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Addressing —

Part 2: Assigning and maintaining addresses for objects in the physical world

Adressage —

Partie 2: Attribution et mise à jour des adresses pour les objets du monde physique

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 287, *Geographic Information,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 19160 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

An address is structured information that allows the unambiguous determination of an object for purposes of identification and location (ISO 19160-1:2015). The objects exist in the physical world (i.e. virtual objects are excluded) and can be outdoor (e.g. a building) or indoor (e.g. an office inside a building).

Addresses provide one of the most common ways to locate and identify an object in the physical world. They are essential for the management of cities, for governance and public administration generally, for service delivery in the public and private sector, and they can give people status or (legal) identity in society. They also play an important role in detecting emerging hotspots and clusters of infected cases during an epidemic or pandemic. Yet, in many parts of the world, addresses do not exist or are poorly maintained, and even if they exist, corresponding address data is often lacking or incomplete. Many stakeholders are involved in address assignment and maintenance, including local governments, postal operators, geographic naming councils, people who live or work at an address, and users of addresses, such as banks, local and national governments, e-commerce, and service providers for utilities, deliveries and emergency response.

This document specifies how to plan, implement and maintain addresses and corresponding address data in order to gain maximum benefits for governance and society in the long run. The aim of this document is to facilitate the design, planning and implementation of address assignment and maintenance by specifying requirements and recommendations for objectives, principles, good practice and a governance framework for assigning and maintaining addresses based on international good practice. Where regional or national standards already exist, this document can complement them.

This document supports the first goal of the United Nations Global Geospatial Information Management (UN-GGIM) Integrated Geospatial Information Framework (IGIF) (http://ggim.un.org/), namely, enabling geospatial (address) information governance, policy and institutional arrangements that ensure effective geospatial (address) information management, accommodate individual organizational requirements and arrangements, and that are aligned to national and global policy frameworks.

This document supports the Universal Postal Union's initiative, "Addressing the World – An Address for Everyone", which promotes the establishment of national addressing infrastructures to the benefit of all. The document is also useful for those involved in slum upgrading, as addresses are often assigned when housing conditions in settlements are being improved.

In many Euro-centric countries, reference to a road network in the address is common, while addresses in countries such as Japan comprise a hierarchy of administrative areas without reference to a thoroughfare. In countries with vast tracts of land, an address can comprise only a place name or the name of an oasis in a desert. Therefore, this document does not intend to promote uniform addresses across the world. It specifies good governance and management practices for any kind of address so that challenges related to address assignment and maintenance can be resolved consistently and sustainably. The requirements and recommendations in this document are aimed at upholding a long-lasting addressing infrastructure that meets today's needs for addressing, but can also be used by future generations.

This document is part of the ISO 19160 series on addressing. The other parts in the ISO 19160 series include:

— ISO 19160-1, *Addressing – Part 1: Conceptual model*, which lays out a conceptual model for address information (address model), and provides terms and definitions that describe the concepts in the model. A profile of ISO 19160-1 is a model that specifies addresses and address data for a specific country, region or application.

— ISO 19160-3, *Addressing – Part 3: Address data quality*, which establishes a set of data quality elements and measures for describing the quality of address data. ISO 19160-3 also describes procedures for reporting data quality and provides guidelines for the use of the established set of data quality elements and measures for describing the quality of address data. By using ISO 19160-3 to assess

and describe the quality of address data, information about the quality can be shared and the data can be improved accordingly (if necessary).

— ISO 19160-4, *Addressing – Part 4: International postal address components and template language*, which defines key terms for postal addressing, postal address components and constraints on their use. ISO 19160-4 is also published as UPU S42 by the Universal Postal Union. ISO 19160-4 is a profile of ISO 19160-1, i.e. it is a conceptual model for addresses used for postal addressing.

Addressing —

Part 2:
Assigning and maintaining addresses for objects in the physical world

1 Scope

This document focuses on assigning and maintaining addresses that allow the unambiguous determination of an object in the physical world for purposes of identification and location in the context of public administration and public service delivery. During assignment, an address is first associated with a particular object in the physical world. During maintenance, the address changes, for example, it is re-assigned to a different object, one or more of the address components are modified (e.g. a street name change), or the address is retired when it is no longer used. This document:

a) specifies a good practice for assigning and maintaining addresses and address data; and

b) specifies a governance framework for assigning and maintaining addresses and address data.

Very often local governments (e.g. municipalities) are assigned the mandate for the planning, implementation, evaluation and ongoing maintenance of addresses, and they are often supported by other organizations, such as the national government, a postal agency, private sector companies and national or regional organizations. This document is applicable to all organizations who have an interest, role or responsibility in address assignment and maintenance, for example in terms of:

— developing legislation, policies or regulations for addressing;

— facilitating and coordinating the naming of address components (the constituent parts of an address) and announcing and communicating these names;

— installing address component signs in the physical world;

— designing and implementing business processes related to address assignment and maintenance;

— designing, implementing and maintaining access to address data;

— developing software to facilitate the above; and

— using addresses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19105, *Geographic information — Conformance and testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
address
structured information that allows the unambiguous determination of an object for purposes of identification and location

EXAMPLE 1 Address where the object is a business: 611 Fifth Avenue, New York NY 10022.

EXAMPLE 2 Address where the object is a building: Lombardy House, 809 Lombardy Street, The Hills, 0039, South Africa.

EXAMPLE 3 Address where the object is a building: 411 Hannuri-daero, Sejong 30116, Republic of Korea.

EXAMPLE 4 Address where the object is a thing, e.g. an emergency water supply facility: 201-ho, 107 Samcheong-ro, Jongno-gu, Seoul 03049, Republic of Korea.

EXAMPLE 5 Address where the object is a natural object, e.g. a park: Ujung Kulon National Park, Ujunjaya, Banten, Republic of Indonesia.

Note 1 to entry: The object is identifiable in the real world, i.e. electronic and virtual addresses are excluded.

Note 2 to entry: "Identification" refers to the fact that the structured information in the address unambiguously determines the object, i.e. it helps the human to identify the object. In other words, "identification" here does not refer to unique identifiers in a database or dataset.

Note 3 to entry: There can be many addresses for an object, but at any moment (or lifecycle stage), an address unambiguously determines a single object.

Note 4 to entry: Two addresses from two different *address classes* (3.4) (i.e. they have different sets of components) for the same *addressable object* (3.2) are two different addresses.

Note 5 to entry: Two addresses for the same addressable object and from the same address class, but in two different languages are two different addresses.

Note 6 to entry: In addition to the addressable object, there may be a multitude of people, organizations, addressees or other objects associated with an address. These are external to the address model.

[SOURCE: ISO 19160-1:2015, 4.1, modified — Example 3 has been modified. Example 4 has been added. Notes 3, 4, 5 and 6 to entry have been shortened.]

3.2
addressable object
object that may be assigned an *address* (3.1)

[SOURCE: ISO 19160-1:2015, 4.2]

3.3
address assignment method
way in which addresses are assigned according to the rules of an *address reference system* (3.10)

3.4
address class
description of a set of addresses that share the same *address components* (3.5), operations, methods, relationships, and semantics

EXAMPLE 1 "25 Blue Avenue Hatfield 0028" and "384 Green Street Motherville 2093" are from the same address class.

EXAMPLE 2 "PO Box 765 Goodwood 33948" and "PO Box 567 Grayville 98373" are from the same address class.

[SOURCE: ISO 19160-1:2015, 4.4]

3.5
address component
constituent part of the *address* (3.1)

Note 1 to entry: An address component may reference another object such as a spatial object (e.g. an administrative boundary or a land parcel) or a non-spatial object (e.g. an organization or a person).

Note 2 to entry: An address component may have one or more alternative values, e.g. alternatives in different languages or abbreviated alternatives.

[SOURCE: ISO 19160-1:2015, 4.5]

3.6
address data management system
system concerned with the organization and control of address data

Note 1 to entry: Adapted for use in the *addressing* (3.7) domain from ISO/IEC TR 10032:2003, 2.30.

3.7
addressing
activities involving addresses

[SOURCE: ISO 19160-1:2015, 4.6]

3.8
addressing infrastructure
fundamental facilities, services, systems and installations that provide a country, city or area with addresses required for the functioning of society

3.9
addressing stakeholder
individual, group of people or organization with an interest, or with a role or responsibility in the *governance framework* (3.15) for address assignment and maintenance

EXAMPLE 1 A citizen (individual) or an organization has an interest in the address for their place of residence or business to be included in a municipal dataset.

EXAMPLE 2 A community (group of people) has an interest in the names assigned to streets in their suburb.

EXAMPLE 3 A municipality (organization) has the responsibility to assign or maintain addresses within its area of jurisdiction.

EXAMPLE 4 A private sector service provider who maintains address data on behalf of a municipality.

Note 1 to entry: Adapted for use in the *addressing* (3.7) domain from ISO/PAS 19450:2015, 3.65.

3.10
address reference system
defined set of *address components* (3.5) and the rules for their combination into addresses

Note 1 to entry: The *address assignment method* (3.3) creates addresses according to the rules of the address reference system.

[SOURCE: ISO 19160-1:2015, 4.8, modified — Note 1 to entry has been added.]

3.11
child address
address (3.1) defined relative to a *parent address* (3.17)

[SOURCE: ISO 19160-1:2015, 4.9]

3.12
child addressable object
addressable object (3.2) that is addressed relative to another addressable object

EXAMPLE 1 An apartment within an apartment building.

EXAMPLE 2 In Japan, a *jukyo bango* (residence number) within a *gaiku* (block).

EXAMPLE 3 A building within a complex of buildings. In Korea, a *dong* (wing or section of a building) within a group of buildings.

[SOURCE: ISO 19160-1:2015, 4.10]

3.13
emergency management
overall approach for preventing emergencies and managing those that occur

Note 1 to entry: In general, emergency management utilizes a risk management approach to prevention, preparedness, response and recovery before, during and after potentially destabilizing events and/or disruptions.

[SOURCE: ISO 22300:2021, 3.1.88]

3.14
good practice
method that has been proven to work well and produce good results, and is therefore recommended as a model

Note 1 to entry: Methods or techniques described as good practice have usually been tested over time and validated, in the broad sense, through repeated trials before being accepted as worthy of adoption more broadly.

Note 2 to entry: A good practice is typically derived from practitioners who work in a specified field, e.g. in the assignment and maintenance of addresses and address data, after it has been proven in practice.

