

COMMUNITY-BASED CONSTRUCTION : MOBILISING COMMUNITIES TO
CONSTRUCT THEIR OWN INFRASTRUCTURE

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ABSTRACT

The development and upgrading of human settlements can provide local communities with both employment and entrepreneurial opportunities. Underdeveloped communities all have one basic resource - their own labour. This resource can be utilised and developed when services are provided in order to improve the quality of life.

The labour content of a construction project can be increased by substituting men for machines. However, if the technology employed is changed to make it appropriate for manual construction, unskilled and semi-skilled workers can carry out the work with minimal reliance on plant. This change in methodology serves to reduce the barriers to entry for local entrepreneurs to the engineering services construction industry. Should professional support be furnished to advise, train and assist local entrepreneurs and to provide all the resources needed, underdeveloped communities can be empowered to undertake the construction/upgrading of services within their own settlements.

The training of local, small contractors (entrepreneurs) on an *earn and learn* basis on community-based construction projects injects into the community commercial, managerial administrative and technical skills. At the same time the community retains and cycles a significant proportion of the money spent on the project.

The challenge to the professionals involved is to develop and implement labour-based technologies in such a manner that the benefits accruing to the community are maximised.

KEY WORDS:

community-based construction; labour-based construction; professional support; services; small contractors.

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, eg., 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 engineering industry.

Traditionally, engineering services and structures are constructed by established contractors, whose operations are highly mechanised. These established contractors possess all the resources required 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 bulk of their labour forces are recruited from other areas and, as a result, the community for which the service is constructed is, in the end, left only with the service, since a negligible percentage of the money spent on the project stays within the community.

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:

- * 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 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.

Clearly, if small local contractors are to be developed to provide infrastructure within their own settlements, both construction practices (methods) and the construction process need to be changed to accommodate emerging contractors. At the same time, projects should be structured so as to:

- * Create employment opportunities.
- * Promote community involvement.

- * Impart technical skills to the unskilled and semi-skilled members of the community.
- * Transfer administrative, commercial and managerial skills to the community.
- * Retain, as far as possible, the funds expended on the project within the community.
- * Develop contractors and entrepreneurs from amongst the local community.

In this manner, the resources of the community can be built up and contractors can become involved in various aspects of construction and operate at different levels, as is the case in the building industry.

REDUCING THE BARRIERS TO ENTRY

The changing of the construction methods from plant-based to labour-based can reduce some of the aforementioned barriers to entry of local entrepreneurs into the construction industry. These changes should extend far beyond the mere substitution of men for machines. Labour-based technologies, whereby the methods employed in the construction process are changed to render it appropriate for manual construction and simplified so that relatively unskilled workers can complete projects with minimal reliance on plant, need to be developed. Such technologies, must, however, ensure that the cost and quality of the end product are comparable with those of plant-based construction.

Labour-based construction methods, in short, necessitate the complete reappraisal of design and construction techniques in order to find solutions appropriate for manual methods. The design approach needs to question and challenge traditional procedures and methods. (Watermeyer 1992a, 1992b, 1993)

Changes in technology will not, on their own, produce local contractors, as skills and competencies in commercial, administrative and managerial fields remain unaddressed. Resources need to be provided and professional assistance is required, ie., technical, managerial, commercial and administrative skills need to be taught, access has to be provided to reliable sources of materials and plant, and finance has to be made available. In addition, contracts need to be structured in such a manner that sureties can be waived.

PROFESSIONAL SUPPORT

Professional support and the resources lacked can, readily, be provided by a professional team appointed by the client. The functions and duties of the professional team, for communities lacking all resources with the exception of labour, are summarised in Table 1.

Thus, the team, in addition to providing conventional consulting services to the client, advises, trains and assists local community-based contractors in the administration and execution of their contracts. It arranges for the supply of plant, equipment and specialist services; procures, supplies, issues and delivers materials to the various construction sites; and arranges fortnightly wage payments.

Table 1 : The duties of participants in labour-based contracts using the Professional Team approach (Watermeyer 1992a, 1993)

BODY	DUTIES
Client	* Appoint a Professional Team * Fulfill obligations in terms of the General Conditions of Contract * Provide bridging finance for Construction/ Materials Manager * Permit alternative tender structures
Engineer	* Administer the contract * Direct staff who: - check setting out - measure the works - conduct inspections to ensure compliance with specifications * Arrange acceptance tests
Design Engineer	* Design the works * Prepare contract documentation * Advise on materials * Call for tenders
Materials Manager	* Procure materials * Store materials * Issue materials * Account for materials
Construction Manager	* Advise, assist and train labour-based contractor in administration and execution of the contract * Arrange for specialist work * Arrange for the supply of plant and equipment * Arrange fortnightly payment to labour-based contractor * Transport materials to the site * Liaise between the contractor and the client * Provide monitoring systems to ensure that the project is completed on time, within budget and to the required quality.
Labour-based contractor	* Provide superintendence * Provide labour * Provide small tools

The community can, also be involved in the support of emerging community based contractors to the extent that the professional team employs and trains members of the local community to operate stores facilities, monitor progress, assist with administration, etc.

