

Introduction

The term “alternative solution” is new to the 2005 Code. It replaces the terms “equivalency” and “equivalent” used in the 1995 Code. This Module introduces alternative solutions and the process for evaluating them.

A. Alternative Solutions

What is an Alternative Solution?

**Alternative solutions are very similar to
equivalencies under the 1995 Codes.**

When a person intends to use a design, system or material that is regulated by the Code and addressed by Division B, but does not meet the specific Division B provisions, they are proposing an alternative solution.

Under the 2005 Code, proposed alternative solutions will likely be very similar to the types of equivalencies that were proposed using the 1995 Code. Here are some examples of possible proposed alternative solutions:

Materials: An innovative material for a fixture that is not addressed by a recognized standard.

Equipment: A device to maintain a trap seal that does not rely on a trap seal depth of water.

System: A method of making joints in pipes that is not recognized in the Code.

Who Proposes Alternative Solutions?

It is the responsibility of the designer to propose an alternative solution. It is not the duty of the regulatory official to develop an alternative solution to help a designer comply with the Code. The designer may be a design professional (e.g., architect, interior designer, residential designer, code consultant, fire protection engineer, structural engineer, mechanical engineer, electrical engineer, etc.), the owner of the building, a contractor, a team of design professionals, etc.

Who Evaluates a Proposed Alternative Solution?

Municipalities, Provinces or Territories may adopt specific policies and procedures for evaluating alternative solutions and may designate officials who are permitted to conduct such evaluations.

Multiple parties may be involved in the evaluation of various alternative solutions. For example, if an alternative solution involves a fire safety issue, a jurisdiction may require both the Fire Department and Building Department to be involved. If an alternative solution involves a plumbing issue, a jurisdiction may require the Building Department and Health Department to be involved. Other authorities may be involved such as utility inspection authorities (electricity and gas). The level of involvement may vary from jurisdiction to jurisdiction.

Compliance Using the 2005 Code

As previously stated in this course, the two methods of compliance using the 2005 Code are described in Sentence 1.2.1.1.(1) of Division A:

- 1) Compliance with this Code shall be achieved by
 - a) complying with the applicable acceptable solutions in Division B, or
 - b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions
1. Under Clause 1.2.1.1.(1)(a), compliance can be achieved by complying with the applicable **acceptable solutions** in Division B.
2. The other method of compliance is to use **alternative solutions**, as specified in Clause 1.2.1.1.(1)(b).

There are three important components to this Clause, which will be examined separately:

- Alternative solutions as a compliance method
- Minimum performance levels
- Evaluating alternative solutions

1. Alternative Solutions as a Compliance Method

Clause 1.2.1.1.(1)(b) of Division A states:

Compliance with this Code shall be achieved by ... using alternative solutions ...

The beginning of the Clause makes it clear that alternative solutions are a method of complying with the Code. The wording also makes it clear that alternative solutions are not a way “to get out of” Code provisions, and they are not a “second best” way to comply with the Code.

Authorities Having Jurisdiction may choose to limit or restrict the ability to use alternative solutions through legislation or regulations. Some jurisdictions may require that proponents give a specific reason for proposing an alternative solution. Some jurisdictions may only permit alternative solutions where there are construction difficulties or in heritage buildings.

2. Minimum Performance Levels

Clause 1.2.1.1.(1)(b) of Division A also states:

Compliance with this Code shall be achieved by ... using alternative solutions **that will achieve at least the minimum level of performance required by Division B** ...

In the 2005 Code, alternative solutions are to be measured against the *minimum* performance level required by Division B. Under the 1995 Code, equivalencies also had to achieve the performance level required by the Code.

Every requirement in Division B has a performance level associated with it, whether it is a prescriptive or performance requirement. *Minimum performance level* can be thought of as the lowest level of performance expected of a material, system or design that is permitted by Division B.

For example, a new piping material is proposed as an alternative solution for cold water supply piping. The designer would have to submit acceptable proof that the alternative piping material performs **at least as well as** one that meets the referenced standards and all related Division B requirements.

The provisions in Division B represent the benchmark performance level for alternative solutions: the Code makes it clear that alternative solutions must be **at least as good as** the acceptable solutions in Division B.

3. Evaluating Alternative Solutions

We have established that:

- using an alternative solution is one of the two methods for complying with the Code, and
- the benchmark for the evaluation of alternative solutions is the minimum performance level required by Division B.

Now, how do we know **what** to evaluate for the proposed alternative solution?