Note 3 to entry: Even though a good practice is only recommended as a model, if it is followed, then some parts or aspects of it may be required. Therefore, the requirements specified for a good practice in this document are conditional requirements, i.e. they are required only if the good practice is followed.

[SOURCE: ISO 14055-1:2017, 3.1.3, modified — Notes 2 and 3 to entry have been added.]

3.15
governance framework
<addressing> strategies, policies, decision-making structures and accountabilities through which *addressing stakeholders* (3.9) assign and maintain addresses in a sustainable manner

EXAMPLE Citizens have an interest in addresses and are therefore addressing stakeholders, but they do not necessarily have any accountabilities in the governance framework.

Note 1 to entry: Not all addressing stakeholders are assigned tasks and responsibilities in the governance framework.

Note 2 to entry: The requirements specified for a governance framework in this document are conditional requirements, i.e. they are required only if a governance framework is implemented.

Note 3 to entry: Adapted for use in the *addressing* (3.7) domain from ISO/IEC TR 38502:2017, 3.1.

3.16
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[SOURCE: ISO/IEC 2382:2015, 2121317, modified — Notes 1 and 2 to entry have been removed.]

3.17
parent address
address (3.1) of a *parent addressable object* (3.18)

Note 1 to entry: Addresses of the *child addressable objects* (3.12) fully inherit the *address components* (3.5) of a parent address.

[SOURCE: ISO 19160-1:2015, 4.13]

3.18
parent addressable object
addressable object (3.2) that fully encloses one or more other addressable objects

EXAMPLE 1 An apartment building with many apartments within.

EXAMPLE 2 In Japan, a *gaiku* (block) with many *jukyo bango* (residence number).

EXAMPLE 3 A complex of many buildings. In Korea, a group of buildings with many *dong* (wings or sections of a building).

[SOURCE: ISO 19160-1:2015, 4.14]

3.19
profile
set of one or more base standards or subsets of base standards, and, where applicable, the identification of chosen clauses, classes, options and parameters of those base standards, that are necessary for accomplishing a particular function

EXAMPLE The South African national standard for address data exchange, SANS 1883-2:2018, is a profile of ISO 19160-1:2015. It specifies a selection of clauses, classes and options from ISO 19160-1:2015 to be used for the exchange of address data in South Africa.

Note 1 to entry: A profile is derived from base standards so that by definition, conformance to a profile is conformance to the base standards from which it is derived.

[SOURCE: ISO 19106:2004, 4.5, modified — An EXAMPLE has been added.]

3.20
public service
work, information, a commodity or utility that is provided to the general public to add value

EXAMPLE Running water, post (mail), sewage, refuse collection, electricity, emergency response.

Note 1 to entry: Adapted from SANS 1883-1:2009[27] and Avis (2016).[10]

3.21
service delivery
interaction between a provider and a client where the provider offers a service

EXAMPLE 1 Many governments are providers of public services, such as running water, electricity and emergency response.

EXAMPLE 2 "In order to support the concept of the single postal territory of the Union, member countries shall ensure that all users/customers enjoy the right to a universal postal service involving the permanent provision of quality basic postal services at all points in their territory, at affordable prices."[34]

Note 1 to entry: Good service delivery provides clients with an increase in value. The provision of sufficient, affordable and quality basic services is considered a core function of governments. Service delivery, e.g. water, sanitation, waste management and housing, correlates closely with the health and well-being of citizens.

Note 2 to entry: Adapted from Avis (2016).[10]

4 Conformance

This document defines conformance classes for the respective specification targets in Table 1, in accordance with ISO 19105:2022. An objective, good practice or governance framework for assigning and maintaining addresses claiming conformance with this document shall implement the relevant conformance class. Conformance with this document shall be assessed against the relevant conformance test cases specified in the abstract test suite in Annex A of this document.

The name and contact information of the maintenance agency for this document can be found at www.iso.org/maintenance_agencies.

Table 1 — Conformance classes

Conformance class	Specification target	Unique Resource Identifier (URI)	Abstract test suite
GoodPractice	Good practice for assigning and maintaining addresses	/19160/-2/1/conf/goodPractice	A.2
GovernanceFramework	Governance framework for assigning and maintaining addresses	/19160/-2/1/conf/governanceFramework	A.3

Some of the conformance classes are structured into subclasses, as indicated in Figure 1. A conformance class is dependent on its subclasses, i.e. the subclasses are also used to test conformance to the parent conformance class. Annex A includes a comprehensive diagram that also lists requirements and recommendations under each of the conformance classes.

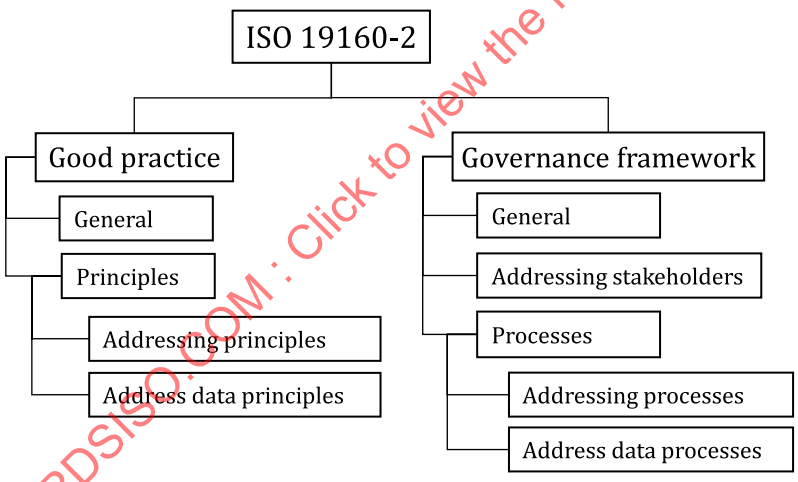


Figure 1 — Conformance classes and their subclasses

For easy reference, the requirements and recommendations specified in this document are listed in Tables 2 and 3.

Table 2 — Requirements specified in this document

No	Identifier	Clause
1	/req/goodPractice/general/objectives	7.1
2	/req/goodPractice/general/context	7.1
3	/req/goodPractice/general/conceptualModel	7.1
4	/req/goodPractice/general/licence	7.1
5	/req/goodPractice/general/communicationThroughPhysicalIdentifiers	7.1
6	/req/goodPractice/principles/addressing/sustainableAssignmentMethod	7.2.1

Table 2 *(continued)*

No	Identifier	Clause
7	/req/goodPractice/principles/addressing/pilotingAssignmentMethod	7.2.1
8	/req/goodPractice/principles/addressing/deviceIndependence	7.2.1
9	/req/goodPractice/principles/addressing/noPersonalInformation	7.2.1
10	/req/goodPractice/principles/addressing/dimensionsCongruentWithObjectives	7.2.1
11	/req/goodPractice/principles/addressing/suitableComponents	7.2.1
12	/req/goodPractice/principles/addressData/representsAddressInPhysicalWorld	7.2.2
13	/req/goodPractice/principles/addressData/interoperability	7.2.2
14	/req/goodPractice/principles/addressData/dataMaintenance	7.2.2
15	/req/goodPractice/principles/addressData/digitalMaintenance	7.2.2
16	/req/governanceFramework/general/strategy	8.1
17	/req/governanceFramework/general/policies	8.1
18	/req/governanceFramework/general/goodPractice	8.1
19	/req/governanceFramework/addressingStakeholders/identification	8.2
20	/req/governanceFramework/addressingStakeholders/responsibilities	8.2
21	/req/governanceFramework/addressingStakeholders/mandates	8.2
22	/req/governanceFramework/addressingStakeholders/resourcing	8.2
23	/req/governanceFramework/addressingStakeholders/sustainability	8.2
24	/req/governanceFramework/processes/specification	8.3
25	/req/governanceFramework/processes/tasks	8.3
26	/req/governanceFramework/processes/addressing/initiationProcess	8.3.1
27	/req/governanceFramework/processes/addressing/proposeValuesProcess	8.3.1
28	/req/governanceFramework/processes/addressing/approvalProcess	8.3.1
29	/req/governanceFramework/processes/addressing/announcementProcess	8.3.1
30	/req/governanceFramework/processes/addressing/communicationProcess	8.3.1
31	/req/governanceFramework/processes/addressData/updateProcess	8.3.2
32	/req/governanceFramework/processes/addressData/distributionProcess	8.3.2

Table 3 — Recommendations specified in this document

No	Identifier	Clause
1	/rec/goodPractice/general/objectivesforPublicGood	7.1
2	/rec/goodPractice/general/ISO19160-1Profile	7.1
3	/rec/goodPractice/general/intellectualPropertyRights	7.1
4	/rec/goodPractice/general/facilitateAssignment	7.1
5	/rec/goodPractice/general/keepingAddressDataInSynch	7.1
6	/rec/goodPractice/principles/addressing/unambiguity	7.2.1
7	/rec/goodPractice/principles/addressing/equivalentDigitalRecord	7.2.1
8	/rec/goodPractice/principles/addressing/updateAddressData	7.2.1
9	/rec/goodPractice/principles/addressData/conformsToISO19160-1	7.2.2
10	/rec/goodPractice/principles/addressData/conformsToISO19160-4	7.2.2
11	/rec/goodPractice/principles/addressData/conformsToISO19160-3	7.2.2
12	/rec/goodPractice/principles/addressData/sharing	7.2.2
13	/rec/governanceFramework/general/policiesSupportObjectivesAndContext	8.1
14	/rec/governanceFramework/processes/addressing/consultationProcess	8.3.1

5 Notation — identifiers

URIs for identifiable provisions in this document are specified as partial URIs relative to https://standards.isotc211.org/19160/-2/1, as specified in ISO 19105.

6 Overview

An addressing infrastructure is a key infrastructure for any country, notably because establishing legal identity often depends on having an address, and because urban development, economic growth and the provision of basic services are inextricably linked to the existence of a sound addressing infrastructure.[33] This document specifies how addresses should be assigned and maintained to strengthen a country's addressing infrastructure.

