

BAND TECHNICAL PUBLICATIONS



MANAGEMENT OF DAY LABOUR PROJECTS FOR INDIAN BAND CONSTRUCTION MANAGERS

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MANAGEMENT OF DAY LABOUR PROJECTS FOR
INDIAN BAND CONSTRUCTION MANAGERS

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MANAGEMENT OF DAY LABOUR PROJECTS FOR
INDIAN BAND CONSTRUCTION MANAGERS

1.0

INTRODUCTION

Construction projects, whether complex or simple, should be viewed by the construction manager as a combining of available resources (for example, people, money, materials, contracts and equipment) in such a manner that the end result will achieve the project goals. These project goals can and should be expressed in terms of getting the work done within the time required, making sure the quality of the finished job is that which was originally designed, keeping the costs within the approved estimate, and last but not least doing the work safely.

A construction project must be planned, organized, directed, and controlled. Disregard of these processes will, in all probability, lead to misuse of resources and failure to meet project goals.

No two construction projects are exactly alike so procedures must be adapted to meet different circumstances and conditions. In this respect the information in this publication is general in nature. The construction manager must make any adjustments which are needed to reflect the type of work involved, the cost of the project, and any unusual circumstances. As well adjustments must be made to procedures if necessary to accommodate such considerations as band hiring practices or purchasing policies, band council resolutions, contribution arrangements. The functions of the project officer should be clear and understood by all.

The information contained in a publication such as this must be combined with experience and good judgement on the part of the construction manager. It is important that the services and knowledge of professionals and qualified tradespeople be utilized when necessary. The roles of these specialists should not be confused with that of the construction manager.

The emphasis throughout this publication is on day labour projects.

In addition to construction managers, anyone who wishes to gain a better knowledge of construction management will find the information useful and interesting.

2.0

DEFINITIONS

Accountability: the manager is liable to be called to account for specific actions or lack of actions related to the achievement of predetermined goals.

Activity: a particular task which forms part of the project and which may be carried out over a planned time period, for example, a feasibility study, identification of personnel requirements and preparation of a project brief.

Contractor: a company or individual who may enter into a contract to carry out specified work or provide services.

Construction contract: an agreement entered into for the construction, repair, renovation or restoration of any work.

Construction manager: an individual who is assigned the responsibility of carrying out the day to day management of the implementation of the project. This person will normally report to the band council but will maintain close liaison with the project officer. (Note: a specific agreement such as a contribution arrangement may call for a project manager who will normally be responsible to the chief or council. The construction manager would in turn normally be responsible to the project manager.

Construction project: a package of activities carried out in sequence or together with a defined set of objectives. A construction project must be undertaken within a specified period of time and at a specified cost.

Construction superintendent: an individual experienced in construction and frequently a tradesperson who reports to the construction manager and is responsible for assigning labour and equipment and for supervising the actual work. Occasionally the construction manager is also the construction superintendent.

Day Labour Project: A project where the work is managed, labour is hired and supervised, and construction materials are purchased or supplied by the band. (Note: in a day labour project, certain parts of the work which require skills or equipment unavailable to the band may be carried out by contract.)

Goal: a measure of attainment in approaching an objective. It must be specific at all organizational levels, be stated as an end result in measurable terms and incorporate a date of attainment.

Objective: a broad statement of an end result or condition which is to be achieved at a future point in time.

Project brief: a document which transmits information and instructions from one group to another for the purpose of implementing a phase or phases of a project.

Project management: the consolidation of the management of an entire project from the initial conceptual planning through programming, budgeting, design and implementation under a single responsible manager for whom resources are especially dedicated for the duration of the project. Project management requires the establishment of a temporary management structure which has the requisite authority and responsibility for the entire project.

3.0 ROLES AND RESPONSIBILITIES

3.1 Construction Manager

The construction manager is appointed by council for the duration of the project. This person must be competent and able to work with and supervise others. The principal duties are:

- a. to review the project schedule, budget and resources and to be satisfied that the project can be implemented within these constraints;
- b. to prepare a cash flow and check this against the proposed source and timing of funds to ensure that funds will be available when required;
- c. to carry out a site inspection to become familiar with conditions, and to ensure that the site is suitable for the proposed facility and that the necessary municipal services will be available when required;
- d. to prepare a project implementation schedule as the basis for procuring materials, engaging labour, assembling equipment, letting of trade and specialists' contracts and generally controlling the progress of the work;
- e. to engage the necessary site supervisory staff and, if administrative services are not available from the band office, a small support staff to carry out day to day administrative services;
- f. to ensure that all materials are procured, delivered to the site, stored and secured according to established procedures, and are available on the site when required;
- g. to ensure that the necessary labour and trades-people are engaged at the required time and released when their services are no longer required;

- h. to ensure that all equipment required for the project is available on site when required;
- i. to ensure that contracts for specialist or trade work are let in accordance with established procedures and that the work of contractors is coordinated with that of the labour;
- j. to manage the implementation of the project in accordance with the contribution agreement, the project brief and the applicable codes, regulations and standards;
- k. to ensure that all changes to the project are approved by the band and that approved changes are incorporated into the project;
- l. to ensure that all administrative work is carried out promptly and that salaries, wages, and invoices from suppliers and contractors are paid when due;
- m. to participate with band council in interim and final inspections of the project; and
- n. to establish fire prevention and construction safety programs for the project.

3.2 Check List

The construction manager must treat each project as different from all others. However, projects can have similar features and the use of standard check lists will be helpful. Appendix 1 contains an example of a checklist for a construction project.

3.3 Support Staff

Large projects will require additional personnel, such as a trades foreman/woman or leading hands, to increase site supervision, and a storeperson to provide security and protection for materials, tools, and the project in general. If the

work-load generated by the project cannot be handled by the existing staff it may also be necessary to provide clerical staff, such as a time keeper and payroll clerk.

3.4 Combining Day Labour With Contract

Simple projects with a high labour element such as right-of-way clearance, landscaping or erection of fencing, may be carried out entirely by day labour. On more complex jobs, band councils may find - as do most general contractors - that the work can be handled more effectively if some of the elements are contracted out to sub-trades or specialists. Typical instances of work which should be contracted out are:

- a. work with a low labour content, such as bulk excavation, pile driving and paving, which requires the use of specialized equipment which may not be readily available to the band;
- b. work requiring skills or experience which may not be available amongst band members such as plumbing, electrical wiring, etc; and
- c. professional and technical services where an independent opinion is required, for example, inspection of work for quality and conformity with specifications, and the testing of aggregates, concrete and other construction materials.

3.5 Resolution of Conflicts

A certain measure of conflict is almost inevitable during the construction phase of a project. The construction manager must be alert to this and take immediate steps to resolve the problems before they assume unmanageable proportions. You as construction manager must ensure that everyone employed on the project is fully briefed on its objectives, and the tasks and priorities. You should also hold regular meetings to report on

progress. Some conflicts will however arise during day to day operations and you can deal with these by:

- a. ensuring that the assignment of tasks is equitable and that the tasks are feasible and well defined;
- b. understanding when to smooth over differences of opinion, when to search for a compromise and when to bring matters to a head so that a decision will be made then and there;
- c. endeavouring to convert conflict into constructive competition to do the job better, faster, and more economically; and
- d. ensuring that external conflicts or personal animosities are not carried over into the project.

3.6

Problem Solving

Closely related to the question of cooperation is the need to resolve day to day problems on the construction site. Some can readily be solved on the site but others may be of a highly technical nature and need the advice of an expert. When faced with a problem the construction manager should take the following steps:

- a. Clarify the problem by determining its exact nature, the reason it is a problem and the effect it will have on the successful implementation of the project.
- b. Define the problem and differentiate between conditions or situations and real problems (for example, rain is a situation, rain water flooding an excavation is a problem).
- c. Determine whether or not the problem can be resolved on site, or whether it requires a technical solution or a policy decision from band council.

- d. Seek the views and suggestions of those people most closely affected by the problem, ensuring that they address the problem and possible solutions rather than personalities. This will build up confidence and encourage general cooperation amongst workers.
- e. Where there are two or more strongly held views on the best solution, select one and emphasize to the proponent that he or she is responsible for ensuring that it works.
- f. Remind the parties of their common interest in the successful implementation of the project.

3.7 Planning Material, Financial and Human Resources

The construction manager is responsible for planning and controlling all aspects of construction. As construction manager you must be familiar with the definition and requirements for the project, your own mandate, the project budget and the source of funds and available resources.

3.8 Finance and Accountability

It is important for the construction manager to know the total amount of money available for the project at any given time, the source and method of transferring the funds and what proportion of the project funds is allocated for construction. For example, the fact that unspent funds cannot be transferred to the following financial year may radically modify the sequence of construction, material purchase, trade contracts, etc. You as construction manager are responsible for the budget allocated for the construction. You must therefore ensure that you fully understand the implications and limits of the authority which is delegated to you, particularly on committing funds and authorizing payments.

3.9 The Mandate of Construction Managers and their Teams

The construction manager's mandate is largely a re-statement of roles and responsibilities (3.1). It is therefore important that the band should provide you, as a construction manager, with a copy of your proposed mandate before you accept employment. An organization chart shows the position of you, the construction manager, and your team in the band organization (see Appendix 2). Since the construction manager is totally responsible for all the conditions stated in the mandate, you must be alert to all potential intrusions on the authorities which the mandate assigns to you. It may happen that the client (band members) intervene or attempt to intrude upon your authority and responsibility for construction. When this occurs you should advise band council in writing of the probable consequences of such intervention and disclaim all responsibility where it relates to changes, plans or estimated costs. In some instances, this may result in termination of your mandate. See 3.5 and 3.6 for ways of overcoming some delicate situations.

The construction management team will vary according to the size and complexity of the project. Consultants may be engaged to execute one or more tasks such as feasibility studies, site and terrain analysis, and design or inspection of work. They too will become part of the construction team for a limited period.

3.10 Preliminary Studies and Site Investigations

As construction manager you must ensure that the title to the property has been checked and the boundaries established on-site before you commence work. The band council will normally identify the site by referring to a plan of survey in the band council resolution requesting the project. The construction manager must also consult all studies and documents on the project concerning the

suitability of the site, the proposed method of construction, the decision to use day labour, the preliminary estimates, etc., with a view to fully understanding the basis of the project. You must question at this time any aspect that requires further clarification. In this way you can undertake the implementation of the project with confidence in your ability to bring it to a successful conclusion.

3.11 Project Estimate and Schedule

Once you are satisfied as to the soundness and feasibility of the project, you should assist the project officer or project manager in preparing or revising the project plan. Together you must identify:

- the responsibilities;
- the labour force;
- the financial resources required; and
- the starting and completion dates for each activity which represents a milestone in the development of the project.

The necessary information can be shown in a table similar to that in Appendix 3.

3.12 Insurance

What insurance do those with a financial commitment (the band) need? The types of insurance required on a day labour project fall into three categories:

- a. Property insurance protects the cumulative value of the property and the materials stored on site against fire, vandalism and theft.
- b. Public liability insurance protects third parties. The band, when acting as general contractor, assumes responsibility for protecting third parties against the effects of accidents resulting from its construction activities.

- c. Workers' compensation insurance protects the labour force against injuries or loss sustained as a result of their employment by band council in its role as general contractor. This insurance may be negotiated privately if the provincial workers' compensation coverage is not acceptable to the band.

3.13 Specifications and Bills of Material

The consultant will prepare a specification describing the quality of materials and the work methods necessary to produce a facility that will meet the codes and standards. The consultant will also provide a bill of materials which details the quantity of each material required to complete the job. This includes allowance for wastage and loss.

3.14 Detailed Estimate

3.14.1 General Remarks

This involves estimating the quantities and cost of the required materials, labour, equipment, sub-contracts and overhead. At this stage, a decision must be made on the proportion of work or the activities which will be carried out by contractors. The total project costs are then determined as described below.

3.14.2 Bills of Material

Bills of material will provide all the necessary basic information for costing and scheduling purchases of materials. They list the types, quantity, size and estimated cost of each material required for the project based upon the drawings and specifications. Materials may be ordered all at once or in a sequence to meet the transportation and construction schedules, taking into account lead time needed by suppliers, required delivery dates and potential delays. Allowances must be made for loss and wastage. If materials are to be delivered sequentially,

allowances must be made for escalation in the base price of the materials and the transportation costs. Bills of material also give the total estimated cost of the materials.

3.14.3 Labour

The labour cost is estimated by referring to the detailed physical plan showing the proposed progress of the work. The type, duration and sequence of all activities is determined and an estimate made of the number and qualifications of tradespersons, labour, office staff and technical assistance required for specific periods of time. The number of hours multiplied by the appropriate hourly rate provides the estimated net labour cost. To this must be added an allowance to cover the cost of hiring, maintaining and releasing the labour force and paying the employer's share of fringe benefits.

3.14.4 Equipment

Equipment may be either purchased or rented. This is discussed in detail in 6.3. The total cost of purchased equipment should not be charged against the project. The fair share of the cost may be established in one of two ways. The band may purchase the equipment and charge a rental fee against the project. As an alternative the equipment may be purchased and the depreciated value at the end of the project, (when the equipment is turned over to the band work section), credited to the project.

If equipment is to be rented the construction manager should obtain unit costs.

The estimated time during which each type of equipment will be needed should be multiplied by the hourly operating cost, in the case of purchased equipment, or by the appropriate rental rate, to give the total net equipment cost. In some instances it may be necessary to add a placing charge.

3.14.5 Other Costs

The following items are not included in the direct cost of the project and must be clearly costed when estimating the total project costs:

- a. The salary of the construction manager, superintendent and other supervisory assistance required during the total life of the project must be included in the overhead. It does not include working foremen/women as their wages are included under direct labour.
- b. On larger projects one or two clerks may be required to prepare the payroll and hiring documents, do purchasing, cost accounting, type reports, etc. A storekeeper and security officer may also be required. An estimate of their wages should be included in the project estimate. If the work is to be handled on a part-time basis by the normal band office staff, the appropriate proportion of their wages should be included in the estimate.
- c. Fees of technical personnel must also be included. Technical personnel include engineers, survey crews, and others required to lay out the project, and carry out technical investigations, special designs or other similar services.
- d. The cost of office space must also be estimated and included in the total cost. On large projects this may be a special building or trailer brought in for the purpose. On smaller projects it may be part of the band office. Included in the office cost must be provision for heat, light, office equipment, a telephone, and supplies such as stationery and an adequate supply of appropriate forms.
- e. If the band does not have the small tools and equipment to support the labour, the cost of purchasing tools for the band, or financing

their purchase by tradespersons through payroll deductions, must be included. (See 6.4.)

- f. The cost of storing and securing materials and equipment must be included. This will probably include:

- grading and fencing the compound;
- spreading gravel or crushed rock;
- purchasing or renting warehousing;
- heating a proportion of the warehouse;
- provision of storage racks, tarpaulins, plastic sheets, etc.; and
- restoration of the site on completion of the work.

- g. Temporary water, electricity and sewer services may be required. These can usually be obtained from the local utility commission. If not the costs of a small electricity generating plant, distribution lines, and temporary water, sewer and fuel facilities must be included in the cost estimate. In addition, the cost of any temporary access roads (including maintenance and snow removal) should be included.

- h. Quality assurance inspection services both for in-factory and site works may be contracted out. The costs should include the salary of the inspector, travel, accommodation and equipment costs.

3.15

Contingencies

In most construction projects there are a number of small unforeseeable items which are beyond the control of the construction manager but which add to the cost of the project. It is usual to provide a contingency item by adding a percentage to the project estimate. On small projects this is usually 10%. As the size of the project increases the percentage may be decreased. This

allowance is not intended to cover inadequate estimating or work not included in the original project.

4.0 IMPLEMENTATION - MATERIALS

4.1 Delivery Schedule

The construction manager is responsible for ensuring that the materials required to construct the facility arrive on site at the appropriate time. In scheduling the deliveries, allowance must be made for the time required to assemble or manufacture and transport the goods. In remote areas it may be possible to ship in bulk materials only at certain times of the year. This also must be taken into consideration when preparing the delivery schedule.

4.2 Local Materials

4.2.1 Selection

Many reserves will have sources of sand, gravel or rock which are suitable for construction. Others may have lumber which could be used on the project. If these materials are to be used, competent, professional advice should be obtained as to their suitability. Sufficient lead time should also be given for exploiting the resources. In the case of lumber it is desirable to start lumbering operations well ahead of the construction, probably in the previous fall. If the band does not already have a lumbering operation and an experienced sawyer it will probably prove more economical to purchase lumber or have it cut and converted by contract with a local sawmill.