The contractor enters into a contract directly with the client. The ownership of the contract, therefore, remains with the community-based contractor. The professional team, who are separately appointed by the client, function as construction facilitators who arrange for the provision of resources that the contractor lacks, as illustrated in Figure 1.

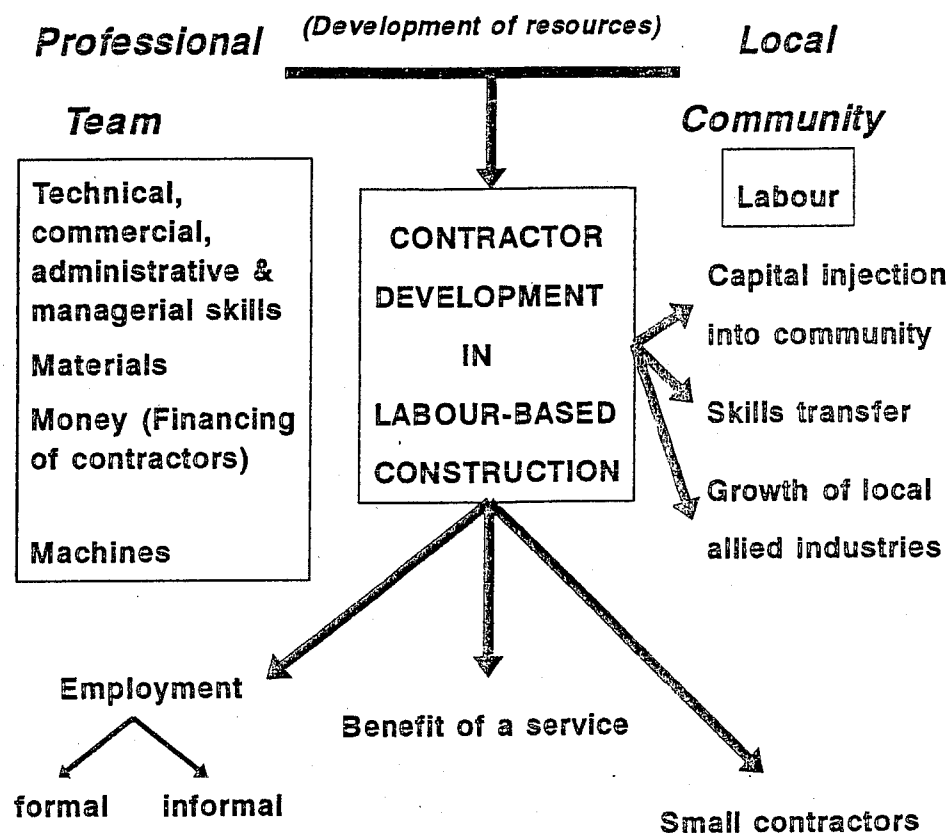


Fig. 1: The concept of community-based construction

THE STRUCTURE OF CONTRACTS

Apart from addressing the subject of monetary reward, an engineering contract document defines the rights, obligations and risks of the parties involved in the contract, as well as the nature, quantity and quality of the work to be executed.

In the professional team approach, the labour-based contractor is directly employed by the Client and is, as such, the main contractor. However, the labour-based contractor is 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 roles of and interfaces between these parties and deal with the risks, rights and obligations of each party including that of the client and the Engineer. (Watermeyer, 1992a, 1993, McCutcheon et al, 1993)

To reduce the contractual barriers facing aspirant contractors and to promote their development as contractors, contracts should be based on industry standards such as the General Conditions of Contract for Works of Civil Engineering Construction, Sixth Edition 1990, and should include the following provisions:

- * 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 Client 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 Client.
- * The Client through the Construction and Materials Managers, supplies and delivers to the site all materials and plant required.
- * The Contractor supplies, supervises and pays all labour required for the contract.
- * The Contractor supplies all minor hand tools.
- * The Construction Manager arranges for specialist work, e.g. blasting, to be carried out.
- * Payment is made to the Contractor at monthly intervals and a retention of 10% is held by the Client until the contract is completed. The Contractor may, subject to certain conditions, receive advance payment, at fortnightly intervals, in order to assist him in financing the contract.
- * The Contractor is required to remedy defects for 6 months after completion of the Works.