Figure 2 illustrates the relationships between different aspects related to assigning and maintaining addresses. A good practice for assigning and maintaining addresses to objects has a specific purpose reflected in a set of objectives (i.e. why are the addresses assigned?). The good practice is guided by these objectives (e.g. for service delivery or tax collection) together with the context (e.g. slum upgrading or smart cities) in which address assignment and maintenance takes place. This good practice is based on a set of addressing principles, i.e. rules according to which addresses are assigned and maintained, and a set of principles for address data, i.e. rules according to which address data are maintained in an address data management system. A governance framework for assigning and maintaining addresses specifies how the good practice is implemented by some of the addressing stakeholders in order to sustainably maintain addresses that conform to ISO 19160-1:2015 and achieve maximum benefits for governance and society.

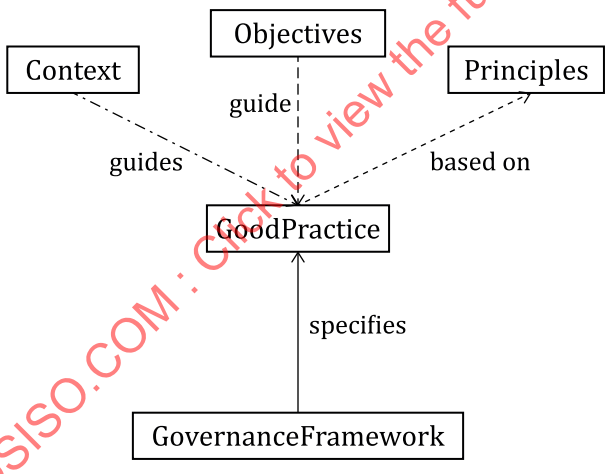


Figure 2 — Relationship between context, objectives, principles, good practice and the governance framework for address assignment and maintenance

Figure 3 provides a more detailed overview of all the aspects of address assignment and maintenance described this document.

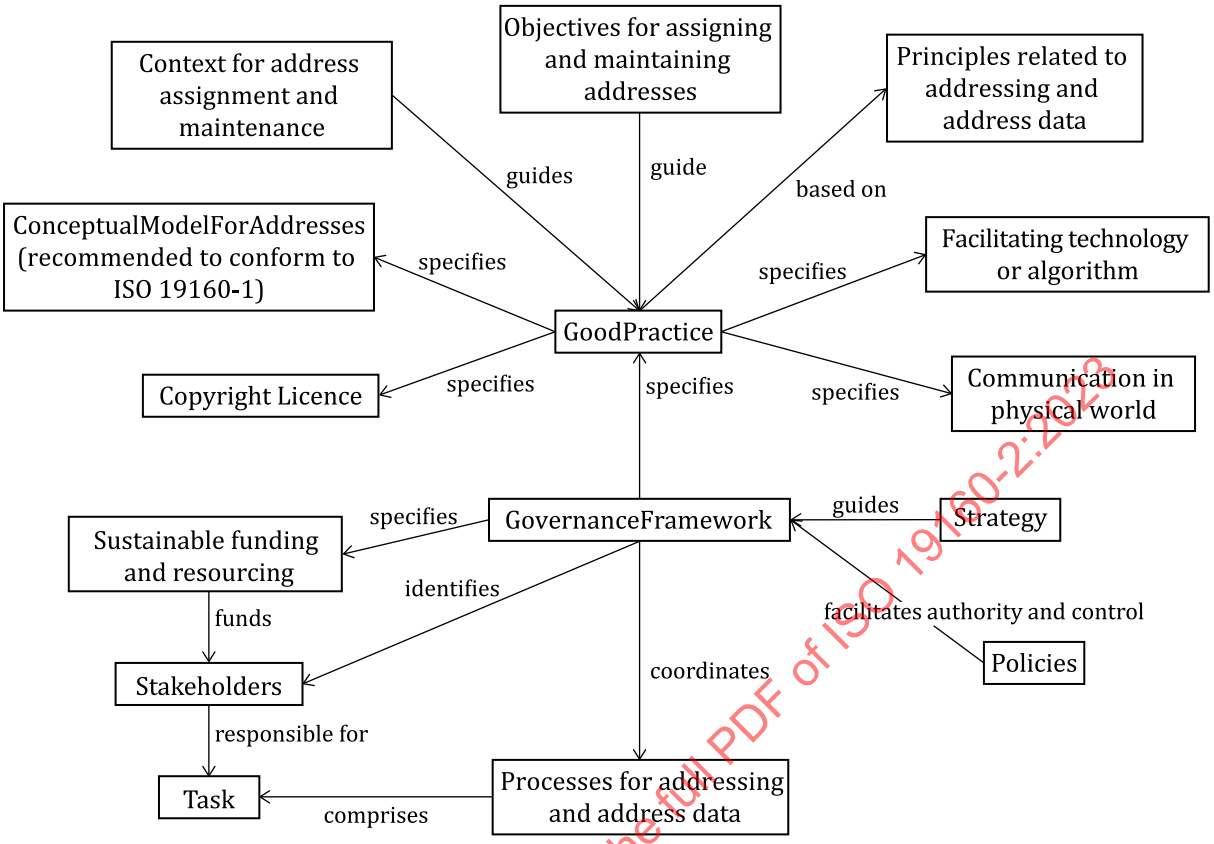


Figure 3 — Overview of address assignment and maintenance

This document supports the first goal of the UN GGIM Integrated Information Framework,[31] namely, enabling geospatial (address) information governance, policy and institutional arrangements that ensure effective geospatial (address) information management, accommodate individual organizational requirements and arrangements, and that are aligned to national and global policy frameworks.

7 Good practice for assigning and maintaining addresses

7.1 General

A good practice for assigning addresses to objects in the physical world specifies requirements and recommendations for an address assignment method that works well in a particular context and produces addresses and address data of good quality and is therefore recommended. The good practice in this document is based on methods that have proven to work well in practice in a range of countries and municipalities.

An objective for assigning addresses to objects in the physical world specifies the purpose for which an address is assigned and therefore suggests how the address will be used. An objective guides the good practice for address assignment and maintenance, e.g. the objective provides guidance on how addresses should be assigned.

Requirement 1. /req/goodPractice/general/objectives

A good practice shall specify one or more objectives for which addresses are assigned and shall be guided by these objectives.

EXAMPLE 1 AS/NZS 4819:2011, is a standard for addressing in Australia and New Zealand, with the objective to "... specify requirements for assigning addresses that can be readily and unambiguously identified and located".

EXAMPLE 2 Address assignment for emergency response or for enabling service delivery. See Annex B for more examples.

EXAMPLE 3 Addressing with the objective of slum upgrading, e.g. by making it possible to provide proof of residence at an officially recognized address.

Recommendation 1. /rec/goodPractice/general/objectivesforPublicGood

An objective should specify that the assignment and maintenance of addresses is done with the purpose of benefitting governance and society and thereby achieving public good.

EXAMPLE 4 Address data that is accessible and usable by anyone, e.g. freely available as open data, can be used in many ways to benefit citizens and achieve public good. For example, addresses that are freely available as open data can be used by anyone for emergency response, deliveries or visiting friends.

EXAMPLE 5 The South African Post Office (SAPO) assigns addresses in rural and underserved areas of South Africa with the objective of providing formal physical addresses to households across the country. This will improve the livelihoods of South Africans ensuring that people in rural and underserved areas have postal services, telecommunication services, water, electricity and other services; can provide their addresses for security or emergency services; and that they can use their addresses for legislative requirements, such as the Financial Intelligence Centre Act, No 38 of 2001.[28]

Requirement 2. /req/goodPractice/general/context

A good practice shall specify the context in which the address assignment and maintenance takes place and shall be guided by this context.

EXAMPLE 6 Addressing in the context of (remote) rural areas.

EXAMPLE 7 The South African Post Office Limited (SAPO) was given the mandate by its shareholder, the South African Government, to roll out physical addresses in rural/traditional areas throughout the country. This mandate, later on, through the National Integrated ICT Policy White Paper and the Postal Services Amendment Bill, gave SAPO legal custodianship of the National Address Database (NAD).

EXAMPLE 8 In Kenya, the legal framework for the establishment of a National Addressing System is provided for in the 4th schedule of the Constitution of Kenya & County Government Act, 2012 and CAP 411A of the Laws of Kenya. The 4th schedule of the Constitution outlines the mandate of County Governments including planning, housing, county roads, boundaries and land survey that include naming and numbering of property and ensuring harmony between national and county planning. CAP 411A mandates the Communication Authority to control, plan, administer and manage addressing and numbering of communications systems and services as further expounded under the Kenya Information and Communications (Numbering) Regulations of 2010.

Requirement 3. /req/goodPractice/general/conceptualModel

A good practice shall specify the conceptual model for the classes (types) of addresses assigned and maintained through the good practice. This includes a description of the address reference system, i.e. a set of address components and the rules for their combination into addresses. For more information

about conceptual models in the Unified Modelling Language (UML) and how they are used in geographic information standards, please refer to the ISO/TC 211 website.[16]

EXAMPLE 9 "25 Blue Avenue Hatfield 0028" is an instance of an address class comprising the following address components: address number, thoroughfare name, place name and postcode.

EXAMPLE 10 SANS 1883-2:2018, is a profile of ISO 19160-1:2015 for South African addresses.

EXAMPLE 11 NZ profile. "Address: Conceptual Model for New Zealand", a New Zealand Profile of ISO 19160-1:2015 Addressing – Part 1: Conceptual Model, was developed and is available as unpublished draft.

EXAMPLE 12 The address system of the Republic of Korea conforms to KS X ISO 19160-1:2018, which is based on ISO 19160-1:2015.

EXAMPLE 13 The conceptual model specifies whether addresses are thoroughfare-based or not.

EXAMPLE 14 In European countries, address databases typically conform to the INSPIRE address technical specification.

Recommendation 2. /rec/goodPractice/general/ISO19160-1Profile

The conceptual model that describes classes (types) of addresses assigned and maintained through the good practice should conform to ISO 19160-1:2015.

NOTE 1 Amongst others, ISO 19160-1 requires that a conformant address model clearly specifies how the position of an address is represented in the model. ISO 19160-1 provides two ways for doing this: 1) an address has coordinates to specify its position; 2) the position of the address is inferred from the addressed object (see ISO 19160-1:2015, 6.1).

NOTE 2 Postal addresses are defined and described in ISO 19160-4, a profile of ISO 19160-1.