Rock and gravel may be used on roads. Good quality stone may be used for construction or facing buildings. Sand and gravel may be used for

casting such items as steps, paving slabs, reinforced concrete lintels, concrete blocks and site poured concrete.

4.2.2 Use

The construction manager must carefully schedule the preparation of materials available on site as follows:

- a. Prepare a list of all materials available at the site, noting the quality, available quantity and cost of converting. Take great care to ensure that accurate information is obtained.
- b. Arrange to have their suitability for use on the project approved by the designer.
- c. Check the locally available materials against the bill of materials prepared by the consultant and deduct them.
- d. Initiate the necessary action to ensure that local materials will be available when they are required.

4.3 Bills of Material

The bills of material provide the basis on which the construction manager will order the materials. They must therefore include for each commodity:

- a. accurate quantities with allowances for waste or spoilage;
- b. the total weight including crates and packaging materials;
- c. the maximum dimensions including crates;
- d. the unit and total estimated cost;
- e. the shipping costs;

- f. any need for special shipping and handling methods or equipment;
- g. any specific need for shop drawings;
- h. the same commodity case as used in the estimate of total cost; and
- i. the appropriate Canadian Standard Association (CSA) standard.

4.4 Other Considerations

The construction manager should review the information in the bill of materials to determine:

- a. whether any special equipment is required for lifting and transporting any of the materials;
- b. whether special provisions must be made to incorporate any particular item or equipment into the project, for example, providing a special access hatch for large equipment; and
- c. the type and area of storage required including outdoor storage, unheated warehousing, heated warehousing and security storage.

4.5 Procurement

The construction manager has several possibilities for procuring the necessary materials which are not locally available. Experience and judgement are required to ensure that the right quality, quantity and price are obtained. Some of the methods are described below:

- a. Under a standing offer contract, a supplier agrees to provide materials on request at various intervals throughout the project at a fixed rate (for example: sand, gravel, concrete and fill).

- b. Under a unit cost contract, a supplier agrees to supply an approximate amount of material at a given time and price -- this is usually arrived at by calling for tenders.
- c. A single price may be paid for a piece of equipment which is to be installed in the project. This price is usually arrived at by asking for quotations on the basis of specified performance, or in some instances where only a single firm provides the equipment by purchasing at the market price.
- d. A single price may be paid for the supply and installation of equipment or materials usually of a proprietary design, -- this will usually take the form of a purchase and service contract.
- e. Local purchases may be made of miscellaneous materials, such as nails and small quantities of lumber, to meet immediate requirements.
- f. Petty cash purchases should usually be limited to items costing less than \$25.00.

4.6

Quality Assurance

For construction of expensive or complex projects the manager should arrange for in-plant inspections of any components which are to be manufactured to ensure the following:

- a. that all materials and equipment conform to the shop drawings and specifications;
- b. that quality control is exercised;
- c. that all crating is done in accordance with the instructions contained in the purchase order; and
- d. that the schedules can and will be met. These inspections may best be undertaken by qualified and experienced persons working under contract to the band.

4.7 Packaging

Purchase orders should contain packaging and shipping instructions which may vary according to destination and method of transportation. Through good communication with the supplier, the construction manager should ensure the maximum size of any crate or package will not exceed the available lifting and transportation facilities on the reserve. The supplier should also attach a copy of the waybill to the outside of each package and place another copy inside identifying all items in the shipment and indicating whether items are on back order or if substitutions have been made. This will enable the construction manager to check the contents against the waybill and the original purchase order and if necessary to re-order from another supplier.

4.8 Expediting

The aim of expediting is to ensure that all items requisitioned are supplied and delivered to the construction site or to a marshalling point at the appropriate time. Expediting may be contracted out or done by in-house staff.

4.9 Shipping and Transportation

The selection of the most appropriate method of transportation should be a co-ordinated effort between the supplier, the purchasing agency, and the construction manager. If possible use carriers who can provide through service from the point of origin to the destination as this will assist in the expediting and tracing. It frequently also results in cost savings.

Wherever possible materials should be purchased "FOB construction site". In this method of delivery, the goods remain the property and responsibility of the supplier until they are received at the construction site. With any other method of delivery the consignee is the owner from the FOB point onward. Air transportation of

construction materials is very expensive and should be kept to a minimum. However, there are some instances where difficulty of access or a very short construction season may justify the chartering of aircraft. If so, the construction manager must determine in advance the type of plane that will be used and include this in the packaging instructions.

4.10 Receipt and Checking

The construction manager should appoint a responsible person to receive materials, arrange for their safe storage and take them into stock. Suppliers should be required to advise the construction manager of the carrier and the expected time of delivery. Incoming shipments should be checked immediately against the carrier's waybill or delivery slip and against the original purchase order. Receipts given to the carrier must state that the shipment has been accepted subject to further checks. Differences in quantity, errors, or unsatisfactory conditions should be noted and reported to the expeditor for corrective action.

4.11 Invoices

Once the shipment has been checked the construction manager should inform the supplier of any variations from the original purchase order. When a purchase is satisfactorily completed the supplier will forward the invoices to the construction manager. The construction manager then certifies the invoice to be correct and forwards it to the band office where it will be recorded and a cheque issued to the supplier by the band manager.

4.12 Loss and Damage

The construction manager must maintain a continual check of receipts against purchase orders and anticipated delivery dates. He or she must also maintain an up-to-date inventory of materials in

store. Damage, theft or loss of materials during construction is frequently encountered. Depending upon the urgency of the replacement, they may be re-ordered from the original supplier or local purchases made.

4.13 Storage

A fenced compound should be constructed for the storage of materials. Sufficient covered warehousing should be made available for those materials which must be kept heated or dry. The actual amount of space will depend on the phasing in of the material required to do the job. Heated warehousing should be kept to a minimum and heating discontinued as soon as possible. Rental of temporary storage is preferable to purchase. If purchase is necessary, a decision must be made whether to provide temporary or permanent facilities, which may in turn be fabricated or site built.

A reliable storekeeper should be engaged to control the receipt and issue of the materials. During off hours a security officer should be on duty. Equipment such as power tools and pumps, and small items such as nails, bolts and hardware, should be locked in a suitable warehouse. Other attractive items such as survey equipment, cameras and office equipment should be placed in a secure place in the construction office. The security officer should maintain a vigil against the outbreak of fire. This person should be aware of the proper action to be taken in the event of fire, and the equipment to be used in the first steps of fire control. This is explained in greater detail in 11.0 and 12.0.

5.0 IMPLEMENTATION - LABOUR FORCE

5.1 Recruitment

The construction manager is responsible for recruiting all persons required for the project including:

- a. administrative personnel such as the expeditor, storekeeper, security officer, timekeeper and clerk;
- b. supervisory staff such as the construction superintendent and foremen/women;
- c. skilled labour and tradespeople such as carpenters, plumbers, welders and equipment operators; and
- d. unskilled and semi-skilled labour.

5.2

Resource Allocation

On a well organized project the number of persons in the labour force starts at a low level, gradually increases to a peak and then drops off as the project nears completion. In badly organized projects there are fluctuations in the number of persons required, and the construction manager is faced with the problem of laying off people for a few days then re-hiring them. You should endeavour to avoid this by carefully scheduling the activities. This can be done as follows:

- a. Break down the work into a series of numbered activities. Estimate the duration of each activity and the amount and type of labour required to carry out the work.
- b. Review the list of activities to establish interdependencies, that is, activities that must be completed before another one can start and activities that cannot start until another one has been completed.
- c. Calculate the earliest and latest starts for each activity and the earliest and latest finishes to determine those activities which have extra time and those which are critical.

- d. Prepare a bar chart showing the activities and the number and occupational classifications of workers required for each activity (Appendix 4).
- e. Allocate resources first to those activities which are critical. The starting times of the activities which have extra or float time are then adjusted to balance out the labour force and allocate the time of tradespeople most effectively.

5.3

Using the Chart

The resource allocation bar chart is an important management tool if used correctly. It tells the construction manager:

- a. the total personnel required to complete the work in person-days;
- b. the timing and size of the peak labour force - particularly important if transportation, accommodation or meals are to be provided;
- c. when to recruit additional personnel;
- d. when and where to assign personnel most effectively;
- e. activities from which personnel may be diverted to assist on critical activities that are falling behind schedule;
- f. whether to recruit additional labour or use overtime to eliminate potential overruns; and
- g. the approximate duration of employment and date of release of employees.

5.4

Employee Selection

The first step in selecting employees is to establish the job requirements for the various positions to be filled. The construction manager,

possibly with assistance from the band manager, should determine the following information for each position:

- a. method of pay - hourly or salaried;
- b. organizational relationship - reports to - supervises - co-ordinates with;
- c. occupational classification;
- d. required level of training and experience;
- e. physical requirements - size - strength - health - eyesight, etc.; and
- f. educational requirements - ability to read plans - set out work, etc.; and
- g. need for leadership or supervisory skills.

As the number of persons selected as suitable for employment may exceed the number required, the construction manager must resist the temptation to over-employ and must establish a balance between the number of persons offered employment and the anticipated labour needs once the project is underway. At the outset it is preferable to have too few employees than too many. Having established the total personnel needs for each activity and decided when administrative, supervisory, labour and trades employees are required, the construction manager can review the inventory of local resources to determine those who can be recruited locally and those who must be hired from outside the reserve.

A number of reserve residents may have some training or experience in some of the required trades. If this is known early in the project planning process, it may be possible to arrange, through the Department, for training and upgrading particular individuals to journeyman status in time for the commencement of the construction.

Having identified suitable personnel on the reserve who are available for employment on the project, the construction manager and band staff should arrange for the interview and selection of the required labour force. Where the necessary numbers or skills are not available on the reserve, the construction manager should request the nearest Department of Manpower and Immigration officer to assist in recruiting and to arrange dates for interviews. If the project is in an isolated area, outside tradespeople being considered for employment should first receive medical clearance.

5.5 Operational and Maintenance Personnel

Some projects may require an on-going operating and maintenance staff on completion. The resource inventory will probably identify individuals who, with some practical training, will be competent to take on these duties. It is desirable that these people should be employed upon the project so that they will be fully familiar with it and at the same time receive on-the-job training. They will then be ready to take over their duties once construction is completed.

5.6 Release of Labour Force

When engaging labour and tradespeople, you as construction manager, should advise them of the approximate duration of their employment. You should also ensure that each employee knows that he or she has no right to employment for the full period of the construction project. As each activity is proceeding, you should be deciding in advance whether to reassign or release the individual employees on completion of the activity. You should keep your labour force to the minimum required to execute the work efficiently. You must be prepared to release personnel:

- a. when there is no further work they can perform;

- b. if they fail to work diligently and harmoniously with other members of the labour force; and
- c. for just cause such as disobedience, drunkenness or theft.

On releasing employees, the construction manager should advise them of the reason for release and inform them whether it is a final termination or whether there is a possibility of their being recalled for further work later in the project.

5.7 Personnel Administration

On large projects the construction manager may set up a construction office with administrative staff. In most instances, however, most of the administration will be carried out by the band office. A register of all persons employed on the project should be maintained and retained in the band office. In addition, a number of documents (examples of which are contained in the appendices) must be completed. These include:

- a. a hiring card (Appendix 5) which is completed locally and retained in the site office or band office as appropriate;
- b. an individual record card which contains personal information about each employee (Appendix 6);
- c. daily time card for foremen/women (Appendix 7);
- d. the prevailing rate pay list which is prepared in the site or band office using information from the employee record cards (Appendix 8);
- e. where non-band members are employed on the site, the form TDI for income tax purposes; and
- f. a record of employment which should be completed for each employee on separation.

At the end of each week the pay roll is made up and cheques prepared in the band office for each employee. Cheques should be handed to employees at the band or site office on a weekly basis.

6.0 IMPLEMENTATION - EQUIPMENT AND TOOLS

6.1 Requirements

Most projects will require the use of equipment and tools: for carrying out the actual construction, for exploiting local materials, and in some instances, for the on-going operation and maintenance of the project.

6.2 Sources

Most bands will have some equipment and tools, owned either by the band jointly or by individual band members, which may be adequate to carry out small projects. On larger projects it may be necessary to supplement this by additional equipment from outside the reserve. The construction manager must determine the equipment that will be needed for the project, obtain details of the availability, condition and capacity of band owned equipment and determine what must be brought in from outside. In selecting the equipment to be brought in, the construction manager must ensure that it can in fact be transported to the reserve economically. In remote areas this may mean upgrading a road, the use of a tractor train over winter roads or possibly the use of a barge in summer.

6.3 Rental or Purchase

When equipment is not available locally the construction manager has the option of renting or purchasing. If equipment is to be purchased the use and maintenance after completion of the project must be considered. Generally, rental is far more economical, however, if the band is carrying out extensive road construction it may be

prudent to buy a grader because it can be subsequently used for road maintenance and snow ploughing. On the other hand if the band were building a bridge and needed a pile driver, it would probably be better to rent the equipment because the band would normally have no further use for it. Vehicles will require garage space and workshop facilities. If these are not available, their provision must be arranged as early as possible.

The rental or purchase of small equipment such as concrete mixers, vibrators, generators, etc., can usually be arranged locally. If none are available, procurement action must be taken to allow for early acquisition and shipping. Equipment that is to be purchased requires specifications to be prepared and sufficient time for delivery and possibly manufacture.

If purchase is decided upon every effort must be made to obtain equipment that is compatible with that already owned by the band or by local equipment rental companies, to reduce the cost of stocking spare parts. Standardization will also reduce the need for upgrading the qualifications of local mechanics.

If equipment is to be rented, the construction manager should compare rental rates obtained locally with those at the nearest town (taking into consideration possible placing charges) and if comparable, use the local equipment. The rental contract should identify the rental period, whether the contract includes the operator, fuel, oil and maintenance, and the guaranteed number of hours per day or week. It should also stipulate whether meals or accommodation are to be provided for the operator.

6.4

Small Tools

Implementation of a project by day labour requires that the band should have small tools and equipment normally found in any construction

company. Such requirements must be clearly identified and will include such items as picks, shovels, wheel barrows, pumps, shop equipment, etc. Journeypeople normally bring their own tools but in some instances local employees may not own the necessary tools. In this instance they may be purchased by the band and the cost recovered through pay roll deductions.

6.5 Inventory of Equipment and Tools

When equipment and tools are purchased they should be carefully inspected as soon as they arrive at the site. An equipment park should be provided for heavy equipment and small tools should be taken into stock by the storekeeper. It is desirable that all tools should bear a distinctive mark that will clearly identify them as belonging to the band. Storekeepers should maintain an inventory of all tools and equipment noting the date of purchase and the supplier so that replacements or spare parts can readily be re-ordered. Tools should be signed out each morning and returned to the store and checked in each evening. The storekeeper should note any deficiencies, wear or breakage and if necessary request that orders for replacement, repairs or spare parts be issued.

Tradesperson's tools remain the property of the individual once the purchase price has been paid either directly or by pay roll deductions. On completion of the project all other tools should be turned over to the band works section and the project credited with the depreciated value.

7.0 IMPLEMENTATION - CONTRACTS

7.1 Preparation for Contracting

It was noted that in all probability some part of the work would have to be implemented by contract. It has also been noted that the construction manager must schedule the purchase

and delivery of materials to the site, the employment of labour and the arrival of equipment. Similarly, the construction manager must also address the timing and duration of work which is to be done by contract because this must fit into the overall schedule for the project. Working backwards from the earliest possible start date of each contract you must allow adequate time for:

- a. the preparation of the necessary drawings, specifications, conditions of contract and other tendering documents;
- b. identifying potential contractors or advertising in the press;
- c. preparation of tenders by the potential contractors;
- d. receiving bids, reviewing them, selecting the successful bidder and letting a contract; and
- e. the placing of equipment and employees on the site by the contractor.

7.2

Tender Call

Having determined which elements of the project will be implemented by contract and identified the appropriate timing, the construction manager must provide instructions and documents to the band manager who will normally call for bids. The construction manager must provide:

- a. sufficient copies of drawings and specifications for the tender call;
- b. an estimate of the cost of the work or services to be provided under the contract;
- c. a recommendation about the type of contract which is required, for example, fixed price, unit price, labour only, etc.;

- d. details of any special clauses or conditions which should be included in the conditions of contract;
- e. recommendations about the method of obtaining bids (public advertising or direct invitation);
- f. the required tender closing and contract completion dates; and
- g. the type and size of security deposit required.

