rural roads and a capacity of 12 km of a standard annual regravelling contract, a continuous requirement of 8 regravelling contractors will be required.

With a present road network of 800 km of roads which require maintenance, and a nominal size maintenance contract of 35 km, a present requirement of approximately 22 contractors qualified in routine maintenance is also required under LCU.

Recently, 4 regravelling contracts and 8 routine maintenance contracts were awarded by LCU through the Central Tender Board to the graduates from Batch 1.

Even if all the present 12 students of the second batch will graduate, there will still be a shortage of contractors, but a possible shortage of funds if all those who qualify in regravelling wish to tender for such contracts.

It should be noted, that a major incentive for the trainees of the programme in Lesotho, with its high unemployment rate, is to lean on the LCU for a "guarantee" of contracts after successful completion of the very demanding programme, and with the very popular Certificate and Registration in hand.

Although such a "guarantee" cannot be given, needless to say, LCU is doing their utmost to fulfil such expectations within their powers.
3.6 Sustaining the labour-based technology in Ghana -
the contribution of the School of Engineering

Dr. S.K. Ampadu and Dr. Y.A. Tuffour, Civil Engineering Department,
School of Engineering, University of Science and Technology, Kumasi

ABSTRACT

The School of Engineering of UST is in collaboration with the ILO and
DRF not only to build the capacity of the university in the area of
labour-based road engineering, but also to help in the long-term
sustainability of the technology of the country. Since in Ghana labour-
based road technology cannot be separated from the small-scale labour-
based contractors, the School has undertaken field studies of the
operations of some of these contractors including a study of technical
quality of the roads they are building. Further, the School has also
started research at the post-graduate level to provide local input for
establishing a firm rational basis for selecting between labour-based
and equipment intensive technologies for road construction. This paper
reports on these activities aimed at sustaining the technology in the
country in the long-term.

INTRODUCTION

In Ghana, the administration of the approximately 36,000 km network
of roads lies with the Ministry of Roads and Highways (MRH) but road
construction, rehabilitation and maintenance are planned and executed
by three line agencies made up of the semi-autonomous Ghana
Highway Authority (GHA), the Department of Urban Roads (DUR)
and the Department of Feeder Roads (DFR). DFR, which is
responsible for the approximately 21,300 km of feeder roads in the
country, was established in 1981 and functions as a civil service agency
under MRH. The constraints this status imposes on the effectiveness
of DFR and therefore on the sustainability of its efforts have been
discussed elsewhere, as for example, Coleman (1991).

The concept of labour-based road rehabilitation was introduced to DFR
through a component of the World Bank sponsored Fourth Highway
Project. With the International Labour Organisation (ILO) as the
executing agency and with funding from the International
Development Association (IDA), the United Nations Development
Programme (UNDP) and the Government of Ghana, a pilot project to
develop labour-based technologies in Ghana was set up in 1986 in the
Western Region of the country. One distinguishing feature of the
project in Ghana was the involvement of the private sector in the form
of small scale contractors from the beginning. An elaborate
programme of training and equipping selected small-scale contractors
was developed as an integral part of the labour-based programme. The
lessons learnt from and some of the problems encountered in the
development of the private sector especially from the financial and institutional points of view have been discussed in previous seminars (Osei-Bonsu, 1992, Bentall, 1992 and Sakibu, 1992, 1993).

So far, a pool of some 70 small-scale contractors have been trained to use the labour-based technology. With an expected annual output of 20 km per contractor, the labour-based programme currently has the capacity to deliver 1,400 km of roads per annum. The early introduction of the private sector to the labour-based programme in itself is an important step towards sustaining the technology in the country in the long run.

The success of the labour-based rehabilitation programme in Ghana is said to be a result of the effectiveness of the contractor training and the subsequent close control and supervision given to these contractors by DFR as well as the technical and financial assistance given by the ILO and the funding agencies respectively. On the question of sustainability of the technology, one is seeking in the long term to maintain an acceptable net benefit from using the labour-based technology long after the technical and financial support from donors as well as the special protection accorded the labour-based contractors cease. Under such circumstances, labour-based contractors will continue to use the technology, only when they find it profitable to do so. As a further step towards the long-term sustainability of the small-scale contractors, the "Improve Your Construction Business (IYCB)" project was executed in Ghana by the ILO from 1990 to 1992, (Anderson, 1993). This project was the result of the realisation that a well-managed small construction enterprise is the key to the continued profitability of the labour-based technology. As part of this project, the constraints faced by small-scale enterprises in the construction sector were studied and documented by Miles and Ward (1991).

The institutional capacity of DFR itself is another important consideration for the long-term sustainability of the technology in the country. That the present capacity of DFR is inadequate for effective management of the relatively vast network of feeder roads is an issue which has long been recognised. Efforts at improving the institutional capacity of DFR include a component of the World Bank funded National Feeder Roads Rehabilitation and Maintenance Project (NFRRMP) which started in 1992.

However, another equally important consideration is the acceptability of the technology by the public in general and the technical leadership of the country in particular. The major problem with the technical leadership is attitudinal, based mainly on a misunderstanding of the nature of the technology. In Ghana, the use of communal labour for the execution of construction works such as public places of convenience, markets, schools and other public places is well known. In fact this laudable communal spirit was used as a basis for planning and executing routine road maintenance activities during the pilot phase of the labour-based programme. However, the experience of DFR with
this voluntary communal system has been unsatisfactory. Among the technical leadership, there is the tendency to equate or at best associate this inefficient extensive use of labour with labour-based road engineering. In other words, the unique features of the technology such as optimisation of the labour content, the cost-effectiveness of the methods used and the high quality of the outputs together with the extensive socio-economic benefits it renders, are not yet appreciated by a vast majority of the technical leadership.

**The ILO/DFR/UST Collaboration Agreement**

The involvement of the University of Science and Technology (UST) in the labour-based programme started with a collaboration agreement involving the ILO, DFR and the Civil Engineering Department (CED) of UST. This collaboration agreement was formalised in June 1992. Prior to this, there had been exchanges of correspondence and material among the three institutions. With the ultimate objective of incorporating labour-based road engineering into the highway and transportation engineering and the construction engineering courses of CED, the collaboration agreement has three main components: contractor studies, short term studies, and post-graduate studies. This agreement fitted into a component of the SIDA-funded African Regional Projects dealing with the use of appropriate technology for road maintenance. This component concerns the establishment of collaborative ventures with selected African Universities with the aim of incorporating learning materials on technology choice, management of labour-based road sector works and rural transport planning into the syllabi of civil engineering departments. In the collaboration agreement, the ILO through the SIDA project provides funding, DFR supplies the transport and facilitates the fieldwork, while UST executes the studies, putting its premises and facilities at the disposal of the studies.

**The School of Engineering**

UST is one of the five universities in Ghana¹. The School of Engineering (SOE) is one of the three schools in the University, others being the School of Medical Science and the School of Mines. SOE is the only institution in the country providing graduate level training in engineering. The organisational structure of SOE showing the divisional responsibility for labour-based road engineering is shown in Fig. 1. SOE has a total of six departments of which the CED is the largest with an average annual student intake of 30% of SOE's total. Apart from training graduate civil engineers, CED also runs a diploma

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¹ The five universities are, UST (Kumasi), Univ. of Ghana (Legon, Accra), Univ. of Cape Coast, Univ. College of Education (Winneba, est. 1991) and Univ. of Developmental Studies (Tamale, est. 1992).
programme, equivalent to the British HND for the middle level manpower in the construction industry\(^2\). For the training of graduate civil engineers for the construction industry in the country, therefore, CED is the sole institution responsible. It, therefore, means that CED is strategically placed to assist in the long-term sustainability of the technology as far as training of engineers is concerned.

For purposes of its teaching function, CED is divided into four broad divisions made up of the geotechnical, highway and transportation engineering division, the structural and materials engineering division, the hydraulics, hydrology and water resources engineering division and the environmental quality engineering division. The responsibility for labour-based road engineering rests with the geotechnical, highway and transportation engineering division. However, apart from the training function, the research function of SOE, is an equally important asset for the long-term sustainability of the technology in the country.

THE CONTRIBUTION OF THE SCHOOL OF ENGINEERING

Contractor studies

Since in Ghana, labour-based road technology cannot be separated from the small-scale labour-based contractors, it appears the best entry route into an understanding of the technology as it is operated in the country is through the small-scale contractors. It was no accident, therefore, that the involvement of SOE in the labour-based programme started with the contractor studies. These studies were undertaken in two phases. The distribution of the study sites in Ghana is shown in Fig. 2. The first phase involving seven (7 No.) contractors in four regions was conducted from November 1992 to February 1993. The second phase involved four (4 No.) contractors in two regions and took place from June to August 1994. The objective of these studies was to monitor the performance of small-scale labour-based contractors executing standard contracts on site. For these studies, recent graduates of our undergraduate civil engineering programme were attached to labour-based contractors. They stayed in the contractor's camp, went to the site daily and observed and recorded the mode of operation of these contractors.

The significance of these studies as far as the SOE is concerned is that they introduced CED to the labour-based technology and thus allowed the Department to increase its capacity for further involvement. The studies also generated data on casual labour characteristics in the different regions as well as the actual activity level productivity rates being achieved by the different contractors. It may be of interest to note that DFR is currently using the results of these studies as a basis for a review of existing rates for labour-based contracts. The results of the first phase of the studies have been reported by Ampadu (1993).

\(^2\) A new educational reform programme currently in operation in Ghana will transfer the responsibility for diploma education to the polytechnics from 1996.
Fig. 3 illustrates some of the results of our study. It shows the casual labour characteristics on the site of three contractors operating in three regions. The figure illustrates the diversity of the casual labour characteristics. Whereas all the labour force of Contractor A may be considered migrant, those of Contractor C is made up of local labour only. In our study, labour is considered migrant if it is drawn from towns and villages outside the influence area of the road under construction. This influence area may be defined as the region within a radius of 3 km from the road. The female participation rate varies from a low 28% on the site of Contractor B to 46% on the site of Contractor C. These results illustrate the danger of blanket application of results of labour survey from one locality to other localities.

**Technical quality studies**

In addition to the contractor studies, the collaboration agreement also called for short-term contracts to study various issues related to the technology. From September 1994 to December 1994, CED undertook a technical quality studies involving eight (8 No.) contractors in four regions. The objective was to collect data on the technical quality of roads being built by these small-scale labour-based contractors. In these studies, measurements were made on newly gravelled sections of roads under construction. The studies generated data on pavement characteristics such as depth of gravel and the level of compaction being achieved on site. It also furnished data on cross-sectional characteristics such as camber and drain characteristics. This study perhaps is the first attempt at generating independent data on the technical quality of feeder roads being built in the country by small-scale contractors. Some preliminary results of our studies are shown in Fig. 4 to illustrate the type of data being achieved in our studies. The figure compares the level of compaction achieved on site using the 650 kg vibratory roller which is the standard compaction equipment used by labour-based contractors in Ghana with the laboratory compaction results. Such results from our studies may be used to design the appropriate intervention measures to ensure the durability of the roads being constructed.

**Master of Philosophy studies**

Another component of the collaboration agreement is the Master of Philosophy (M.Phil.) studies. The M. Phil. degree is a post graduate masters degree by research, in which a candidate undertakes an in-depth study of a problem (usually of local practical significance). The studies is on the technical and economic comparison of labour-based and equipment intensive technologies in Ghana. It seeks to contribute towards the establishment of a rational basis for the selection between labour-based and equipment intensive technologies for feeder road
construction in Ghana. The study does this through a comparison of the two technologies in the different agro-ecological zones in Ghana in terms of technical, financial, socio-economic and institutional factors. The study started in October 1994 and is scheduled to be completed in September 1996.

The country may be divided into four (4 No.) agro-ecological zones as shown in Fig. 2. The objective is to select at least one capital-intensive and one labour-based road in each zone for study. On each of these roads, study sections will be selected. Typically, three study sections based on topography (vertical alignment) and horizontal alignment will be selected on each road. The structure of each study section is shown in Fig. 5. There is a destructive testing subsection and a non-destructive testing subsection each about 40 m long. On each section pavement characteristics such as properties of gravel material, thickness of gravel layer and the level of compaction achieved will be determined. In addition, cross-sectional characteristics such as camber, drain width and depth will be determined. Later when deterioration sets in, changes in running surface characteristics in terms of width, depth and number of ruts and potholes will also be measured. Gravel loss will be determined from changes in road surface levels as determined from spot levels taken with a level instrument. These measurements will be repeated at the beginning and end of each season in order to determine the rate of deterioration. These measurements will form the basis for the technical comparison of the roads.

In order to obtain the financial costs of building these roads, records at the contractor's office as well as those at DFR will be studied. It is intended to obtain in addition to the overall cost, the breakdown of these costs in terms of resources (i.e., labour, equipment, and material) and also in terms of operations (i.e., site preparation, earthworks, gravelling etc.). Our contractor studies have already generated data on the productivity rates for labour for most activities. The equivalent rates for equipment such as graders and dozers will be obtained from data available from DFR supplemented by data from plant rental companies.

On the socio-economic comparison, it is assumed that the impact of road improvement can be assessed by analysing the inter-relationship between the road condition, socio-economic activities in the influence area of the road and the volume and composition of traffic on the road. The major dependent variable in this framework being traffic; the volume, modal distribution and purpose of the traffic reflecting not only the road condition, but also the socio-economic activities in the influence area. This component of the studies will be undertaken only in the Western Region where baseline data already exists. The road condition will be measured through a road condition survey and the baseline data will be obtained from reports of previous work done. Traffic survey will be conducted on the roads to generate data on
vehicle type, origin-destination and purpose. In addition, structured interviews with key persons from the user community will also be conducted.

The comparison of the institutional factors will involve a study of the working environments in which the two technologies operate. This will involve a study of the contractual procedures, work load, pre-qualification systems and access to working capital.

Labour-based seminar

As part of our effort to disseminate information on labour-based technology, CED used the occasion of the visit by an ILO consultant to organise a one-day seminar under the theme "Small-scale contractors in labour-based road construction". There were two main presentations for the day. The first on "Labour-based road engineering and socio-economic development in Ghana" was presented by the first author. The second presentation on "The management aspects of small-scale contracting" was presented by Mr. John Ward, an ILO management consultant.

The seminar was attended by a total of 43 participants including five small-scale labour-based road contractors. There were participants from institutes and faculties outside SOE. Within SOE, apart from CED, there were participants also from the mechanical and geodetic engineering departments. The geodetic engineering department is already assisting with the gravel loss measurement component of the M. Phil studies and the camber measurement in our technical quality studies. The diverse background of the participants illustrates our effort to reach not only civil engineers but also people from other disciplines as well.