EXAMPLE 15 The draft New Zealand (NZ) profile of ISO 19160-1 describes its conformance to ISO 19160-1. The NZ profile defines six address classes: Thoroughfare, Water, Service Delivery, Rural Post Delivery, Thoroughfare4819, and Water4819. New addresses (excluding NZ Post addresses for service delivery and rural post delivery) quality assured by the LINZ address team are assessed against the Thoroughfare4819 and Water4819 classes, and these classes align with the requirements in AS/NZS 4819:2011.

Recommendation 3. /rec/goodPractice/general/intellectualPropertyRights

A good practice should specify to whom the intellectual property rights of the address assignment method and the address data belong. At the least, government organizations should have free access to the address data for services to ensure the health, safety and welfare of the public.

Requirement 4. /req/goodPractice/general/licence

A good practice shall specify the licences under which the address data is available and the terms and conditions for their use. Different licences may apply for different users.

EXAMPLE 16 Address data is licensed to public sector users under a different licence than to users generally.

EXAMPLE 17 The New Zealand Street Address dataset is Crown Copyright, and available from the LINZ Data Service under a Creative Commons Attribution 4.0 International licence.

EXAMPLE 18 In the Republic of Korea, the public can use the address information provided under the Road Name Address Act. Individuals can use the attribute component of the address information without restrictions and request locational information, including exact coordinates. The Ministry of the Interior and Safety reserves the rights to the address information. Private corporations such as navigation and mapping companies are allowed to access the address information, subject to the approval of applications.

EXAMPLE 19 In France, the national dataset is under Open Licence v2.0.[23]

Recommendation 4. /rec/goodPractice/general/facilitateAssignment

A good practice should specify a method for assigning values to address components that could be automated to speed up or facilitate address assignment and maintenance.

EXAMPLE 20 AS/NZS 4819:2011, contains a clause for addressing rural properties based on the measured distance along the road of the accessway of the property from a defined datum point, with odd numbers on the left side of the road and even numbers on the right.

EXAMPLE 21 The South African guidelines for address allocation and updates (SANS 1883-3:2009) recommend that addresses be assigned in regular intervals, omitting numbers between them, so that these numbers can be used in future in the case of subdivisions or densification.

EXAMPLE 22 In Costa Rica, five distinct street types are used: Plaza, Avenida, Calle, Diagonal, Transversal. They are used depending on the direction of the respective thoroughfare.

EXAMPLE 23 In the Republic of Korea, road types are classified into three categories: 1) ground roads, 2) grade-separated roads, and 3) internal roads. Ground roads are further divided into highways, *daero* (i.e. roads wider than 40 m), *ro* (i.e. roads that are between 12 m and 40 m wide), and *gil* (i.e. all other roads). A *gil* is a narrow road that diverges from either a *daero* or *ro*, and it is typically identified by a number. This facilitates the creation of mental maps. Grade-separated roads include overpasses and underpasses, and internal roads refer to public footpaths in buildings, such as corridors in subway stations.

EXAMPLE 24 In the Republic of Korea, addresses are assigned from west to east and from south to north for each road section. A road section is divided into 20-m intervals, and odd numbers are allocated to the left side and even numbers to the right side of the road. The numbers that are allocated every 20 m are called basic numbers. The distance between locations can be estimated by multiplying the basic number by 10 m.

EXAMPLE 25 The Saudi National Address system covers the whole kingdom, including deserts, mountains, valleys and even the areas that do not have specific names or identifications yet (to meet present and future expectations). This is possible because the system is developed based on the local Universal Transverse Mercator (UTM) coordinate system. This method could be applied in any country with the standard tools and techniques of a geographic information system.

Requirement 5. /req/goodPractice/general/communicationThroughPhysicalIdentifiers

A good practice shall specify how addresses will be communicated through physical identifiers.

EXAMPLE 26 Addresses are communicated by street name signs on street corners and number signs on buildings.

EXAMPLE 27 AS/NZS 4819:2011, specifies that "it is desirable that the possible range and direction of numbers be included on the road name sign".

EXAMPLE 28 In Soweto, South Africa, the address numbers are sometimes painted on the walls of houses.

EXAMPLE 29 The US regulation/guidelines for posting address numbers on private property specify that they ensure that 1) all the numbers/letters are present; 2) they are large enough to be seen easily from the street; 3) landscape vegetation is not limiting their visibility.

EXAMPLE 30 In the Republic of Korea, signs for road names, building numbers, thing numbers, basic numbers, and national grid codes are installed where necessary for navigation purposes.

EXAMPLE 31 Displaying signs for addresses of indoor features, such as rooms, windows or doors, so that first responders know how to access a given room in the case of an emergency, e.g. street name, number, postcode, city, the floor, identifier for the room on the floor and for the door/window in the room.

Recommendation 5. /rec/goodPractice/general/keepingAddressDataInSynch

A good practice should specify a method for keeping addresses in the physical world in synch with address data.

EXAMPLE 32 In the Republic of Korea, address information maps are constructed and regularly maintained to ensure up-to-date and accurate representations of physical spaces. They depict all addressable objects as polygons or points, and thoroughfare names and road sections as polylines.

7.2 Principles

7.2.1 Addressing principles

A principle specifies a rule in the form of a value or proposition. This subclause presents requirements and recommendations for address assignment and maintenance if the good practice is followed.

Recommendation 6. /rec/goodPractice/principles/addressing/unambiguity

An address should be assigned to an addressable object in the physical world so that it allows the unambiguous determination of the object for purposes of identification and location (ISO 19160-1:2015).

NOTE 1 The position of an address can be represented in two ways: 1) the position is specified by coordinates in the "position" attribute; 2) the position is inferred from the addressed object. See ISO 19160-1:2015, 6.1.

EXAMPLE 1 In the Republic of Korea, addressable objects are explicitly designated for each type of address (i.e. Address of Buildings, Address of Things, and Address of Spaces).

EXAMPLE 2 In the Republic of Korea, addresses are assigned not only to buildings (or building groups) but also to things, such as overpass elevators, riverside parking lots, taxi stands and drone delivery points. The addresses assigned to these are called the Address of Things.

EXAMPLE 3 Saudi Post implemented a unique and systematic National Address for each location within the kingdom: a 13-digit address consisting of a unique combination of 5 digits for the postal code, 4 digits for the building number and 4 digits for additional numbers. Each digit in the postal code is assigned as follows: (1st) Region, (2nd) Sector, (3rd) Branch, (4th) Division and (5th) Quarter. Building Number and Additional Number are represented by 4 digits created by calculating x-coordinates with an absolute value between 2000 and 5999 and y-coordinates with an absolute value between 6000 and 9999 for each location within the kingdom. If the x-value is a building number, the y-value is an additional number and vice versa. The National Address can accept additional input (information) when it is available such as area/district, street, or city. For example, an address with full information located in a city with areas/districts and streets names provided: “8228 King Abdulaziz - Al Amal Dist, RIYADH 12643 – 2121”; an address located on the highway and there is a street only “6561 King Fahd, AR RASS 58887 – 3025”; and an address in a desert with no district or street: 6150, AL HUWAYMIL 68762 – 3281.

Requirement 6. /req/goodPractice/principles/addressing/sustainableAssignmentMethod

Addressing shall be sustainable in the sense that additional addresses can be added without breaking the consistency of the address assignment method of existing addresses.

EXAMPLE 4 Leaving spaces between numbers when addresses are initially assigned makes it possible to assign additional addresses later when densification takes place. Alternatively, a number can be assigned based on the distance from an intersection of origin of the street.

Requirement 7. /req/goodPractice/principles/addressing/pilotingAssignmentMethod

The assignment method shall be piloted or tested before rolling it out on a larger scale.

Requirement 8. /req/goodPractice/principles/addressing/deviceIndependence

Unambiguous location of the object shall be possible without requiring the use of a digital device.

This requirement is necessitated, for example, in the case of an emergency when an object needs to be identified and located in the absence of connectivity (e.g. through signage when standing in front of it).

EXAMPLE 5 During the 2019-20 Australian wildfires there was widespread loss of connectivity due to direct fire damage to telecommunications infrastructure. This resulted in a prolonged loss of internet access to location information (e.g. address) which hampered firefighters who had to rely on radio (verbal) communication.

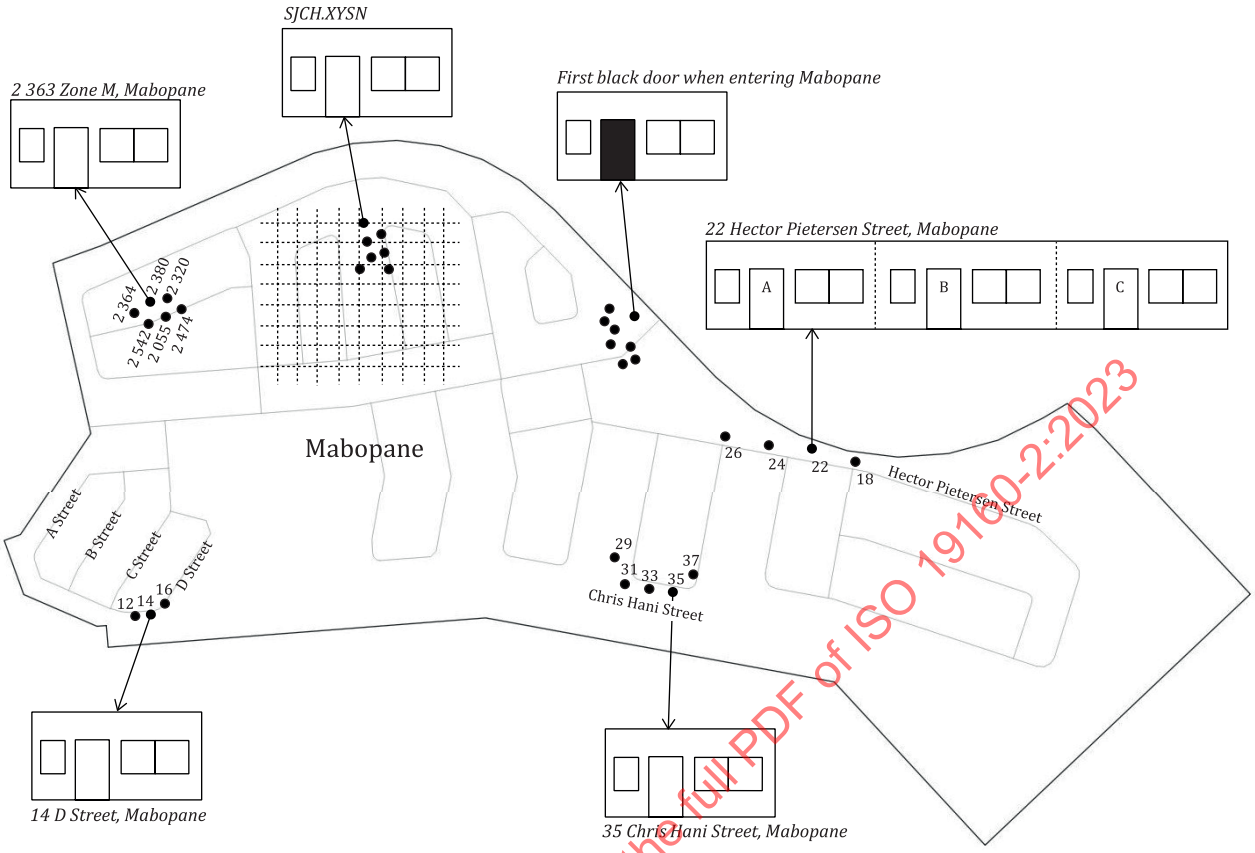
Requirement 9. /req/goodPractice/principles/addressing/noPersonalInformation

An address shall not include information about an individual or organization, owning the object to which it is assigned, or living and/or working at the object to which the address is assigned.