If a unit price contract is involved the construction manager must provide the band manager with a break down of the work elements and the estimated quantities for incorporation in the tender documents. The contractor is normally responsible for the transportation, shipping and receipt of equipment and supplies. There are, however, times when it may be advantageous to coordinate the transportation of the contractor's equipment and supplies with that of other materials supplied to the project. On-site storage and warehousing is usually provided to a contractor at no cost by the band. Any such arrangements should also be stated at the time that bids are being sought.

7.3

Tender Opening and Contract Award

When tenders are received they should be placed in a closed and locked box in the band office and retained until the closing date of the tenders. After that time they should be opened by a committee appointed by band council. The construction manager should, of course, be a member of the committee. The committee reviews the tenders and checks them to see that they are complete and valid. They then recommend acceptance of the most favourable bid to band council. If this is approved by band council a formal contract is entered into with the successful bidder.

7.4 Change Orders

However well planned and documented a contract is, it may be necessary to make changes. Before the contractors commence work they should be advised who is empowered to make changes on the site. Normally this will be the construction manager. The contractors should also be advised that, if they accept instructions for changes from any unauthorized person and implement them without receiving signed directions from the construction manager, they do so at their own risk and cost. In some instances the construction superintendent or a foreman/woman may have to make on-the-spot decisions to deal with emergency situations. These should immediately be reported to the construction manager who should issue a change order as soon as possible. If this results in a substantial increase or decrease in the amount of work to be performed by the contractor it may affect unit costs. Before issuing a change order that will substantially increase the cost of the contract the construction manager must ensure that the funds in the budget which were allocated to that particular activity are adequate to cover the increased cost of the contract. The construction manager should not use funds budgeted for other purposes to cover such increases. If the increase in costs are attributable to unforeseen circumstances, the overrun is a legitimate charge against the contingency allowance in the original estimate. On the other hand if the increase is attributable to design changes, it is not a legitimate charge against the contingency item and the construction manager should ask the band council to seek additional funding before proceeding.

Change orders should be numbered sequentially and dated and their receipt should be acknowledged by the contractor. The construction manager should also ensure that the construction superintendent and the foremen/women are fully aware of the changes provided. A typical change order is shown in Appendix 9.

If verbal changes to the contract must be made on site it is important to ensure the scope and total extent of the work and the method of evaluating, costing and paying for it, and that the instructions are confirmed by a change order.

7.5 Band Contract Procedures and Policies

The construction manager must determine if there are procedures or policies the band follows when arranging contracts or dealing with contractors. Unless arrangements are made to cover special situations which may exist, the construction manager must adhere to normal band practice.

8.0 PHYSICAL AND FINANCIAL CONTROLS

8.1 General Requirements

In planning and implementing any day labour construction project the construction manager must adopt a reporting and recording system in order to evaluate and control the physical and financial status of the work at pre-determined intervals. This involves monitoring project schedules, quality performance, and overall efficiency and will enable the construction manager to make adjustments and adopt alternative courses of action when necessary. Sometimes the original schedule may be revised. The project officer and the construction manager should agree upon the frequency of reports and ensure that reporting procedures provide the required amount of detail. Although relatively simple reports are adequate prior to the construction stage, more detail is required once construction commences.

8.2 Project Number

If the accounting of the project is undertaken by the band administration, assign a project number coding and credit all expenses and revenues to it. The project number is also the code used to accumulate all cost information on the project

including the correlation of the financial and physical status reports. It should also be used on all purchase requisitions, time sheets, contracts, reports, etc.

8.3 Frequency of Reporting

The project officer and construction manager, in consultation with the project team members, will establish reporting intervals, the depth of detail and the form that will be used. Reports are prepared at several levels and at the following intervals:

- a. Daily - the foreman/woman reports on the use of the equipment, receipt and transfer of materials, and hours of work spent on specific elements of the project by employees under his or her supervision.
- b. Weekly - the summary report of daily activities on labour, material usage and equipment is prepared by the construction superintendent from the information contained in the job diary and reports from the job foreman/woman. In addition it identifies activities planned for the coming week. This summary report is forwarded to the construction manager.
- c. Other records and reports are prepared as necessary, depending on the size and complexity of the project. These might include a drawing control register, minutes of meetings, concrete and steel register, accident reports and the contractor's progress report.

8.4 Physical Progress Controls

The purpose of control procedures is to make it immediately apparent to the construction manager when corrective action is needed. Normally, a review of progress will be undertaken weekly or monthly depending on the complexity of the

project. If there is sufficient variance from planned progress, adjustments will be required to resources, supervision, materials, sources of supply, etc. On most day labour projects, two types of control will be required:

- a. Bar charts in which physical activities, such as detailed in the project schedule, are assigned time intervals for completion and are plotted on a bar chart which compares the actual against the planned progress as of the date of the monthly report. The construction manager may further refine this by plotting a cumulative curve showing the percentage of time lapsed since the start of the project or the award of a contract (See Appendix 11).
- b. Site control of contractors retained to carry out a portion of the work is the responsibility of the construction manager through the construction superintendent who will normally use the contractors' weekly force report. This lists the number of workers and their trades working on the project every day, and the notification of change form.

8.5 Physical Progress Reports

Specific reports and forms can be adopted to identify the progress of the various elements and activities of the construction project. These are prepared at specific intervals and at various levels to support the monitoring process and permit the construction manager to take any required action. Some of the typical reports and documents are described below:

- a. The job diary is a daily record by the construction superintendent containing information on the weather, site activities and instructions received from the construction manager together with observations and comments by the superintendent (Appendix 12).

- b. The equipment daily report form identifies the type of equipment and the number of hours worked on specific elements of a project and the down time on any particular date. This information will assist the construction superintendent in preparing the weekly and monthly reports on physical and financial progress for the construction manager (Appendix 13).
- c. The concrete and steel register is a daily record of concrete pours, locations and shipments of reinforcing structural and miscellaneous steel (Appendix 14).
- d. In the contractor's progress report, the contractor's schedule is reviewed weekly or monthly. A comparison is made between the plan and the actual progress achieved in the field. A subsidiary bar chart may be used to plan and record progress. The month end review may take the form of a progress report on which the contractor's progress claim is based.
- e. The weekly report is prepared by the construction superintendent from the job diary and covers work done during the previous week and activities planned for the coming week -- it is submitted to the construction manager (Appendix 15).
- f. The drawing control register records the receipt of new or revised drawings and the issue of drawings to field staff. It should also record changes in bills of materials due to drawing revisions.
- g. Minutes of meetings should also be kept, recording items discussed and decisions made at site meetings between the project officer, the construction manager, superintendent, contractors and representatives of the users.

8.6 Financial Controls

8.6.1 General Remarks

The detailed estimate is an essential tool for cost control. It identifies the total estimated cost of the project against which actual costs are compared and subsequent action taken to rectify variations if necessary. Financial control embraces a series of elements beginning with the contribution agreement and including such items as financial authorities, cost accounting, purchasing and progress claims. This control continues until the project is completed. The various elements of financial control are described below.

8.6.2 Budget

The construction manager is responsible for budgeting that part of the project cost assigned for the implementation using the funds provided in the contribution agreement.

8.6.3 Contractor's Financial Progress Claim

Where a portion of the work is carried out by contract, progress claims will be prepared by the contractor and superintendent on the basis of the contractor's progress report at specific periods of time, usually monthly. The claim will record, and will be based on the actual physical progress during the period under consideration (Appendix 16). The construction manager will check the claim and issue a payment certificate (Appendix 17) authorizing the band manager to issue a cheque in payment.

8.6.4 Cost Accounting

Cost accounting includes recording commitments and expenditures. A coding system should be used to record commitments and expenditures against the estimates for the particular activity involved. The sequence of steps is estimate, approval, commitment and expenditure. Estimates should be

current to allow revised approvals or control measures as appropriate. Commitments and expenditures are made only for activities and against amounts included in the estimates. The degree of detail required in the estimates should relate directly to the delegated authority of the construction manager and the types of agreements or actions he or she can take.

8.6.5 Field Purchasing

There are four methods of field purchasing:

- a. The petty cash method, if adopted by the construction manager, may be used to purchase materials or services up to a limited value, usually not exceeding \$25.00.
- b. Local purchases can be made in day labour projects. It may be necessary for the construction superintendent to follow band policies and regulations. A purchase order book should be used when a form cannot be typed and when the volume of purchase warrants the use of a carbon interleaved form.
- c. A standing offer can be used to provide direct access to a supply source for materials and services at pre-arranged prices which sometimes include a discount and are valid for a specific period of time on an as required basis.
- d. Local service contracts can be used but must be awarded in accordance with the procedures defined in the contribution agreement.

8.7 Financial Coding

The construction manager and his or her team assume the role of a general contractor in implementing day labour projects. During the implementation phase the construction manager will require administrative and cost control procedures in addition to those normally used for other types

of projects. The construction manager should ensure that records of labour, equipment and material costs are kept. To do this, it is necessary to maintain a complete up-to-date account of commitments and expenditures made by authorized persons including:

- a. requisitions, purchase orders, contracts, unpaid invoices and details of other funds committed as an official commitment record; and
- b. suppliers' accounts, contract payments, day labour pay lists and other disbursements as official expenditure records.

The construction manager must verify that commitments and expenditures are properly coded and agree with approved budgets, contracts, requisitions and purchase orders. Continual comparison must be made of actual against planned costs and these must be analyzed by the construction manager. One method of analysis is to plot cumulative curves representing the total planned cost and the total actual cost to date. These can be superimposed on a bar chart (Appendix 18). The result will show if further action is necessary to bring physical progress into line with the financial expenditures.

8.8

Labour Force Control and Reports

The construction manager must ensure that strict control is exercised over the labour force to ensure:

- that the minimum number of persons needed are employed;
- to know to what each person is assigned;
- to know where they will be on the site at any particular time; and
- to have an immediately available record of all persons working on the site in the case of an emergency. This is readily achieved through the normal administrative processes. The pay roll will normally be administered from the

band office. If persons other than band members are employed, a copy of the fair wages and hours of labour act must be posted in a conspicuous location on the job site. Each employee will complete or have completed for him or her the following documents:

- a. A hiring card is completed locally for each employee and retained at the site (Appendix 5).
- b. An individual record card contains the following information:
 - name and position;
 - rate of pay;
 - income tax exemption code;
 - social insurance number;
 - starting, hiring and termination dates;
 - weekly hours of work, gross pay, deductions and net pay; and
 - vacation pay.

(The details for maintaining this card are included in Appendix 6).

- c. The foremen/women's daily time cards record how much time employees spent on the various activities (Appendix 7).
- d. The prevailing rate pay list is prepared using data from employee record cards. The totals for gross salary, pension plan, unemployment insurance, other deductions and net salary are entered at the bottom of the pay list. This is then passed to the band office for the preparation of individual cheques for issue to all employees.

8.9

Combined Physical and Financial Reports

The exercise of effective control over the project requires the construction manager to make regular comparisons between planned and actual progress. She/he should ensure that:

- a. physical progress is proceeding as planned;
- b. financial expenditures are in accordance with the planned cash flow; and
- c. the funds expended are reflected in the value of the work and services performed. The figures must be reconciled not only for the overall project but also for the individual components. For example, if there has been a saving on the purchase of material that has been compensated for by an increase in the amount paid for labour, there is a danger that the project costs may over-run unless labour productivity can be increased or further savings on material costs made. The construction manager may find it advantageous in making these comparisons to establish separate accounts, budgets and cash flows for labour, material, equipment, contracts and miscellaneous overheads and administrative costs. The construction manager will then see at once whether any particular component is being over-spent.

The reporting procedures for day labour projects involve several levels of authority. Foremen/women prepare specific reports on labour, materials and equipment usage and these are combined with on-site costs updated by the construction superintendent and forwarded to the construction manager. Upon receipt all other expenditures and commitments from purchase orders, invoices and contracts are added to produce a detailed report showing costs and progress by element and sub-element, actual and planned. This report is summarized by the construction manager and forwarded to the band council with a copy to the project officer, together with comments from the construction manager relating to any unusual aspects of the report or any substantial variations from anticipated progress.

9.0 ORGANIZATION

9.1 The Need

Closely related to the question of physical and financial controls is the need for an effective site organization. The construction manager cannot manage the project effectively and at the same time supervise every aspect of the work. He or she must therefore establish an efficient site organization and exercise project control through subordinates. The size and type of the organization will depend upon the size and characteristics of the project.

Memory and discussion alone should not be relied upon when organizing a project. A system, such as the bar chart shown in Appendix 10, will not only assist in organizing what has to be done but will also be of great assistance during the actual construction.

9.2 Project Characteristics

Most of the day labour projects which will be undertaken by Indian bands will fall into one of the following general categories:

- a. The work consists of a relatively small number of on-going activities many of which will be proceeding simultaneously. Road construction is a typical example, as separate gangs can be assigned to carry out various tasks in sequence.
- b. Some projects consist of a succession of repetitive elements. Construction of houses is an example; a gang may complete one element of a house and then move to another or alternatively a number of similar gangs may be assigned to construct different houses.
- c. Large complex projects involve a variety of activities and different trades where work must be carefully coordinated. Construction of a school is a typical example.

9.3 Functions

The site organization must fulfill a number of functions. On some projects that are relatively small or simple, an individual may have to perform more than one function. It is, however, important that the person understands the division of responsibilities so that on more complex projects he or she will know which task should be assigned to someone else. The functions to be performed are as follows:

- a. Management is primarily the construction manager's responsibility although the construction superintendent may participate in some aspects of management.
- b. Administration may be carried out by the band office on small projects but on larger projects will be carried out by a separate site office established for the term of the project. A timekeeper, clerk, storeperson and watchperson might be employed.
- c. Supervision is primarily the responsibility of the superintendent but may also be assigned to a foreman/woman on larger jobs and on very large jobs there may also be trades foremen/women or leading hands directing crews or gangs.
- d. Inspection ensures the quality of the work and materials meet the specifications. This responsibility will normally be divided between the superintendent and foremen/women. On larger jobs independent inspectors may be employed.
- e. Specialist work is carried out by tradespersons, equipment operators, etc.
- f. General construction duties are carried out by employees who may be assigned to various parts of the project.

9.4 Relationships

In establishing the site organization the construction manager must ensure that there is a clear line of command which everybody understands and which should not be by-passed except in an emergency. The supervisor at each level is responsible for directing and co-ordinating the activities of those people reporting to him or her and for co-operating with other supervisors at a similar level to ensure that the work proceeds smoothly and harmoniously. The construction manager is also responsible for reporting progress, problems and unusual conditions or events to his or her supervisor (for example, a project manager, the band chief or council).

9.5 Building the Organization

In determining the site organization the construction manager should examine the schedule of work which is being developed and determine the minimum number of people required to perform each activity at the various stages of the project to bring it in within the time frame. The construction manager can then estimate the number of supervisory personnel required at various stages of the project. Examples of typical organizations are shown in Appendix 19.

10.0 START-UP

10.1 Preliminary Work

Sections 7 and 8 discussed the steps to be taken by the construction manager to assemble materials, workers, equipment and tools, and to obtain contracts for specialist services. Once the construction manager receives authority from band council to commence work, he or she must:

- a. check that these items will all be available when required;

- b. check that funds for the project are available - preferably in a special band account separate from the general funds of the band* and that the cash flow will match the required payments throughout the project; and
- c. ensure that the appropriate administrative and financial services are available.

10.2 Site Inspection

The construction manager should then make a thorough site inspection, preferably on foot, with the following objectives:

- a. Identify the sites for dumping excavated material, stock piling top soil, borrow pits, sources of local materials, sites for disposing of garbage and builders waste, etc.
- b. Select routes between these sites and the construction site that will minimize the impact on and not conflict with existing development or areas which should be protected.
- c. Identify site hazards and note what remedial action should be taken.
- d. Prepare a record of existing site conditions, preferably a combination of notations on a site plan, explanatory notes and photographs.
- e. Note trees, vegetation, water courses, etc., which should be protected or preserved.

10.3 Safety and Security

The following steps should be taken for the safety and security of the project and the people working on it:

- * This will normally be a condition of Capital Contribution Agreements.

