

BAND TECHNICAL PUBLICATIONS



GUIDELINES FOR CONSTRUCTION
INSPECTION BY INDIAN BANDS

June 1981

E78.C2
B35
no.GT2
c.1

Indian and Northern
Affairs Canada

Affaires indiennes
et du Nord Canada

Canada

BTP-GT-2

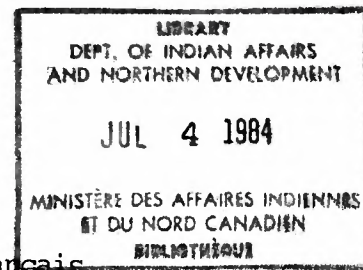
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C.1

**Technical Services
and Contracts**

**Services techniques
et marchés**

GUIDELINES FOR CONSTRUCTION
INSPECTION BY INDIAN BANDS

June 1981



Disponible en français

Published under the authority of the
Hon. John C. Munro, P.C., M.P.,
Minister of Indian Affairs and
Northern Development,
Ottawa, 1984.

QS-3365-000-EE-A1

Cette publication peut aussi être obtenue
en français sous le titre:

Lignes directrices concernant l'inspection
des travaux de construction par les conseils
de bandes

GUIDELINES FOR CONSTRUCTION INSPECTION BY
INDIAN BANDS

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GUIDELINES FOR CONSTRUCTION INSPECTION BY

INDIAN BANDS

1.0 INTRODUCTION

1.1 Purpose

The purpose of this guideline is to present to Indian Bands some basic information regarding construction inspection. Although this information applies more particularly to the larger projects where outside consultants will likely be hired to design and manage the project, most of it is also applicable to the smaller projects. Finally, the list of suggested references in 6.0 will provide valuable technical data on construction inspection.

1.2 Definitions

Construction manager: a management position established for the duration of the construction of the project. The construction manager has the authority and the responsibility for construction of the project.

Field engineer: an on-site engineering position for direct supervision of field operations in the case of large or complex projects. The field engineer or resident engineer reports to the construction manager.

Field inspector: an on-site resident inspector reporting either to the field engineer or to the construction manager.

Laboratory tests: physical tests of various materials used in a project such as steel, concrete, roofing, performed by a company specialized in inspection testing.

Mill tests: tests performed on various materials by the fabricators before they leave the plant.

Codes: regulations and requirements regarding construction projects, issued by municipal, provincial and federal levels of government.

Operational test: test of a system or component installed in a construction project (such as a heating system) to ensure that it operates according to requirements in the as-built condition.

Shop drawings: drawings, prepared by a subcontractor for that part of the work allotted to him, which provide full details of a particular component of the work.

2.0 ROLE OF CONSTRUCTION INSPECTION

The role of construction inspection is to ensure that the work is carried out according to the specifications, drawings, code requirements and accepted work practices. Proper inspection will ensure that:

- the band is receiving fair value for money spent.
- the adherence of materials and craftsmanship to the standards approved by the band in the final working drawings and specifications,
- the avoidance of extra construction costs beyond the approved construction contracts,
- the elimination of unacceptable substitutions,
- the prevention of errors which might result in unnecessary and costly maintenance and upkeep costs,
- the discovery of errors or elements overlooked in the final drawings or specifications and their early correction,

- the prevention of unfair practices and procedures.

3.0 REQUIREMENTS

3.1 Functional Requirements

To properly fulfill his duties, the inspector must be knowledgeable of, and experienced in, the work which he is examining. For instance, knowledge requirements might include plumbing, sewage disposal, carpentry and general construction, electrical installations, heating and air conditioning systems, roads, etc. Experience in inspecting similar construction projects and the ability to prepare correspondence and detailed technical reports are also requirements. This knowledge and experience are normally acquired through completion of a full-time course of instruction at an institute of technology or an engineering school (depending on the project requirements) and through many years of related experience.

3.2 Job Requirements and Extent of Inspection

Most projects requiring specialized technical knowledge are done with resident inspectors checking quantities and quality of materials as well as workmanship.

In the case of building or civil construction projects valued in excess of \$250,000 or of a duration exceeding six months, serious consideration should be given to having at least one full-time resident inspector. Normally, civil engineering projects of all sizes will have full-time inspection.

Full-time inspection is required on civil engineering projects because these are generally unit-price contracts, and a resident inspector can check quantities and quality of materials as well as workmanship. Furthermore, if inspection is not continuous, defects can easily creep in, leading to problems which are difficult and expensive to correct at a later date. For instance, improper procedures

or materials used in the installation of a sewer system could cause major damage that is difficult to localize and expensive to repair.

Projects valued below \$50,000 would not generally require full-time inspection, although this would depend on their complexity. However, these projects should have at least one job visit by inspection personnel (a minimum 2 hours in duration) each week of activity and at the completion of each major stage of the project.

Projects between \$50,000 and \$250,000 in value should be a matter for individual assessment, depending on complexity, time scheduling and costs approved within the budget.

On projects exceeding \$1,000,000 full-time inspection should be used, not only to observe all aspects of subcontract work, but to ensure that the contractor has properly planned each stage of construction operations before commencing work.

Normally, the inspector will be involved with the project from the start of construction till the final certificate of completion is signed.

4.0 AUTHORITY, RESPONSIBILITIES AND DUTIES OF THE INSPECTOR

4.1 Limit of Authority

The inspector receives directions from, and reports to, the construction manager. The limit of his authority to stop work must be stated clearly in his terms of reference. Normally, he is authorized to stop work on a job whenever the safety of men or equipment is in jeopardy. The inspector has no authority to change the plans or the specifications, or to make his own interpretation of them. However, he can offer suggestions. In cases involving quality of the work or an interpretation of the

specifications, there is usually time for the matter to be resolved by the construction manager who may, in turn, be required to refer the matter to the band or to the designer.

4.2 Duties

The inspector is responsible for:

- understanding his authority and responsibilities,
- ensuring adherence to plans, specifications and approved shop drawings and other related documents,
- maintaining a daily record of his activities and observations of the work in progress and materials delivered,
- witnessing tests such as shoring, welding, concrete batching and placement,
- approving acceptance tests of equipment or systems,
- making inspection reports and progress reports as required, (see Appendices 1, 2 and 3)
- making a running list of deficiencies existing prior to final inspection, (see Appendix 4)
- listing shop drawings and their approvals
- compiling changes for the as-built drawings,
- measuring quantity and preparing progress claims,
- maintaining records of extra costs or cost changes,
- monitoring costs and adherence to schedule.

The various records and reports prepared by the inspector are important because:

- they enable the designer to keep in touch with the job without spending too much time on the site;
- they provide a record of progress, on which to base a work schedule;
- they record instructions to the contractor, problems encountered and deviations from plans and specifications;
- they provide a basis for possible cost adjustments for litigation.

The inspector may call on the field engineer for quality control support. Survey personnel must be provided to locate and lay out facilities or to measure quantities. Material-testing personnel must be available to sample and test soils, concrete and other materials incorporated in the work.

4.3 Responsibilities

4.3.1 Preliminary Stage

To perform his work properly, the inspector must be familiar with all contract documents. Consequently, he should be provided with his own copy of the contract, the specifications and the drawings as well as any addenda, revisions or changes to these documents. This will permit him to check the plans and specifications for errors, omissions, ambiguities and conflicts. He will also check for any conflict with national and local code regulations and also verify that local site conditions have been carefully considered; this includes checking clearing, excavation, regrading, access roads and hook-up to existing services. His comments on these items should be made to the construction manager who in turn will transmit them to the designers. Ultimate responsibility for the design, however, rests with the designers.

4.3.2 Field Layout

The inspector shall check that the site is clear of encumbrances such as housing, underground lines, old foundations, local land use agreements, etc. He will ensure that soil testing has been done and that the information is clearly outlined on the plans and specifications. He will check that profiles, cross-sections, and topographical features bear a close resemblance to those shown on the drawings. He will check water, sewer, power and gas services, and ensure that they conform to the intent of the plans and specifications. He will check availability and location of borrow pits, gravel, sand and water for concrete and grading purposes. Before construction begins, he shall ensure that all building or demolition permits, blasting permits, permits for the use of streets and any other permits required by the local authorities have been obtained.

4.3.3 Inspection Planning

The inspector must prepare his own plan of inspection to ensure that the quality of work is satisfactory. The inspector makes certain that the contractor's staff adhere to the plans, specifications, shop drawings and good practice. His plan of inspection must ensure that:

- the instructions for the work at hand are observed,
- the materials incorporated in the work are those approved for use,
- the trades at work perform their jobs in a competent manner.

4.3.4 Testing

Specifications will normally indicate the standard and/or method of testing to be employed to demonstrate the quality of materials acceptable for installation. All materials and workmanship can of

course be tested in some manner; but generally, independant site, shop or laboratory testing is regularly done on individual projects for the following portions of the work during the construction phase:

- piles,
- compaction of soil, base course and grading,
- masonry,
- structural steel work and fasteners,
- windows,
- built-up roofing (on large structures),
- water, sewer and fire lines,
- mechanical and electrical equipment,
- painting.

Mill tests of reinforcing, structural and light gauge steel should be requested and reviewed for all important work.

Underwriter's Laboratories, Canadian Standards Association and other independant agencies also issue certified listings for products and, if so specified, these are normally accepted as labelled.

The selection of laboratories to make the required tests is either made by the construction manager or the contractor, and approved by the construction manager, depending on the specifications. In either case, the selection and approval should be made early in the work. Unless laboratory inspection is stipulated in the specifications, the construction manager or the field inspector cannot require the contractor to furnish it.

Arrangements should be made for one copy of each testing laboratory report to be sent to the field inspector for his information and file.

The inspector must plan to witness field tests. Also, the following critical operations should be carefully and thoroughly checked:

- job layout and grade elevations,
- pile driving,
- site paving, base course and grading,
- concreting, grouting and caulking,
- excavation and backfilling,
- jointing and bedding of pipework,
- pulling electrical cables,
- testing of mechanical and electrical equipment,
- testing of water, sewer and fire lines, etc...

- structural or other field sampling or testing of materials on site,
- built-up roofing,
- site assembly of systems buildings,

- removal or installation of unit priced materials,

- installation of critical structural fasteners, such as high tensile bolts, welding, etc...

The inspector also must observe the construction and cleanliness of forms before he permits concrete to be placed; he checks the rods used by the welder to

ensure that it is the rod submitted and approved for use. He checks that shoring, ladders, rails and scaffolding are safely placed. He observes that earth fills are being properly placed and compacted. Also, he arranges to witness operational tests of equipment such as motors and submits a certificate saying that the test was conducted as specified and obtains records of operational tests for future use. He observes and approves operational tests of systems - electrical, water, heating, ventilating and air conditioning (HVAC), sound, etc.

4.3.5 Records

The inspector keeps a record of all daily occurrences which affect the project. This record includes discussions, agreements and disagreements, decisions and instructions from the band regarding project activities such as job safety, labor, quality of work and compliance with specifications. These records are kept in the project file.

5.0 ACCEPTANCE INSPECTION

5.1 General

Acceptance inspection is the inspection of the facility carried out by the acceptance board at or toward the end of construction and prior to the band's takeover of the facility. The construction manager's objective is to ensure that the requirements of the plans and specifications have been met and to correct any defect, deficiency or operational adjustment as it arises. Therefore, all queries, criticisms, suggestions, requests, etc. concerning the planning, construction, operation or maintenance of the facility should be directed to him. He, in turn, will direct the contractor accordingly. The contractor is responsible for any defect, deficiency or necessary operational adjustments for the guarantee period. However, the

band is responsible for maintaining the guaranteed condition of the construction.

5.2 The Contract

- a. A contract is entered into between the general contractor and the band. The contract documents are:
- the articles of agreement,
 - the general conditions,
 - the terms of payment,
 - the labour conditions,
 - the insurance schedule,
 - the plans,
 - the specifications.
- b. The contract requires, among other things, that the general contractor carry out the specified work for a specific sum of money and complete this work within a stipulated time to the satisfaction of the construction manager.
- c. Under the terms of the contract, the project will normally be under a guarantee for twelve months after the effective date of the final certificate of completion.

5.3 Inspection and Acceptance

- a. When the construction manager is satisfied that a project is substantially completed and ready for occupancy, he convenes an official acceptance board. The board should be composed of:
- the band's representative,
 - the construction manager,
 - the consulting architect(s) and engineer(s),

- the general contractor's representatives.
- b. The acceptance board inspects the work and establishes a list of all unacceptable and incomplete work indicating the value of such work and the amount to be retained from the contractor's contract payment to cover such work.
- c. After the list of deficiencies has been signed by the acceptance board, it is attached to and becomes part of the interim certificate of completion (see appendix 5).

5.4 Interim Certificate of Completion (see attachment)

- a. Once the facility has been inspected by the acceptance board, an interim certificate of completion is issued by the construction manager; it serves the following purposes:
 - it indicates the date of acceptance of the facility from the contractor, subject to the listed deficiencies,
 - it permits the release of holdbacks and the security deposit to the contractor. The band retains only the amount necessary to complete in all respects the work shown on the inspection and acceptance form. If applicable, the band will also retain sufficient funds to cover any other assessments against the contractor,
 - it permits the contractor to request the authority to cancel the contract insurance which had been maintained throughout the construction stage of the project.
- b. Operating Manuals. Once the project is accepted, or earlier when possible, the band will be given operation and maintenance manuals covering the equipment installed in the project and will be instructed in its proper use and maintenance.

As-built drawings shall also be transmitted at acceptance time.

- c. Keys. The band will accept all keys including a master key set.
- d. Maintenance. On the date the interim certificate of completion is issued, the band will assume the responsibility for:
 - the proper operation and use of the equipment installed in the project,
 - the security of the facility,
 - the maintenance of the grounds,
 - the general cleaning and maintenance of the facility,
 - the fuel and utility charges.

5.5 Final Certificate of Completion

- a. When the construction manager is satisfied that all the deficiencies listed in the interim certificate of completion have been corrected and all the work under the contract is complete in all respects, he may reconvene the acceptance board for the final inspection and acceptance of the project.
- b. If, after inspection, the board finds the work completed in accordance with the terms of the contract, a final certificate of completion is then issued. This certificate permits the payment of all monies still owing to the contractor under the contract, with the exception of special assessments against the contractor, i.e. assessments for late completion, etc.
- c. The effective date of the final certificate of completion (the date of the acceptance of the completed work from the contractor) establishes the commencement date of the twelve month guarantee period. (Depending on the terms of the

contract, the period of guarantee might also start on the day the interim certificate of completion is signed).

- d. The band then becomes the owner of the facility.

5.6 Guarantee Period

- a. The work under the contract normally bears a twelve month guarantee. The construction manager shall take the necessary action to ensure that all faulty items, are rectified as expeditiously as possible during this period. However, the band must not correct or authorize work on any item as this will jeopardize the contract guarantee.

In cases where emergency repairs are necessary, the band shall notify immediately the construction manager who will take action. If the building is in an isolated area and emergency repairs are necessary, and if the band has somebody do the work, the band should notify the construction manager immediately by wire or telephone.

- b. It is important in all cases to notify the construction manager who will instruct the contractor to make arrangements to carry out emergency repairs or agree to accept the work and costs of others without prejudice to the contract guarantee.
- c. When the band notifies the construction manager of any items which it considers are not performing properly, appropriate action will be taken. Immediate action should not be expected for every small item as it occurs. It is not normal procedure for the contractor to return to the project to rectify each minor item as it occurs. An inspection is made at the end of ten months to list all items coming within the guarantee clause of the contract for correction by the contractor.

- d. During the twelve month guarantee period, the general contractor is responsible for defects in the contract work as determined by the construction manager. The contractor is not responsible for damage to the building caused by abuse, neglect, or improper operation or maintenance.

5.7 Ten Month Guarantee Inspection

- a. The construction manager will convene an inspection board ten months after the effective date of the final certificate of completion, for the purpose of recording all defects requiring attention under the guarantee.
- b. A certificate of completion marked across the top "Ten month guarantee inspection" is prepared listing all items to be corrected by the general contractor.
- c. The general contractor is then instructed to rectify the defects. When this has been satisfactorily completed, the final guarantee inspection is made.

5.8 Guarantee Period Inspection

When all items listed on the ten month guarantee inspection certificate have been completed to the satisfaction of the construction manager, a recommendation for release of defect warranty is issued; this now completes the general contractor's main contractual obligations. In some cases, there will be special extended guarantees (e.g., roofing, mechanical and electrical equipment, etc.): in these cases, the band will deal directly with the responsible sub-contractor.

5.9 Post Guarantee Period

The band is now responsible for the facility with regard to maintenance, repair and upkeep, except for

buildings maintained by others. However, should any failure or defect become apparent at any time, either a consultant should be hired or a representative of the department of Indian Affairs and Northern Development should be asked to investigate and provide the band with a report. Failure of any part will be researched to determine the causes and to recommend methods of rectifying the problem.

6.0 REFERENCES

- Construction quality assurance guide for inspection staff; this guide is published by the Department of Public Works and can be obtained from:

Construction Quality Assurance
Building Construction Directorate
Public Works Canada
Ottawa, Ont. K1A 0M2

- Canadian wood-frame house construction issued by

Central Mortgage and Housing Corporation
Montreal Road
Ottawa, Ont. K1A 0P7

CMHC also produces other publications which might be of interest.

- Canadian Code for Residential Construction
(Residential standards)
- National Building Code

These last two publications are produced by:

Associate Committee on the national
building code
National Research Council of Canada
Ottawa, Ont. K1A 0R6

Appendix 1

SPECIMEN

JOB DIARY

DATE _____ 197 ___

Weather _____

- description of the work performed on the day in question;
- record of any verbal instructions received from the Band Council;
- record of any verbal instructions given to the superintendent and or foremen;
- other comments.

Appendix 2

SPECIMEN

CONSTRUCTION PROGRESS REPORT

Ground Services and Misc. Structures

 Location File No. Date of Report

 Contractor Job No. Report No.

 Project

Item of Work	% of total contract value	Percentage completed			% of Total completed
		Last report	Increase	This report	

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- etc

 overall % completed

Labour Force will contract be completed on time (check)

a) hourly paid employees		Yes	No
	man hours		

b) other employees	man hours
--------------------	-----------

 Date contract awarded Contract completion date

% Time elapsed
 % Work completed

 Date work started Estimated acceptance date

 Remarks Construction Manager

Appendix 3

SPECIMEN

Construction Progress Report - Buildings

Location	File No	Date of Report
Contractor	Bldg No.	Date Work Started
Project	Report No.	Contract Completion Date
	Job No.	Estimated completed Date

Item	% of Total Contract	Percentage Completed			% of Total Completed
		Last Report	Increase	This Report	

- Excav. Backfilling and site cleanup
- Concrete Foundations
- Concrete-other
- Reinforcing steel
- Structure steel
- Masonry
- Rough Carpentry
- Roofing & Sheet Metal
- Misc. Iron Work
- Ext. Doors & Windows
- Ext. Finish (excl. masonry)
- Insulation
- Wallboard, Lath & Plaster
- Millwork, Hardware and wood flooring
- Other finished flooring
- Painting
- Glazing
- Plumbing-roughing in
- Plumbing-Fixtures
- Heating & Vent-roughing in
- Heating & Vent-equipment
- Electrical-wiring & Fixtures

Overall % Completion

Appendix 4

NOTIFICATION OF DEFECTS

THIS NOTICE IS GIVEN PURSUANT TO CLAUSE _____ OF
THE GENERAL CONDITIONS OF CONTRACT COVERING THE
CONTRACT DATED AND DESCRIBED BELOW:

CONTRACT FOR: _____ DATE OF CONTRACT: _____

DATE OF FINAL
HANDING OVER NOTICE:

LOCATION FILE NO DATE OF CERTIFICATE
JOB NO CONSTRUCTION MANAGER

DESCRIPTION OF DEFECTS:

Construction Manager
Date _____

Band Council
Date _____

03/10/80

TO:

Appendix 5

CERTIFICATE OF COMPLETION
(Please see next page for instructions)

1. Interim () 2. Effective Date
Final ()

3. Financial Code 4. Contract No. 5. Location

6. Contractor 7. Project Title

8. Incomplete work, deficiencies, and faults

Appendix attached () yes () no

9. Remarks

Final certificate of measurement attached () yes
() no

Appendix attached () yes () no

10. Statement of Band Council representative

I hereby certify that all the work called for in the contract described above has been completed in accordance with the contract.

Date Signature Title

Appendix 5

INSTRUCTIONS FOR COMPLETION OF FORM

1. Check either INTERIM or FINAL.
2. Insert the effective data on which the Band Council accepts custody of the facility from the Contractor, which is:
 - a) the date of issue of the Interim Certificate of Completion (if issued); otherwise
 - b) the date of issue of the Final Certificate of Completion.
3. Insert the complete financial coding.
4. Insert the contract number as it appears on the tender form.
5. Insert the name of the area, municipality, settlement, or reservation where the project is located.
6. Insert the Contractor's complete name and mailing address as it appears on the contract.
7. Insert the title of the project as shown on the contract.
8. a) List:
 - i) all authorized work not done and not paid for;
 - ii) all deficiencies (including work improperly done but paid for; as-built drawings, warranties, catalogues, etc., not supplied by the Contractor; and
 - iii) all faults in the work together with the Engineer's estimate of for each, based on the assumption that Band Council will be required to complete the work and rectify the deficiencies and faults.
- b) Outline the reason(s) for non-completion and state the forecast completion date.

Appendix 5

NOTE If the space provided is sufficient, attach a separate list as an Appendix to the Certificate and so indicate in this Section.

9. Indicate any additional remarks applicable, such as:
 - a) Where the project completion date established in the Contract occurs before the date on which the Engineer issues the Interim Certificate of Completion or the Final Certificate of Completion (whichever is first issued), the Engineer shall attach to the Certificate a statement regarding the Contractor's liability for such delay, or good and sufficient reasons for waiving such liabilities.
 - b) Recommendations concerning release or retention of holdback, security deposit, insurance and delay liabilities.
 - c) Reference to documents forwarded with Certificate.
10. a) The STATEMENT is only applicable if Certificate is FINAL.
 - b) The Certificate is signed by the Engineer.