Clause 1.2.1.1.(1)(b) of Division A finally states:

Compliance with this Code shall be achieved by ... using alternative solutions that will achieve at least the minimum level of performance required by Division B **in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions.**

Here, the 2005 Code states the framework for the evaluation of alternative solutions, which consists of two parts:

- ***“the areas defined by the objectives and functional statements”*** means that the evaluation is limited to the issues that the Code addresses. In broad terms, only issues of safety, health, accessibility and structural and fire protection can be considered in an evaluation.
- ***“attributed to the applicable acceptable solutions”*** means that the objectives and functional statements to be used in the evaluation are the ones linked to the Division B provisions that the alternative solution is addressing. For example, if a new type of toilet fixture were proposed, the objectives and functional statements linked to the Division B requirements on fixtures would apply. The objectives and functional statements linked to manholes would not be applicable.

B. Objectives, Functional Statements and Attributions

Objectives and functional statements were introduced in Module 2. These will be examined in more detail since they are the tools used in the evaluation of alternative solutions.

Objectives

Objectives are defined in Part 2 of Division A.

Objectives describe the overall goals that the Code's provisions are intended to achieve.

The top-level objectives of the 2005 National Plumbing Code are:

- OS Safety
- OH Health
- OP Protection of the Building or Facility from Water and Sewage Damage

These top-level objectives serve to define the boundaries of the Code. They are a useful reminder of the areas to which the Code applies. (The Building, Fire and Plumbing Codes do not address convenience, appearance, privacy, energy efficiency or protection of the environment.)

There are second-level objectives and third-level objectives under most of the top-level objectives.

Functional Statements

Functional statements are defined in Part 3 of Division A.

Functional statements describe the functions that a building must perform to fulfill the objectives.

Examples of functional statements are:

- F20 To support and withstand expected loads and forces.
- F30 To minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision.
- F46 To minimize the risk of contamination of potable water.
- F72 To provide facilities for the sanitary disposal of human and domestic wastes.
- F80 To resist deterioration resulting from expected service conditions.

Functional statements are grouped by subject matter. There are gaps in the numbering of functional statements to allow for the addition of functional statements in the future.

Attributions

Each Division B technical requirement has objectives and functional statements linked to or “attributed” to it: this link is called an *attribution*.

In the printed version of the Code, the attributions are listed in a table at the end of Part 2 in Division B. The table is titled “Objectives and Functional Statements Attributed to the Acceptable Solutions.”

For example, the attribution table shows that the objectives and functional statements for Sentence (1) of Article 2.2.5.5., Polyethylene Pipe and Fittings, are:

[F20–OH2.1,OH2.2,OH2.3]

[F20–OP5]

In the electronic version of the Code, the attributions can be viewed by clicking on the icon next to a requirement or by clicking on the last Article in Part 2 of Division B from the Table of Contents.

C. Evaluating Alternative Solutions

A brief introduction to the evaluation of alternative solutions is provided here.

Areas of Performance

The term “areas of performance” is an abstract term that requires some explanation. It is derived from the wording of Clause 1.2.1.1.(1)(b) of Division A, which states:

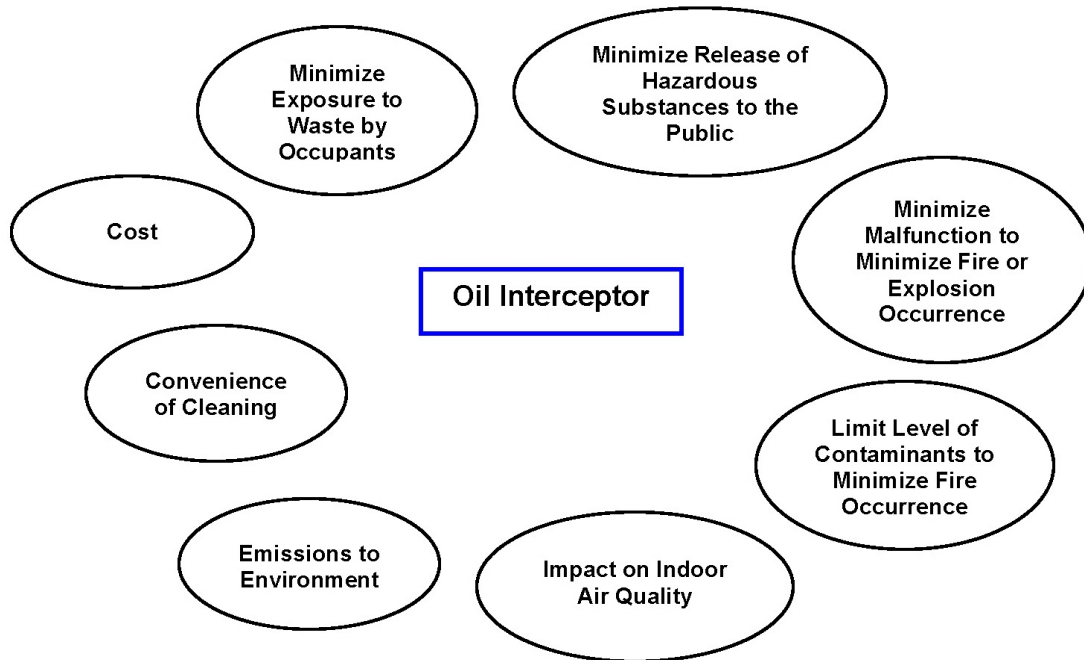
Compliance with this Code shall be achieved by... using alternative solutions that will achieve at least the minimum level of performance required by Division B in the **areas** defined by the objectives and functional statements attributed to the applicable acceptable solutions.