- a. Ensure that adequate insurance coverage is obtained and in effect before any work commences.
- b. Arrange for the posting of a notice in a prominent place enforcing the safety requirements of wearing hard hats and safety boots, and where appropriate, working gloves and protective goggles.
- c. Place direction signs from the nearest highway to the site for the use of suppliers and emergency vehicles.
- d. Notify the local police force, fire brigade, ambulance service and doctor that the project is about to start and explain how to get to it in an emergency, as well as obtaining and recording the telephone numbers of these emergency services.
- e. Ensure that a first aid kit and fire extinguishers are available on-site and are eventually placed in the site office.
- f. Identify a source of water for firefighting purposes and if possible provide a pump and pipe line to the site.
- g. Arrange for the erection of a notice board requiring all visitors to the site to report to the band office on arrival and before leaving.

10.4

Start-up Crew

The initial small labour force required for site preparation can then be engaged. This should normally include the superintendent (or foreman/woman, depending on the size of the job) and the storekeeper. The crew should be kept to a minimum so that there will be plenty for them to do at all times and some momentum in work will be obtained.

10.5 Site Preparation

The work of the start-up crew is to carry out the site preparation including the following:

- a. erect the site office, toilet facilities, etc., and grade and fence the storage compound and parking and maintenance areas;
- b. prepare the site for a surveyor;
- c. provide temporary services; and
- d. erect security lights for the site and storage areas.

10.6 Briefing Tour

At this point the construction manager can occupy the site office. He or she should then arrange a briefing tour for the band council, the project officer and representatives of the client, if this is not band council. The construction manager must ensure that there is no misunderstanding about the size and location of the facility to be constructed and its relationship to existing development.

10.7 Environmental Protection

The construction manager is responsible for environmental protection on the site and for implementing any of the requirements of the environmental impact study. This may include:

- a. stripping top soil from parts of the site which are to be disturbed and stock piling for re-use later;
- b. taking steps to prevent interference with or pollution of drainage ditches, rivers, etc., by run-off from the project; and
- c. protective measures for trees and vegetation that are to be retained.

10.8 Protective Measures

It may be necessary to take some measures for the protection of the project such as the following:

- a. provide temporary drainage for excavated areas or construct cut-off ditches to prevent flooding by run-off from higher areas;
- b. stabilize slopes of cuttings or embankments;
- c. clear brush, low shrubs and long grass at least 15 m back from the work site or provide a fire break;
- d. provide safe and isolated storage for flammable materials such as gasoline;
- e. ensure that bridges and culverts are strong enough to carry the construction traffic and remedy any traffic hazards identified during the site inspection; and
- f. ensure that there is adequate space around the construction site for snow clearance in winter.

10.9 Start-Up After Work Stoppage

Work on the project may stop for a number of reasons such as an accident or delays in deliveries of materials. On some projects, it may be planned stoppage because work can only be carried out at certain seasons of the year. The procedures for start-up after accidents or disasters are described in detail in 11.0. In other cases, the construction manager should take the following steps:

- a. Carry out a site inspection to determine that the site is safe to work on, that all required services are functioning properly, noting any damage or deterioration that has occurred and which must be made good.

- b. Arrange for a general clean-up including clearing ice and snow away in winter.
- c. In the case of long stoppages, review the construction schedule and, if necessary, establish new target dates and priorities or take steps to expedite the work to bring it back on the original schedule. This may involve carrying out more work by contract than was originally intended. If a long term stoppage has resulted in cancellation of material deliveries, the withdrawal of equipment from the site or delays in implementing work by contract, it may be necessary to re-negotiate the prices, rental rates and contracts. These increased costs may persist throughout the duration of the project unless the construction manager can expedite the work and bring it back on schedule as rapidly as possible.

11.0 SECURITY AND SAFETY

11.1 Importance

It is almost impossible to overstate the importance of security and safety. The maximum protection must be taken against the risks inherent in any construction project. In the event of an emergency the primary consideration must always be the protection of life and health.

11.2 Codes and Regulations

As noted in the description of duties (see 3.1) the construction manager is responsible for ensuring that the project meets the appropriate codes, regulations and standards. The Canadian Construction Safety Code may be used as a guide.

11.3 Site Conditions

The construction site, including the entrances and exits, must always be maintained in a clean and tidy state. Preventive measures must be adopted

to avoid dangers arising from the storage of materials and equipment or from the accumulation of garbage and surplus materials. Smoking must be prohibited near inflammable or combustible materials. Scaffolds, platforms and work areas must be kept clean and, in winter, clear of ice and snow. Sand or something similar should be spread on icy surfaces.

11.4 Traffic Control and Protection of Public Safety

In some instances, it will be necessary to divert or interrupt traffic on public roads to carry out work. Provide protective barriers and erect warning signs and traffic control devices in accordance with the codes and standards of the local highway authority. Competent personnel should be assigned the duty of traffic control. They should wear approved safety clothing such as safety-T vests, sleeves or arm bands.

11.5 Safety, Clothing and Equipment

All persons entering or working on a construction site must wear an approved safety helmet. Workers must also wear safety boots. Glasses, belts and other safety equipment must be worn wherever necessary. Operators of equipment, tools or machines should wear well fitting clothing to avoid entanglement with moving parts. Workers can also reduce risks by refraining from wearing jewellery and by keeping their hair short.

11.6 Vehicles and Cranes

Every worker who drives a vehicle must have a valid driver's licence. Vehicles moving in reverse must be directed by a worker who can see both the driver and the area into which the vehicle is moving. Shovels, backhoes, cranes and similar equipment must observe minimum safety distances from all overhead electricity lines and the appropriate electricity authority must be advised before work commences near any lines carrying currents in excess of 750 volts.

11.7 Excavations

Any excavations which may present a danger to the public must be provided with a safety fence. The sides of all excavations exceeding 1.2 m in depth must be supported by bracing or by trench boxes. The placement of equipment and construction material and spoil from the excavation must not endanger workers in the excavation below.

Before commencing the excavation all existing streams and underground services such as telephone, gas, electricity and water should be located and marked. If the services are to be cut, they must be closed with a stopper or plug. In all cases, the appropriate authority must be given advance notice. If any excavation will lead to the closure or diversion of a road, the various emergency services must also be advised of the interruption and the alternative means of access.

11.8 Ladders, Step-ladders and Scaffolds

Never use lifting equipment or similar devices in place of adequate scaffolding and ladders. Do not use barrels, boxes and similar objects as working platforms nor to support scaffolding or stagings. Attach all scaffolding to adequate supports at regular vertical intervals. Ladders and step-ladders must be constructed and used safely. Ladders should be securely attached to a scaffolding or building and should have a firm footing.

11.9 Storage and Safekeeping of Materials

All materials must be stored, moved and transported in a manner that avoids risk. Maximum loads on structures must observe the standards in the Canadian Construction Safety Code. The standards for height and width of piled or stacked materials must also be observed. Corrosive, inflammable or toxic materials must be stored in approved receptacles which must bear labels

indicating the name of the substance, the danger, prohibited uses and the protective and remedial measures to be taken.

11.10 Tools

All electric tools other than those with double insulation must be suitably grounded and should be disconnected when left unattended. All tools must be maintained in good and clean condition. They should be secured under lock and key outside working hours. Explosive operated equipment and tools should only be used by trained operators, and their use, maintenance and storage should be in accordance with the established standards.

11.11 Explosives

All work involving blasting must be directed and executed by a competent and experienced person holding a valid blasting licence. This person must ensure that safety precautions are taken. Federal regulations for the transport, storage and security of explosives must also be complied with. If blasting is to be carried out near utility services it is advisable to have a representative from the service company available in case service is disrupted.

11.12 Electricity

The electrical services to the construction site must be protected by the incorporation of a service panel with fuses and a master switch contained in a lockable enclosure. On large sites, separate circuits should be provided for security lighting and equipment.

11.13 Emergency Procedures

It has already been noted (see 3.1) that the construction manager is responsible for establishing a construction safety program and that the construction superintendent is responsible for implementing it. A list of

procedures to be followed in case of an emergency or fire should be drawn up and posted in a prominent place. Someone should be appointed to coordinate emergency operations on the site. A list should be kept of employees with first aid training, and volunteer firefighters who could provide assistance during emergency. Emergency telephone numbers should be posted at all telephones on site. The construction manager must also ensure at the outset of the project that the organizations responsible for providing emergency services are informed of the location of the construction site and its means of access. They should also be advised as to the availability and location of water for firefighting.

A comprehensive first aid kit should be available on site. In some cases, for example, road-works, the actual work may be taking place at some distance from the site office, and the first aid kit should be carried on a vehicle which remains at the work site.

Workers witnessing an accident should assist the construction superintendent in the production of an accident report immediately after first aid has been administered. In the case of loss of life all access to the site must be prohibited until permission has been given by the coroner and, in certain instances, the insurance company. In exceptional cases work may continue if it is essential to avoid further accidents or deterioration in site conditions.

One of the commonest emergencies on a construction site is fire. This is of such significance that it is dealt with separately in 12.0.

11.14

Recommencement of Work Following an Accident

Work should not recommence until the cause of an accident has been determined and, if necessary, corrective measures undertaken. The costs resulting from the accident, the program of work and secondary effects such as loss of equipment

and materials, deterioration in workers' morale, etc., must also be considered and the project evaluated before starting work.

The necessary measures to restore safety on the site should be directed by experts such as engineers, architects, or electricians. They would inspect the project and be responsible for determining the conditions under which work might recommence. For example, in the case of subsidence, a soil engineer should determine the nature and extent of the unstable ground and the required remedial measures. If electrical, gas or similar services were involved or in danger of being damaged, it is necessary to seek the advice of the appropriate authority.

11.15 Insurance

Despite the most stringent precautions, the risk of an accident or disaster will always exist. It is for this reason that the three types of insurance discussed in section 3.10 should be obtained and maintained in force throughout the duration of the project.

12.0 FIRE PROTECTION

12.1 Causes of Fires

Fire is one of the greatest hazards on a construction site. It may be caused by:

- a. external sources such as lightning, or forest and prairie fires;
- b. defective equipment or installations such as insulation on electrical wiring or leaking gas services; and
- c. human error (probably the commonest cause of fire).

12.2 Protection Against External Sources

It is difficult to provide adequate protection against major forest or prairie fires or a direct lightning strike. It is however relatively simple to prevent the spread of minor fires into the construction site. This may be done by providing fire breaks in wooded areas and by clearing brush and long grass to a distance of at least 30 m from any construction activity.

12.3 Protection Against Defective Equipment and Installations

The simplest way of protecting against this type of fire source is to ensure that only good quality equipment and materials meeting Canadian Standards Associations, Underwriters Laboratory of Canada and Factory Mutual Systems requirements are used. The work should be carried out by qualified tradespeople and should be inspected and tested for quality of material and labour prior to closing in and use.

12.4 Protection Against Human Error

12.4.1 Site Organization

In organizing the layout of the site, the risk of fire can be substantially reduced by taking the following steps:

- a. fire hazards should be sited down wind from the main construction site;
- b. separate areas should be provided for the storage of inflammable materials and combustibles, and adequate space (not less than 15 m) should be provided between them;
- c. a site apart from the main storage area should be provided for the storage of fuel and lubricants and for the refuelling and servicing of vehicles and mechanical equipment; and

- d. the construction site should be kept clean and tidy and free from waste materials (these should be carted to a well controlled garbage dump).

12.4.2 Site Control and Discipline

Strict control and discipline on the site is probably the most effective protection against fire. This includes the following:

- a. Deny access to the site to anyone who is in any way impaired through the use of alcohol or drugs (prescription or self-administered) or any other cause.
- b. Prohibit smoking when refuelling vehicles or handling or working with petroleum solvents or other highly inflammable materials.
- c. Use plumbers' torches and welding equipment correctly and ensure that they are shut off or disconnected if left unattended.
- d. Dispose of cotton waste, rags and other materials which have been used with solvents very carefully.
- e. Burn waste materials only under controlled conditions.
- f. Exercise special care when lighting fires for warmth or using equipment for heating food or beverages in cold weather.
- g. Carefully control the location and maximum temperature of heaters for buildings or concrete in cold weather.
- h. Ensure strangers or children do not enter the site particularly during non-working hours.

12.5

Protective Measures

Most large fires start as small fires that can be easily extinguished if caught at the start. The construction manager should therefore develop a fire protection plan to be implemented by the workers on site pending the arrival of the fire brigade. This would include the following:

- a. Ensure that all employees are briefed on the action to take in the event of a fire and that responsible persons will sound the alarm and call out the fire brigade.
- b. Locate portable type ABC 10 pound fire extinguishers in strategic locations on the site.
- c. Ensure that all vehicles and mechanical equipment carry an appropriate type of fire extinguisher.
- d. Identify a source of water for firefighting and, if necessary, provide a small pump hose capable of delivering water to the site.
- e. Prepare an evacuation plan and brief all employees on it in case the fire gets completely out of control. In the initial stage of the fire all workers should participate in the firefighting operations providing this does not present a risk to their lives.

12.6

Fire Department

Part of the initial firefighting operation should be to ensure that no materials, tools or equipment will hinder the arrival of the fire apparatus at the scene of a fire. Once the fire department arrives on site all directions on firefighting will come only from the fire chief. Workers should assist if required to or keep clear of the site.

12.7 Fire Reports

All outbreaks of fire must be recorded in the job diary and as a separate report. This should cover:

- a. the location, date and time of the fire;
- b. the cause or source of the fire;
- c. the starting point and extent of the fire, the estimated value of the damage, and the remedial action required;
- d. the names, addresses and telephone numbers of all witnesses;
- e. the actions taken to raise the alarm, call the fire brigade and bring the fire under control, and the time the fire was extinguished;
- f. any measures taken to secure the site or structure, for example, temporary shoring or fencing;
- g. weather conditions at the time of the outbreak; and
- h. status of site utility services at the time of the outbreak. Were they charged and in operation?

12.8 After the Fire

Once the fire has been extinguished a careful watch should be maintained to ensure that there is no secondary outbreak caused by smouldering materials. If there is major damage to the project it should be inspected by competent professionals to ensure the safety of the structure. If an insurance claim is to be made no further work should be undertaken until it has been inspected by the insurance adjuster. If there is a loss of life the site must also be inspected by the local coroner before work can recommence.

13.0 COMPLETION - CONTRACTS

13.1 Meeting Deadlines

The completion of work which is carried out by contract will frequently control the start of other activities. For example, electrical wiring in a building must be completed before the wall can be closed in. Contracts will normally be scheduled to meet deadlines at various stages of work, for inspection, testing and for making good any deficiencies in the work. If a contract must be done before other work and the contractor is unable to make the deadline, it will delay all subsequent work. A construction manager must therefore be alert to anything that may prevent the contractor from meeting the deadline.

13.2 Inspection

All contract work is subject to inspection by the construction manager and the supervisory staff so the actual progress in relation to the project schedule is monitored and a check can be made for completeness, compliance with specifications, and quality of materials and work. The completed work should be inspected by the construction manager, and representatives of the contractor and client. In some cases, for example, electrical and plumbing work, it must also be inspected for compliance with established codes.

13.3 Deficiencies

Routine inspections while work is in progress should ensure that it is carried out satisfactorily and in accordance with the terms of the contract. Failure to meet specifications will normally result in the contractor being called upon to rectify them. Nevertheless some deficiencies may be noted during the inspection of completed work. All deficiencies must be listed and a copy passed to the contractor with

instructions to make good the work. Whenever possible, this should be done before the contractor's work force leaves the site.

13.4 Hold-backs and Warranties

When the work is satisfactorily completed the construction manager issues a certificate of completion. Payment is then authorized for the work. A percentage, such as 10% (see Appendix 20) is normally held back until all the deficiencies are corrected. It is also customary to require a one year warranty period on all work carried out. The contractor should turn over to the construction manager any manufacturers' warranties for equipment or other components which were installed in the project.

13.5 Records

An accurate record of the actual work should be kept in the form of as-built drawings amplified by notes and measurements. This is particularly important if the completed work is not visible. For example, the positions of junction boxes in electric wiring, and the location of water mains should all be noted and preferably referenced to some permanent fixture so that they can subsequently be located if it is necessary. The record should be stored in the site office until completion of the project. After the project is finished these important records must be stored where they will be safe and available to those who will be maintaining the facility.