Requirement 10. /req/goodPractice/principles/addressing/ dimensionsCongruentWithObjectives

Addresses shall be of an address class with dimensions congruent with the context in which they are assigned and maintained, and with the objectives for which they are assigned and maintained.

Depending on the circumstances and objectives, address classes (types) may differ significantly in terms of a number of dimensions, including rigidness of structure, precision of identification of the object, human friendliness, and computability. Figures 4 to 8 illustrate how different kinds of addresses (address classes) identify objects and where these kinds of addresses are located with reference to these dimensions.



Key

- building

Figure 4 — Examples of addresses from different address classes

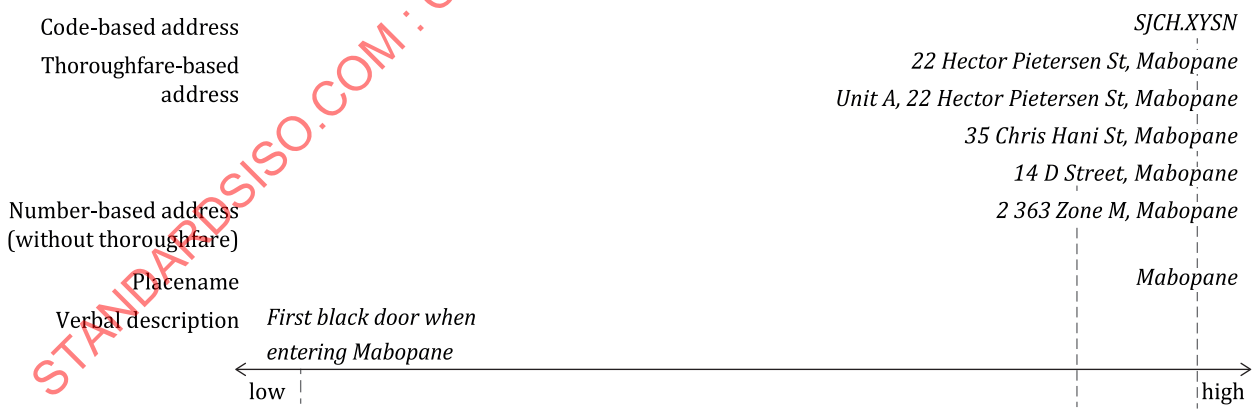
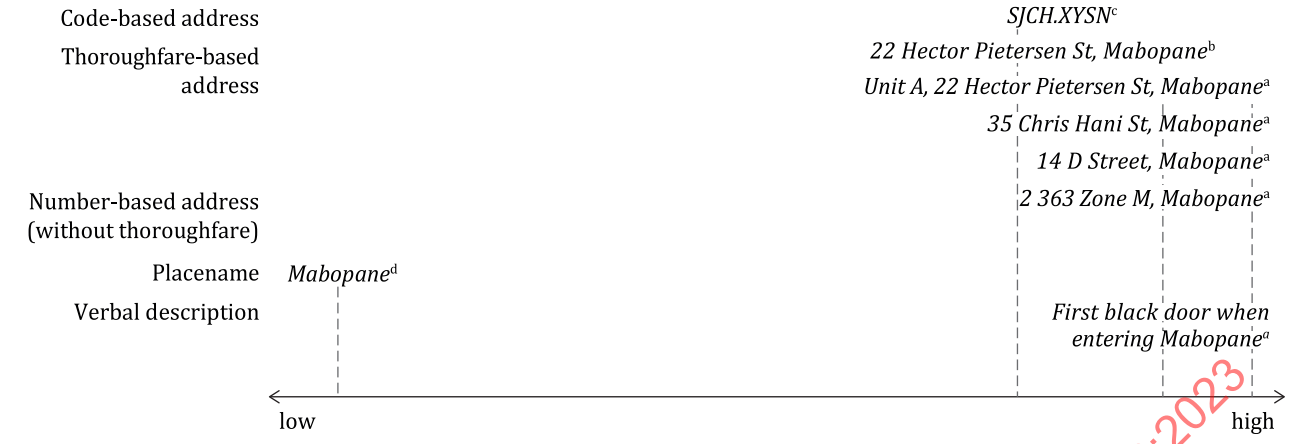


Figure 5 — Address classes on the "Rigidness of structure" dimension



Key

a Each of these addresses identify the respective object with the same precision.

b This address identifies three objects and is therefore less precise.

c The code-based address identifies all the buildings within a cell and is therefore less precise.

d The placename address identifies all buildings within Mabopane and therefore has the least precision.

Figure 6 — Address classes on the "Precision of identification of the object" dimension

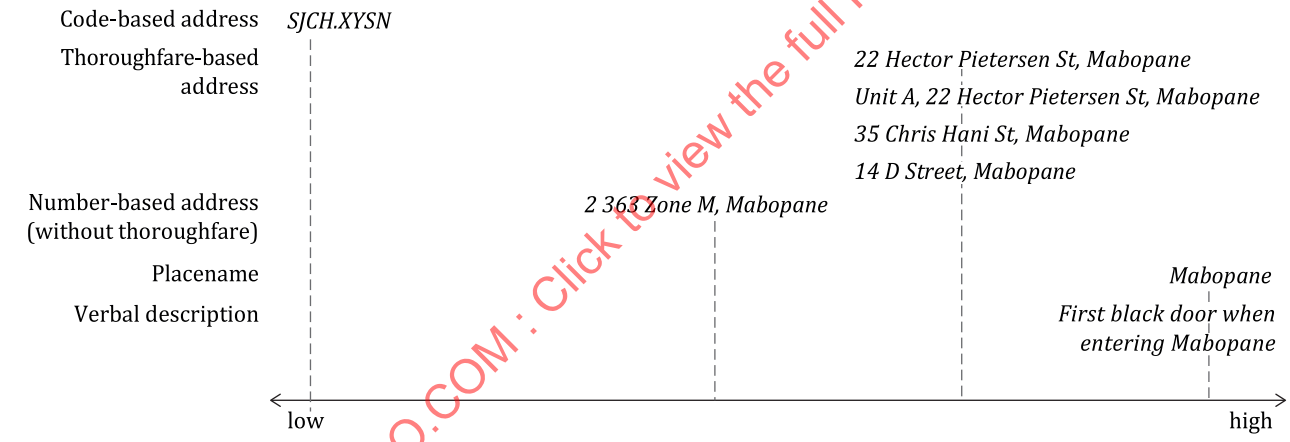


Figure 7 — Address classes on the "Human friendliness" dimension

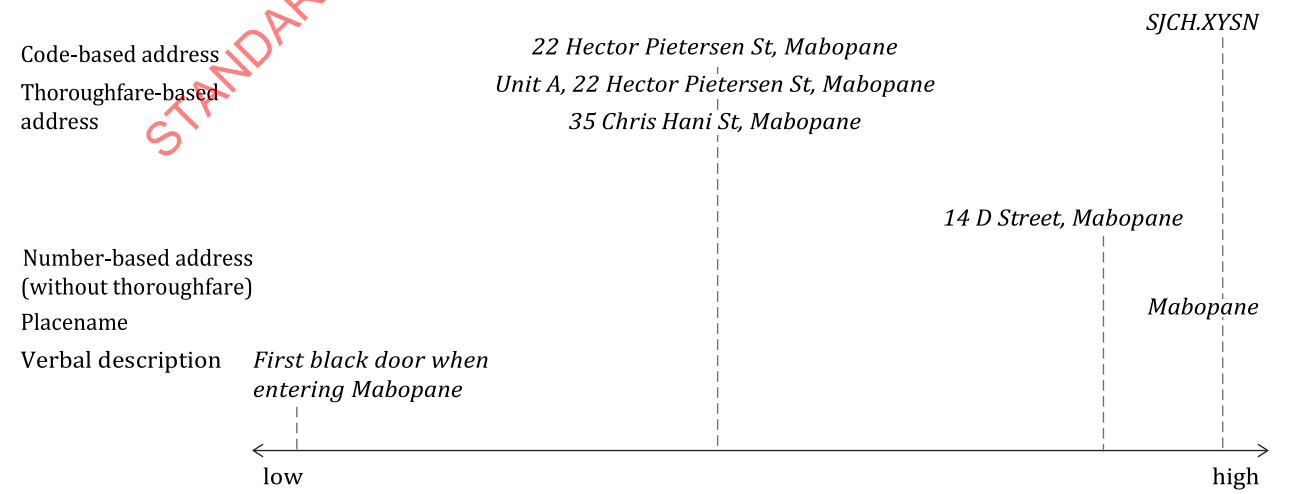


Figure 8 — Address classes on the "Computability" dimension

EXAMPLE 6 If addresses are assigned with the objective to upgrade a slum, the focus is typically on the transformational potential of integrating the slum into the urban fabric, therefore address classes with culturally neutral street names (e.g. 'K Street') are more appropriate than addresses requiring a lengthy street name approval process.

EXAMPLE 7 If addresses are assigned for property taxation purposes, addresses with higher precision of identification of an object are required. Therefore, addresses in the form of verbal descriptions are not appropriate, but rather addresses with an address number that precisely identifies a specific building from the neighbouring buildings.