In simple terms, the *areas of performance* tell you what to evaluate for a proposed alternative solution.

Example of Areas of Performance

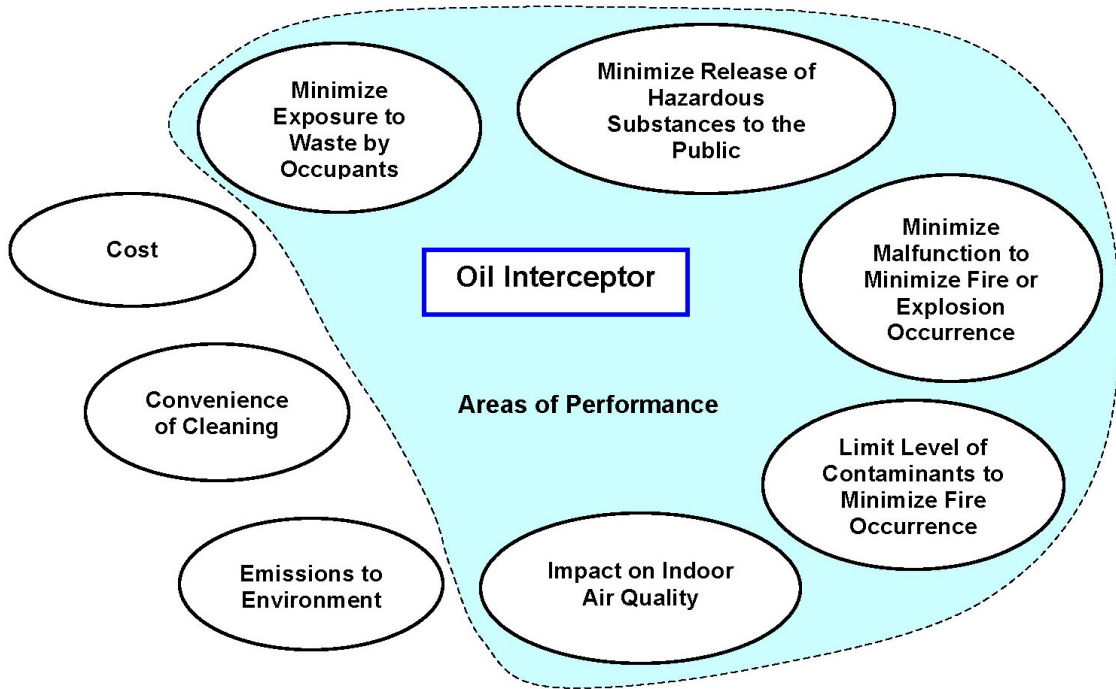
Imagine an alternative solution that involves an oil interceptor for a car repair garage. There are many possible aspects that could be evaluated when comparing an innovative oil interceptor to one permitted by the Code, as shown in the diagram below.

Here are some functions and features that could be considered in the selection of an oil interceptor:



When evaluating an alternative solution, the Code tells you the areas of performance to evaluate. The Code narrows the areas of performance to *only* the functions that address the objectives of the Code. These areas of performance are defined by the objectives and functional statements linked to the technical requirement(s) the alternative solution is addressing.