14.0 COMPLETION - PROJECT

14.1 Maintaining Momentum

There may be a tendency for the pace of work to slacken as the project nears completion and the labour force is reduced. This can result in a number of minor tasks being left uncompleted. The cost of bringing back labour, tradespeople and

contractors to complete such tasks is usually out of all proportion to the actual value of the work to be done. It is therefore important to maintain momentum and ensure that all work is satisfactorily completed on time.

14.2 Interim Inspection

When the facility is nearing completion, the construction manager should arrange an interim inspection by the project officer, and representatives of the client and contractor to:

- a. ensure that the constructed facility meets the original plan requirements and is constructed in accordance with plans and specifications and properly authorized change orders;
- b. test all equipment and ensure that all electrical, mechanical and other installations fit and work properly;
- c. prepare a deficiency list; and
- d. arrange that any deficiencies in work will be corrected.

14.3 Beneficial Occupancy

At this time the construction manager may authorize interim or beneficial occupancy or use of the facilities by the client or users while correcting deficiencies, restoring disturbed ground, and generally cleaning up the project. The construction manager should also check that all changes from the original plans are recorded and that as-built drawings and records incorporating the work done by contractors referred to in 13.5 are complete. Original completed warranty certificates and operating and maintenance manuals should be turned over to the client. The construction manager should also be satisfied that operating and maintenance personnel

have received adequate training and have been briefed on procedures for recording the operation, maintenance and repair of all installations.

14.4 Completion After Occupancy

There is little problem in completing minor deficiencies after the facility is in use. There are, however, some situations in which major works can only be undertaken after occupancy. For example, schools are normally required early in September which means having occupancy in late August to bring in furniture, etc. The best time of the year to carry out landscaping is in September and early October when the school is in full use. In such cases, the construction manager has added responsibilities including:

- a. minimizing conflict between the construction operation and the use of the facility by the client;
- b. protecting the construction work from vandalism or from accidental damage caused by the users;
- c. protecting materials and equipment; and
- d. making provision for the safety of the users particularly if there are open excavations, overhead work or heavy equipment operations in progress.

14.5 Final Acceptance

After all deficiencies have been corrected, the band council will form a team to accept the project officially. The team should include the project officer, the construction manager, and representatives of the user and the band council. This team should inspect the project and check that:

- a. the construction site is cleaned up;

- b. all deficiencies are completed;
- c. all equipment warranties and operation and maintenance manuals are in order and available;
- d. the users' operation and maintenance staff are familiar with all installations and with their duties;
- e. an inventory is prepared of all equipment and materials that are to be retained;
- f. the final statutory declarations are prepared;
- g. all financial claims and disputes are settled;
- h. all tools and other equipment are handed over to the client; and
- i. the as-built drawings and records are formally handed over to the band manager for safe keeping.

14.6 Completion Certificate

The construction manager and the project officer will issue a completion certificate to the band council. A copy should be given to the program manager (Appendix 21).

14.7 Project Completion Report

The construction manager must prepare a job completion report which identifies any deficiencies found in the drawings, specifications and bills of materials, problems encountered during construction and general comments and recommendations. The report should also list all records and project documents that were used on the site, all of which should be gathered together and turned over to the band manager. Such records may prove to be very important in the event of disputes with contractors, or the correction of construction faults which appear after takeover. The as-built drawings and records are also

important when maintenance, alterations and additions are planned for the project. The date of transfer of responsibility and other administrative details must also be included.

15.0 POST - CONSTRUCTION SERVICES

15.1 Operation and Maintenance Manuals

The construction manager should request that operation and maintenance manuals are provided not only for equipment installed for the constructed facilities but also for other equipment purchased to support its operation and maintenance. It is also very important to ensure the maintenance staff themselves receive the necessary training to use the manuals and look after equipment. If this has not been done the construction manager should see that the necessary arrangements are made.

15.2 Project Evaluation

Each project that is carried out by day labour provides important data which may be effectively used later for other projects. The experience gained, particularly with regard to difficulties which are encountered and the steps taken to resolve them, should be recorded for the benefit of construction managers who will be involved with future projects. The evaluation process is directed primarily towards the project and the basic purpose is to assess it as objectively as possible.

16.0 RELATED PUBLICATIONS AND SOURCES OF INFORMATION

16.1 Band Technical and Contract Publications

The following publications can be obtained from your district office:

BTP-CN-1 Construction Contracting Guidelines
for Band Councils.

BTP-GT-1 Guidelines for Construction Management
by Band Councils.

BTP-GT-2 Guidelines for Construction Inspection
by Band Councils.

16.2 Other Publications

Canada Mortgage and Housing Corporation. Canadian
Wood Frame House Construction. Montreal Road,
Ottawa, Ontario K1A 0P7.

National Building Code:

- . Section 8, Construction Safety Measures.
- . Section 9, Housing and Small Buildings.

16.3 Labour Rates

Labour rates are available from:

- . Labour Canada, Eastern & Northern Ontario
District, SBI Building, 11th Floor,
2323 Riverside Drive, Ottawa, Ontario K1A 0L5.
- . British Columbia, Alberta, Yukon Territory &
Northwest Territories, Mountain Region, Dept.
of Labour, 750 Combie St., Vancouver, B.C. V6B
2P2.
- . Saskatchewan, Manitoba, Northwestern Ontario,
Central Region, Dept. of Labour, 4000 303 Main
St., Winnipeg, Manitoba R3C 3G7.
- . Quebec, Saint Lawrence Region, Port of
Montreal Bldg., Wing 3, Cité du Havre,
Montreal, Quebec H3C 3R5.
- . New Brunswick, Nova Scotia, Prince Edward
Island and Newfoundland, Atlantic Region,
Canadian Dept. of Labour, c/o VIC Offices, 4th
Floor, Federal Bldg., 1075 Main St., Moncton,
N.B. E1C 1H2.

16.4 Safety Codes

Most provinces have provincial safety codes which can be obtained from the regional workers' compensation office.

16.5 Fire Safety Standards

Copies of the following standards may be obtained from the Fire Commissioner of Canada, Public Works Canada K1A 0M2, or from a regional commissioner.

DFC No. 374 Dominion Fire Commissioner's Standards for General Storage (Indoor & Outdoor), March 1977.

DFC No. 301 Fire Commissioner of Canada's Standards for Construction, June 1982.

16.6 Unemployment Insurance

Information on unemployment insurance can be obtained from the district office of the Unemployment Insurance Commission in the area of the project.

16.7 Workers' Compensation

Information on workers' compensation can be obtained from the provincial workers' compensation board.

Appendix 1

CHECKLIST FOR CONSTRUCTION MANAGERS: PLANNING PHASE

This list shows typical items with which the construction manager should be familiar. It is not necessarily exhaustive nor applicable in its entirety to every project. It is recommended that the construction manager should prepare his or her own list for each project, adding or deleting items as necessary.

Appendix 1 (cont'd)

CONSTRUCTION MANAGERS CHECKLIST - PROJECT PLANNING PHASE

No.	DESCRIPTION	BY	DATE
1.0	Budget authorized \$-----		
1.1	- band \$-----		
1.2	- DIAND \$-----		
1.3	- other -----		
2.0	Site selected		
2.1	- title cleared		
2.2	- boundary survey		
3.0	Local resources checked		
3.1	- tradespeople		
3.2	- labour		
3.3	- materials		
3.4	- equipment		
3.5	- other -----		
4.0	Site access agreed		
4.1	- temporary		
4.2	- permanent		
5.0	Servicing approved		
5.1	- water, temporary		
5.2	- water, permanent		
5.3	- electricity, temporary		
5.4	- electricity, permanent		
5.5	- sanitation facilities, temporary		
5.6	- sanitation facilities, permanent		
5.7	- site drainage, temporary		
5.8	- site drainage, permanent		
5.9	- garbage disposal, temporary		
5.10	- garbage disposal, permanent		
5.11	- telephone, temporary		
5.12	- telephone, permanent		
5.13	- other -----		
5.14	- other -----		

Appendix 1 (cont'd)

CONSTRUCTION MANAGERS CHECKLIST - PROJECT PLANNING PHASE

No.	DESCRIPTION	BY	DATE
6.0	Temporary facilities approved		
6.1	- site office		
6.2	- storage compound		
6.3	- warehousing		
6.4	- eating facilities		
6.5	- lodging		
6.6	- garage		
6.7	- other-----		
7.0	Safety & security arranged		
7.1	- fire protection		
7.2	- police protection		
7.3	- first aid		
7.4	- insurance		
7.5	- other -----		
8.0	Construction managers mandate agreed		
8.1	- authority		
8.2	- responsibilities		
8.3	- reporting responsibilities		
8.4	- staff		
8.5	- remuneration		
8.6	- duration		
8.7	- other -----		

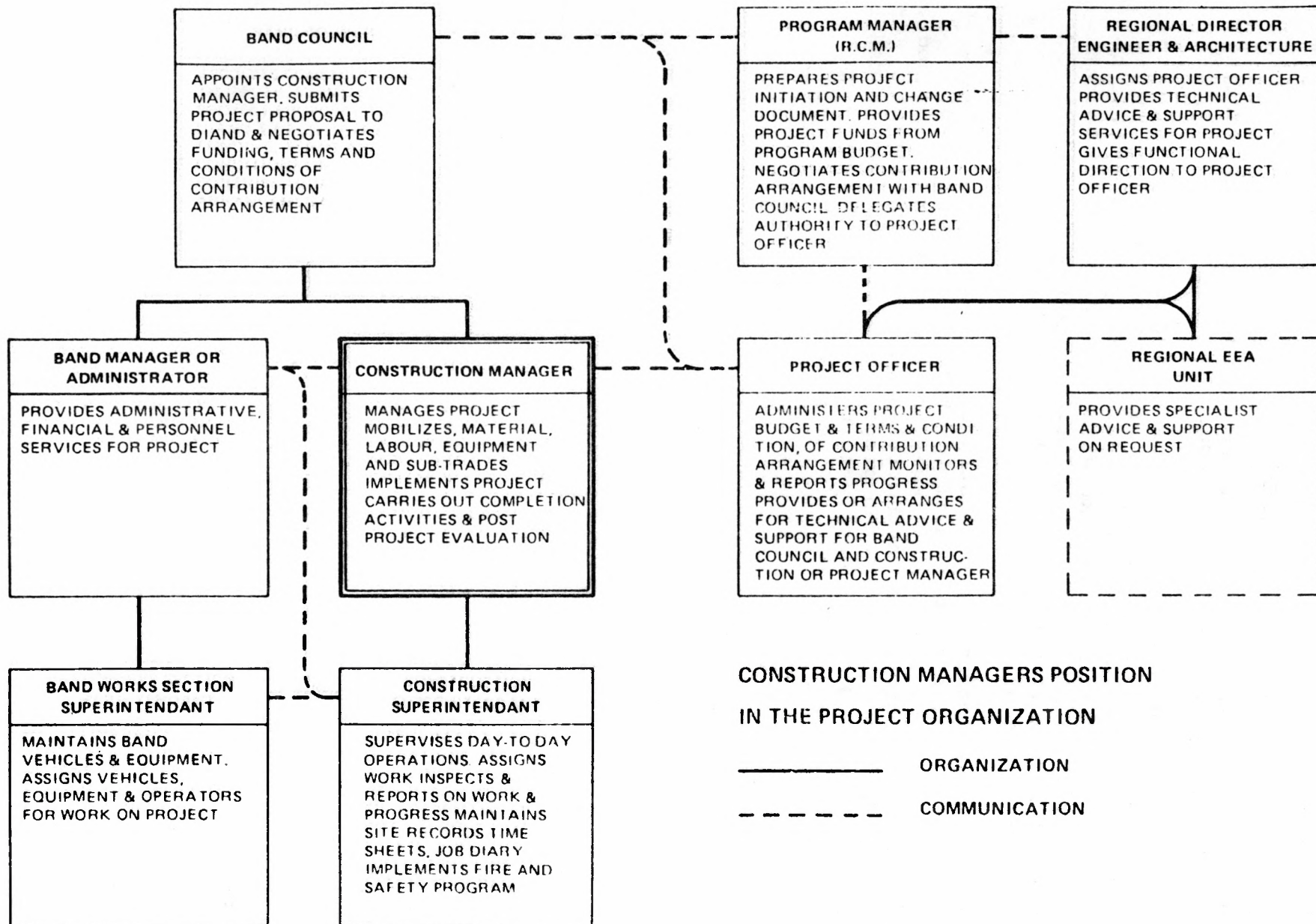
Appendix 2

ORGANIZATION CHART

The chart illustrates a typical organization for implementing band managed projects by day labour.

The construction manager should be appointed by and report to band council. Whenever possible this person should be appointed early in the project development process so that he or she can contribute their knowledge of construction to the planning and design process, and at the same time become thoroughly familiar with the site conditions and with all aspects of the project.

Prior to appointment, the construction manager should arrive at an agreement with band council (preferably in the form of written terms of reference) regarding the construction methods, reporting relationships, authorities and responsibilities. The construction manager can then prepare a site organization chart (see Appendix 19) and identify suitably qualified local residents who may fill some of the positions.



Appendix 3

ESTIMATE AND SCHEDULE FOR CONSTRUCTION

The construction manager and project officer should determine the division of responsibilities for the construction phases of the project. This is particularly important where there is multi-source funding or participation in the project by other agencies or organizations who may reserve the right to design or construct certain facilities (for example, electricity distribution systems, parts of a sewer or water supply system serving an adjoining municipality as well as the reserve).

Together they should determine the amount of unskilled and semi-skilled labour and the number and types of operators or tradespeople who will be needed to implement the project by day labour and whether or not the band can provide them. If the band cannot meet the requirements, additional employees or trades contractors must be brought in. This may affect the cost estimate.

The attached tables show ways of preparing:

- an estimate of the required labour force;
- the financial requirements, financial allocation and cost sharing; and
- the project time schedule.

In preparing financial statements the costs should be estimated in constant dollars (making due allowance for remoteness, difficulty of access, local conditions, etc.) and multiplied by escalation indices (to allow for inflation) to convert the estimate to current dollars for the base year.

A break down of estimated construction costs should be appended. It should be qualified by allowances for inadequate site information, delays in implementation, etc.

Appendix 3 (cont'd)FINANCIAL REQUIREMENTS

Estimated costs in current 198_ dollars

	\$	\$
Preliminary investigations and studies		XXXX
Surveys		XXXX
Design		XXXXX
Construction:		
- materials	XXXXXX	
- labour	XXXXXX	
- equipment	XXXXXX	
- contracts	XXXX	
- supervision and quality control	XXXX	
- contingency	<u>XXXX</u>	XXXXXX
Salaries		XXXXX
Administration		XXXXX
Miscellaneous		<u>XXXX</u>
Total estimated cost in current 198_ dollars		<u>XXXXXX</u>

FINANCIAL ALLOCATION AND COST SHARING

YEAR	BAND	DIAND	OTHER	OTHER	TOTAL
	XX%	XX%	XX%	X%	
To date					
CY					
CY+1					
CY+2					
CY+3					
CY+4					
CY+5					
TOTAL					

Appendix 3 (cont'd)

LABOUR FORCE REQUIRED TO IMPLEMENT PROJECT

TRADE	NO.	HOURS	P/HRS	RATE	TOTAL	REMARKS
Labourers						
Drivers						
Operators:						
- backhoe						
- bulldozer						
- scraper						
- loader						
- crane						
-						
-						
Tradespeople						
- bricklayers						
- carpenters						
- electricians						
- plumbers						
- pipefitters						
-						
-						
Leading hands						
Fore man/woman						
Rod man/woman						
Store keeper						
TOTAL						

01/05/84

Appendix 4

RESOURCE ALLOCATION BAR CHART

This chart is used for scheduling activities and allocating resources in the most effective manner. The objective is to use the smallest labour force to complete the project in the prescribed time while maintaining employment at a relatively constant level throughout the project.

The steps are as follows:

- draw up a line of activities;
- estimate the duration of each activity using the minimum number of personnel;
- for each activity identify activities controlling its start and activities which cannot start until it is completed;
- plot the sequence of activities on a bar chart and identify those which lie on the critical path and those with float time;
- record duration and resources for each activity and the cumulative elapsed time on completion of each activity;
- plot a line showing the level of total labour force throughout the project;
- level off variations in personnel by inspection;
- plot a revised bar chart showing the scheduling of activities after resource levelling; and
- plot a new line showing the revised labour force.

The construction of a small concrete block building has been used to illustrate the procedure.