EXAMPLE 8 In the Republic of Korea, the *Addresses of Buildings* identify the locations of residential properties, buildings, and rooms in buildings. The *Addresses of Things* identify the locations of public facilities, such as emergency water supply facilities for government services and taxi stands. The *Addresses of Spaces* identify the locations of roadways, sidewalks, mountains, or alike where no buildings or objects are found.

EXAMPLE 9 For urban infrastructure management and emergency response, a rigorously structured address system is needed. In this sense, the positional precision and the easiness to be understood needs to be considered.

EXAMPLE 10 In the Republic of Korea, for delivery using drones outdoors, an address is assigned to a drone delivery point. The drone is operated on the geographic coordinate system, but the address needs to be easy for the people's understanding.

EXAMPLE 11 South Africa makes use of different address types, as described in SANS 1883-1:2009.[25] Some address types used in (urban) metropolitan areas are assigned by municipalities. The South African government, through the Postal Services Act No.124 of 1998, is mandated to ensure greater access to basic services through the achievement of universal postal service, by providing an acceptable level of effective and regular postal services to all areas including rural and underserved areas and small towns where post offices are not sustainable. The South African Post Office therefore also assigns addresses in rural and underserved areas, based on both location information (e.g. village name) and postal routing information (e.g. post office name).

EXAMPLE 12 Addresses assigned for postal delivery purposes provide the mechanism through which mailers specify the intended recipient and the means by which the postal operator can fulfil its delivery commitment. Postal addresses combine information about the addressee (party who is the ultimate recipient of a delivery item or service), which includes private information, with the publicly known address identifying the delivery point. See ISO 19160-4 for more detail.

EXAMPLE 13 A single address class (type) is not necessarily sufficient. For example, the NZ profile of ISO 19160-1 specifies several address classes.

Requirement 11. /req/goodPractice/principles/addressing/suitableComponents

The address components of an address class shall be suitable to meet the objectives for which that class is designed.

EXAMPLE 14 The NZ profile defines a "rural mail delivery address" address class. One of its components is called Mailtown. This component represents the name of a city or town from which the mail is delivered (loosely translates to the town where the post office is). It is not the name of the town in which the address is located. The Thoroughfare address class (the "standard" street address) has a component called "CityTown", which represents the name of the city or town in which the address is located. Even though the values of both Mailtown and CityTown are drawn from the same domain list and look almost identical when used in an address, Citytown is not the appropriate component to have in a rural mail delivery address.

Recommendation 7. /rec/goodPractice/principles/addressing/equivalentDigitalRecord

Any address that is assigned to an object should have a digital equivalent address record in an authoritative address dataset.

EXAMPLE 15 In the Republic of Korea, address information is maintained as digital records and updated daily for addresses created or modified by the Korean Address Information System (KAIS).

EXAMPLE 16 In France, the government maintains an address database, the National Address Database (BAN) which can be downloaded or accessed through an application programming interface (API).[24]

EXAMPLE 17 In the case of an apartment building with a parent address for the main building entrance and child addresses for the individual apartments, both the parent and child addresses are included in the authoritative address dataset.

EXAMPLE 18 The authoritative address dataset includes addresses of different addresses classes (type).

Recommendation 8. /rec/goodPractice/principles/addressing/updateAddressData

The authoritative address dataset should be updated whenever an address is assigned or changed due to maintenance.

7.2.2 Address data principles

A principle specifies a rule in the form of a value or proposition. This clause presents required and recommended principles for address data if a good practice is followed.

Requirement 12. /req/goodPractice/principles/addressData/ representsAddressInPhysicalWorld

Address data shall represent the addresses assigned to objects in the physical world.

Requirement 13. /req/goodPractice/principles/addressData/interoperability

Address data shall be interoperable between public administration systems, such as the cadastre, population register or urban information systems.

EXAMPLE 1 An address often serves as a link or reference between information in different systems, e.g. citizens in the population register, inhabitants of a property, and a vehicle licence can all be associated with the same address. Therefore, exchange of address data between the different systems is needed.

Requirement 14. /req/goodPractice/principles/addressData/dataMaintenance

Address data shall be maintained through processes and systems that consider general purpose data management principles, as well as specific requirements due to the geospatial nature of address data.

NOTE 1 This combined approach is the foundation of sound and sustainable address data maintenance.

Requirement 15. /req/goodPractice/principles/addressData/digitalMaintenance

In the case of digital address data, the data shall be maintained in an address data management system with appropriate software solutions, such as spatial database management systems and/or geographic information systems.

EXAMPLE 2 In Saudi Arabia, the National Address was developed as web maps and mobile applications supported by a huge geodatabase. The National Address system helps the logistic service providers, API services and e-commerce.

Recommendation 9. /rec/goodPractice/principles/addressData/conformsToISO19160-1

Address data should conform to ISO 19160-1:2015, or a profile thereof.

EXAMPLE 3 Address data accommodates address aliases, i.e. a set of addresses unambiguously identifying the same addressable object in the physical world; and address data that represent the addresses assigned to objects in the physical world including lifecycle, provenance and locale information (metadata) conformant with ISO 19160-1:2015.

Recommendation 10. /rec/goodPractice/principles/addressData/conformsToISO19160-4

For postal addressing, address data should conform to ISO 19160-4:2023, or a profile thereof.

NOTE 2 Key terms for postal addressing, postal address components and constraints on their use are defined in ISO 19160-4. ISO 19160-4 is based on UPU S42, Part A, Version 7, and has been developed with the Universal Postal Union (UPU).

Recommendation 11. /rec/goodPractice/principles/addressData/conformsToISO19160-3

The quality of address data should be described conformant to ISO 19160-3:2020, or a profile thereof.

Recommendation 12. /rec/goodPractice/principles/addressData/sharing

In the case of digital address data, the data should be shared through address retrieval solutions that preserve and maintain data integrity, e.g. through spreadsheets or APIs.

EXAMPLE 4 In the Republic of Korea, the address information is publicly available through the Address Information System.[21]

8 Governance framework for assigning and maintaining addresses

8.1 General

The governance framework for assigning and maintaining addresses specifies the addressing stakeholders involved in address assignment and maintenance. Responsibilities are assigned to each stakeholder, and policies specify how decision-making is done. A governance framework is guided by a strategy and has funding mechanisms that sustain its operation.

Requirement 16. /req/governanceFramework/general/strategy

A governance framework shall be guided by a strategy for assigning addresses to objects. The strategy shall be based on policies and guidelines.

Requirement 17. /req/governanceFramework/general/policies

A governance framework shall exercise authority and control over address assignment and maintenance through policies with well-defined decision-making structures and procedures.

Recommendation 13. /rec/governanceFramework/general/ policiesSupportObjectivesAndContext

The policies should support the objectives and context.

NOTE 1 Guidelines describe the execution of the policies.

Requirement 18. /req/governanceFramework/general/goodPractice

A governance framework shall specify the good practice according to which addresses shall be assigned and maintained (see Clause 8).

8.2 Addressing stakeholders

Requirement 19. /req/governanceFramework/addressingStakeholders/identification

A governance framework shall identify the addressing stakeholders involved in the processes and decision-making related to assignment and maintenance of addresses.

EXAMPLE 1 Typical addressing stakeholders include municipalities, postal services, users in government departments and the general public. Not all of them are necessarily included in the governance framework.

EXAMPLE 2 In the Republic of Korea, addresses are designated and maintained by the public sector, which includes the typical stakeholders.

EXAMPLE 3 A workshop in Kenya towards implementation of national addressing included stakeholders from the Communications Authority of Kenya, County Governments, Kenya Revenue Authority, Kenya Bureau of Standards, Ministry of Information, Communication and Technology , Courier Industry Association of Kenya (CIAK), Higher Loans Board (HELB), several banks, Council of Governors (COG), the Public Postal Licensee-Postal Corporation of Kenya, Independent Electoral and Boundaries Commission (IEBC), Kenya Urban Roads Board, Ministry Transport/Infrastructure, Survey of Kenya, and the National Land Commission.[12]

Requirement 20. /req/governanceFramework/addressingStakeholders/responsibilities

A governance framework shall assign at least one responsibility to each stakeholder in the governance framework, and they shall be accountable for their responsibilities.

NOTE 1 To take up responsibilities, resourcing is required. See Requirement 22. /req/governanceFramework/ addressingStakeholders/resourcing.

EXAMPLE 4 In South Africa, municipalities have the responsibility to assign addresses within their area of jurisdiction, while the South African Post Office is responsible for address assignment in rural and underserved areas in collaboration with other organs of state, such as traditional authorities.

EXAMPLE 5 The South African Geographical Names Council (SAGNC) has the mandate for standardizing and transforming geographical names. The Provincial Geographical Names Committee advise local authorities (municipalities and traditional authorities) on naming, including place and street names that appear in addresses. The Provincial Committees submit naming recommendations to the SAGNC for approval.

EXAMPLE 6 In the Republic of Korea, addresses can be designated by the authorities of local governments. Citizens can request that local governments initiate an address designation process.

EXAMPLE 7 In the Republic of Korea, the head of the local government has the authority to make decisions regarding the address designation process.

EXAMPLE 8 In the Republic of Korea, the public sector is responsible for maintaining the Korean Address Information System (KAIS) and distributing the address information. Other government agencies verify the locational accuracy of addressable objects on the address information maps.

EXAMPLE 9 In New Zealand, under sections 319A and 319B of the Local Government Act (1974),[19] local councils are given the power to name roads and allocate property numbers. Section 319B also gives the Surveyor General the power to request a council allocate or change a property number.

EXAMPLE 10 In France, the physical address management is the responsibility of the city administration whereas the national address database is managed by the government with the help of the city services. Also, the physical process of assigning an address is governed by a set of regulations which assign duties to the local administration, such as uniquely identify addresses or ensure coherence within the address assignments.

EXAMPLE 11 In France, the main obligations of the local authorities regarding addresses are: 1) follow a numbering pattern for all cities; 2) inform of all numbered addresses for all cities of more than 2000 inhabitants within 1 months in case of creation or modification; 3) the use of street signs for public circulation; 4) the use of a unique identifier according to the national dataset. The INSPIRE framework in Europe[13] also adds duties regarding the dissemination of address datasets.

Requirement 21. /req/governanceFramework/addressingStakeholders/mandates

Assignment of responsibilities to stakeholders shall consider legal and other mandates.