From the question and answer sessions, two points came out clearly. First, current data on the technical quality and financial costs of labour-based operations compared with capital intensive methods are urgently required. The fact that these needs are being addressed in our studies illustrates the relevance of the direction of our efforts towards the long-term sustainability of the technology. The second point that came out and is perhaps the cause of the first was the fact that several of our colleagues in SOE still consider the technology to be retrogressive. This clearly indicates the need for further exposure of faculty members to the technology.

Field visits

CED recognises the importance of a receptive environment in order to achieve the ultimate objective of introducing labour-based road engineering as a course in the regular civil engineering programme in SOE. It has, therefore, initiated steps to expose both staff and students to labour-based technology through visits to labour-based sites. From 25-26 June 1993, an overnight visit to the small-scale labour-based contractor training site in Koforidua was organised for staff of the Department. Eight staff members expressed interest even though ultimately only four were able to make it. This was followed two weeks later by a visit of 40 final and third year students. The visits took staff and students to contractor training sites and also to
some previously-constructed labour-based roads in the Koforidua District. The visit provided the first opportunity for staff and students to visit a labour-based construction site and to observe labour-based technology in operation.

**CONCLUSION**

The collaboration agreement with ILO and DFR has been a useful framework for assisting SOE build its capacity for labour-based road engineering. In addition, through its contractor studies, technical quality studies and post-graduate studies in labour-based road engineering, SOE is contributing towards the long term sustainability of labour-based road engineering in Ghana.

**ACKNOWLEDGEMENT**

The School of Engineering is grateful to the ILO for the financial support and to DFR for facilitating the field work. The contribution of IHE and other institutions towards the capacity building so far is gratefully acknowledged.

**REFERENCES**

Fig. 1 Structure of the School of Engineering (UST) showing responsibility for labour-based road engineering
Fig. 2 Map of Ghana showing the distribution of School of Engineering study sites
Fig. 3 Casual labour characteristics

- Total
- Local
- Female

Contractor A
Contractor B
Contractor C
Fig. 4 Levels of compaction achieved on labour-based roads
Fig. 5. Structure of a typical study section for technical comparison of labour-based and equipment intensive roads.
3.7 Is training enough?
R.C. Petts, Intech Associates

SYNOPSIS
Training must not be viewed in isolation, but as a key component of manpower development to meet the needs of the road authority.
Frequently, insufficient consideration to the operational environment of the trainees severely restricts the effectiveness of training.
The paper discusses some of the considerations that are essential in planning and implementing an effective training programme for labour-based roadworks.

INTRODUCTION
The paper discusses some of the issues that are important to consider, to achieve successful training for road authority personnel. They relate principally to aspects of the operational environment into which the trainees emerge.

OBJECTIVES
The objective of training can be stated as development of workforce knowledge and skills to improve the construction and management of the road network to satisfactory standards. This should be achieved in a cost-effective way.

THE BASIC REQUIREMENTS
It is necessary to design the training to attempt to reduce or eliminate the existing knowledge or skill deficiencies. The basic steps required are:
A To assess the knowledge and skill requirements of the job.
B To assess the trainee's knowledge and skills.

This will allow the training requirements to be identified:
C Train to minimise the difference between A and B.
Monitoring and follow up, to assess the effectiveness of training, are aspects that are too often overlooked or inadequately pursued.

OTHER CONSIDERATIONS
Unfortunately the above assessment will only be the starting point for a successful training programme. Training is only one component of manpower development and should be planned and implemented in
close conjunction with the development of the road authority operations. If this is not achieved, the training efforts will have very limited impact. An integrated approach to tackling existing deficiencies is required.

A structured analysis of a road authority’s operations will normally show a large number of problems that interact to severely restrict the performance of the staff and therefore the authority.

These constraints can usually be categorised under the following groupings:

- FUNDING
- INSTITUTIONAL
- TECHNICAL
- SYSTEMS
- MANPOWER

The funding and institutional problems and their possible solutions are beyond the scope of this paper.

The technical problems are relatively easy to identify. They are one of the principal reasons for the widespread efforts to replace heavy sophisticated equipment with more appropriate labour and tractor technology.

Systems for the planning, implementation and monitoring of work are also a significant problem area; the substantial "human" component makes establishment of effective systems elusive for many road authorities. This is due to the poor existing situation with regard to a number of important issues discussed later.

**TECHNICAL & SYSTEMS**

For training to be successful there are a number of technical and systems requirements that should be met. These can be summarised as follows:

- SYSTEMS SHOULD BE DEVELOPED AND FUNCTIONAL
- DOCUMENTATION AND MANUALS SHOULD BE AVAILABLE
- TRAINING MATERIAL SHOULD BE DEVELOPED
- TRAINING SHOULD BE PRACTICALLY & REALITY ORIENTATED
- TRAINERS SHOULD BE COMPETENT TO DELIVER THE TRAINING

These requirements can usually be satisfactorily met by the resources within the road authority, or by external experts/consultants. There have been notable successes in tackling the above training aspects for labour-based roadworks. These have brought about beneficial changes in the technical and organisational approach to roadworks in less developed countries.
MANPOWER

The Road Authority problem analysis will probably show a substantial number of constraints relating to manpower status, development and motivation. Compared to the technical and systems problems, these are usually far more difficult to overcome. However, unless these problems are effectively tackled, the impact of training will be severely restricted, even if the foregoing aspects have been properly addressed.

The following requirements are crucial to the motivation of trainees and the effectiveness of training:

- **POSSIBILITY TO APPLY KNOWLEDGE AND SKILLS TAUGHT**
- **INDIVIDUALS AND ORGANISATION APPRECIATE THE IMPORTANCE OF TRAINING**
- **APPROPRIATE ORGANISATIONAL STRUCTURE AND RESPONSIBILITIES EXIST**
- **MANPOWER DEVELOPMENT PLANS EXIST**
- **INDIVIDUALS & ORGANISATION HAVE PERSPECTIVE OF CAREER DEVELOPMENT**
- **EFFECTIVE FINANCIAL & TECHNICAL AUDIT SYSTEMS ESTABLISHED**
- **REASONABLE REMUNERATION PACKAGE OFFERED**

These issues naturally apply to the training personnel as well as the trainees.

Unfortunately insufficient attention has been given to these aspects in the past. Consequently the impact of training to achieve sustainable manpower development has been limited. The remuneration issue has been sadly neglected. The disastrous decline in the remuneration of African engineers, technicians, managers and other skilled personnel in the civil service sector over the last 25 years is well documented (Figs. 1 & 2). This trend is generally continuing unabated. Engineer and manager remuneration is now completely unrelated to the value of the assets and resources managed. Furthermore, there is insufficient appreciation of the potential added (or lost) value to the road network asset, relating to the efforts of these key people.

Engineers are often forced to supplement their meagre salaries through various authorised and unauthorised means. The end result is that "availability" of engineers to carry out their official duties is severely reduced as they must necessarily spend time each day on other activities. This is a wasteful use and mis-direction of a valuable resource. The result is that other initiatives to improve road authority performance are constrained by this motivation problem.
CONCLUSIONS

It is now time to dedicate efforts to restoring fair remuneration packages for engineers and other high skill personnel, either through civil service reform or other institutional and sustainable arrangements.

It is also necessary to insist that future training programmes are integrated with initiatives to establish a motivating environment for the targets of the training efforts. Although it may not be possible to fully tackle all of the issues raised, a concerted attack across the range of issues should bring about a marked improvement in the effectiveness of training and manpower performance. It will then be possible to reverse the dramatic decline in the local capability to manage Africa's roads.
ENGINEER SALARIES
DECLINE IN REAL VALUE

Real Value as Percentage of Initial Value

0 50 100 150

ETHIOPIA (1974-87)
GAMBIA (1975-85)
KENYA (1975-86)
NIGERIA (1975-87)
SOMALIA (1975-87)
SUDAN (1975-86)
TANZANIA (1975-85)
ZAIRE (1975-86)
TUNISIA 1975-85)

Source: Civil Service Pay in Africa (ILO)

Source: SSATP & other documentation
3.8 Counterparts and technology transfer
J. Clifton, Feeder Roads Programme, Mozambique

EXECUTIVE SUMMARY
Donor agency experience suggests that technical assistance is significantly more successful in "technical" matters (e.g. engineering) than in "institutional" matters (i.e. training, technology transfer, managerial and institutional support). Why?

• Are the technical problems easier to identify and solve as they relate to a "concrete" problem while "institutional" problems have less identifiable parameters?
• Are the practitioners of technical assistance demonstrating a poor capacity for addressing less easily conceptualised problems and solutions?
• Are better inter-personal skills required?

This paper does not relate the history of a completed project and draw conclusions which may be valid for other projects or countries. Rather, the policy for technology transfer and counterpart training now evolving in the course of the Mozambican Feeder Roads Programme is presented with reference to the received wisdom of other programmes and projects.

Feedback and criticism of these proposals are welcomed as this aspect of the programme is, like many institutional aspects in Mozambique, in a state of flux.

The Feeder Roads Programme, Mozambique is expanding very rapidly with currently 23 labour based construction brigades operational or mobilising nation-wide. Further commitments already secured will increase operations to at least 39 brigades by the end of 1995, with funding by a large donor consortium.

INTRODUCTION
Mozambique has just emerged from a generation of civil strife. Infrastructure in all sectors is deficient or weak. The entire social fabric of the country has been damaged with a large percentage of the population having fled their home areas.

As a result, education and technical training of all specialisation has been disrupted. Institutional, technical and management skills are deficient or very limited. Against this background the Feeder Roads Programme was established as a means of employment generation through rehabilitation of rural roads by labour-based methods.
At the outset it was agreed that counterpart staff should be appointed
to all technical assistance staff. However, the establishment of the
National Directorate for Roads and Bridges (DNEP) was no better
placed than any other Mozambican institution and suitable staff were
not initially available.

Thus a scheme for sponsorship and recruitment of undergraduate and
recently graduated engineers has been established for the Directorate
as a whole including the Feeder Roads Programme.

Those counterpart staff are, almost without exception, lacking
practical experience and are new arrivals in an institutional
environment which itself is seeking to improve its capacity and
resources. Thus, the traditional three factors for success of technical
assistance (i.e. commitment of the parties, design of technical
assistance, and flexibility of technical assistance management) have
been considerably influenced by the circumstances surrounding the
development of the programme.

Firstly, the commitment of all the parties to a strategy for
development of counterparts is strong. However, the design of the
technical assistance which would normally involve choices of:

1) mode of delivery.
2) role of recipient and technical assistance staff.
3) administration arrangement.

have been severely limited by the constraints noted above.

For reasons of practicality a number of normally available options are
not realistic in the present and past environment. However,
circumstances are changing rapidly and thus, management processes
of the technical assistance must be flexible in order to accommodate
redesign of implementation processes made necessary by increased
institutional and personal capability on the part of recipients, even if
the ultimate goals do not change.

In Mozambique, today's circumstances are very different from those of
one year ago and it can be expected that the passage of another year
will bring change of equal magnitude.

**Commitment**

That there was, and is, a clear need for technical assistance is clearly
understood by all parties. However, the past perception of technical
assistance was as a line function with training and technology transfer
as a side issue. The future thrust of technical assistance must be a
transfer of emphasis onto institution building and counterpart
development leading, during the course of the next few years, to
assumption of executive responsibility by these counterparts.
Commitment of senior recipient management and technical assistance
is confirmed. Commitment of the counterparts themselves can only be
gained by their confidence in the aims and tangible results of the technical assistance project.

To this end it is planned to shortly hold a seminar for all counterparts, directly involved technical assistance staff and senior DNEP management which will explore the definition of the counterpart and technical assistance role, working methods to increase the likelihood of successful technology transfer, changes required in institutional and personal attitudes and the preparation of guidelines.

**DESIGN**

There are normally four technical assistance models:

a) **Line function model** - execution of a task or responsibility by technical assistance staff.

b) **Apprentice model** - counterpart acts as an apprentice to the technical assistance.

c) **Team (collaborative) model** - technical assistance and counterpart act as a team with line tasks and responsibility shared.

d) **Adviser model** - technical assistance is purely an adviser to the counterpart who undertakes the line function.

The history of technical assistance and technology transfer to counterparts in Mozambique has been to opt in project documents for option b), but actually execute these projects using option a). Now that most technical assistance posts have counterparts in place, albeit with very limited practical experience, option b) has now become possible. Option c) is the next step as counterparts increase their experience and in some cases undergo further training and this is tentatively starting. It is expected that this option will continue for approximately two years to about the end of 1996, which will also give time for further strengthening of the institutional arrangements of the National Directorate and for resources for the counterparts (e.g. transport, support facilities, funds for travel and subsistence) to be acquired either through government or donor commitment. Option d) will then be phased in over the following two years to the end of 1998.

Obviously progression through these options will vary with the different counterpart situations. A further element is training of counterparts which will take the form of not only on-job training (the thrust of training will be transferred to provincial and district initiatives from the centralised efforts of the past) but also fellowships and sponsorship of advanced courses e.g. relevant M.Sc. and other specialised courses.

**FLEXIBILITY**

This is of paramount importance in the Mozambican situation. The present project document was produced while fighting was still going
on and thus has been overtaken by the dramatic change in circumstances since the peace accord was signed.

Travel by road is now possible to all parts of the country for the first time in over a decade and the scale of operations has mushroomed such that control and management is a real problem as weak institutional capacity is exceeded. An effectively line function technical assistance model has become an apprentice model.

Current technical assistance to the Feeder Roads Programme effectively ceases at the end of 1995. A proposed project document for an extension of technical assistance to the end of 1998 has been produced and is currently the subject of comment between government and donor agencies. This technical assistance will seek to continue the progression of counterpart development through the team/collaboration model to the adviser model, while providing resources to counterparts to be able to function effectively in an executive role.

**MONITORING**

A system of monitoring matrices based upon the World Bank Staff Appraisal Report for the ROCS (Roads and Coastal Shipping Project) has been adopted. With some reservations, examples of the monitoring matrices are included in Annex 1.

Although there is a sense of attempting to enumerate the unquantifiable this system will be used for the foreseeable future, the assessments to be carried out jointly by technical assistance team member and counterpart at six monthly intervals. (In fact the differences in scoring when the matrices are completed independently by technical assistance and counterpart are a most interesting manifestation of the different perspectives.)

**PROBLEMS**

Everyone engaged in development projects or technical assistance has at least one horror story of a technical assistance/counterpart situation which goes seriously wrong.

There are various circumstances:

- technical assistance not performing.
- counterpart not performing.
- combination of both (inter-personal problems).

which may be the result of a poorly designed technical assistance package, lack of resources, lack of experience or aptitude and attitude problems.

To date problems have been mainly concerned with lack of counterparts and lack of facilities to enable a counterpart to
consolidate his position as effectively as possible. As the numbers of counterparts increase so the problems due initially to inadequate resources and to a lesser degree due to aptitude and attitude problems are increasing. There is currently no formal framework to resolve problems as they arise. The normal method in such cases is complaint by counterpart or technical assistance team members to their respective superiors about the attitude, capability or personal characteristics of the other, which is then taken up by project manager/government agency level. Traditionally this method has not had a high success rate in resolving such inter-personal problems, which has sometimes led to the removal of staff. It has thus been proposed that the powers and duties of both recipient body (DNEP) and executing agency (in this case ILO) will be set out in a jointly agreed terms of reference for future technical assistance.

Although it is hoped that some steps will be taken to resolve this problem as a result of the seminar mentioned in the section about commitment in page 238, the most serious constraint appears to be passivity of attitude on the part of the counterparts. It is stressed that this is not solely an attitude problem, but a reaction to the organisational situation in which he finds himself. Every attempt has to be made to ensure the receptivity of the counterparts by trying to arrange necessary resources to permit them to function adequately in their post, although it is not expected that any topping-up of salary will be involved.

CONCLUSIONS

Successful technology transfer and counterpart training can only be claimed when, at the end of the technical assistance assignment, the technical and managerial capability is available in house to the recipient entity.

However, sustainability of a function is dependent not only on the capability of national staff to undertake a particular function. They cannot function without the wider technical and material resources to do the job, in this case the means to continue to pay for the road rehabilitation and maintenance, replace equipment, buy spares and tools, pay workers and so on. Sustainability is the goal. Technology transfer is one aspect only, albeit an important one, of the wider picture of planning for realistically sustainable operations.
### MONITORING OF TECHNOLOGY TRANSFER

### MANAGEMENT ASSISTANCE TO FRP PHASE II

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**MOZ/91/007 > PHASE II**
### Monitoring of Technology Transfer

**Management Assistance to FRP Phase II**

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4 Information material for field visit to Soweto’s Contractor Development Programme

4.1 Programme for field visit

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>08.30</td>
<td>Bus departs from Wits University</td>
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<tr>
<td>09.15</td>
<td>Arrive at J abulani (UBC)</td>
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<tr>
<td>09.30 - 09.35</td>
<td>Welcome (Soweto City Council)            Dick Hallet, City Engineer, Soweto City Engineers’ Department</td>
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<tr>
<td>09.35 - 09.40</td>
<td>Welcome (National Black Joe Magagula, Grinaker Contractor Development Forum)</td>
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<tr>
<td>09.40 - 09.50</td>
<td>Overview Graham Nevin, Projects Branch, Soweto City Engineers’ Department</td>
</tr>
<tr>
<td>09.50 - 10.00</td>
<td>Structure of programme Ron Watermeyer, Soderlund &amp; Schutte Inc.</td>
</tr>
<tr>
<td>10.00 - 10.05</td>
<td>Design of water Ron Watermeyer, Soderlund &amp; Schutte Inc.</td>
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<tr>
<td>10.05 - 10.10</td>
<td>Design of roads Tom Marshall, Van Niekerk, Klein and Edwards</td>
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<tr>
<td>10.10 - 10.20</td>
<td>Materials management Sam Amod, Project Management Techniques</td>
</tr>
<tr>
<td>10.20 - 10.25</td>
<td>Construction Manager’s perspective Development Charles Ndleheleni, Grinaker Contractor</td>
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<tr>
<td>10.25 - 10.30</td>
<td>Construction Manager’s perspective Malan Inc Christo Coetzer, Du Toit Lombard and</td>
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<tr>
<td>10.30 - 13.00</td>
<td>Visit Klipspruit (roads) Malapo (Secondary Mains), Moroka (plumbing)</td>
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<td>13.00 - 13.30</td>
<td>Boerewors rolls at stores</td>
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<tr>
<td>13.30 - 14.00</td>
<td>Visit stores</td>
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<td>14.00 - 14.15</td>
<td>Travel back to J abulani (UBC)</td>
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<td>14.15 - 14.25</td>
<td>Training</td>
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<tr>
<td>14.25 - 14.50</td>
<td>What the programme means in practise</td>
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<tr>
<td>14.50 - 15.00</td>
<td>Concluding remarks</td>
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<td>15.00 - 15.45</td>
<td>Questions</td>
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<td>15.45</td>
<td>Return to Wits University</td>
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4.2 An Overview of Soweto's Contractor Development Programme

R.B. Watermeyer, Soderlund & Schutte Inc

INTRODUCTION

Soweto's Contractor Development Programme (CDP) is a unique programme which embraces labour-intensive methods and labour-based technologies. It furthermore encourages and trains the community to participate in the managerial, commercial and administrative aspects of construction. The programme, by its very structure, increases the labour-content of a construction project and, at the same time, trains local entrepreneurs in labour-based construction methods of installing services. In this way, technical, commercial, managerial and administrative skills are developed within the community with a concomitant increase in earning capacity. At the same time, the community retains and cycles a significant proportion of the money spent on a project. Local entrepreneurs who are from the outset, employers in the community can, with sufficient technical, financial support and instruction, become fully fledged contractors and, as such, provide greater earning opportunities for others in the community. Thus the project may be described as a job creation programme with the potential for sustainability through entrepreneurial development.

The programme objectives of the CDP may be described as being to structure and to execute construction projects using labour-based technologies and labour-intensive methods in such a manner that through the construction process:

- Employment and entrepreneurial opportunities are created for members of the community.
- Skills and competencies in technical, commercial, managerial and administrative areas are transferred to participants.
- The percentage of the construction cost retained by the community is maximised.

Project objectives, on the other hand, may be described as being to have the works constructed to specification within a specified period and a given budget using community-based contractors and labour-based construction practices in such a manner that:

- Opportunities for employment and training are created for the local community.
- As much as possible of the project expenditure is retained by the community.
- Community-based contractors (local entrepreneurs) are developed from within the community.
• A sense of participation within the community is fostered.
• Members of the local community are, as far as is practicable, employed by the Construction and Materials Managers to assist them in the execution of their duties.

THE RECONSTRUCTION AND DEVELOPMENT PROGRAMME

The Reconstruction and Development Programme (RDP) suggest that one of the first priorities in meeting basic needs is to provide jobs (cl 1.4.2). In regard to construction, it suggests that our people must be involved in these programmes by being made part of the decision-making on where infrastructure is located, by being employed in its construction and by being empowered to manage and administer these large scale programmes ... (cl 1.4.3) ... infrastructural programmes must take into account the implications for micro enterprises (cl 4.4.7.10).

The RDP makes specific reference to public works and sets out that programmes of this nature should:
• involve communities in the process so that they are empowered (cl 2.3.6).
• create assets which are technically sound (cl 2.3.6).
• not abuse labour standards (cl 2.3.9).
• give priority to job creation and training (cl 2.3.9).
• encourage and support self-employment through small and medium enterprise creation to ensure sustainability of skills (cl 2.3.9).

The RDP in terms of housing and services suggests that a housing programme should:
• incorporate the development of small, medium sized and micro enterprises owned and run by black people (cl 2.5.6).
• introduce support mechanisms in order to maximise the use of local materials (cl 2.5.19).
• encourage community-controlled building materials suppliers (cl 2.5.19).
• involve beneficiary communities at all levels of decision-making and in the implementation of their projects (cl 2.5.21).
• benefit the beneficiary community in matters such as employment, training and award of contracts (cl 2.5.21).

The project and programme objectives of Soweto's CDP are not dissimilar to the requirements of the RDP. Although they were developed before the formulation of the RDP, they are in harmony with the RDP in that projects which are executed in terms of the programme create jobs, develop skills, address affirmative action and target disadvantaged communities.
CURRENT PROJECTS

Township roads (R 70 So)

Background

Approximately 300 km of the total road network of 850 km of minor roads (residential and minor collectors) in Soweto are unsurfaced, in poor condition and are difficult to maintain as gravel roads. The roads are susceptible to severe storm damage during the rainy season. Apart from the high cost of maintenance of the roads, the Soweto City Council spends in excess of R2 million per annum, a figure well below which it should expend, in removing silt that has washed from the roads into the stormwater system. At the same time, these unsurfaced roads are located in fully developed areas and give a rundown appearance to these areas.

Scope of project

The project entails the surfacing of streets, the provision of kerbing to accommodate the flow of stormwater and, where necessary, the installation of underground stormwater drains to allow for efficient run-off.

Project status

Approximately 30 000 m² of roads have already been constructed in terms of this programme and construction on a further 21 000 m² has commenced in terms of the current DBSA/CWRSC loan agreement.

Water house connections (W5 So) and the upgrading of secondary water mains (W22 So)

Background

When Soweto was originally developed, most secondary water mains were laid along mid-block boundaries. The need for connecting pipe work was largely eliminated, since latrines and standpipes were located within a meter or two of the mid-block water mains. The piping used was 50 mm diameter black steel piping, with screwed and socketed joints.

The use of small diameter mid-block water mains resulted in the water supply system suffering from several inherent defects, principally:

- The small size of the mid-block water mains meant that the quantity of water that could be supplied to consumers was severely limited.
- The system of fire hydrants in roadways was, unavoidable, sub-standard, since most road reserves did not contain water mains.
• Metering of water consumption was impractical because of the difficulty of reading inaccessible meters on private properties.
• Maintenance of mid-block water mains by the local authority was hampered by limited access to the mains.

The following problems arose and became serious:
• Furring up of pipes.
• The original reticulation of small steel pipes could not meet the consumers' increasing water demands.
• External corrosion of the steel pipes due to stray electrical currents and acidic soil conditions resulted in leakage of alarming proportions.
• The number of fractures in secondary water mains average between 350 and 400/month.

The upgrading programme was implemented to remedy the situation.

At the outset of the upgrading programme, it was recognised that the new secondary reticulation could be broken down into water loss management districts. Accordingly, the districts which have been created incorporate 3.8 to 6.5 km of secondary mains and depending on the size of erven, comprise between 250 and 750 erven. Each district has been designed and constructed in such a manner that the districts:

a) Can be permanently isolated from adjacent districts by the closure of not more than 5 inter-district valves.

b) Are supplied, when isolated with water from a single off-take from a primary main.

c) When isolated, can supply water to erven at the minimum rate of flow under residual peak flow and fire conditions.

d) Can be supplied with water from preferable, an alternative primary main, or adjacent district at a reduced pressure and flow rate, in the event of repairs being required on the primary mains serving the district.

Thus, should a meter be installed at the inlet to the district, this meter could be used to establish the following:

a) average flows.

b) peak flows.

c) night flows.

Changes in peak and average flows, as well as high night flows, would indicate the presence of leaks. District inspection and further investigations may then be carried out to locate the leak.

District meters could also provide valuable information relating to design parameters which may lead to more economical designs on future upgrading projects and new townships. At the same time, the
information obtained from these meters could be used to monitor consumer usage patterns, so that future extensions to reservoirs and the upgrading of primary mains may be undertaken on a just in time basis, i.e., only when the actual consumer demand necessitates increased storage capacity or supply.

Scope of project
The work includes the construction of 90 to 200 mm diameter secondary mains in the road reserves and their connection to the existing plumbing installations on erven.

The design approach is as follows:

- All small diameter secondary water mains are to be replaced by new secondary mains, with a minimum nominal diameter of 90 mm, located within the road reserves.
- Fire hydrants are to be provided of the new mains in accordance with the requirements laid down in the Department of Community Development's "Blue Book" for a low-risk, Group 2 fire-risk category.
- The new reticulation will be able to supply residential areas with an annual average water demand of 900 litres/day/erf.
- The new reticulation will be broken down into water loss management districts, in order to facilitate the early detection of water losses. (typically, approximately 5 km of secondary mains can be isolated from the trunk mains and be metered.)

Project status
The project when completed will have involved the laying of some 560 km of secondary mains and the replumbing of 56 000 erven. To date, approximately, 30 000 erven have been replumbed and 290 km of secondary water mains have been laid.

EVALUATION OF PROJECT

Background
The Soweto City Engineer's Department and their consultants have developed a procedure to appraise projects in terms of the objectives set out in paragraph 1. In terms of this procedure, the following items are examined:

- the multiplier in employment opportunities.
- expenditure per unit of employment generated.
- the amount of construction cost retained by the community.
• the cost of the proposed construction compared to that of conventional construction.

The above mentioned parameters are then used to compute a Project Index for the project. Thereafter the delivery of the programme as a whole is examined.

**Evaluation of parameters**

The multiplier in employment opportunities in construction activities using the proposed labour-based construct methods are:

- excavate and backfill for water reticulation 1,9
- excavate, lay pipes and backfill water reticulation 1,4
- construct concrete block paved roads
- construct waterbound macadam roads 4,7

The remaining key parameters which have been established on specific projects following a rigorous analysis are as follows:

<table>
<thead>
<tr>
<th>Project</th>
<th>Type of Construction</th>
<th>Estimated cost/man-hour (Rand/man-hour)</th>
<th>Percentage of construction cost retained by the community (%)</th>
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<tbody>
<tr>
<td>R70</td>
<td>Waterbound macadam roads</td>
<td>17.9</td>
<td>37</td>
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<tr>
<td>R70</td>
<td>Concrete block paved roads</td>
<td>18.4</td>
<td>37</td>
</tr>
<tr>
<td>W22</td>
<td>Secondary watermains</td>
<td>17.4</td>
<td>39</td>
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<tr>
<td>W5</td>
<td>House connections</td>
<td>17.1</td>
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All of the projects, with the exception of R70 (township roads) are expected to have construction costs less than or equal to conventional and/or plant-based costs. A study has shown that road construction is expected to be approximately 15% more expensive than plant-based construction.

By way of comparison the average cost per man-hour in the civil engineering industry as a whole is R37,50. A NHF report has shown conventionally constructed roads to be well above this average value. The Framework Agreement labour-based projects which are currently in progress in the Western Cape have only 12% retained by targeted labour, i.e. the community.

It should be noted in this regard that a National Housing Forum report entitled "The Development of Small Scale Enterprises, Skills, Entrepreneurship and Employment Opportunities through the
The provision of Housing makes the observation that when comparing costs, it should also be borne in mind that labour-based construction practices will probably become more cost competitive since current cost comparisons with conventional construction practices have been undertaken in a recessionary period where plant on most projects have been priced at unrealistically low levels.