The Activity List shows that Activity A 'Layout Work' will last 2 hours and require 2 persons. Its completion controls the start of Activity B. Similarly Activity B 'Excavate' will last for 2 hours, require two persons and cannot start until Activity A is completed. Activity J 'Cut Lumber' controls the start of Activity K 'Make window and door casings' and Activity L 'Assemble roof trusses'. The start of Activity N 'Install casing' is dependent upon Activity K 'Make door and window casings' and Activity M 'Lay block' (start).

Appendix 4 (Cont'd)

The activities are plotted to a horizontal time scale on the initial bar chart. The times shown are working hours. The two day durations for Activity E 'Cure concrete footings' and Activity I 'Cure concrete slab' are therefore shown as 16 hours each. The dotted line identifies activities on the critical path. The duration, the cumulative elapsed time on completion of each activity and the personnel required are shown under each activity. Activities having float time (Activities J, K, L & S) also carry symbols showing the earliest start, the latest start, and the latest finish. These activities can be rescheduled to commence anywhere between the earliest start or the latest start.

A line is plotted below the bar chart to show the total labour force required throughout the project. It will be seen that it varies between 6 and zero and that there are a number of peaks and hollows.

The resources are levelled on an inspection and trial and error basis and a new bar chart is plotted to show the rescheduling and revised resource allocation after levelling. The steps taken are referenced to the revised bar chart.

- A Commence work on Friday so that Activity E, which does not require a labour force, will occur at the weekend.
- B Reschedule Activities K and L and reassign the workers to Activity C 'Erect Formwork' to reduce the duration from four hours to two hours thereby ensuring that the footings can be poured within the normal work week (that is no overtime).
- C Carry out Activities K and L on Tuesday and Wednesday and assign additional workers to Activity L which has now become critical.
- D Complete Activity H 'Pour slab' on Tuesday afternoon and allow it to harden overnight sufficiently to carry out Activity M 'Lay Block' (start) just before midday.
- E Assign additional labour to Activity N 'Install casings'.
- F Assign additional labour to Activity P 'Erect trusses' to ensure that the work will be completed within the normal working week.

Appendix 4 (Cont'd)

- G Carry out Activity S 'Install doors and windows' at the same time as Activity A, 'Sheath roof' and Activity T 'Paint' at the same time as Activity R 'Shingle Roof'.

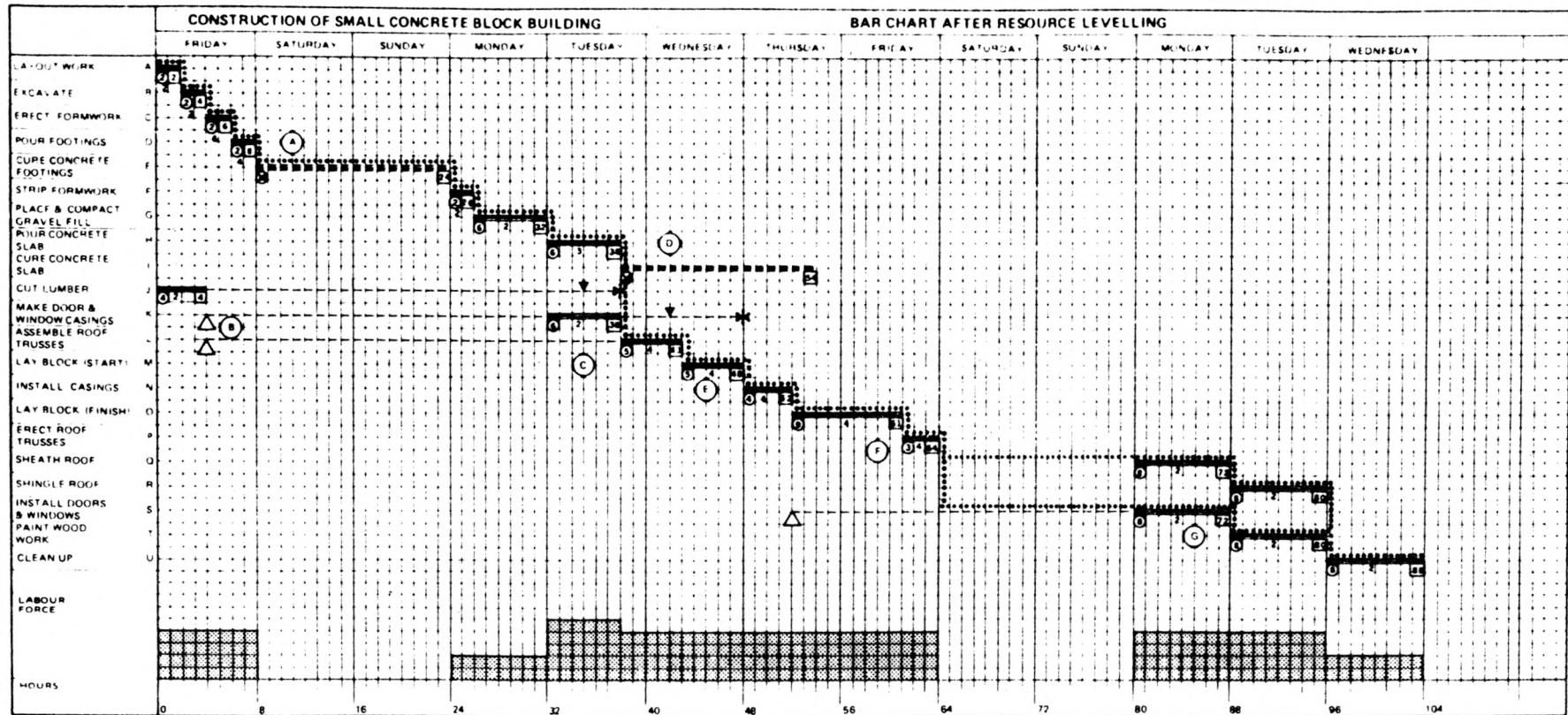
A line showing the revised labour force is again plotted below the bar chart. It will be seen that the level is reasonably consistent and that there are no major bumps or hollows.

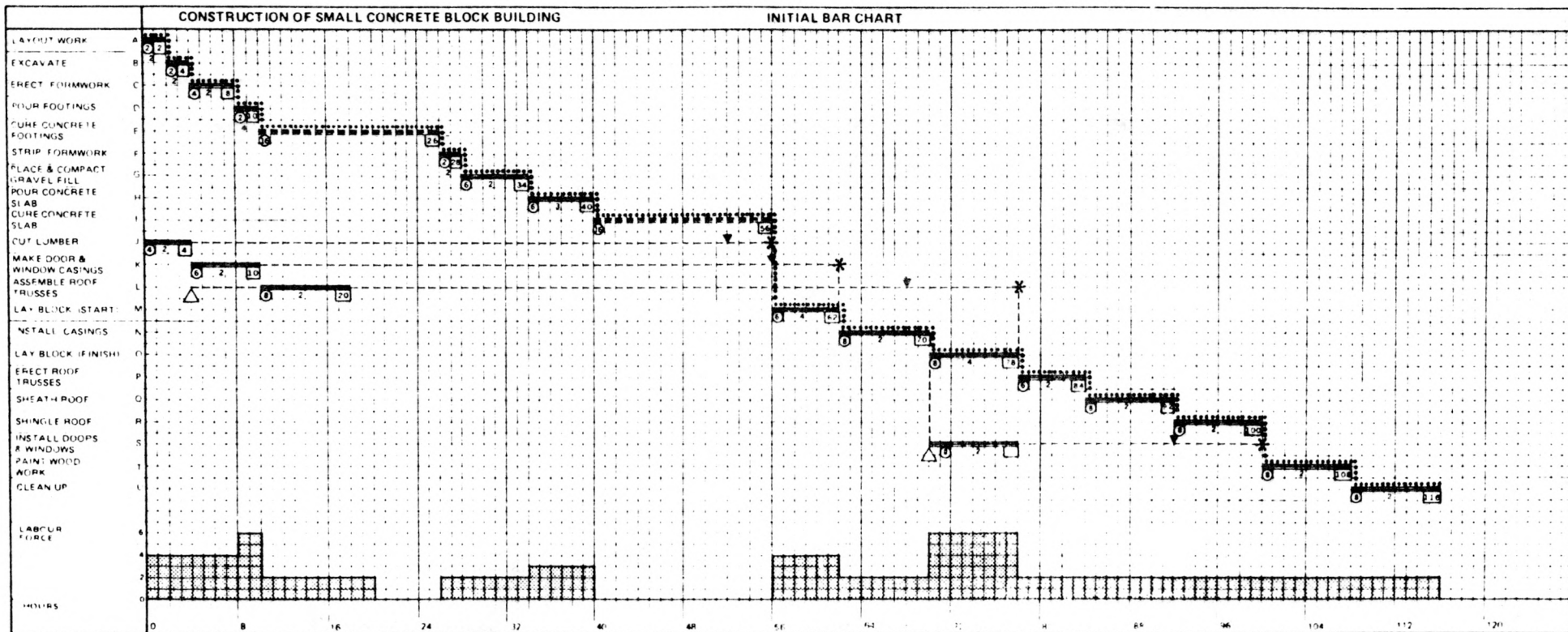
The case used to illustrate the procedures is relatively simple and addresses only the levelling out of personnel requirements. On larger more complex projects it may be necessary to level various elements on the project independently. On some projects the rental and operation of mechanical equipment may represent a major cost element in which case the allocation of equipment should be levelled in a similar manner.

Appendix 4 (Cont'd)

CONSTRUCTION OF SMALL CONCRETE BLOCK BUILDING
ACTIVITY LIST

ACTIVITY			START	FINISH	PERS-
ITEM	DESCRIPTION	TIME	DEPENDS ON	CONTROLS	ONNEL
A	Layout work	2 hrs.	-	B	2
B	Excavate	2 hrs.	A	C	2
C	Erect formwork	4 hrs.	B	D	2
D	Pour footings	2 hrs.	C	E	4
E	Cure concrete footings	2 days	D	F	---
F	Strip formwork	2 hrs.	E	G	2
G	Place and compact gravel fill	6 hrs.	F	H	2
H	Pour concrete slab	6 hrs.	G	L	3
I	Cure concrete slab	2 days	H	M	---
J	Cut lumber	4 hrs.	-	K&L	2
K	Make door and window casings	6 hrs.	J	N	2
L	Assemble roof trusses	10 hrs.	J	P	2
M	Lay block (start)	6 hrs.	L	N	4
N	Install casings	8 hrs.	K&M	O&S	2
O	Lay block (finish)	8 hrs.	N	P	4
P	Erect roof trusses	6 hrs.	L&O	Q	2
Q	Sheath roof	8 hrs.	P	R	2
R	Shingle roof	8 hrs.	Q	U	2
S	Install doors and windows	8 hrs.	N	T	2
T	Paint woodwork	8 hrs.	S	U	2
U	Clean up	8 hrs.	R&T	--	2





Appendix 5

HIRING CARD

The Hiring Card is to be completed for each employee except those who are working under contract and others from regional or district offices who may be seconded to the project temporarily or permanently. These cards are to be retained locally and contain the following information:

- a) name and position;
- b) Social Insurance Number;
- c) date hired and terminated;
- d) exemption code;
- e) income tax exemption;
- f) reason for leaving;
- g) notification of next of kin; and
- h) authorization to deduct funds for board, lodging, medical fees, transportation, purchases, loss of tools etc.

Appendix 5 (cont'd)

HIRING CARD (TYPICAL)

(FRONT)

SURNAME		GIVEN NAME		BADGET NO.
OR HIRING		LAST DAY WORKED		
SEX: M F	DATE OF BIRTH		STATUS M S	
SOCIAL INSURANCE NO.		INC. TAX EXEMPTION CODE		
DATE	RATE	OCCUPATION	ADDRESS	TEL.
IN CASE OF ACCIDENT, NOTIFY				
NONE		ADDRESS		
PERSON FOR LEAVING		RE-ENGINEER	YES ()	NO ()
PREPARED BY _____		APPROVED BY _____		

(BACK)

Date.....
 I, the undersigned, hereby agree to enter at the employ of

 At the rate of pay appearing on the opposite side.
 I also authorize.....
 to deduct from my wages all amounts I owe to

 for board, lodging, transportation, purchases, etc.....
 as well as the cost of all tools and equipment taken out and not
 returned.
 Signature.....

Appendix 6

INDIVIDUAL RECORD CARD

An individual's record card contains all the pertinent information necessary to ensure that all necessary deductions are made and payment received for all hours worked. This card contains the following information for each employee.

- a) name and position;
- b) rate of pay;
- c) income tax exemption code;
- d) Social Insurance Number;
- e) starting and employment termination date; and
- f) weekly hours of work, gross pay, deductions, net wages and vacation pay.

The employee's record card is maintained as follows:

- a) For each regular pay period, enter the hours worked and multiply by the hourly rate to arrive at the gross salary.
- b) Using the gross salary, enter the appropriate deductions for Canada Pension and Unemployment Insurance using the proper section of the tables.
- c) Using the gross salary minus the Canada Pension and Unemployment Insurance deductions, enter the deduction for income tax from the appropriate section of the tax tables. The column used in the table depends on the code shown on the employee's T.D.-1 form.
- d) Determine the total deductions and subtract from the gross pay to get the net pay.
- e) The time check column is ticked off when time sheets are received and the hours verified.
- f) Vacation pay is calculated at the current percentage rate and paid on termination.
- g) Room and board costs to be deducted, if applicable.
- h) Isolated Post Allowances to apply to those communities so designated in isolated areas.

Appendix 7

DAILY TIME CARD FOR FOREMAN/WOMAN

Progress control involves monitoring schedules and surveying completed quantities. To do this, factual records must be prepared initially at the first level of supervision; the foreman/woman level.

The work plan is divided into activities, elements and sub-elements, each with its designated code, and corresponding to the data contained in the estimate. The hours of work are then recorded, both regular and overtime, for each employee on all of the work performed. An employee may work on more than one element in any given day. When the appropriate rate of pay has been applied to the hours worked, the card will provide factual data on the total expense for any given day, for each element of work.

[illegible]

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Appendix 8

PREVAILING RATE PAY LIST

This form is used to determine the net wages to be paid to each hourly rated employee on the project. It is completed for each pay period by entering the name, classification and hourly rate for each employee.

Normal hours, overtime and allowances are entered and multiplied by the hourly rate to give the total wages earned during the pay period. From these are deducted the appropriate sums for income tax, retirement funds, accommodation, meals, etc., to give the net wages.

The completed forms should be forwarded to the band office for processing and issuance of wage packets or cheques.

PREVAILING RATE PAY LIST

PERIOD		LOCATION		EXPLANATION OF STATUS CODES FT=FULL TIME, S=SEASONAL, PT=PART TIME, P=PROJECT, C=CASUAL		TIME HRS	RATE / HR.	AMOUNT OF WAGES	INCOME TAX	RET. FUND	SUPERANNUATION		DEATH BENEFIT	UNEMP. INS.	QUARTERS & RATIONS	RENT	OTHER DED.	CD	OTHER DED.	CD	TOTAL	NET PAY
NAME AND CLASSIFICATION		POSITION NUMBER		NORMAL				Q & R VAL.			CURRENT	ARREARS										

STATISTICS

STATUS OF EMPLOYEES	NORMAL		OVERTIME	
	NO. OF EMPLOYEES	EARNINGS	NO. OF EMPLOYEES	EARNINGS
REGULAR				
CASUAL				
TOTAL				

COLUMN
TOTALS

I HEREBY CERTIFY THAT THE EMPLOYEES LISTED HEREIN OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT HAVE BEEN ENGAGED IN DUTIES PERTAINING TO THEIR CLASSIFICATIONS DURING THE WHOLE TIME INDICATED AND THAT THE RATES OF PAY HAVE BEEN AUTHORIZED

OFFICER IN CHARGE

FOR MINISTER

EXPLANATION OF OTHER DEDUCTIONS CODES

MEALS	1	QUEBEC TAX	6
STAFF ASSOC. DUES	2	ADVANCE	7
BONDS	3		8
GOV'T MED	4		9
BLUE CROSS	5		0

Appendix 9

CHANGE ORDER

This form is used to give instructions (or confirm verbal instructions) to a contractor requiring him/her to:

- delete work contained in the original contract;
- extend the amount or scope of work contained in the contract;
- alter the sequence or method of performing work from that agreed in the contract; or
- carry out additional work not included in the contract.