Responsibilities are assigned to each stakeholder in the governance framework based on the extent of the mandate of the respective stakeholders.

Requirement 22. /req/governanceFramework/addressingStakeholders/resourcing

Stakeholders shall take responsibility for how they are funded, resourced and organized to fulfil their responsibilities in the governance framework.

NOTE 2 Resourcing includes making sure that stakeholders (people and organizations) have the capacity, skills and expertise (e.g. through on the job training) to fulfil what is expected from them in the governance framework.

NOTE 3 Resourcing includes job descriptions and annual budgeting for salaries and operational expenses, amongst others, hardware, software or data maintenance.

EXAMPLE 12 In the Republic of Korea, the government and local governments spend part of their budget on the designation and maintenance of addresses.

Requirement 23. /req/governanceFramework/addressingStakeholders/sustainability

Funding and resourcing of stakeholders in a governance framework shall be sustainable, i.e. ongoing and able to be maintained in the long run.

NOTE 4 The governance framework is not a one-off temporary endeavour with a specified end date; it is a long-term arrangement without a specific end date and is therefore funded as an operational expense.

8.3 Processes

Requirement 24. /req/governanceFramework/processes/specification

A governance framework shall specify and coordinate the processes for assigning and maintaining addresses, as specified in 8.3.1, and if address data is maintained, it shall specify and coordinate the required processes related to address data, specified in 8.3.2. Each process comprises a series of tasks aimed at achieving a specified goal.

Requirement 25. /req/governanceFramework/processes/tasks

A governance framework shall assign at least one stakeholder to each task in a process.

The processes represent sequential phases in address maintenance. Figure 9 shows the sequence of processes to followed for address assignment and maintenance in a governance framework. The figure includes the relevant requirement or recommendation describing the process in brackets. The respective requirement or recommendation number is included in brackets. Recommended processes are indicated in italics.

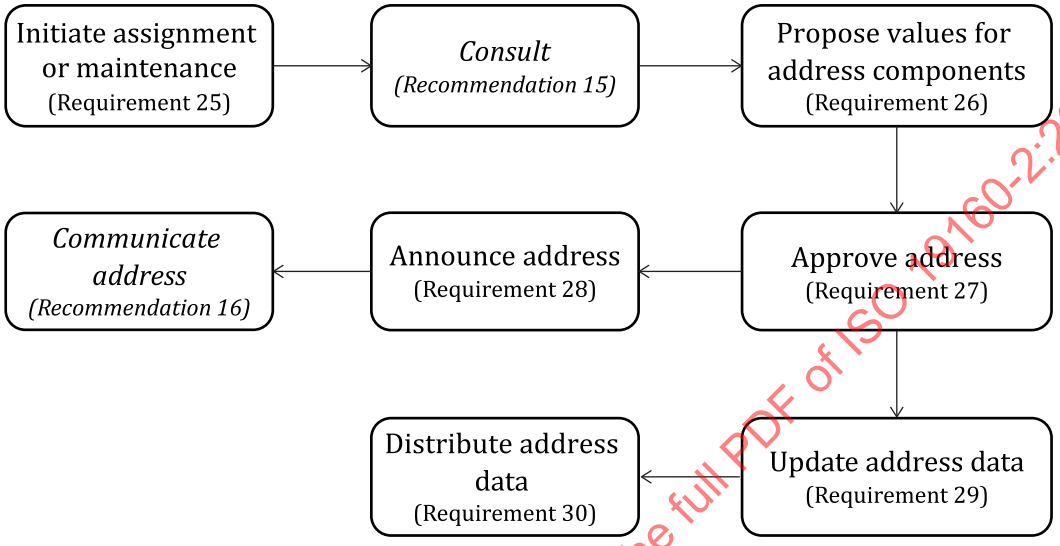


Figure 9 — The sequence of processes to be followed for address assignment and maintenance in a governance framework

8.3.1 Addressing processes

Requirement 26. /req/governanceFramework/processes/addressing/initiationProcess

A governance framework shall specify and coordinate a process for initiating the assignment or maintenance of an address.

NOTE The process for initiating the assignment of a large number of addresses, for example if a national infrastructure does not exist in a country or specific area (such in rural areas), is different.

EXAMPLE 1 This process begins for example when a developer applies for permission for a new development, when permission is obtained to construct an apartment block, or an owner applies for the sub-division of a property.

EXAMPLE 2 An address is assigned when a specific address is associated with a specific addressable object, e.g. "2837 Mankwe Street, Mabopane" is associated with a specific house in Mabopane.

EXAMPLE 3 An address is re-assigned when its addressable object changes, e.g. when the house at "2837 Mankwe Street, Mabopane" is demolished and replaced with an apartment block.

EXAMPLE 4 An address is modified when the value of one of its components changes, e.g. a street name changes from Mankwe Street to Tau Street.

EXAMPLE 5 An address is modified when one of if its lifecycle attributes is changed, e.g. when the lifecycleStage changes from proposed to current.

EXAMPLE 6 An address is retired when it is not used anymore.

Recommendation 14. /rec/governanceFramework/processes/addressing/consultationProcess

A governance framework should specify and coordinate a process for consultation when new address component values are assigned or changed due to maintenance.

EXAMPLE 7 In the Republic of Korea, local governments make decisions on the designation or changes of addresses through a resolution by the address information committee, which considers public submissions.

Requirement 27. /req/governanceFramework/processes/addressing/proposeValuesProcess

A governance framework shall specify and coordinate a process for proposing new values or changes to address components values.

EXAMPLE 8 A municipality proposes a name for a new street according to their policy, which is aligned with national legislation. When the name is approved by the municipal council or by a national council, it is assigned to the street.

EXAMPLE 9 A municipality proposes address numbers to be used along a specific street, and they are approved by the municipal council.

Requirement 28. /req/governanceFramework/processes/addressing/approvalProcess

A governance framework shall specify and coordinate a process for approving or rejecting the proposed new address assignment or changes to an address due to maintenance.

EXAMPLE 10 A municipality follows a process to approve or reject an address.

Requirement 29. /req/governanceFramework/processes/addressing/announcementProcess

A governance framework shall specify and coordinate a process for the announcement of a newly assigned address or changes to an address due to maintenance.

EXAMPLE 11 The decision can be announced on a website or in a government gazette (e.g. in South Africa).

EXAMPLE 12 In the Republic of Korea, for any designation of new addresses or changes to existing addresses, users are notified by mail, in person, online, or any other appropriate means. The same information is also provided to relevant public sectors to maintain consistency. The updated address information is published on the local government website.

EXAMPLE 13 The announcement of new and updated addresses in New Zealand is achieved by a well-understood weekly update cycle where the address database clearly labels any changes from the previous update.

EXAMPLE 14 In Australia, the open data version of the Geocoded National Address File is updated quarterly with some information regarding new or updated address data.

Requirement 30. /req/governanceFramework/processes/addressing/communicationProcess

A governance framework shall specify a process for communicating addresses in the physical world, following approval of assignment or maintenance of an address.

EXAMPLE 15 Following approval of an address change, the municipality puts up or replaces the relevant street name signs, and the owner puts up or replaces the number sign on a building.

EXAMPLE 16 In the Republic of Korea, institutions that manage specific facilities install or replace the signs for Address of Things within 100 m of the road or, for the national grid codes, 100 m away from the road upon the approval of the address.

8.3.2 Address data processes

Requirement 31. /req/governanceFramework/processes/addressData/updateProcess

A governance framework shall specify and coordinate a process for updating the authoritative dataset after approval of assignment or maintenance of an address.

EXAMPLE 1 In the Republic of Korea, the public sector acquires address information for roads, buildings, administrative areas, and entrances and then updates it on the Korean Address Information System (KAIS) and address information maps.

EXAMPLE 2 In the Republic of Korea, when assigning addresses to facilities, called Address of Things, the public sectors perform the surveying for the locational accuracy. When implementing a facility in the area where the Korean National Grid Reference System (grid-based address) is required to be marked, the public sectors perform surveying for the positional accuracy. The digital record is updated on the Korean Address Information Systems.

Requirement 32. /req/governanceFramework/processes/addressData/distributionProcess

A governance framework shall specify and coordinate a process for making address data available after an update to the authoritative dataset.

Annex A
(normative)

Abstract test suite

A.1 Summary of conformance classes, requirements and recommendations

This annex specifies an abstract test suite comprising two conformance test classes. The respective conformance test class shall be passed by an objective, good practice or governance framework claiming conformance with this document. Figure A.1 provides an overview of the conformance classes, subclasses and their corresponding requirements and recommendations.

URIs in this annex are relative to https://standards.isotc211.org/19160/-2/1.