**Project Indices**

The Project Index may be evaluated from the following formulae:

\[
PI = \frac{20}{EEC} + \frac{1,75}{100} \cdot PCR + \frac{ECC}{EPC}
\]

where \(ECC \leq 1,0\)  
\(EPC\)

where \(ECC = \) Estimated cost of conventional construction  
\(EEC = \) Estimated expenditure per man-hour of employment generated  
\(EPC = \) Estimated project construction costs  
\(PCR = \) Percentage of construction cost retained by the community

The Project Indices in respect of the various projects which have been analysed on a rigorous basis are as follows:

<table>
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<tr>
<th>Project No.</th>
<th>PI</th>
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<tr>
<td>R70 So</td>
<td>2,6</td>
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<tr>
<td>W22 So</td>
<td>2,8</td>
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<tr>
<td>W5 So</td>
<td>3,1</td>
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(A threshold value of 2,3 has been proposed. Projects having a PI below this are considered to be unacceptable. By way of comparison, plant-based construction has a PI below 2,0 and the current Framework Agreement labour-based projects in the Western Cape, a value of 2,1).

**Conclusion**

All the projects proposed have Project Indices above Soweto's threshold limit and therefore comply with Soweto's programme objectives. At the same time, all the projects produce employment at a unit cost below the average for the construction industry and hence may be regarded as being labour-based.
4.3 Soweto’s Contractor Development Programme - a contractor’s view

S. Mazibuko, Owner, Mazibuko Civils

WHAT I HAVE LEARNED

Labour-based construction came to me as an eye-opener in terms of civil engineering. Prior to my training I had no inkling of what constitutes civil engineering projects. I did not know, for example, what fittings are being used in civil works, except what I saw when I passed construction work in progress. The knowledge that I have acquired in labour-based projects is as follows:

- **Project Planning**: Undertaking set objectives using resources to achieve the ultimate goal within the constraints of time, cost and quality.

- **Organising the Project Plan**: Undertaking and organising the project in terms of tasks, time and quality. An organisation chart must be drawn based on a work breakdown structure; giving a brief description of duties that will be undertaken by the people that are involved in the project.

- **Direct the Project Plan**: Delegating the persons that are in charge of the labour work force on site which involves communication skills coupled with motivation and co-ordination. Not doing these vital things will be like the right hand not knowing what the left hand is doing.

PROBLEMS

- The first problem that I encountered was working with a plan that did not show existing services, which resulted in several damaged services.

- Trying to make labourers maintain the standardised specification i.e. right measurements of the trenches. At times you are not on site for some time during the day, you find out that your trenches are zigzagging. In other words you must have a disciplined team.

- Non-availability of materials and fittings on site.

- Tools quickly get damaged or worn out and need constant replacing.

- Materials and fittings not arriving on time on site (not regularly happening).

- At times you get co-operative residents. That is where you must be a good PR man.

- The place that had the biggest problems was the Zola area where thuggery, robbery, and intimidation was at its worst. By
maintaining cool tempers we weathered the storm so that at the end we were friendly with those tsotsis to the point that they simply started ignoring us.

- Closing of water supply without notice by Water Branch during pressure testing of lines was a major problem in terms of time and cost.

**PROGRESS MADE AND LIFESTYLE**

Since I started working on these projects I have achieved quite a number of good things in life. I have managed to build my family a new house and bought myself a bakkie to make my work professional and productive. As for my family and personal lifestyle our life has improved tremendously. My involvement with these projects has changed my life completely. Maybe it's what you call a "redistribution of wealth".

**WHY SHOULD I GET ANOTHER CONTRACT?**

The most important reason of all is that I have been acting as a faithful agent for my employers and their client. The result and quality of my work speak for themselves. Also I had taken over and completed other projects that have been abandoned by other contractors.

I have the necessary experience and skills to undertake work on bigger contracts than the present and past ones, and I have and I have an experienced and reliable labour force on my hands.

So what it means is that I have a very experienced labour force on my hands.

**PROJECT CONTROL**

Controlling a project is very important in terms of time measurement, i.e. the required time to finish the project. Also included is cost and quality performance. In controlling a project I also learned that forecasting and not deviating from the original plan is also very important. Also getting a feedback from your site foreman.

**WHAT MAKES A GOOD CONTRACTOR?**

a) We must maintain a high standard of personal and professional conduct.

b) We must advance the integrity and profession by practising in a dignified manner.

c) Support other contractors by actively participating and encouraging them.

d) Provide suitable working conditions and opportunities for your staff.
HAVE THESE CONTRACTS BEEN SUCCESSFUL AND WHY SHOULD THEY CONTINUE?

In terms of the standard achieved I strongly believe that they have been successful, although we had very serious problems that nearly resulted in the discontinuation of the projects in the past. We have eliminated most of these problems. We will continue to find and minimise these problems.

Another important factor about these projects is that they create job opportunities. Considering that one contractor employs about 25 people with an average of five dependants per person that means 125 people are benefiting from one contract. That is one of the strongest reasons why I encourage the continuation of these projects.
4.4 Soweto’s Contractor development Programme - training

S. Mokone, Senior Trainer, Promatra Training Services

I am addressing the training of contractors in management skills in Soweto's Contractor Development Programme. Whilst this is the specific project on which I am presenting, the many aspects that I will cover are similar on every project on which I have trained over the past 18 months. My area of training includes parts of the NW Province, Eastern Transvaal and Gauteng. The civils projects on which I have trained include Soshanguwe, Atteridgeville, Soweto, KwaGuqa, Duduza, Vosloorus and Meadowlands. In addition to which I have trained in several other areas.

The aspect that strikes home the most in each of the areas is the will and desire of the trainees to uplift themselves. They clearly realise that in order for this to happen they need to enhance their knowledge of the construction industry. In general, they approach training with tremendous enthusiasm and the results thus far have been extremely encouraging.

What has been particularly rewarding is the fact that several of the trainees who originated from informal settlement areas with little or no knowledge of the construction industry have gone on to make successes of their own businesses. In other instances, contractors who started being trained whilst already operating as contractors have increased their turnover by up to ten times.

In Soweto, the training commenced with an introductory course given by Entrepreneurial Development South Africa (EDSA) and then moved to Promatra's Construction Management Course. The training that I have been giving is the latter, which transfers skills and competencies to the contractors in the areas of:

- tendering and estimating
- planning
- execution of a contract
- managing of resources
- quality control

The training has been given once a week in Soweto to allow the contractors the opportunity to attend the lectures without having to upset their work routine.

The format of the training is Competency Based Modular Training (CBMT) which is adult learning ideally suited to local conditions. It allows the individual to progress at his pace and allows him to put in extra study should he see fit.
Due to the nature of the projects it has not been possible for all the contractors to attend every session. The utilisation of the CBMT format means that contractors are able to obtain benefit from every period attended. If they miss the training for any length of time, they can catch up when convenient to them as each module is independent of the others. This also allows the attendance to the course of “new” contractors who might have missed a portion of the training.

I believe formal training to be an essential part of any project that includes contractor development as a part of its aims. Without such training I do not see that the contractors will be able to progress beyond their present status. With such training, as I tell the contractors, “the sky is the limit”.
4.5 Material management within the Contractor Development Programme - a brief overview

S.A. Amod, Project Management Techniques

INTRODUCTION

Labour-intensive construction projects can take many forms. To obtain the maximum benefit, the projects should be linked to training and development programmes which will elevate at least some of the beneficiaries to a level of greater capability and, ultimately, removal from the cycle of poverty which so often characterises job-creation schemes. Such a programme is Soweto’s Contractor Development Programme which trains contractors in the areas of management, administration and commercial skills, and provides developmental support to the emerging entrepreneur.

The emerging contractor faces many barriers which are outlined in detail by others. A very significant problem concerns the procurement of materials and small plant for construction. Training will assist in transferring knowledge of contractual requirements, such as provision of sureties, and the skills of tendering, but nothing can initially be done about the following disadvantages which the small contractor faces:

- Lack of financial credibility.
- Lack of experience in procurement.
- Lack of resources for the purchasing and storage of materials.

In addition to these there is the advantage that a central materials procurement operation serving a number of contracts has:

- The bulk purchase discounts obtained.
- The central storage advantages of security and control.
- Economies of scale.

The materials management function is therefore integral to the Contractor Development Programme in Soweto. Labour-based projects, and labour-intensive construction in general, can benefit from the materials management function being provided by either the managing contractor or the development team. As the contractor-in-training develops and succeeds in obtaining sustained work and financial credibility, the job of procuring materials may be passed over to him.

The following is a brief overview of the objectives, advantages, and the process of materials management as practised in Soweto.
PURPOSE OF MATERIALS MANAGEMENT

The main reason for having a Materials Manager on labour-based projects is so that the barriers which have been outlined may be surmounted. An additional reason is that the reticence shown by some developers and funding agencies to provide funding to inexperienced contractors may be overcome by keeping 30-50% of the cost of construction (the cost of materials) under the control of a professional agency who only issues the materials as they are required by the contractor. It also overcomes the problem of the discontinuity of work experienced by individual contractors.

The Materials Manager serves both the emerging contractors as well as the Client (the funding agency). To each contractor he behaves as though he were the procurement section of a conventional contractor. This means that materials must be procured in advance of their required time, at the best price, of adequate quality, and in a professional manner. To the Client, the Materials Manager ensures that the materials purchased with the Client's money are properly stored, are secure, and are only distributed to qualifying contractors. Advantage must be taken of the best market prices and settlement discounts. Money must not be wasted on excessive purchasing and the stock (bin) levels must be maintained at the most efficient level.

To all parties the Materials Manager's reports are of vital significance. This makes the controls and the administrative systems employed by the Materials Manager most important.

THE SYSTEMS AND THE PROCESS

Perhaps the most important quality that the systems employed should have, is that they must be easy to use by the site staff, i.e. Construction Manager, Contractor and Store-man. The systems must also provide sufficient clarity for contractors, Construction Managers and Clients to understand what materials have been issued, to which contractors, and at what price.

The Materials Manager generates and updates a comprehensive list of materials, which in some instances will include plant and consumable items, for use on labour-based projects. He also develops relationships with manufacturers and merchants, for bulk items such as HDPE and PVC piping, cement, pipe fittings, aggregates, etc.

The annual materials tender attempts to cover the materials required for all projects to be constructed in that year. This is adjudicated by the Materials Manager with the assistance of the Design Consultants and the approval of the Client. Suppliers are then appointed who will provide materials according to a schedule drawn up by the Materials Manager.

The nature of the Reconstruction and Development Programme and labour-based projects makes it desirable to support small merchants.
and suppliers. This is generally done for items where the small supplier can compete with the larger organisations, as well as for items where the proximity of the small supplier to the construction site is advantageous. Small suppliers also frequently have fewer administrative bottlenecks and are able to procure items in short supply at short notice. They are, of course, free to compete with the larger suppliers in terms of the annual materials tenders.

Since the Materials Manager generates tenders on an annual basis, the scheduling of each contract within the development programme is not critical. The materials management process for each contract, however, may be sub-divided into three phases which are not clearly defined but rather blend into each other.

The pre-construction phase

Once the schedule of quantities is obtained from the Design Engineer, an estimate of costs is provided to the Construction Manager and the Design Engineer for them to calculate the budget for the project in the pre-construction report. A shadow price is determined for the contract and, on the basis of various factors, a decision is taken as to whether the contract is feasible within the programme. Should the contract be approved, the Materials Manager obtains prices for all items not on his annual tender and provides these to the Construction Manager. The Construction Manager in turn provides the Materials Manager with a list of allowables and the construction programme from which is derived a materials usage programme.

The contract is then tendered for by labour-based contractors and is awarded, and the contractor’s details are entered into a computer database together with his allowables for the particular contract. The Materials Manager then informs the relevant suppliers of the expected orders and delivery schedules in anticipation of construction.

The construction phase

The materials management during the construction phases revolves around the materials store. The Store Manager monitors the bin levels for all items in the store. Using the lead times provided by the suppliers on their materials tenders and the materials usage programme, the Store Manager maintains the bin levels at an acceptable level. Purchase orders are placed on the suppliers who then deliver the goods according to an agreed schedule.

During the construction stage of the project each contractor provides a requisition note for every item required from the store. This document is authorised by the Construction Manager whereupon the Materials Manager issues a stores issue note and issues the materials requisitioned, provided the quantities remain within the allowables allocated to that contractor. Contractors are permitted, within reason,
to return materials not used to the store for which they receive a credit. At the end of every month the Contractor and Construction Manager receive a report from the Materials Manager outlining the items, quantities, unit price, and total value of materials issued to each contractor for the month.

The Materials Manager places purchase orders on suppliers and processes the delivery documentation and invoices, and makes the necessary payments. In Soweto the Materials Manager operates a float account established by the funding agency which enables him to make payments directly to suppliers thereby obtaining the maximum benefit in terms of settlement discounts for prompt payment.

At the end of each month the Materials Manager reconciles the total quantity and value of materials received from each supplier, the quantity and value of materials issued to each contractor, the cost of materials allocated to each funding programme, and all costs involved in the store administration and management. This information is passed to the Project Manager who in turn informs the Client or funding agency who then transfers funds into the Materials Manager's float account.

**The post-construction phase**

Once construction is completed, and the contract is in the maintenance period, the Materials Manager and Construction Manager reconcile the quantity and value of material used by the contractor. This is then incorporated into the final close-out report which is completed for each contract.

**CONTROLS**

The systems outlined already include a number of control measures to minimise infidelity and abuse. Some of the other measures that are undertaken are as follows:

- The store maintains a parallel system of recording. A kardex system is employed in the store together with a computerised data-base, both of which record essential information. The computer system is comprehensive and records all incoming materials including the delivery notes, the details of the supplier, the date on which delivery was taken, the quantity and the purchase price. They also record the requisition note number, the stores issue note number and the contract to which the material was issued and on what date.

- Stock-takes are performed every quarter to monitor shrinkage. Local labour is used to man the store and security is maintained at a strict level at all times. The computer system employs various levels of security clearance allocated to the system users. The clerk who inputs the data, including stock levels,
might not have the security clearance to process reports and to examine stock movement.

- Quality control checks are also carried out by the Materials Manager to ensure that material received is consistently adequate in quality.

The systems and control measures ensure that the materials management operation is transparent and open to audit at very short notice.

CONCLUSION

The Contractor Development Programme operates within the concept of labour-based construction. It has as its basis a faith in the ability of people to achieve given the chance to do so. It recognises, however, that many barriers are encountered by the emerging contractor and provides assistance in surmounting these.

Materials management fulfils this function with regard to the procurement of plant and materials for labour-based construction. It combines appropriate systems and controls used by conventional contractors, merchants and municipal storage systems, whilst remaining transparent and accessible to external audit at any time. In this way it serves to protect the interests of the funding agency while providing an essential service to emerging contractors.
4.6 Upgrading of township services - labour-based residential road construction

T. Marshall, Partner VKE Consulting Engineers and D. Gertzen, Engineer VKE Consulting Engineers

INTRODUCTION

The Soweto City Council have implemented a programme of labour-based road construction as part of their Contractor Development Programme. The programme is designed to upgrade existing township services using labour-intensive methods and to develop local contractors using a Development Team approach.