When completed and signed the original should be delivered by hand to the contractor, a copy retained on the project file and a copy forwarded to the band office. A note of the change should be made in the job diary (see Appendix 12), on the contractor's progress claim (see Appendix 16) and on the certificate of payment (see Appendix 17).

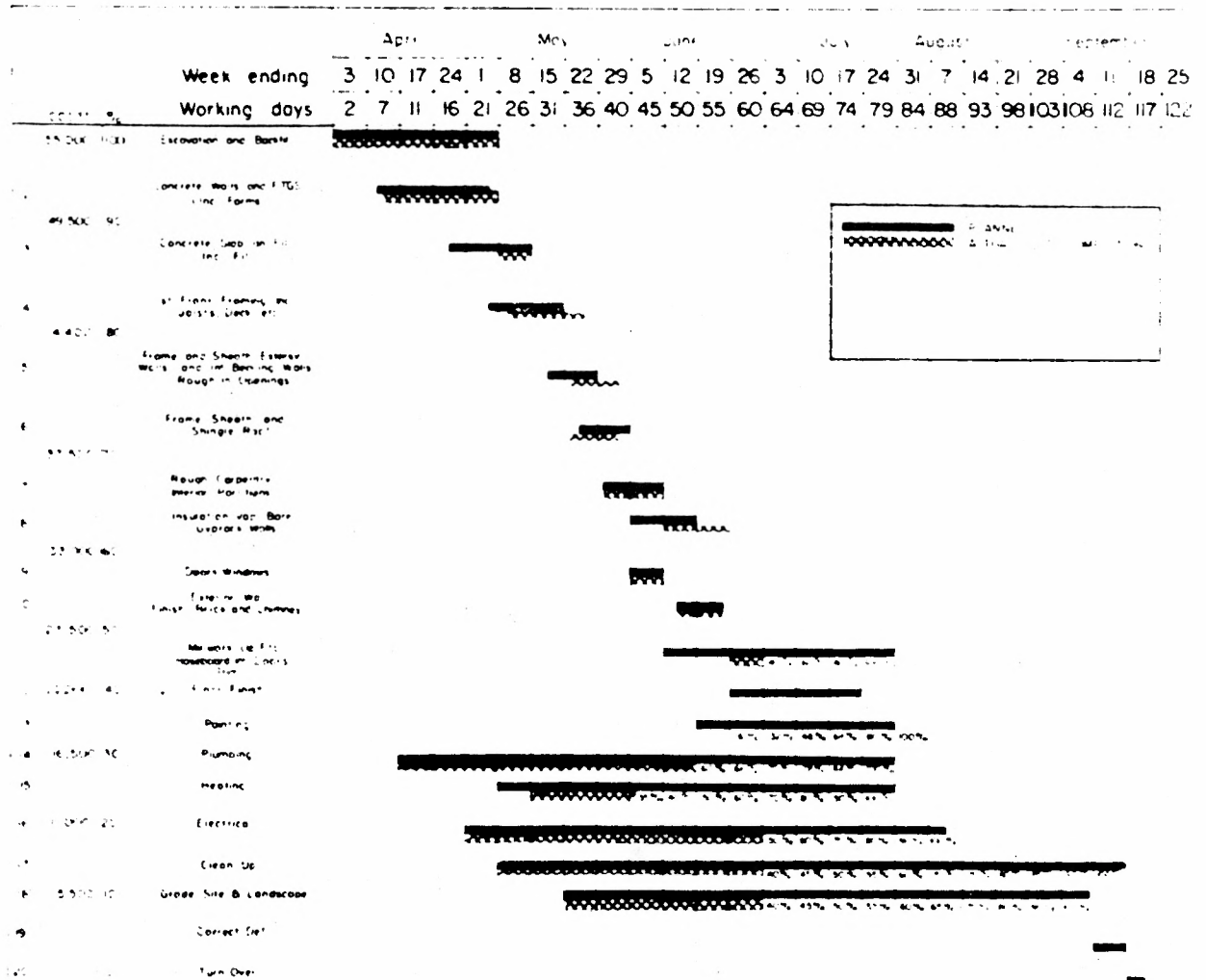
CHANGE ORDER

Date	Change Order no:	
To (Contractor)	Project	
	Project Construction Manager	
Owner	Distribution	
Description		
<p>Issued by _____ Date _____ Signature _____</p> <p>Complete, in the space provided, your proposal for the change described above; attach relevant details as necessary, and submit promptly to the Construction Manager. This change Order shall not be executed until your proposal has been approved by the Owner and the Construction Manager.</p>		
Contractor's proposal		
The contract amount shall be increased by \$ _____ be decreased by \$ _____ remain unchanged	The time of completion of Contract shall be increased by _____ days be decreased by _____ days remain unchanged	
	Date	Contractor's Signature
Approval		
	Date	Signature
Architect	Date	Signature
Construction Manager	Date	Signature
Owner	Date	Signature
Cancellation of present Change Order		
By	Date	Signature

Appendix 10

PHYSICAL PROGRESS DURING CONSTRUCTION PHASE

Physical Progress during Construction Phase



Adapted from *A Study of Project Planning and Progress in the Canadian Construction Industry*, published by the Canadian Construction Association, Ottawa

01/05/84

Appendix 11

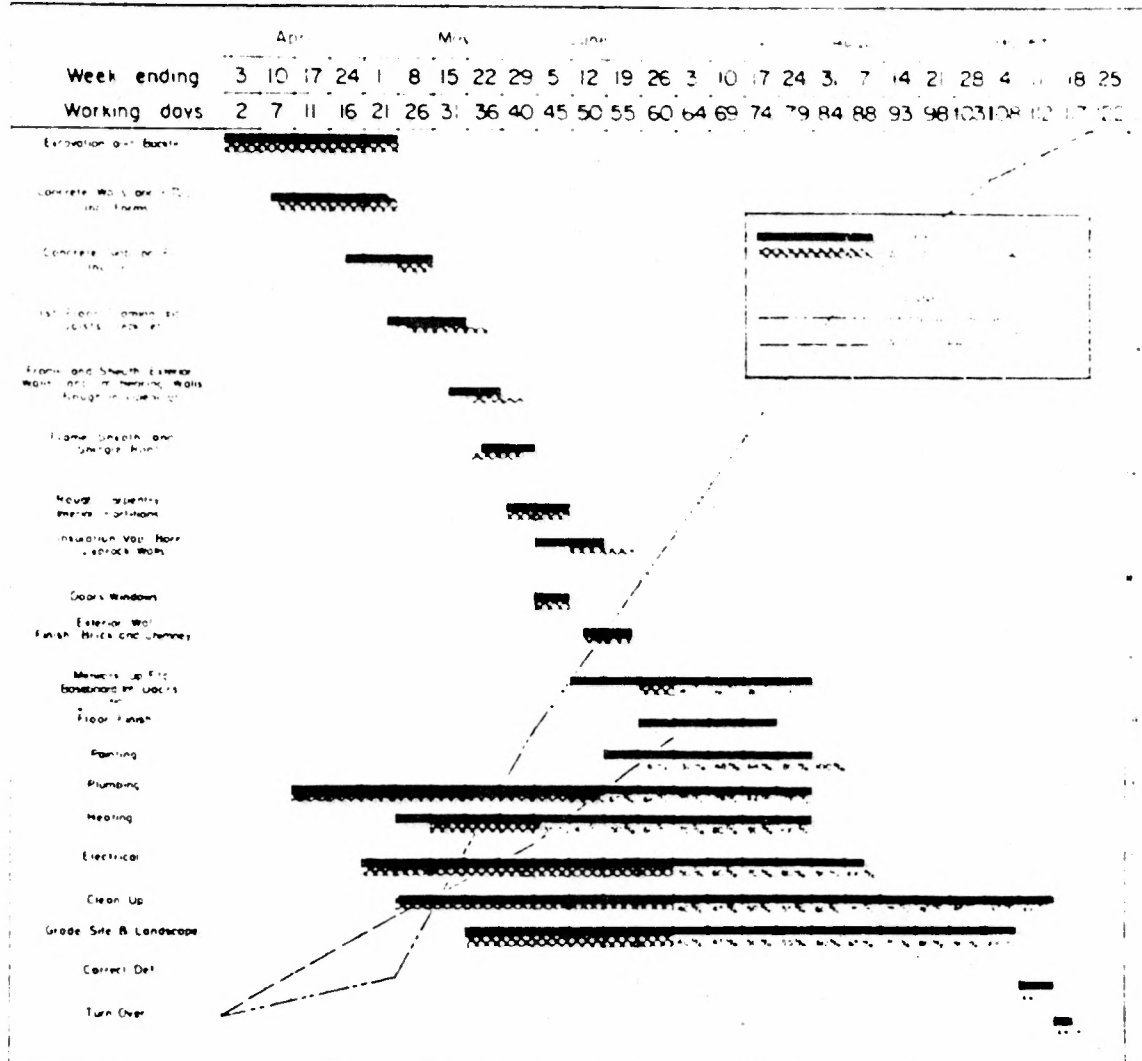
CUMULATIVE CURVES OF PHYSICAL PROGRESS (PLANNED AND ACTUAL) SUPERIMPOSED ON A TYPICAL BAR CHART SHOWING PROGRESS BY ELEMENT

Project control permits the assessment of project status compared with the original plan. One of the most important aspects of control is physical progress of the work. The chart shown below can be used to help the construction manager to visualize, immediately, the cumulative physical progress against the original plan. It is an expansion of the bar chart in Appendix 10 and is used to make it immediately apparent to the construction manager when and where corrective action is needed.

Variances due to unforeseen conditions or changes in the scope of work will require adjustments such as increasing resources, supervision, expediting materials etc. The original schedule may have to be revised to reflect changes in activity duration or the addition of new activities.

Appendix 11

**Cumulative Curves of Physical Progress (Planned and Actual)
Superimposed on a Typical Bar Chart Showing Progress by Element**



Adapted from *A Study of Project Planning and Progress in the Canadian Construction Industry*, published by the Canadian Construction Association, Ottawa.

Appendix 12

JOB DIARY

In addition to progress and financial controls and reports, it is essential that the construction manager maintain a job diary, recording daily, information on:

- a. weather and temperature;
- b. site activities;
- c. instructions received from the project manager;
- d. personnel changes;
- e. material arrivals;
- f. number of staff;
- g. deviations from earlier plans; and
- h. other observations and comments.

Appendix 13

EQUIPMENT DAILY REPORT FORMS

The construction manager and his or her team assume the role of a general contractor on projects built by day labour. During the construction phase, the construction manager will require administrative and cost control procedures in addition to those normally used for other types of projects.

The construction manager should ensure that, in addition to recording information on labour and materials, data on use and operation of equipment is recorded daily. The Equipment Daily Report form is in common use for this purpose and will provide a measure of equipment control. It will also show the actual hours of operation on each element. The use of small power tools is not included in this card. The main concerns of equipment control are optimum usage, minimum downtime and good preventive maintenance procedures.

[illegible]

This chart is taken from *The Construction Contractor*, its reproduction and operation by Bonyard Associates, Ltd. Montreal

Appendix 14

CONCRETE AND STEEL REGISTER

A Concrete and Steel Register is maintained to record the following information:

Concrete

- a. Date of arrival.
- b. Amount received in m³.
- c. Location of pour.
- d. Total concrete received on any particular date.

Structural Steel

- a. Date of arrival.
- b. Waybill number.
- c. Weight in tonnes (1000 kg).
- d. Item and locations placed.
- e. Total steel received on any particular date.

(TYPICAL)
CONCRETE AND STEEL REGISTER

JOB #

CONCRETE				STRUCTURAL STEEL				
Date	Volume m ³	Item(s) & Location of Pour	Total To Date (m ³)	Date	Waybill No.	Weight Tonnes	Item(s) & Location	Total To Date (Tonnes)

Appendix 15

WEEKLY REPORT

The information contained in the daily job diary (Appendix 12) is summarized in the weekly report. The report should contain:

- weather and temperature during the week;
- details of labour force on site (both day labour and contractor's employees);
- details of work performed;
- details of equipment on site and duration of use;
- work planned for the following week;
- details of accidents, fires, etc.;
- changes from original plans;
- a list of visitors and the purpose of their visit should be appended; and
- any additional information affecting the project.

WEEKLY REPORT

Date	Weather	Temperature	Job:
			Name:
			Week Ending:
			Compiled By:
			Approved By:

Labour Force	Equipment

Work Performed this Week

Work Anticipated for the Coming Week

Concrete: this week _____ to date _____
Accidents: _____ Date Reported to Office: _____
Visitors: _____
Remarks: _____

Appendix 16

PROGRESS CLAIM - CONTRACTOR

All progress claims and payments shall be processed in accordance with the Terms and Payment in the contract. In some circumstances, depending on the size and value of the contract, the contractor may be required to submit a "Cost Breakdown and Time Schedule". If so, the contractor shall submit all progress claims in accordance with this schedule.

All progress payments will be made by the construction agency pursuant to the contract on the basis of progress claims by the contractor as shown. Claims are normally recommended by the construction manager and forwarded to the band office for approval and payment. Claims are usually submitted monthly and request payment for that portion of work completed for the defined period and for materials delivered to the site but not incorporated into the work.

Progress claim forms provide progressive totals of all work completed to date, the date of the claim, and material delivered to the site but not incorporated in the work. The appropriate hold-back is deducted to arrive at the net value of the claim.

(To be filled in by contractor)

PROGRESS CLAIM

Page/total amount of pages	Date	Claim no.		
To (Owner)		Project		
		Construction Manager		
General description of work	Completed work to-date	Previous claim	Present claim	
Original contract price				
Authorized extra work				
Sub-total				
Authorized credits				
Total contract to date				
Hold back				
Current claim				
The undersigned certifies that the work mentioned above has been completed in accordance with the contract documents and that all amounts due to the subcontractors for the work mentioned in previous claims for which payment was received have been paid to them.				
Previous progress claim no.		has been paid on (date)		
Current payment claim is now due to the amount of \$		For the period from to		
Contractor		Signature		
Remarks				
Received payment on		Signature		

[illegible]

Appendix 17

CERTIFICATE OF PAYMENT

On receipt of a progress claim from a contractor the construction manager should verify the correctness of the claim and, if necessary, ask the contractor to correct any errors. Once satisfied with the accuracy of the claim the construction manager should complete a certificate of payment and forward it to the band office so that the appropriate payment may be made.