The sizes of contracts should be such that the contract duration is between 3 and 6 months and several contracts may run concurrently. A single professional 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.

The risk to the Client, in spite of the fact that no sureties are called for, is probably less than that on conventional contracts. Materials and plant are supplied by the professional team at cost less all trade and settlement discounts, while the labour-only contractor is paid for work done, which is usually measured on a fortnightly basis. The professional team members carry professional indemnity insurance which may be called upon in the event of any negligence on their parts. (Watermeyer and Davis, 1993)

A CONTRACTOR DEVELOPMENT PROGRAMME

Construction involves the interaction of men, materials, money and machines. At the start of a community-based construction project, most developing communities can only contribute human resources with limited skills. During the course of construction, a transfer of skills takes place, and resources within the community are built up as developing contractors purchase their own equipment and build up financial resources with the profits made.

At the lowest level of community-based contract, the emphasis is on introducing contractors to tendering procedures and contract documentation, the acquisition of basic technical and administrative skills and the employment and supervision of labour. At this level, contractors develop only limited managerial, commercial and administrative skills, particularly with respect to the procurement of materials and plant. At the same time the responsibility assumed and the degree of contractual risk is minimal.

A contractor development programme can offer the developing, community based contractor the opportunity to mature, eventually, into a conventional contractor, who has sufficient resources to execute a project. Such a programme should allow local contractors to develop (Watermeyer 1992a):

- * Commercial skills
- * Managerial and administrative skills
- * Credibility in commercial circles
- * Experience in pricing complete contracts, whilst accepting increasingly greater risk and contractual responsibility

Such a programme which has been produced by the Contractor Development Team (Watermeyer, 1992), is set out in Table 2. Five levels of contractor development are identified. At each successive level, the contractor's responsibility is increased and the management function of the professional team is diminished.

As the levels of development increase, contractors become responsible for the distribution of materials, the financing of wages, the procurement of materials, the furnishing of sureties and the provision of plant; the degree of protection being progressively reduced. The programme gives contractors the opportunity to develop managerial skills and financial expertise and resources, whilst acquiring plant and technical skills.

Not all contractors will, necessarily, advance to Level 5 and some may only aspire to Level 2 or 3. Similarly, not all projects will be of sufficient duration to permit the introduction of successive levels of contract. Projects should, wherever possible, cater for as many levels of contract as the available resources within a community suggest to be appropriate, provided, always, that suitable candidates, with the necessary resources, exist within the community.

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.

Table 2: Five levels of Contractor Development
(Watermeyer 1992a)

LEVEL	CONTRACTOR'S CONTRACTUAL RESPONSIBILITY	CONSTRUCTION/MATERIALS MANAGERS' DUTIES
1	Provide labour Provide small tools	Offer advice, practical assistance and training Provide and distribute materials Provide plant other than small tools Finance fortnightly wages
2	Provide labour Provide small tools Provide minor materials Produce, finance and administer transport for distribution and collection of materials and plant	Offer advice, practical assistance and training Issue most materials Provide plant other than small tools Finance fortnightly wages
3	Provide labour Provide small tools Provide all materials Provide transport Finance fortnightly wages	Offer advice, practical assistance and training Provide plant other than small tools Offer materials for purchase
4	Provide labour Provide all materials Provide all plant and transport Finance all contractual aspects including the provision of surety	Offer advice, practical assistance and training Offer materials for purchase and plant for hire
5	Provide all labour, plant and materials Finance all contractual obligations	Offer advice and consulting services

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 necessary to ensure that budding contractors are able to fend for themselves in the open market. This is best achieved by involving the contractors in specialised programmes, such as the programme developed by Promatra entitled *Developing the Entrepreneurial Contractor*, which is aimed at contractors working in the informal sector of the market who desire to compete in the formal sector (Watermeyer 1992a). Additional funding is required to sponsor such programmes, as this type of training is not included in the duties of the Construction Manager. On large projects, the cost of such training is relatively insignificant.

PROJECTS ON WHICH COMMUNITY-BASED CONSTRUCTION PRACTICES HAVE BEEN IMPLEMENTED

The principles, contract provisions and professional support structures described above have been thoroughly tried, tested and developed in the course of the Contractor Development Programme which commenced in Soweto in August 1988.

The programme was initiated by the Soweto City Engineer's Department in an attempt to address the major short comings seen in a services upgrading programme in the early 1980's which had involved the expenditure of hundreds of millions of rands. From an engineering and management point of view, the upgrading project had been 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 (Watermeyer and Davis, 1993):

- * 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 and administrative fields.
- * The amount of project expenditure retained within the community was insignificant.

The Department embarked upon a series of experimental projects during 1987 and, based on the lessons learned, decided that the following policies should be adopted (Watermeyer 1992a):

- * 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.

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 implementation by means 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
- * 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. Changes in technologies, contract documentation and support structures were developed to reduce the barrier to entry facing local entrepreneurs and small building contractors.

Between August, 1988, and January, 1993, 76 Level 1 and 5 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 Construction Manager (Watermeyer, 1992a, 1993). Some 35 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 Central Witwatersrand Regional Services Council (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 has not advanced beyond Level 2 contracts. Nevertheless, at the end of 1992, just over R32 million had been spent on the upgrading of the water supply system and some R1,6 million on the construction of residential roads using water-bound Macadam base courses. Approximately 207 km of secondary water mains were laid and 9300 erven were replumbed. In the 1992/93 financial year, approximately R24 million or more than 25% of the funds received by Soweto from the CWRSC, was made available to the CDP.

An analysis of CDP projects has revealed that (Watermeyer 1992a, 1992b, 1993):

- * 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. It is estimated that some 800 people could be continuously employed should the funding level be R36 million per year.

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 City Engineer (Electrical) of Port Elizabeth visited Soweto and was exposed to the Contractor Development Programme (Watermeyer 1993). 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 professional team which had been established in Soweto rendered assistance to the local consultants in the form of 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% (McCutcheon et al, 1993).

Other projects for local authorities in Port Elizabeth and the PWV area (Watermeyer 1993) have included the construction of a water and sewer reticulations including all external plumbing work, to a low cost housing development and squatter settlements the erection of toilet structures and the installation of on-site digestors.

A four year housing development costing R120 million in Port Elizabeth for a private sector developer has also been implemented using the principles previously described (Band 1993). In this instance, three levels of contractors were employed on the project, being those who could provide the materials and labour, those who could provide labour only and those who could provide labour for a specific trade. Contractors of the third type were assembled into teams supported by a Construction Manager, to enable them to construct complete houses. Members of the local community were also trained to sell the houses which were constructed.

CONCLUSIONS

Community-based construction shifts the focus in a project to the means used, to achieve the desired end. Modification of construction methods and the provision of professional assistance to facilitate the construction process can overcome all the barriers which prevent local entrepreneurs and small builders employing members of the community, from contracting to construct, or upgrade, township services.

Community-based construction:

- * Promotes the economic development of a community.
- * Channels a significant portion of capital expenditure into the local community.
- * Builds up the resources of a community.
- * Enables community members to acquire technical, commercial, administrative and managerial skills, which in turn can lead to a diversity of employment opportunities.
- * Is cost comparable with traditional construction practices.
- * Is generally able to meet time constraints.
- * Is able to meet quality requirements.
- * Is suitable for the provision and upgrading of township services (both civil and electrical), refuse removal and the provision of housing, schools, clinics and community centres.
- * Can be established in a community at nominal start-up cost and with short lead times.
- * Allows community leaders to direct their urban development needs so as to benefit their own people.

The challenge to professionals is to develop and implement labour-based technologies in such a manner that the benefits accruing to the community are maximised. The opportunity presented to the community is the acquisition of various skills and the retention of a significant proportion of the money spent on the project. The acquisition of skills in turn can open the doors to a diversity of employment opportunities whilst the retention of money spent on the project will ensure that the resources of the community are in fact developed.

REFERENCES:

Band, N.B. (1993) Community-based Housing Development. XX1st IAHS World Housing Congress, Cape Town, South Africa.

McCutcheon R.T., van Zyl C.W.L., Croswell J, Meyer D and Watermeyer R.B. (1993). Interim guidelines for labour-based Construction Projects. Development Bank of Southern Africa.

Watermeyer, R.B., Ed. (1992a). Contractor Development in Labour-based Construction. The Contractor Development Team, Johannesburg.

Watermeyer, R.B. (1992b). Contractor Development in Labour-based Construction. EPPIC '92 - Poverty and the Environment. Session 7, September, Midrand.

Watermeyer, R.B. (1993) Community-based Construction. SAICE/SARF symposium on Labour-Intensive Construction. March, Midrand.

Watermeyer, R.B. and Davis A.D. (1993). Professional Support Structures Employed in Community-based Construction Projects in Soweto. Paper submitted for publication in the IMIESA journal.