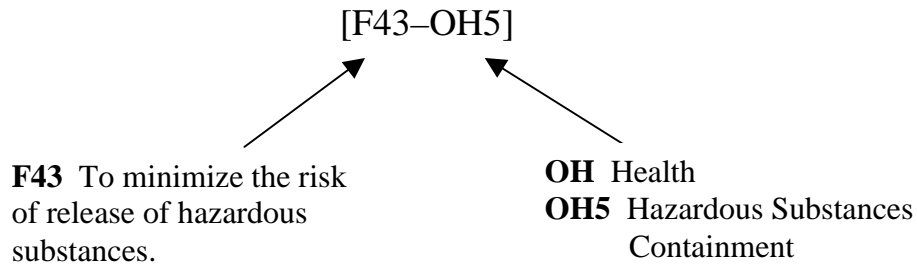
Aspects such as cost, convenience and environmental emissions are not regulated by the Code so they would not be part of the evaluation of an alternative solution. In the example of an innovative oil interceptor, the areas of performance that must be considered are shown in the next diagram.



Defining the Areas of Performance

Every technical requirement will have at least one area of performance that is defined by a functional statement and objective pair.

For example, the Plumbing Code requires that an oil interceptor be installed where discharge from a fixture may contain oil or gasoline. This requirement is linked to many functional statements and objectives including the following *attribution pair*:



A functional statement or objective cannot be used on its own. The attribution pair is required to define the area of performance because it indicates what function the alternative solution needs to perform and the reason why.

How To Make an Attribution Pair

The attributions for many provisions are already in pairs. But some provisions have multiple functional statements and objectives, which are grouped by second-level objective into bracketed sets. Pairs are then made by linking together the functional statements and objectives within the sets.

For example, Sentence 2.5.5.2.(2) of Division B states:

Adjacent compartments within every oil interceptor shall be connected to each other by a vent opening.

The attributions for this Sentence are as follows:

[F40,F81-OS1.1]

[F40,F81-OH1.1]

These sets must be separated into [FS-O] pairs:

[F40,F81-OS1.1] = [F40-OS1.1] and [F81-OS1.1]



[F40,F81-OH1.1] = [F40-OH1.1] and [F81-OH1.1]



And so, four attribution pairs apply to this requirement:

[F40-OS1.1] [F81-OS1.1]

[F40-OH1.1] [F81-OH1.1]

Therefore, any proposed alternative solution to this requirement will be evaluated in four areas of performance.

Describing the Area of Performance in Words

An attribution pair is required to fully answer the question “What does the alternative need to do and why?” The reason for the function will not be clear if the objective is not part of the pair.

The area of performance can be stated as:

“The alternative solution must <functional statement> for <objective> reasons.”

For [F40–OS1.1], the functional statement and objective are defined in Division A as follows:

F40 To limit the level of contaminants.

OS1 Fire Safety

The areas of performance can be simply stated:

“The alternative solution must **limit the level of contaminants** [F40] for **Fire Safety** reasons [OS1].”

Why Are There So Many Pairs?

There can often be more than one reason for a building to perform a certain function. For example, the requirement for adjacent compartments in an oil interceptor to be joined by a vent is linked to functional statement F40. As noted above, two objectives are linked with F40 for this requirement, which means there are two reasons to limit the level of contaminants in oil interceptors:

OS1.1 → to reduce the risk of injury caused by fire or explosion occurring

OH1.1 → to reduce the risk of illness caused by inadequate indoor air quality

**Functional statements and objectives are required
to be in pairs to fully explain the reasons for a
building function.**

Summary

The key points of this Module are:

- A proposed alternative solution is any proposed product, material, component, design, system, equipment or procedure that does not conform to the applicable Division B provisions.
- Designers or owners, and not building officials, are responsible for proposing an alternative solution.
- The regulatory authority evaluates the proposed alternative solution.
- Using alternative solutions is one of the two possible methods of complying with the Code.
- Alternative solutions must provide at least the *minimum performance level* required by the applicable provisions in Division B.
- Each Division B technical requirement is linked to at least one objective and one functional statement, which define the *areas of performance* that an alternative solution must fulfill.
- The **top-level objectives of the 2005 NPC** are:
 - OS Safety
 - OH Health
 - OP Protection of the Building or Facility from Water and Sewage Damage
- Functional statements describe the functions that a building must perform to fulfill the objectives.
- Functional statements and objectives must be in pairs to fully explain the reasons for a building function.
- The area of performance is defined by the functional statement-objective pair. The *attribution pair* describes what needs to be done (the function) and why (the objective).
- In simple terms, the **areas of performance tell you what to evaluate** in a proposed alternative solution.