Klipspruit Ext 2 was identified as an area needing upgrading (see Fig. 1) and contracts for labour-based road construction have been awarded to local contractors. Van Niekerk, Kleyn and Edwards have been appointed as the Engineer and Grinaker Contractor Development as the Construction Manager for the contracts.

BACKGROUND

The total length of Soweto's road network is 850 km which includes approximately 550 km of surfaced roads and 300 km of gravel roads.

The Soweto City Council experiences the following problems with the gravel roads in the urban areas:

- The gravel roads are susceptible to surface run off from stormwater during the summer rainy season, which leads to potholes and disintegration of the road surface.
- Uncontrolled stormwater run off from the street surfaces is not drained at low points resulting in the flooding of properties and erosion of roads.
- The gravel roads are difficult to maintain due to their rocky base.
- Erosion gulleys in the road shoulders undercut and progressively collapse the road edges.
- Muddy conditions are experienced during the rainy season and dust problems during dry periods, which results in a rundown appearance to these fully developed urban areas.
- Apart from the high cost of maintenance for the roads the Soweto City Council spends in excess of R2 million per annum in removing silt washed from these roads onto existing surfaced roads and into stormwater drains.

A programme to upgrade the unsurfaced roads through labour-based methods has been implemented as part of the Soweto Contractor Development Programme.
Development Programme through the Central Witwatersrand Regional Services Council (CWRSC) Urban Development Programme. Funding is from the Development Bank of South Africa.

The benefits of surfacing the roads can be listed as follows:

- Stormwater control will be improved and this will result in an alleviation of the problem of the flooding of properties experienced by the residents.
- The surfaced roads result in erosion damage being eradicated.
- The installation of kerbs as part of the programme prevents ravelling of the road edges and the resultant structural damage that occurs.
- The riding surface is enhanced.
- Dust problems and muddy conditions are overcome.
- There is an immediate and substantial aesthetic improvement of the urban environment.
- Minimal maintenance costs are experienced and road cleaning efficiency is improved which results in great cost savings.
- The road and stormwater construction is labour-intensive and the project offers employment opportunities for the local community.
- Training of labour and small contractors results in a skills transfer.

**PROJECT: KLIPSRUIT EXT 2**

Klipspruit Ext 2 was identified as an area requiring upgrading. Electrical, water, sewer and telephone services have already been installed in the area. The project entails the surfacing of streets, the provision of kerbing to accommodate the flow of stormwater and, where necessary, the installation of underground stormwater drains to allow for efficient runoff. The contracts consist of waterbound macadam asphalt roads and concrete block paving. There is 2594 m of underground concrete stormwater pipeline and 21074 m² of surfacing.

Eight contracts have been awarded to local contractors. The contractor provides labour and small tools and developmental support is offered through the provision of plant, materials, advise, practical assistance and training by a Materials Manager and a Construction Manager.

**DESIGN OF ROADS**

The geometric design consists of 5 m wide residential access roads and a 6 m access collector.
The structural pavement design depends on traffic loading characteristics but may be broadly defined in two categories:

1. concrete block paving
2. asphalt and water bound macadam with the appropriate layer works (see Fig. 2)

The following materials have been used for the road construction:

Asphalt has been used as it is less susceptible to damage from vehicles and other incidents and has a substantially lower maintenance cost. For a 4 m tarred road the maintenance cost per annum has been estimated at R1,54/m as opposed to a graded road cost of R12,26/m/per annum (Sparks 1994). Minimal patching is needed over a 25 year period after which the minor road generally needs to be resurfaced. Problems have been experienced in obtaining annual maintenance budgets and so capital projects with minimum maintenance are preferred.

- Block paving has been specified for the following reasons:
- The ease of repair that is experienced when service trenches are necessary.
- Concrete block paving is locally manufactured and is labour-intensive in both production and construction.
- It is recommended for low speed roads and has a good aesthetic appearance.
- It also requires minimal maintenance.

Waterbound macadam is a traditional high quality, labour-intensive pavement material and has been shown to employ 10 times more labour than crusher run (Phillips 1992). There is evidence that when properly constructed the materials exhibit higher structural qualities and are less water susceptible than granular materials. Waterbound macadam has been used as a base for all the asphalt surfaced roads.

All excavation for the layer works will be done using labour-intensive methods. Material will be stockpiled and replaced in specified layers. Labour-based methods will be used for the placing, profiling and working of the materials where possible.

Compaction will be done using conventional equipment and layer works are designed according to accepted standards. A stabilised layer will be used where necessary.

Ongoing quality control testing of the materials and layer works will ensure that workmanship meets international standards.
DISCUSSION AND CONCLUSIONS

Some of the project objectives cited in the DBSA appraisal report for the CWRSC Urban Development Programme are as follows:

"To structure and execute construction projects using labour-based technologies and labour-intensive methods in such a manner that through the construction process:

- Employment and entrepreneurial opportunities and created for members of the community.
- The percentage of the construction cost retained by the community is maximised."

It has been estimated that 27 000 man hours of employment will be generated by the 8 projects and that 37% of all expenditure on the project will be retained by the community.

The contracts will achieve the above mentioned objective but also have the following benefits. They will result in a substantial aesthetic improvement of the urban environment, lower maintenance costs than are experienced at present and a greatly improved riding surface.

Stormwater damage will be minimised and skills transfer and employment will have taken place in the community. An asset of value will be created to be enjoyed for the foreseeable future by the community.

The project fulfils the criteria mentioned by Minster J. Naidoo in the RDP information brochure, as a project that meets the basic needs and services of our people while building the economy. It creates jobs, develops skills, addresses affirmative action and targets disadvantaged communities.

REFERENCES


ASPHALT AND WATERBOUND MACADAM OR CONCRETE BLOCK PAVING

5000

2 % CROSS FALL

SUBBASE

ROADBED PREPATION (RP AND COMPACT)

PRECAST MOUNTABLE KERBS
4.7 **Extracts from the National Housing Forum document entitled “The development of small scale enterprises, skills, entrepreneurship and employment opportunities though the provision of housing”**

R.B. Watermeyer, Soderlund & Schutte Inc and N.G. Band, Project Management Techniques

**EXTRACTS FROM PART 1 - SECTION 4**

**4.3.3 SOWETO’S CONTRACTOR DEVELOPMENT PROGRAMME: A CASE STUDY**

**4.3.3.1 Background**

Numerous employment-intensive projects have been undertaken in South Africa with varying degrees of success. Most have been executed as isolated projects, few in terms of a programme. One of the longest running of these projects, and one which has most influenced the direction in which many projects, manuals, guidelines, policies, etc. have been formulated and structured, is that run by the Soweto City Engineer’s Department. This project has become known as Soweto’s Contractor Development Programme. A particular feature of this programme is that it has been well documented\(^1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17\) and all the necessary contract documentation (standardised specifications, model forms of agreement, etc.), required to replicate the programme on a national basis, have been developed.\(^25\) As a result, this project will be briefly reviewed.

During the early 1980’s, hundreds of millions of Rand were spent in Soweto on services upgrading projects. From an engineering management point of view the project was a huge success, as it was completed on time, within budget and to the correct quality standards. However, from a community point of view it was a dismal failure in that:

- Unemployment levels were the same after construction as they had been before construction.
- Little, or no, transference of skills took place particularly in the commercial, managerial and administrative fields.
- The amount of project expenditure retained within the community was insignificant.

The City Engineer’s Department in an attempt to redress this situation, embarked upon a series of experimental projects during 1987 and, based on the lessons learnt, decided that the following policies should be adopted:

- Community-based contractors should be employed to aid community development and productivity.
• Professional management, supervision and training should be used to improve skills and to ensure satisfactory progress on projects.

• Commercial skills, which are an important factor in a contractor's success, should be taught.\(^4\)

A civil engineering project involving the upgrading of approximately two-thirds of the secondary water reticulation of the city was identified as a project suitable for the implementation of a labour-based Contractor Development Programme (CDP). The Soweto City Council's primary objectives in implementing the CDP were to:

• Create employment opportunities for Soweto residents.

• Stimulate the development of competent contractors from amongst the local Soweto population.

• To retain as much as possible of the expenditure within Soweto.

At the outset, it was recognised that no Sowetan either owned, or operated, a civil engineering construction company.\(^7\) It was also recognised that the calling for tenders for the construction of services and structures, albeit by means of labour-based construction methods, from the community would not necessarily result in the production of local contractors. Nor would it elicit any response whatsoever, since the community lacked commercial and managerial skills in addition to the necessary resources. The approach whereby established contractors are required, in terms of the conditions of contract, to engage local sub-contractors, wherever possible, to execute specific aspects of the works was equally considered to be rather meaningless, since this approach assumed that sub-contractors existed within the community. It was therefore decided to develop contractors within Soweto in terms of a programme which could address the barriers to entry which precluded local entrepreneurs from participating in the proposed upgrading project.

The barriers to entry were identified as being:\(^4\)

• Tendering and contractual requirements, such as the provision of sureties, the inclusion of penalty clauses and the tendering of rates.

• The prevalence of plant-based construction practices.

• The lack of financial resources to purchase materials, hire plant and tools and to pay wages.

• The lack of credibility in commercial circles.

• The lack of commercial, managerial and administrative skills.

• The lack of technical competence.

To address these barriers to entry, it was recognised that changes in the construction methods had to go much further than merely substituting men for machines, as technologies had to be altered to
render the construction process appropriate for manual construction methods, using relatively, unskilled workers. In addition, the very construction process had to be changed to eliminate the remaining barriers to entry which faced local entrepreneurs. Technical, managerial, commercial and administrative skills had to be taught as an integral part of the process, the requirement for sureties had to be waived, access to reliable sources of materials and plant had to be provided, and finance for wages, etc., had to be made available. In short, resources had to be provided and developmental support furnished.

4.3.3.2 Structure of developmental support and contracts

The consulting engineer who set up the Ilinge project in the Transkei, where small contractors were established to construct the works, was appointed to initiate the project in 1988. Today, a development team (see 4.4.6), comprising a number of firms of consulting engineers and a large firm of well established civil engineering contractors, provide the necessary support to emerging contractors as illustrated in Figure 4.1. The team, apart from providing conventional consulting services, advises, trains and assists local community-based contractors in the administration and execution of their contracts; procures, supplies, issues and delivers materials to the various construction sites; and arranges fortnightly payments. At the same time, the development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc.

The contractor enters into a contract directly with the employer. The development team, on the other hand is separately appointed by the employer on a fee basis. Thus the development team may be regarded as construction facilitators who arrange for the provision of resources that the contractor lacks. The ownership of the contract, however, remains with the community-based contractor.

The CDP apart from addressing the Council's objectives, affords members of the community the opportunity to participate in various levels and capacities in construction activities, i.e., as labourers, semi-skilled workers, skilled workers, foremen, contractors, storemen, inspectors, clerks, transporters, etc. The programme envisages 5 levels of contract, full details of which may be found in section 4.4 of part II. These are:

- Level 1: labour only
- Level 2: labour plus transport of materials to site
- Level 3: labour plus transport plus materials (assisted)
- Level 4: labour plus transport plus materials (unassisted)
- Level 5: labour plus transport plus materials plus full surety
Training of community-based contractors begins when tenders are advertised. Prospective tenderers may attend pre-tender classes where tender procedures are explained. Upon the award of a contract, an initial mentorship and technical training period commences, during which contractors learn to organise work groups, ensure that productivity targets are met, develop communication skills, carry out payment procedures, etc., in addition to learning the technical aspects of the work.\textsuperscript{1,6}

Training is, predominantly on-the-job with infrequent, formal after-hours training sessions. Members of the community are, therefore, trained on an "earn and learn" basis, the cost of which is nominal and forms part of the construction cost. However, a formal training phase is also provided to ensure that budding contractors are able to fend for themselves in the open market.\textsuperscript{1,3}

Since the objective of the Council was as much to train local contractors as to provide work for the community, it was decided to use the Standard General Conditions of Contract for Works of Civil Engineering.
Engineering Construction as the basis of the agreement between the labour-based contractor and the Council. Accordingly, contracts were prepared strictly in accordance with part 1 of SABS 0120. The main features of the contracts at the lowest level of contract are:

- Tenderers may price the schedules of quantities, or may, subject to certain conditions, submit lump-sum prices.
- The Contractor is not required to furnish a surety.
- The Council arranges for all necessary insurances except Workmen's Compensation insurance.
- The Contractor is assisted in all aspects of the contract and is trained by a Construction Manager appointed by the Employer.
- The Council supplies and delivers to the site all materials and plant required through his appointed Construction Manager.
- The Contractor supplies, supervises and pays all labour required to execute the contract.
- The Contractor supplies all minor hand tools.
- The Construction Manager arranges for specialist work, e.g., blasting, to be carried out.
- The Contractor is required to remedy defects for 6 months after completion of the works.

After the first year, the documentation was reviewed and substantially revised. Preliminary and general items were introduced. The Contractor was given greater responsibility in the testing of backfill and pipelines, and was required to provide all small tools. The roles of the Construction and Materials Managers and the Engineer were more clearly defined and the specifications were totally revised. Standardised specifications for labour-based construction, based on the principles contained in SABS 0120, were prepared, as it was found that the plant-based SABS 1200 specifications were in many respects neither practical nor relevant. At the same time construction manuals were prepared to supplement the performance-orientated standardised specifications.

The sizes of contracts are such that the contract duration is usually between 3 and 6 months and several contracts run concurrently. A single development team can comfortably support between 8 and 10 contracts running simultaneously. Should any contract be determined, the outstanding work can be readily executed under concurrent contracts.

4.3.3.3 An analysis of the project

Between August, 1988, and January 1994, 87 Level 1 and 9 Level 2 contracts were awarded. Of these, only eight contractors involving five
contractors were determined, due to unsatisfactory performance, and almost all of those during the first two years of the project. In most instances the failure of the contractors could be directly ascribed to inexperience on the part of the management team. Some 30 contractors have successfully completed contracts and it is now not uncommon to receive in excess of 30 tenders for a single construction contract. There is great enthusiasm for the scheme and productivity on the contracts has been high. Most contractors appear to have made satisfactory profits.

The funding of the programme by the CWRSC has been somewhat erratic as the annual provision of funds has, for the past few years, been subject to severe cuts owing to funds having had to be rescheduled, as a result of rent and service charge boycotts. This has meant that the programme as at the end of January 1994, had not advanced beyond Level 2 contracts. Nevertheless, at the end of January 1994, just over R42 million had been spent on the upgrading of the water supply system and some R2,6 million on the construction of residential roads, mainly using waterbound macadam base courses. Approximately 215 km of secondary water mains have been laid, 19 500 erven have been replumbed and 30 000 m² of roads have been surfaced. Recently, a R30,5 million Rand loan agreement between the CWRSC and DBSA has been concluded to finance the programme during the 1993/94 financial year. However, owing to administrative delays, most of this expenditure will be incurred only during the 1994/95 financial year. It is anticipated that Level 3, 4 and 5 contracts will be introduced during this period.

An analysis of CDP projects has revealed that:\(^3\)

- Community-based construction is cost comparable with conventional construction and, in some instances, is significantly more economical.
- The portion of expenditure retained within the community, expressed as a percentage of total expenditure, depends on the type of service installed. Typically this figure lies between 30% and 65%.
- The number of people employed on the programme can be significant. (The project has peaked with employment levels of about 900 people.)
- The project, as a whole, can be effectively accelerated, or decelerated, by varying the number of contracts awarded and the sizes of the management teams.

The development support structure employed in the CDP in Soweto has ensured that projects are being completed on time, to the required quality and at a cost which, on average, is no higher than that of conventional construction. At the same time, the support structures have ensured that the objectives of the CDP are being met, i.e., local
entrepreneurs are being trained as contractors; commercial, technical, administrative and managerial skills are being taught; employment opportunities for local residents are being created and a significant proportion of the project expenditure is being retained by, and recycled within, the community.

4.3.3.4 Replicating the project

The support systems developed in the CDP can be used to mobilise communities to construct their own infrastructure. Furthermore, the programme has been developed in such a manner that it can be readily replicated elsewhere in South Africa with very short lead times and nominal start up costs. An example of this occurred when the City Engineer (Electrical) of Port Elizabeth visited Soweto and was exposed to the CDP. Two local firms of electrical engineers were, thereafter, appointed to implement a community-based project for below-ground, low voltage electrical cables to provide electricity to some 15,000 erven in Ibhayi, over a period of three years.

Some of the core members of the development team, which had been established in Soweto, rendered assistance to the local consultants in the form of developing project proposals, contract documentation, advice on management systems and the provision of staff. As a result of the technology transfer that took place, the cost to the local authority in setting up the programme has been nominal, even if expressed as a percentage of the cost of the two pilot contracts which were executed. This is in direct contrast to labour-intensive type programmes implemented elsewhere in Africa, e.g., the Kenyan Rural Access Roads programme which swallowed up the bulk of the expenditure during the first few years in overhead costs and took around 10 years to reduce overheads from 84% of total project cost to 16%.

Other projects for local authorities in Port Elizabeth and the PWV area have included the construction of water and sewer reticulations including all external plumbing work/toilet structures, to a low cost housing development and informal settlements.

4.3.3.5 Development of contractors

What has been a characteristic of this programme, is that local contractors are in fact developed. For example, the three first time "contractors" from the local informal settlement community in Missionvale, who are currently installing sewer and water pipelines, have recently formed a consortium and have won their first electrical low voltage cable installation contract in nearby Ibhayi, where a similar programme is being run. In Soweto, contractors are tendering on projects outside the programme and have been awarded several contracts. They have also worked as subcontractors and on
maintenance contracts within Soweto. Relationships are currently developing with large conventional construction companies. Early in 1993, a group of contractors operating within Soweto's CDP met with emerging electrical and civil contractors from other parts of the country and established the National Association of Civil and Electrical Contractors (NACEC). This is the first employer body to be established since the 1930's to represent civil engineering contractors. NACEC is a member of the NABCAT Forum.

4.4.6 DEVELOPMENT TEAM APPROACH

In the Development Team Approach (also referred to as the Professional Team Approach \(^{4,6,9}\) and Third Party Contractor Support\(^{10}\)), experienced and suitably qualified persons assist local community-based contractors with the administration and management of their contracts, offer technical training, engage specialist contractors, and supply the necessary materials and equipment.\(^{6}\) The development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc. Normally, the local contractor enters into a contract with the client/funding body and the development team is appointed on a fee basis directly by the client.\(^{1}\) The development team may be regarded as construction facilitators who arrange to provide resources that the contractor lacks. In a community-based project, the development team must ensure that certain specific functions are carried out, normally by the following individuals who assume distinct responsibilities:\(^{6}\)

- The Design Engineer.
- The Engineer.
- The Construction Manager.
- The Materials Manager.

Engineering contractors, project managers or consulting engineers may perform the duties and assume the responsibilities of the Construction and Materials Managers. However, the design and supervision of the works, i.e., the duties and responsibilities of the Design Engineer and the Engineer must be undertaken by Professional Engineers or Technologists.

It should be noted that the Construction and Material Managers are appointed by the client on a fee basis. Thus the contractor is motivated by profit to successfully complete his contract whereas the development team is motivated by seeking to secure another appointment. Model forms of agreement have been written for the appointment of Construction and Materials Managers.\(^{1,21}\) (If, however, the client is a developer and the developer provides the development support, then the model form of agreement forms the basis of the modus operandi between the parties.)
In terms of the Model Form of Agreement written by Soderlund and Schutte, the Construction Manager cannot ensure the performance of the Contractor nor guarantee against any failure by the Contractor to perform his work in accordance with the Contract. However, the client's contractual risk is minimised and his objectives of having the works constructed to specification within a specified period and a given budget using community-based contractors and labour-based construction practices are met by the appointment of a Construction Manager. The Construction Manager acts as a professional and is required in terms of his agreement to advise, assist and train on-the-job the Contractor in the execution of his Contracts and to this end shall make visits to the Site at such intervals as he deems appropriate during the various stages of Construction in order to ensure that the contractor makes satisfactory progress, shows technical competence in the execution of all aspects of the works and generally fulfils his contractual obligations. The Construction Manager shall procure the services of site staff, as necessary, to assist him and provide continuous support to the Contractor in order to ensure that the Client's objectives are achieved.

The developmental support provided by the Construction and Materials Managers at the lowest level of contract may be summarised as follows:

**Construction Manager**
- offer advice, practical assistance and training.
- provides plant other than small tools.
- arranges for specialist work.
- arranges for payment of fortnightly/weekly wages.
- transport of materials to site.

**Materials Manager**
- procures, stores and issues all material.

Materials and plant are supplied by the development team at cost less all trade and settlement discounts, while the labour only contractor is only paid for work done. It should be noted that the Construction and Materials Managers carry professional indemnity insurance which can be called upon in the event of negligence on their part.

The support provided is flexible and can be varied depending upon the needs of the community, e.g., should the community be in a position to perform the function of materials procurement, then there would be no need for a Materials Manager. This approach is well suited to a CDP.
since the role of the Construction and Materials Managers diminishes, as emerging contractors become more competent and are capable of assuming greater contractual responsibility and risk.\textsuperscript{1,3} (see subsection 4 in part II).

In addition to the support offered by the development team:

- Tenderers may tender on the basis of rates or a lump sum.
- No sureties are called for.
- Insurances are arranged for contractors.
- Fortnightly wages may be advanced to contractors upon completion of a fortnight's work.

Standardised specifications based on the SABS 1200 series have been developed to adequately assign risk and responsibility and to describe payment items.\textsuperscript{1}

Training is, predominantly, "on-the-job" with infrequent, formal after-hours training sessions. Members of the community are, therefore, trained on an "earn and learn" basis, the cost of which is nominal and forms part of the construction cost. However, a formal training phase is also usually provided to ensure that potential contractors are able to fend for themselves in the open market. Training includes:\textsuperscript{6}

- How to tender.
- On-the-job training (how to execute contracts).
- Formal (how to develop a business).
- Mentorship.

The risk to the client is probably less than that of conventional contracts in spite of the fact that no sureties are called for. This is due to:

- Smaller contracts of short duration.
- Labour only contracts.
- Contractors are paid only for work done.
- Retention is applied to all contracts.
- Developmental support provided.
- Developmental team members carry professional indemnity.

Soderlund and Schutte, with respect to community-based projects in Soweto, regard the development team approach as being well suited to facilitate community-based construction for the following reasons:\textsuperscript{22}

i) Ownership of the construction contract remains within the local community.

ii) Local community-based contractors enter into a direct contract agreement with the Council.
iii) Formal employment opportunities are created for Sowetans in that the development team employs storemen, clerks, inspectors, etc., to support the developing contractors.

iv) The development team is separately remunerated for services provided and is, therefore, not perceived as a competitor.

v) A significant proportion (between 30 to 65%) of the value of a projects is channelled back into the community.

vi) Growth of local allied industries is promoted, e.g., transportation, supply of fuel and building materials.

This approach to a large extent, relies on the human factor for its success. As such, the success or otherwise of a project, using this approach, relies to a large extent on the competence, enthusiasm and communication skills of the Construction Manager and his staff. Although the contract documentation and model forms of agreement, etc., describe the construction process in a comprehensive manner, it requires a high level of dedication and commitment on behalf of all the participants, to implement this approach on a project. Where consulting engineers have become involved in this approach, simply to maintain or secure a client and so provide their practices with work, this approach tends to be misunderstood and departures from the agreed upon processes, responsibilities and liabilities can occur. This in turn affects the project in a negative manner. The personality of individuals can also influence a project, e.g., if the Construction Manager cannot communicate with or have the trust and respect of the community or the emerging contractors, difficulties are bound to occur.

Another problem which can arise on a project which involves a series of contracts over a period of time, is that of site staff costs. It is usually not in a project's interests to terminate the services of site staff between series of contracts. Thus if for some reason, the funding body, local authority or the like, delays the awarding of contracts, site staff charges can be incurred. This in turn can distort the management costs associated with a particular phase of a project and cause construction costs to increase.

Croswell sums up this approach by stating that this is an attractive alternative because insofar as the relationship between the employer and the contractor is concerned it is a more realistic situation with no additional obligations being assumed by the employer or his engineer. The employer, however, has the assurance that the local small contractor (by relying on the contractor support organisation) will have the necessary skills available to adequately complete the contract.  

4.8.6 DEVELOPMENT TEAM APPROACH

The cost of community-based projects, inclusive of that associated with the developmental support provided, has been found to be comparable with that of conventional plant-based construction on various projects where the development team approach has been adopted, viz.:
- upgrading of secondary water mains (Soweto): 6-15% less expensive\textsuperscript{11,13}
- internal sewer and water reticulation for a housing development (Sandton): ± 6% less expensive\textsuperscript{23}
- installation of low voltage cables (Ibhayi): 16 to 19% less expensive\textsuperscript{24}
- upgrading of roads using waterbound macadam (Soweto): little or no cost premium\textsuperscript{7}

In all the above mentioned projects, tenders have been awarded to community-based contractors whose tender prices were not more than 10 to 15\% below the Construction Manager’s estimated value. In all cases, the Construction Manager’s estimate, used for tender adjudication purposes, was based upon the prevailing minimum wages laid down in the Wage Order for Civil Engineering Works for casual employees. Community-based contractors had therefore the potential to remunerate their workers in accordance with the prevailing minimum hourly rates on these projects.

The reason for these lower costs being experienced, lies in the cost structure of contracts and the approach which was adopted.

The cost structure of conventional (traditional) contracts and community-based contracts are made up as follows:

**Conventional contracts**

Contract price equals sum of:

- Preliminary and general items
- Labour @ cost + overheads + profit
- Materials @ material price + waste allowance + overheads + profit
- Plant @ cost + overheads + profit

**Community-based contracts**

Contract cost equals sum of:

- Disbursements (provision and maintenance of site facilities, transport for site staff, printing, computer costs, etc.)
- Management fees and site staff charges
• Materials @ cost + waste allowance - settlement discount
• Plant @ cost
• Labour @ cost + nominal overheads + profit

The "non-productive" component of the works using typical values of the above mentioned cost components, expressed as a percentage of the cost of the works, amounts to:

Conventional contract:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary and general items</td>
<td>15%</td>
</tr>
<tr>
<td>Profit on materials and plant</td>
<td>6%</td>
</tr>
</tbody>
</table>

21%

Community-based contract:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disbursements</td>
<td>3,0%</td>
</tr>
<tr>
<td>Site/stores staff charges</td>
<td>11,0%</td>
</tr>
<tr>
<td>Management fees - materials</td>
<td>3,5%</td>
</tr>
<tr>
<td>Management fees - construction</td>
<td>3,5%</td>
</tr>
</tbody>
</table>

21%

From the above analysis, it can be seen that community-based construction should be cost comparable with convention construction and possibly cheaper, as materials and plant are supplied at cost to the project and community-based contractors have lower overheads. Thus in effect, profit on materials and a conventional contractors overheads are traded for development support costs.

What is, however, of interest is that community-based construction practices have proved to be cost effective on a small project in Sandton, involving the installation of water and sewer mains for approximately 40 houses. In this project, the management costs, expressed as a percentage of the project cost, was virtually identical to that of projects which involved the construction of water mains in Soweto and which were some 10 times greater in terms of costs. In addition, this project was estimated to be about 6% cheaper than that of plant-based construction.23 The implications of this is that the cost associated with this approach to construction may not be dependent on the scale of the project.
A CONTRACTOR DEVELOPMENT PROGRAMME

4.1 INTRODUCTION

Construction, albeit housing or infrastructure, involves the effective employment of men, materials, machines and money. Any Contractor Development Programme (CDP) needs to stimulate the development of small-scale contractors in each of these areas over a period of time, starting with the effective employment of men. In South Africa, the building and construction industries are predominantly in the hands of medium and large-scale enterprises which are largely owned and controlled by the white sector of the population. This has, inter alia, arisen from the following:

- A previous political dispensation which favoured the creation of white-owned businesses.
- Policies such as job reservation.
- Disparities in education standards and associated funding levels between different population groups.
- The lack of entrepreneurial training
- The structure of training in the industry which has largely been aimed at improving skills in the technical field to produce better quality workers/employees.

To address this imbalance and to meet the demand for contractors to construct 300,000 dwelling units per annum, (see section 1 of part I) construction methods and the construction process itself need to be changed to facilitate the creation and development of small-scale contractors within disadvantaged communities. This, however, needs to be undertaken without compromising the three absolutes of project management, viz.:

- on time.
- within budget.
- to the required quality.

At the same time, sector efficiency and effectiveness must not be impaired.

The success or otherwise of a CDP can therefore be measured in terms of:

- Band's five absolutes or project management as set out in subsection 1.
• Its ability to enable and empower emerging contractors to benefit from utilising opportunities.
• Its effectiveness in reducing imbalances in access to opportunities in specific regions.26

4.2 KEY OBJECTIVES

The key objectives of a CDP are to:
• Optimise job creation opportunities in the construction of infrastructure and housing.
• Encourage the creation and sustainability of small-scale enterprises.
• Strive towards fulfilling the country's projected needs for the construction of housing and infrastructure.
• Enhance the benefits accruing to the community through their involvement in the construction of buildings and infrastructure.

4.3 GUIDING PRINCIPLES

A CDP should be based on the following convictions:
• An excellent bricklayer does not necessarily make a good contractor.
• A successful contractor must possess certain practical, theoretical and managerial knowledge in addition to individual flair (entrepreneurship).
• Professional management, supervision and training should be used to improve/transfer skills and to ensure satisfactory progress on projects.6
• Commercial skills, which are an important factor in a contractor's success, should be taught.6
• A skill is normally developed by repeating the same work on a repetitive basis.15
• Participants with suitable experience should be allowed to enter the programme at their level of proficiency and not be forced to enter at a beginner level.
• Not all small-scale enterprises will necessarily grow into medium and large-scale enterprises.
• Participants should not be allowed to "camp" in the programme (i.e. operate solely on a continuous basis within the programme) and should be encouraged to leave and return to the programme from time to time.
• Certain small-scale contractors may elect to operate as labour only contractors/subcontractors and not express any desire to progress beyond this level of operation.

• The contract documentation employed should enable emerging contractors to become familiar with industry standards to enable them to ultimately compete in the formal sector of the economy.

• The selection of emerging contractors for participation in a CDP should be on the basis of open tenders.

• Development support provided should be aimed at enabling emerging contractors to operate in the formal sector of the economy.27

• Credibility and financial security are earned through training and through successful, profitable, completion of projects.

A CDP should offer emerging contractors the opportunity to mature into a contractor/subcontractor who has all the resources to execute a project or portion thereof. Such a programme should therefore allow emerging contractors to develop:6

• Commercial skills.

• Managerial and administrative skills.

• Credibility in commercial circles.

• Experience in pricing complete contracts while accepting increasingly greater risk and contractual responsibility.

The structure of a CDP should be such that the supporting structures and the associated construction processes, effectively eliminate the barriers to entry, outlined in section 5 of part I, for those entering the programme and reimposes these barriers as emerging contractors are developed within the programme. This should be done in such a manner so as to enable contractors leaving the programme to compete in the formal sector of the economy at their level of proficiency. At the same time, the CDP should encourage entrepreneurial flair, provide training to enhance business skills and enable participants to learn and mature through experience. Contractor development should take place within the confines of the triangle shown in Figure 3. Care must be taken that development in each of the areas is balanced. A healthy CDP is one that operates within the boundaries of this triangle.

4.4 PROGRAMME FOR CIVIL AND ELECTRICAL ENGINEERING CONTRACTORS

4.4.1 INTRODUCTION

The civil engineering industry in South Africa differs in many respects from the building industry. The building industry, particularly in the
area of house construction, has developed and promoted the emergence of small contractors who operate at one of three levels, namely:

- Provide all materials and labour to construct a complete house.
- Provide labour only.
- Provide labour only for a specific trade, e.g., bricklaying.

Small contractors who are able to operate at one or more of these levels can be found within almost any urban community in South Africa. However, the same is not true of the civil and electrical engineering industry.

Traditionally, infrastructure is constructed by established contractors, whose operations are highly mechanised. These established contractors possess all the resources to execute projects, viz., labour, materials, machines and money. They have the finances required for salaries and wages and the purchase of materials; the credibility in commercial circles to obtain sureties, to open accounts with suppliers and to hire plant; the managerial, commercial, technical and administrative skills required to secure and execute contracts.

The barriers which prevent potential local entrepreneurs or small contractors within underdeveloped communities from engaging in the construction of engineering services such as township roads, stormwater drains and water, sewer and electrical reticulations are presented in section 5 of part I, the major ones being:

- Tendering and contractual requirements, such as the provision of sureties, the inclusion of penalty clauses and the tendering of rates.
- The lack of financial resources to purchase materials, hire plant and tools and pay wages.
- The lack of credibility in commercial circles.
- The lack of commercial, managerial and administrative skills.
- The lack of technical competence.
- The discontinuity of work.
- The prevalence of plant-based construction practices.

Clearly, if small local contractors are to be developed to provide infrastructure, both construction practices (methods) and the construction process need to be changed to accommodate emerging contractors.

The above mentioned barriers to entry can be reduced by:

- The employment of labour-based technologies.
- The provision of access to resources that are lacking, e.g., bridging finance, materials, plant, etc.
- The provision of developmental assistance.
• The structuring of contracts.

However, a CDP is required to facilitate the development of contractors and to provide an environment in which such contractors can develop to their full potential.

Support structures (role models) for the development of contractors have evolved on various civil and electrical projects (refer to 4.4 in section 4 of part I). These structures have not necessarily been developed with a view to support emerging contractors, but to meet project objectives relating to job creation, training and community involvement in construction works which have been imposed by funding bodies seeking to introduce labour-intensive and labour-based construction practices. A noticeable exception is that of Soweto City Engineers' Department (refer to 4.3.3 in section 4 of part I) which initiated a CDP in August 1988 with the objective of:

• creating employment opportunities for Soweto residents.

• stimulating the development of competent contractors from amongst the local Sowetan population.

• retaining as much as possible of the project expenditure within Soweto.

Demands for the incorporation of labour-intensive methods of construction in projects have necessitated the development of innovative approaches to construction to cost effectively manage and incorporate an increased labour component in projects. If labour-intensive construction methods were cheaper than conventional plant-based methods to implement, conventional contractors would have utilised such methods to obtain a competitive advantage in tendering on the open market. The ILO has recognised that small-scale contractors are more liable to choose employment-intensive solutions than large-scale contractors. It is therefore not surprising that some of the approaches developed to implement labour-intensive methods of construction and labour-based practices encourage the development of small-scale contractors. The approaches to implementation developed for labour-based methods of construction, which can be used to promote the emergence of small-scale enterprises, are:

i) The Development Team approach.

ii) The Managing Contractor approach.

iii) The Managing Consultant approach.

Full particulars of these approaches may be found in 4.4 in section 4 of part I. For the reasons set out in section 4 of part I, the Managing Consultant approach is not recommended as a support structure to facilitate the development of emerging contractors. Accordingly, the Development Team approach, the approach favoured in Soweto's CDP, and the Managing Contractor approach, will be put forward as appropriate supportive structures.
It should be noted that the NCLIC Framework Agreement (see 4.4 in section 4 of part I) makes little reference to emerging small-scale contractors, and falls short of addressing their aspirations. Furthermore, participants from local communities do not normally receive entrepreneurial training and are usually engaged by conventional contractors as task-based remunerated "employees".

The CDP for civil and electrical contractors developed in this section is based on Soweto’s CDP\textsuperscript{3,4,6}, which has evolved and developed since 1988.

### 4.4.2 Levels of Contract

A CDP needs to be structured in levels of contract to enable emerging contractors who have different proficiencies, aspirations, business acumen and size of businesses, the opportunity to enter and exit the programme at various stages. At the same time, the levels of contract need to be structured in such a manner that those leaving at any level or stage, can function without developmental support in the formal industry, and those within the programme have reduced and appropriate developmental support at each successive level of contract, with increased contractual responsibility and risk.\textsuperscript{6}

Five levels of contract are proposed\textsuperscript{3,4,6} viz.:

- **Level 1**: labour only
- **Level 2**: labour plus transport of materials to site
- **Level 3**: labour plus transport plus materials (assisted)
- **Level 4**: labour plus transport plus materials (unassisted)
- **Level 5**: labour plus transport plus materials plus full surety

The contractual responsibilities and developmental support required for each level of contract is summarised in Table 1 and the proposed value and duration of contracts at each level is tabulated in Table 2.\textsuperscript{3}

The levels of contract can also be viewed as the re-introduction of the barriers to entry with each successive level of contract to ensure that emerging contractors can be integrated into the mainstream of the economy. This is demonstrated in Table 3.\textsuperscript{29}

The 5 levels provided for in the programme are structured in such a manner that a contractor, who has no resources when he enters the programme, can build up his resources while he learns tendering and contracting skills. This is generally achieved by putting profits back into his business. Credibility in commercial circles at the higher levels of contract can be established by successfully completing a number of lower level contracts.\textsuperscript{29}

Not all contractors will, necessarily, advance to Level 5 and some may only aspire to Level 2 or 3. The programme caters for all levels of contract and allows contractors to operate in a manner similar to that
of the building industry. Competent contractors who operate at Level 2 could, for example, leave the programme and successfully operate as labour only subcontractors to established contractors, on other projects outside of the programme. The programme, by virtue of providing contract opportunities for all levels of work, will also provide emerging contractors with opportunities for continuity of work. The opportunities for contractors who leave the programme and the qualifications of those who enter the programme are depicted diagrammatically in Figure 4.

To ensure that participants within the programme have an incentive to progress to higher levels and not "camp" at a particular level and so effectively exclude others from participating in the programme, it is recommended that the following rules, for example, may be applied:

i) Contractors within the programme can only tender for one level of contract above and one level below the highest level of contract at which they are currently operating at, or where they have operated at in the past.

ii) No contractor within the programme may tender for a Level 2 contract unless he has completed two Level 1 contracts.

iii) No contractor can undertake more than three Level 1 contracts and a total of five Level 1 and 2 contracts.

iv) No contractor can undertake more than three Level 3 and Level 4 contracts and two Level 5 contracts.

v) Contractors who have worked outside the programme can enter the programme at any level provided that they have suitable contracting experience to operate at that level, whereupon they would be subjected to the above mentioned rules.

In this manner, participants will have some opportunity for repetition and continuity of work.

Access to levels of contract should be on the basis of an open tender and should not be linked necessarily to attendance and passing of courses and the like.
Figure 4: A Contractor Development Programme for Civil and Electrical Contractors
<table>
<thead>
<tr>
<th>LEVEL OF SUPPORT</th>
<th>TYPE OF CONTRACT</th>
<th>CONTRACTOR'S CONTRACTUAL RESPONSIBILITIES</th>
<th>DEGREE OF DEVELOPMENTAL SUPPORT PROVIDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Mentor</td>
<td>Provide labour, materials and plant. Provide 5% surety. Engage specialist contractors. Finance all contractual obligations.</td>
<td>Conduct a tender workshop. Advise, coach, counsel, guide, teach, instruct and tutor the contractor. Render assistance in the setting up of proven systems to enhance management and business skills.</td>
<td></td>
</tr>
<tr>
<td>5 Mentor</td>
<td>As for level 4. Provide 10% surety.</td>
<td>As for level 4.</td>
<td></td>
</tr>
</tbody>
</table>

* Refer to paragraph F 4 of Annex F for further particulars.
Table 2: The duration and value of contracts.3

<table>
<thead>
<tr>
<th>LEVEL OF CONTRACT</th>
<th>TYPICAL CONTRACT DURATION</th>
<th>TYPICAL CONTRACT VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 to 4 months</td>
<td>&lt; R100 000 «</td>
</tr>
<tr>
<td>2</td>
<td>3 to 7 months</td>
<td>&lt; R250 000 «</td>
</tr>
<tr>
<td>3</td>
<td>6 to 9 months</td>
<td>&lt; R1 200 000</td>
</tr>
<tr>
<td>4</td>
<td>up to 12 months</td>
<td>&lt; R1 000 000</td>
</tr>
<tr>
<td>5</td>
<td>up to 18 months</td>
<td>&lt; R2 000 000</td>
</tr>
</tbody>
</table>

* Labour only

Table 3: Resources required by contractors at each successive level of contract.29

<table>
<thead>
<tr>
<th>LEVEL OF CONTRACT</th>
<th>ADDITIONAL RESOURCES REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Transport or access to transport. Finances for transport and the supply of minor materials.</td>
</tr>
<tr>
<td>3</td>
<td>Finances for fortnightly wages. Credit with materials suppliers.</td>
</tr>
<tr>
<td>4</td>
<td>Finances for wages. Credit for plant hire and purchase of materials. Access to a surety equal to about 5% of the value of the works.</td>
</tr>
<tr>
<td>5</td>
<td>All the resources of a conventional contractor. Access to a surety equal to 10% of the works.</td>
</tr>
</tbody>
</table>

4.4.3 DEVELOPMENT SUPPORT

The calling for tenders for the construction of infrastructure (albeit by means of labour-based construction methods), from an undeveloped community will not necessarily result in the production of local contractors, as borne out by the absence of black members in SAFCEC. Nor will it necessarily elicit any response whatsoever from the community since such communities invariably lack the commercial and managerial skills in addition to the necessary resources. The approach whereby established contractors are required in terms of the conditions of contract to engage local sub-contractors, wherever
possible, to execute certain aspects of the works is equally unlikely to be meaningful since this approach assumes that sub-contractors exist within an undeveloped community.\(^8\) It is therefore imperative to provide developmental support.

At the other end of the spectrum, there are a handful of small-scale contractors who have risen from the ranks of disadvantaged communities and are competing for work in the open market. They also, however, require developmental support in executing contracts in order to improve their management and business skills and to acquire and develop systems to project manage contracts with an improved level of competence.

For this reason, the nature of the development support provided needs to change once emerging contractors operate at a certain level of proficiency. This occurs at Level 4 (see Table 1). The recommended form of developmental support is, therefore, as follows:

Levels 1 to 3: Development Team approach.

Managing Contractor approach.

Levels 4 and 5: Mentorship approach.

In the Development Team approach, experienced and suitably qualified persons assist local community-based contractors with the administration and management of their contracts, offer technical training, engage specialist contractors and supply the necessary materials and equipment. The development team employs and trains members of the local community to run stores facilities, monitor progress, assist with administration, etc. Normally, the local contractor enters into a contract with the Client/Funding body and the development team is appointed on a fee basis directly by the Client. The development team may be regarded as construction facilitators who arrange to provide resources that the contractor lacks. In a community-based project, the development team must ensure that certain specific functions are carried out, normally by the following individuals who assume distinct responsibilities:

- The Design Engineer.
- The Engineer.
- The Construction Manager.
- The Materials Manager.

The duties and responsibilities of the Design Engineer and the Engineer are exactly the same as for that performed by a consulting engineer for the design and tender stage and construction stage, respectively, for conventional contracts. The duties and responsibilities of the Construction and Materials Managers are, however, as follows:

Construction Manager
• offer advice, practical assistance and training
• provide plant other than small tools
• arrange for specialist work
• arrange for payment of fortnightly/monthly wages (see paragraph F4 of Annex F)
• transport of materials to site (Level 1 only)

Materials Manager

• provide all materials (Level 1)
• provide most materials (Level 2)
• make materials available for purchase (Level 3)

Construction and Materials Managers carry professional indemnity insurance which may be called upon in the event of any negligence on their parts. (see 4.4.6 in section 4 of part I)

Engineering contractors, project managers or consulting engineers may perform the duties and assume the responsibilities of the Construction and Materials Managers. However, the design and supervision of the works, i.e., the duties and responsibilities of the Design Engineer and the Engineer must be undertaken by Professional Engineers or Technologists.

It should be noted that the Construction and Material Managers are appointed by the Client on a fee basis. Thus the contractor is motivated by profit to successfully complete his contract whereas the development team is motivated by seeking to secure another appointment (see Figure 5.) Since the development team is appointed on a fee basis, materials are usually supplied to the Client at cost, i.e., the net cost after all trade and settlement discounts have been deducted. There is furthermore, no mark-up for profit on labour and specialist contracts. (further particulars may be found in 4.4.6 and 4.8.6 in section 4 of part I.)

In the Managing Contractor approach, an experienced conventional contractor contracts with the Client to administer, manage, finance, train and supply materials and equipment to a labour-based subcontractor. The Managing Contractor, accordingly, undertakes the duties of the Construction and Materials Managers as described in the Development Team approach. In this approach, the local contractor enters into a nominated subcontract agreement with the Managing Contractor who, in turn, will have a contract with the Client. Since the emerging contractor is a nominated sub-contractor, the Client can exercise discretion and a measure of protection against tendering too low prices in the appointment of emerging contractors. This approach
is most suited to Level 2 contracts, where emerging contractors have either been "blooded" by the Development Team approach or been formally trained in contracting approaches by a training organisation.

Conventional contractors who act as Managing Contractors, do not usually possess the necessary in-house training skills to train emerging contractors. At the same time, by contracting to train emerging contractors, situations can arise where the Managing Contractor is cast in the role of a "player and a referee" or experiences conflicts of interest. To overcome these deficiencies in this approach, it is advisable to appoint a Training Manager to undertake the training of the emerging contractors and to mentor them. In addition, the Training Manager can co-ordinate the training to ensure that it complies with the Training Structure Plan (refer to subsection 11).

On large projects where a Development Team approach is employed to support several emerging contractors, the Training Manager can oversee the training and supplement it, should it not meet with the requirements of a Training Structure Plan.

In the Mentorship approach, in the case of Level 4 and 5 contracts, experienced and qualified persons are appointed on a fee basis, to ensure that emerging contractors:

- Acquire the necessary skills to win tenders in a competitive and open market.
- Improve their management and business skills.
- Acquire and develop systems to project manage contracts with an improved level of competence.

Accordingly, mentors undertake to provide the following:\(^{21}\)

Preconstruction stage

- Conduct a tender workshop.

Construction stage

- Advise, coach, counsel, guide, teach, instruct and tutor the contractor.
- Render assistance in the setting up of proven systems to enhance management and business skills.
- Identify strengths and weaknesses of the contractor and address specific areas of need.

The contractual agreements between participants in each of the above mentioned approaches is illustrated in Figure 5 and the contractual relationships in terms of the construction contract in Figure 6.
Figure 5: Contractual relationships between participants in a Contractor Development Programme (Civil and Electrical Engineering Projects)
Figure 6: Contractual relationships in different support structures for emerging contractors in civil and electrical engineering contracts.
4.4.4 CONTACT DOCUMENTATION

One of the primary objectives in a Contractor Development Programme is the training and development of competent contractors. It is therefore considered highly desirable that contract documents should follow the format laid down for conventional contracts, which in the case of civil engineering contracts is contained in part 1 of SABS 0120.9 Furthermore, contracts should be legally and technically correct.6 It is for this reason that it is recommended that the General Conditions of Contract for Works of Civil Engineering Construction, Sixth Edition (1990) or the General Conditions of Contract for use in connection with Electrical and Mechanical Works, First Edition (1985) be used as the basis of contract for all levels of contract.6,25

The temptation to produce bridged, condensed or simplified specifications and general conditions of contract should be strongly resisted since alternative documents would not:3,25

- Be suitable for higher levels of contracts without major revisions.
- Be familiar to the development team, managing contractors and the local authorities service departments.
- Afford contractors the opportunity of becoming familiar with industry standards and so preclude them from tendering on conventional contracts elsewhere.

Apart from addressing the subject of monetary reward, a contract document defines the rights, obligations and risks of the parties involved in an engineering contract, as well as the nature, quantity and quality of the work that is to be executed.

In the Development Team approach, the labour-based contractor is directly employed by the Client and is the main contractor. He is, however, supported by a Materials and a Construction Manager, as well as specialist contractors appointed by the Construction Manager. The contract documents need to clearly define the role and interfaces between these parties and adequately deal with the risks, rights and obligations of each party including the Client (Employer) and the Engineer. The principle features of contracts for each level of contract should be as set out in Table 4.

The modification of SABS 1200 series standardised specifications20 for construction of Level 1 to 3 contracts has been found to be somewhat impractical and cumbersome,6,6,9 It is preferable to write standardised specifications for specific labour-based construction activities based on SABS 1200 specifications and in the format set out in SABS 0120: part 1.

Soderlund and Schutte Inc have produced contract documentation suitable for Level 1 to 3 contracts for both the Development Team...
approach and the Managing Contractor approach. In addition, they have produced the S100 standardised specification which is suitable for use with contracts where the developmental support may be either in the form of a managing contractor or a development team. This specification follows the format laid down in SABS 0120 part 1 and covers most of the major specifications that would be required in infrastructure projects, i.e. the equivalent specifications to the SABS 1200 series, namely, specifications A, D, DB, DM, G, L, LB, LC, LD, LE, LF, ME, MF, MK and MS. It also contains miscellaneous electrical engineering and building specifications.

A Model Form of Agreement has also been prepared for the appointment of a development team and the appointment of a mentor. This document is based on the South African Association of Consulting Engineers' agreement and is appropriate for works of both electrical and civil engineering natures. Included is a suggested scale of fees for the remuneration of the development team. In terms of the agreement, time-based fees relate only to site staff, additional services performed and materials management. The appointments of the Design Engineer, the Engineer, Mentor and the Construction Manager are based on percentage fees relating to the cost of the works, or the cost of construction, as appropriate.

Specifications normally address standards of workmanship and the acceptable post-construction limits of performance of the structures and components thereof. They rarely describe how the work is to be performed. Consequently manuals describing construction methods should be prepared to address this shortcoming. These manuals can be referenced in the specifications and can contain background and supplementary information relating to and guidelines for the correct installation of components in the works.
Table 4: Principle features of contracts at each successive level of contract.

<table>
<thead>
<tr>
<th>LEVEL OF CONTRACT</th>
<th>CONTRACT PROVISIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rise and fall contract price adjustment formula based on ± 95% of the amount by which the minimum statutory hourly wage for labourers changes from that prevailing at the close of tenders.</td>
</tr>
<tr>
<td></td>
<td>Cession of income mandatory should contractor require financing of fortnightly wages.</td>
</tr>
<tr>
<td></td>
<td>Lump sum tenders admissible provided that tenderers price each schedule separately and the Construction Manager has the right to enter in rates in the schedules which, when extended and totalled, equal the tendered lump sum.</td>
</tr>
<tr>
<td></td>
<td>S 100 Standard Specifications, modified as necessary by project specifications.</td>
</tr>
<tr>
<td></td>
<td>No surety called for.</td>
</tr>
<tr>
<td></td>
<td>No site facilities provided by contractors.</td>
</tr>
<tr>
<td>2</td>
<td>Rise and fall contract price adjustment formula based on ± 85% of the amount by which the minimum statutory, hourly, wage for labourers changes from that prevailing at the close of tenders.</td>
</tr>
<tr>
<td></td>
<td>Cession of income mandatory should contractor require financing of fortnightly wages.</td>
</tr>
<tr>
<td></td>
<td>Lump sum tenders are inadmissible.</td>
</tr>
<tr>
<td></td>
<td>S 100 Standardised Specifications, modified as necessary by project specifications.</td>
</tr>
<tr>
<td></td>
<td>No surety called for.</td>
</tr>
<tr>
<td></td>
<td>No site facilities provided by contractors.</td>
</tr>
<tr>
<td>3</td>
<td>Rise and fall contract price adjustment formula on ± 35% of the amount by which the minimum statutory hourly rate for labourers changes from that prevailing at the close of tenders; actual increase on price of materials from submission of tenders.</td>
</tr>
<tr>
<td></td>
<td>Cession of income mandatory should contractor require financing of monthly wages or materials or both.</td>
</tr>
<tr>
<td></td>
<td>S 100 Standardised Specifications, modified as necessary by project specifications.</td>
</tr>
<tr>
<td></td>
<td>No surety called for.</td>
</tr>
<tr>
<td></td>
<td>Provide certain site facilities.</td>
</tr>
<tr>
<td>4</td>
<td>Surety equal to 5% of cost of the works called for.</td>
</tr>
<tr>
<td></td>
<td>All site facilities required in terms of SABS 1200 A.</td>
</tr>
<tr>
<td></td>
<td>SABS 1200 Standardised Specifications, modified as necessary by project specifications.</td>
</tr>
<tr>
<td>5</td>
<td>Surety equal to 10% of cost of the works called for.</td>
</tr>
<tr>
<td></td>
<td>All site facilities required in terms of SABS 1200 A.</td>
</tr>
<tr>
<td></td>
<td>SABS 1200 Standardised Specifications, modified as necessary by project specifications.</td>
</tr>
</tbody>
</table>
4.4.5 TRAINING

Credibility and financial security are earned through training and through successful, profitable, completion of projects. A CDP must therefore provide for training through participation in a project to ensure that emerging contractors possess the necessary skills and competencies outlined in section 3 to profitably run their enterprises. Generally, training should have both a "theoretical" and "practical" aspect and should comply with the requirements of a formal Structured Training Plan as set out in subsection 11.

Training should preferably be overseen by a Training Manager and should commence when tenders are advertised to afford local entrepreneurs and emerging contractors the opportunity to tender. Depending upon the level of contract, this could range from the conducting of tender classes to the staging of tender workshops. This should, depending upon the level of contract, be followed by:

- an initial mentorship period.
- a technical training phase.
- a formal training phase.
- a counselling phase.

A Construction Manager's training focus is to train contractors and their staff on-the-job to ensure that the works are constructed within time and to the correct quality. This is unusually confined to:

i) Informing tenderers as to the nature of the works and tender documents.

ii) Instructing tenderers in methods of costing and tender procedures to ensure that reasonable tenders are received.

iii) Assisting the Contractor with:

- The preparation of and submission to the Engineer for his approval of a programme of construction.
- The setting out of the works.
- The structuring and employment of his workforce.
- The administration and execution of the contract.
- Registration for RSC levies, Workman's Compensation Insurance and as a VAT vendor.
- The preparation of payment certificates.
- The handing over of the works to the Client upon completion.
iv) Teaching contractors how to order materials required for incorporation into the works.

v) Training a contractor in-house and on-the-job in the following:

- The basic technical skills required to execute his contract.
- The need to develop communication skills.
- What is expected of a contractor.
- The need to execute appropriate tasks correctly the first time.
- How to control and motivate his workforce.
- The necessity of planning.
- How to prepare and use construction programmes.
- The relationship between the tender, productivity and payment certificates.
- Payment procedures for Workman's Compensation Insurance, RSC levies and VAT, etc.

A Mentor's training focus, on the other hand, is on developing the strengths and weaknesses of contractors.21 The training provided by the Construction Manager is largely based on a need to know principle. As such, the preparation of detailed construction manuals, training manuals, codes of practice and the like and the provision of formal training courses by recognised training agencies are beyond the scope of his normal services. It is the function of the Training Manager to undertake need assessments, develop training programmes and engage the necessary recognised training organisations in accordance with the Structured Training Plan to ensure that emerging contractors, commensurate with their level of contract, receive acceptable training, in respect of the following:

- How to tender.
- How to execute contracts.
- How to run a business.

4.4.6 Tender Adjudication Criteria

At the lower levels of contract, a relatively unsophisticated contractor is quite likely to tender a price which is either extremely high, or unrealistically low. In the former case, the tenderer will have to learn by experience in order to be awarded a contract. In the latter case, however, it is necessary to protect the tenderer from his own folly.6 For this reason, the manner in which tenders in the public sector are commonly awarded to the lowest tenderer is not appropriate for levels of contracts up to and including 3.
In order to protect emerging contractors/subcontractors from tendering unrealistically low prices, the Construction Manager, in the case of Development Team approach, and the Consulting Engineer, in the case of the Managing Contractor approach, should prepare an estimate of the value of the contract. This estimate should be based on an agreed upon profit margin, average productivity rates, and prevailing minimum wages and statutory obligations. This estimate, in the case of Level 1 and 2 contracts/subcontracts should be read out immediately prior to the opening of tenders so as to:

- Reduce the element of subjective judgement in the exercising of protection provided for emerging contractors.
- Ensure transparency in adjudication procedures.
- Enable tenderers to know where their price stands, with respect to the tender price, for which the contract is likely to be awarded.

The suggested adjudication criteria for the various levels of contract, are as follows.

**Level 1**

Eliminate tenderers whose tender price, less all provisional sums, are more than 10% below the Construction Manager's/Consulting Engineer's estimate.

Award contract to tenderer immediately above the cut off point subject to the following factors being acceptable:

- Compliance with the conditions of Tender.
- Tender price make up.
- Ability to supervise and control labour.
- Current work situation.
- Ability to complete the contract within the time laid down.
- Rates and prices being balanced.

**Level 2**

Eliminate tenderers whose tender price, less all provisional sums, are more than 15% below the Construction Manager's/Consulting Engineer's estimate.

Award contract to tenderer immediately above the cut off point subject to the factors described in Level 1 being acceptable in addition to the tenderer demonstrating that he/she can transport materials to the site.

**Level 3 Contracts**

The contract should be awarded to the lowest valid tenderer subject to the following factors being acceptable:
• Tender price is above the Construction Manager's/Consulting Engineer's estimate (i.e., cost of works allowing no profit margins) or the tenderer can furnish the Engineer with valid reasons for the tender price being less than the Construction Manager's/Consulting Engineer's cost estimate.

• Tender price make up.

• Credit facilities for the procurement of materials from sources other than the Materials Manager.

• Arrangements for the storage of materials and site facilities.

• Current work situation.

• Ability to complete the contract within the time laid down.

• Unrealistic rates or prices.

Level 4 and 5 Contracts
The contract should be awarded to the lowest tenderer, as is the case for conventional contracts.

The above mentioned approach to the adjudication of tenders is currently being used in Soweto's CDP and has been accepted in principle by participants at a recent workshop conducted by the Soweto's City Engineer’s Department which included representatives of NACEC, the SDBF and the Soweto Civic Association. This approach also ensures that the emerging contractor has the potential to remunerate his employees at the prevailing minimum wage levels.

REFERENCES


29. Watermeyer, RB and Band, NG: Presentation on Soweto's Contractor Development Programme made to the Metropolitan Chamber, February 1994.