CERTIFICATE OF PAYMENT

Date	Certificate no.	
To (Owner)	Project	
	Construction Manager	Project no.
	Contractor	
Statement of account		
Original contract amount \$	Amount of work completed \$	
Authorized change orders (additions) \$	Holdback () \$	
Sub-Total \$	Sub-Total \$	
Authorized change orders (deductions) \$	Less previous certificates \$	
Current contract amount \$	Amount of this certificate \$	
<p>This is to certify that in accordance with the terms of the contract, the attached progress claim has been found reasonable and the amount of</p> <p>\$</p> <p>is payable to the contractor for the work executed from to</p>		
Issued by	Signature	

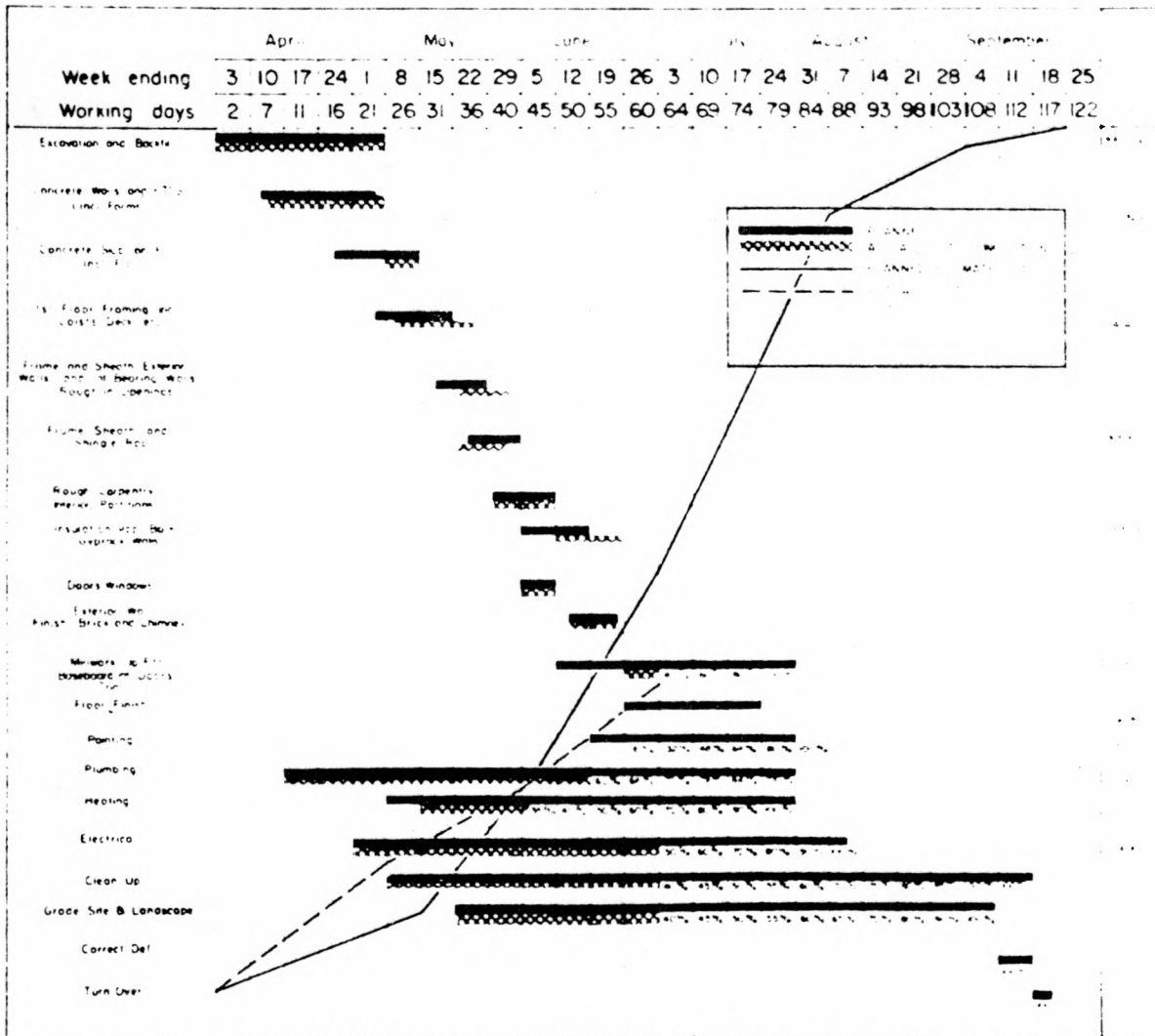
Appendix 18

CUMULATIVE CURVES OF COST (PLANNED AND ACTUAL) SUPERIMPOSED ON A TYPICAL BAR CHART SHOWING COST BY ELEMENT

This chart can help the construction manager to see the cumulative costs against planned costs. It is an expansion of the bar chart shown in Appendix 11 and indicates to the construction manager where cost corrections are required. The construction manager can use this chart, together with Appendix 12 to take the necessary corrective action to bring the project back on schedule.

Appendix 18 (cont'd)

Cumulative Curves of Cost (Planned and Actual) Superimposed on a Typical Bar Chart Showing Cost by Element



Adapted from *A Study of Project Planning and Progress in the Canadian Construction Industry*, published by the Canadian Construction Association, Ottawa.

Appendix 19

TYPICAL PROJECT ORGANIZATIONS

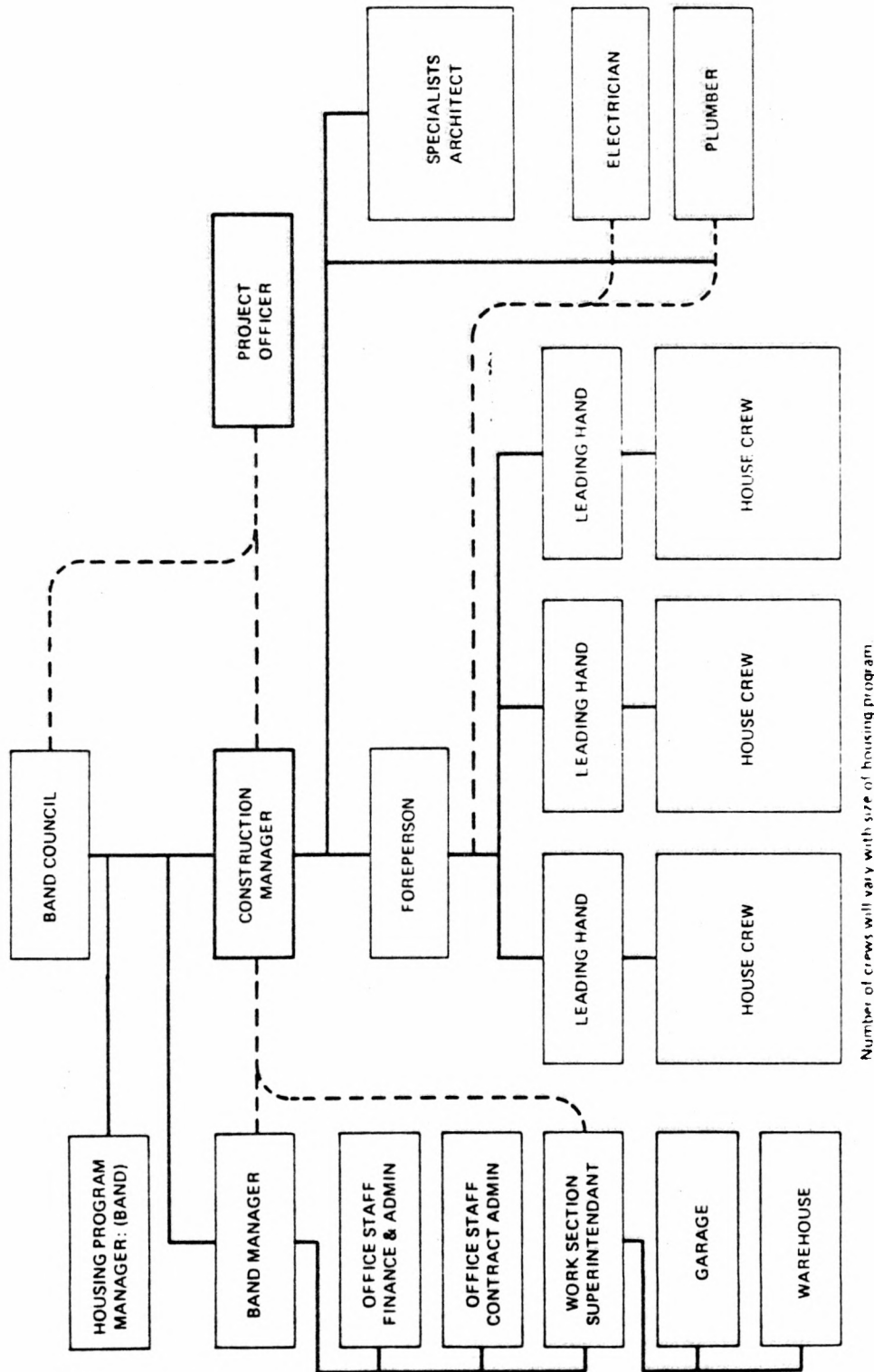
The three charts 19A, 19B and 19C show typical organizations for different types of projects which may be constructed by day labour.

The construction manager should prepare a chart showing the organization required to implement the project and identify the number and size of crews required.

Appendix 19 (cont'd)

HOUSE CONSTRUCTION

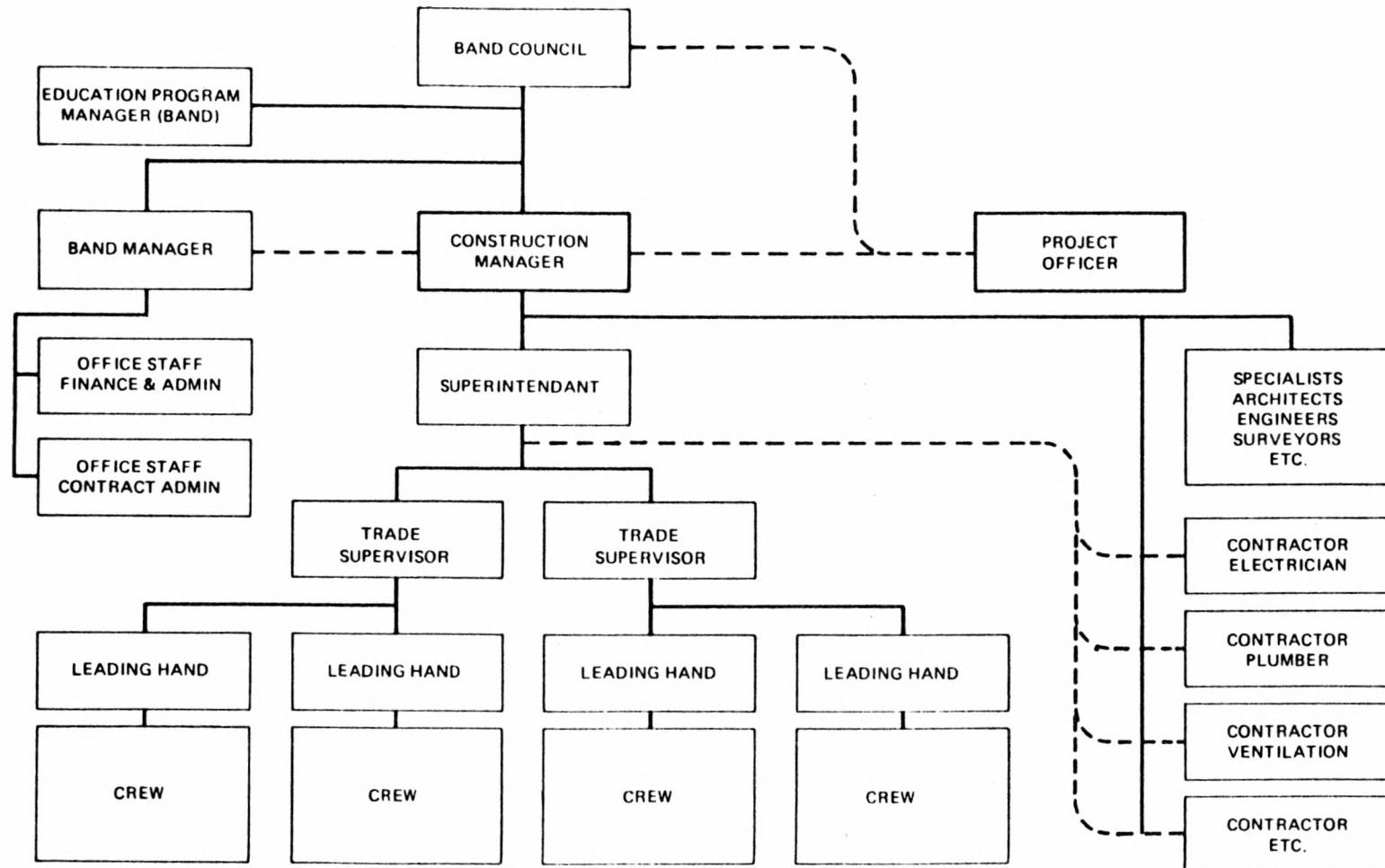
Chart 19A



Number of crews will vary with size of housing program

SCHOOL CONSTRUCTION

Chart 100



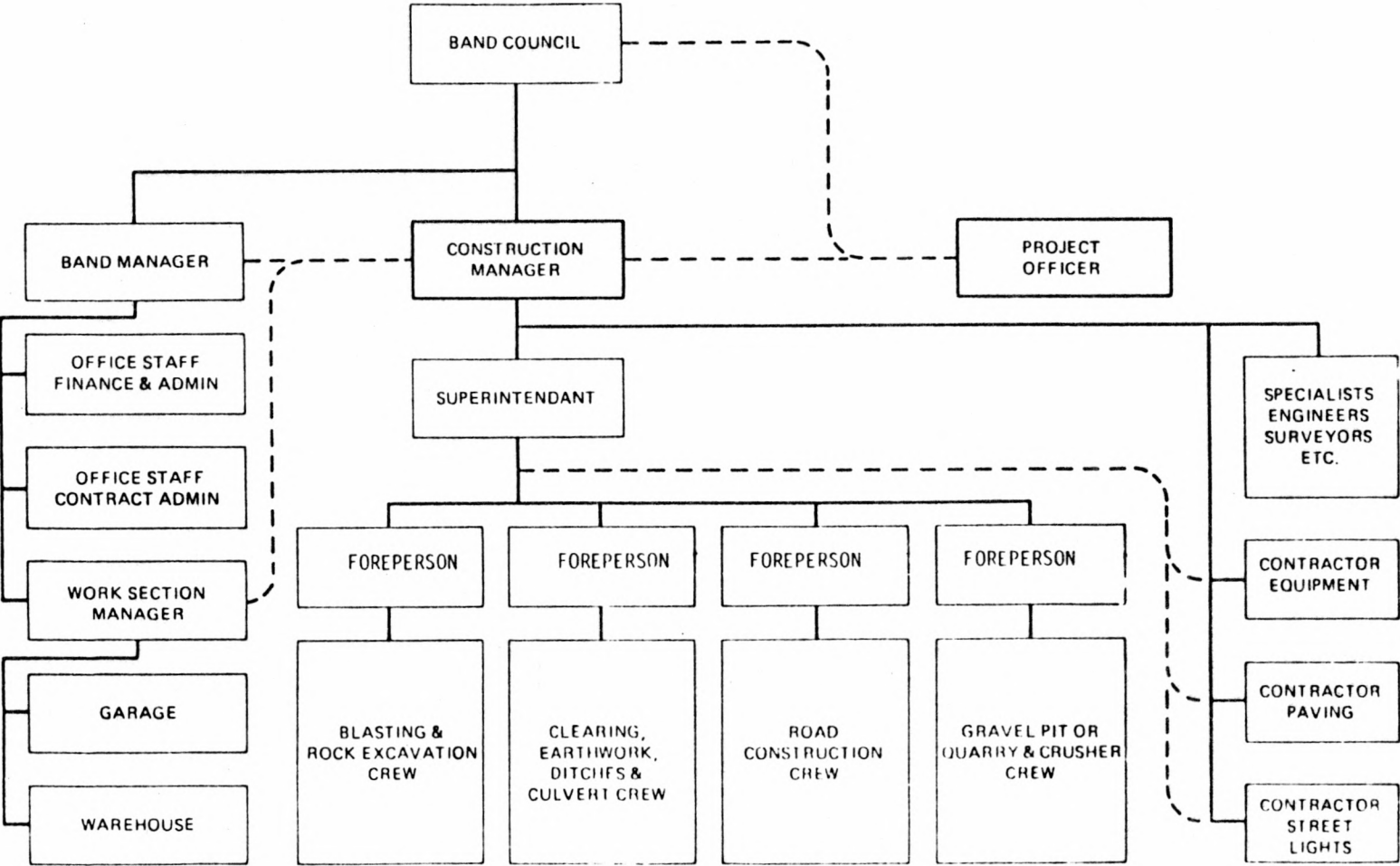
The trades will depend upon school design

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Appendix 19 (cont'd)

ROAD CONSTRUCTION

Chart 19C



Number & size of crews will vary with length of road to be constructed

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Appendix 19 (cont'd)

Appendix 20

HOLD-BACKS

Amount to be withheld from each progress payment:

- | | |
|---|-----|
| 1. when security deposits are provided | 10% |
| 2. when labour and material payment bonds
are provided | 5% |

Appendix 21

COMPLETION CERTIFICATE

Work carried out by contract is normally subject to a warranty period during which the contractor is held responsible for making good any defects or deficiencies which may arise. It is important to establish the date at which the warranty period begins and record it in a formal manner for the protection of both the owner and the contractor. This normally takes the form of a certificate of end of work or a completion certificate.

CERTIFICATE OF END OF WORK

Date	Project	
To (owner)	Construction Manager	Project no.
	Contractor	
<p>On the basis of an inspection effected on:</p> <p>We, the undersigned, certify, herewith, that to the best of our knowledge, the work included in the contract documents has been executed and that the construction is ready for the use for which it is intended.</p> <p>A list of items requiring corrections is attached herewith. This is not a limiting list and does not release the contractor of his obligations as per the terms of the contract.</p>		
Architect: per:		Signature:
Engineer: per		Signature:
Engineer: per		Signature:
Engineer: per		Signature:
Construction Manager: per:		Signature:
		Signature: