

# Specifying Infrared Services for Building Applications

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## Abstract

The commercial building industry employs generic formats for written specifications that form part of the contract tender documents. The Canadian National Master Construction Specification (NMS) is the generic specification format used extensively in the Canadian construction industry for new and retrofitted commercial building projects. The NMS Secretariat, developed four new specification sections for commonly implemented infrared thermographic services associated with building construction and maintenance. These include inspection services for building envelopes, roofs, mechanical equipment, and electrical systems. This paper will highlight the important differences of each type of inspection service thus explaining the need to develop individual specification sections to correspond to each type of infrared thermographic inspection service. The NMS maximizes protection against duplication and errors, while minimizing chances of risk, misunderstanding and liability. It can be edited and adapted for any size and type of construction project, for government or the private sector. Building owners and property managers can integrate these thermographic specifications into their Project Manuals or incorporate them into contractual documents to call up services for building condition studies. Although the NMS was primarily designed for use in the commercial and light industrial building industry, the residential construction industry can benefit as well, by modifying any section for their use.

## 1. National Master Specification (NMS); What It Is, What It Does and How It Is Used

The NMS is a comprehensive library of construction specification sections used by government and private industry. Specification writers and other construction specialists use it as a tool to produce clear, complete and accurate specifications for inclusion into construction project manuals. As a guide specification and as a delete master, the NMS is designed to produce construction contract documents that are easy for contractors to understand and reduce the risk of misunderstandings and litigation. The NMS is used throughout Canada by non-federal government organizations, by architectural and engineering design offices either directly or as a tool for updating their "office" master specification system.

## 2. NMS Content Structure

When calling up requests for services for infrared thermographic assessments, it is important to specify the following items for each type of inspection:

- Reference the appropriate standards having relevance to the work to be performed
- Definition of the most relevant terms found in the request for services

- State the submittals being requested; include relevant information to be included in the report along with appendices and additional back up documentation.
- Reference qualifications required by equipment operators, analyzers and report authors.
- Itemize the scheduling requirements.
- Itemize specifications for equipment required to carry out work.
- State requirements for examinations of relevant bid and as built documents.
- List required items to be carried out in preparation of field inspections.
- List general field inspection requirements.
- List specific inspection requirements for each type of infrared thermography inspection methodology being requested.
- List data and information to be recorded as part of the inspection services.
- List re-inspection requirements if remediation work is carried out.
- State cleaning requirements and job site status after inspection services.

### 3. Summary

The applications and equipment considerations can be summarized in the following table:

Small Building	Detection	Measurement	Field of View	Thermal Sensitivity	Operator Knowledge	Author Knowledge
Electrical	< 3mrad	>100:1	>20 degrees	<0.3C@ 30C	Level I	Level I
Mechanical	<3mrad	>100:1	>20 degrees	<0.3C@ 30C	Level I	Level I
Interior	<3mrad	>100:1	>20 degrees	<0.1C@ 30C	Level I	Level I
Exterior	<3mrad	n/a	>20 degrees	<0.1C @ 0C	Level I	Level I
<b>Large Building</b>						
Electrical	<3mrad Outdoor <1mrad)	>100:1 Outdoor 300:1	>60 degrees if through IR window	<0.3C@ 30C	Level I	Level II
Mechanical	<3mrad	>100:1	>45 degrees on large equipment	<0.3C@ 30C	Level I	Level II
Interior	<3 mrad	>100:1	>20 degrees	<0.1C@ 30C	Level II	Level II
Exterior	<0.5mrad	n/a	>45 degrees preferred <10 degrees to meet IFOV	<0.1C @ 0C	Level II	Level II
Low slope roof	<3mrad	n/a	>20 degrees	<0.2C@ 30C	Level I	Level II

**Table #1:** Summary of spatial resolution, measurement resolution, field of view, thermal sensitivity, operator and report author requirements for building types and system/applications assessments.