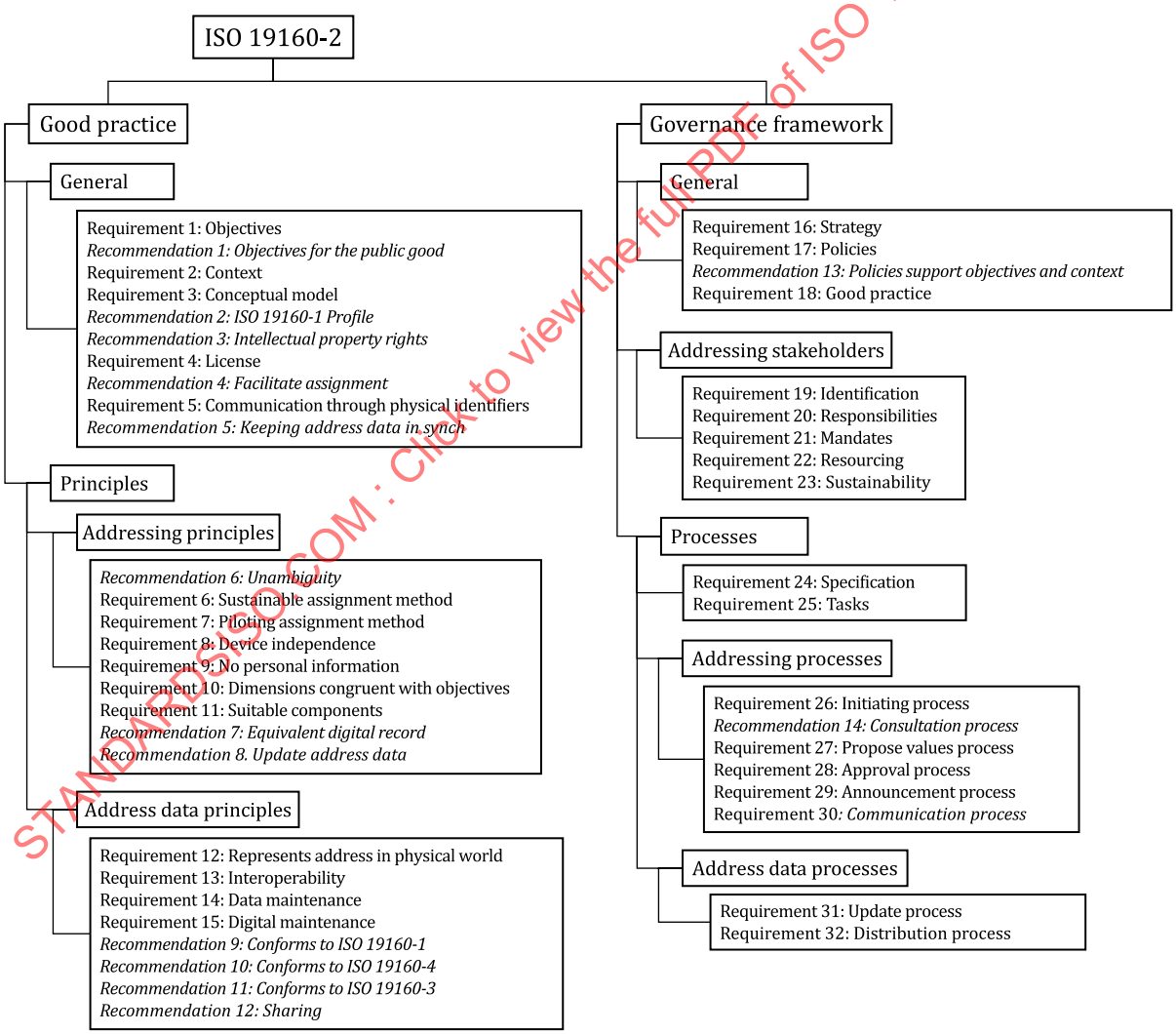


Figure A.1 — Conformance classes, requirements and recommendations

Even though ISO 19105:2022 requires only requirements to be included in a conformance test report, in this document, we also included the recommendations, as we wanted to illustrate if and how recommendations can be implemented.

A.2 Conformance test class: Good practice for assigning and maintaining addresses

A.2.1 Conformance test subclass: General

Test case identifier:	**Requirement 1. /conf/goodPractice/general/objectives**
Test method:	`Check that the good practice specifies a set of objectives.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/general/objectives

Test case identifier:	**Recommendation 1. /conf/goodPractice/general/objectivesForPublicGood**
Test method:	`Check that each objective specifies that the assignment and maintenance of addresses is done with the purpose of benefitting governance and society thereby achieving public good.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/general/objectivesForPublicGood

Test case identifier:	**Requirement 2. /conf/goodPractice/general/context**
Test method:	`Check that a context is specified to guide the good practice.` Test passes if constraint evaluates to be "true"
Reference:	/req/goodPractice/general/context

Test case identifier:	**Requirement 3. /conf/goodPractice/general/conceptualModel**
Test method:	`Check that the good practice specifies a conceptual model that describes the classes (types) of addresses assigned and maintained by the good practice, and that addresses assigned and maintained by the good practice conform to this conceptual model.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/general/conceptualModel

Test case identifier:	**Recommendation 2. /conf/goodPractice/general/ISO19160-1Profile**
Test method:	`Check that the conceptual model conforms to ISO 19160-1.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/general/ISO19160-1Profile

Test case identifier:	**Recommendation 3. /conf/goodPractice/general/intellectualPropertyRights**
Test method:	`Check that the good practice specifies to whom the intellectual property right of the address data belongs, and under which terms and conditions the data can be used.` Check that government organizations have free access to the address data for essential services, such as emergency response and disaster management. Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/general/intellectualPropertyRights

Test case identifier:	**Requirement 4. /conf/goodPractice/general/licence**
Test method:	`Check that the good practice specifies the copyright licence(s) under which the address data can be made available.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/general/licence

Test case identifier:	**Recommendation 4. /conf/goodPractice/general/facilitateAssignment**
Test method:	`Check that the good practice specifies a method for assigning values to address components that could be automated to speed up or facilitate address assignment and maintenance.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/general/facilitateAssignment

Test case identifier:	**Requirement 5. /conf/goodPractice/general/communicationThroughPhysicalIdentifiers**
Test method:	`Check that the good practice specifies how addresses are communicated through physical identifiers.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/general/communicationThroughPhysicalIdentifiers

Test case identifier:	**Recommendation 5. /conf/goodPractice/general/keepingAddressDataInSynch**
Test method:	`Check that the good practice specifies a method for keeping addresses in the physical world in synch with address data.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/general/keepingAddressDataInSynch

A.2.2 Conformance test subclass: Addressing principles

Test case identifier:	**Recommendation 6. /conf/goodPractice/principles/addressing/unambiguity**
Test method:	`Check that addresses assigned according to the good practice make it possible to unambiguously determine an object for purposes of identification and location.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressing/unambiguity

Test case identifier:	**Requirement 6. /conf/goodPractice/principles/addressing/sustainableAssignmentMethod**
Test method:	`Check that when addresses are assigned, additional addresses can be assigned without breaking the consistency of the address assignment method of existing addresses.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressing/sustainableAssignmentMethod

Test case identifier:	**Requirement 7. /conf/goodPractice/principles/addressing/pilotingAssignmentMethod**
Test method:	`Check that the assignment method was piloted or tested before rolling it out on a larger scale.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressing/pilotingAssignmentMethod

Test case identifier:	**Requirement 8. /conf/goodPractice/principles/addressing/deviceIndependence**
Test method:	`Check that addresses assigned according to the good practice makes it possible to unambiguously determine an object without requiring the use of a digital device.` Test passes if constraint evaluates to be ‘true’.
Reference:	/req/goodPractice/principles/addressing/ deviceIndependence

Test case identifier:	**Requirement 9. /conf/goodPractice/principles/addressing/noPersonalInformation**
Test method:	`Check that addresses assigned according to the good practice do not include information about an individual or organization associated with the object.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressing/noPersonalInformation

Test case identifier:	**Requirement 10. /conf/goodPractice/principles/addressing/dimensionsCongruentWithObjectives**
Test method:	`Check that the dimensions of addresses assigned according to the good practice are congruent with the context in which they are assigned and maintained, and with the objectives for which they are assigned and maintained.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressing/dimensionsCongruentWithObjectives

Test case identifier:	**Requirement 11. /conf/goodPractice/principles/addressing/suitableComponents**
Test method:	`Check that the address components of an address class are suitable for meeting the objectives for which the class was designed.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressing/suitableComponents

Test case identifier:	**Recommendation 7. /conf/goodPractice/principles/addressing/equivalentDigitalRecord**
Test method:	`Check that the authoritative address dataset contains a digital equivalent address record for each address assigned to an object in the physical world.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressing/equivalentDigitalRecord

Test case identifier:	**Recommendation 8. /conf/goodPractice/principles/addressing/updateAddressData**
Test method:	`Check that the address data is updated whenever an address is assigned or changed due to maintenance.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressing/updateAddressData

A.2.3 Conformance test subclass: Address data principles

Test case identifier:	**Requirement 12. /conf/goodPractice/principles/addressData/representsAddressInPhysicalWorld**
Test method:	`Check that each address data record maintained according to the good practice represents an address assigned to an object in the physical world.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressData/representsAddressInPhysicalWorld

Test case identifier:	**Requirement 13. /conf/goodPractice/principles/addressData/interoperability**
Test method:	`Check that each address data record maintained according to the good practice is interoperable with relevant public administration systems.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressData/ interoperability

Test case identifier:	**Requirement 14. /conf/goodPractice/principles/addressData/dataMaintenance**
Test method:	`Check that address data is maintained according to general purpose data management principles, considering specific requirements due to the geospatial nature of address data.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressData/dataMaintenance

Test case identifier:	**Requirement 15. /conf/goodPractice/principles/addressData/digitalMaintenance**
Test method:	`Check that digital address data is maintained in an address data management system with appropriate software solutions, such as spatial database management systems and/or geographic information systems.` Test passes if constraint evaluates to be "true".
Reference:	/req/goodPractice/principles/addressData/digitalMaintenance

Test case identifier:	**Recommendation 9. /conf/goodPractice/principles/addressData/conformsToISO19160-1**
Test method:	`Check that the address data conforms to ISO 19160-1:2015, or a profile thereof.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressData/conformsToISO19160-1

Test case identifier:	**Recommendation 10. /conf/goodPractice/principles/addressData/conformsToISO19160-4**
Test method:	`Check that the address data conforms to ISO 19160-4:2017 or a profile thereof if the addresses are assigned for postal purposes.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressData/conformsToISO19160-4

Test case identifier:	**Recommendation 11. /conf/goodPractice/principles/addressData/conformsToISO19160-3**
Test method:	`Check that the quality of address data is described conformant to ISO 19160-3:2020, or a profile thereof.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressData/conformsToISO19160-3

Test case identifier:	**Recommendation 12. /conf/goodPractice/principles/addressData/sharing**
Test method:	`Check that address data is shared in a way that preserves and maintains data integrity.` Test passes if constraint evaluates to be "true".
Reference:	/rec/goodPractice/principles/addressData/sharing

A.3 Conformance test class: Governance framework for assigning and maintaining addresses

A.3.1 Conformance test subclass: General

Test case identifier:	**Requirement 16. /conf/governanceFramework/general/strategy**
Test method:	`Check that the governance framework specifies a strategy based on policies and guidelines, and that the framework is aligned to this strategy.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/general/strategy

Test case identifier:	**Requirement 17. /conf/governanceFramework/general/policies**
Test method:	`Check that the governance framework specifies policies that specify decision-making structures and procedures, and that the governance framework exercises authority and control over address assignment and maintenance accordingly.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/general/policies

Test case identifier:	**Recommendation 13. /conf/governanceFramework/general/policiesSupportObjectivesAndContext**
Test method:	`Check that the policies support the objectives and context of the good practice.` Test passes if constraint evaluates to be "true".
Reference:	/rec/governanceFramework/general/policiesSupportObjectivesAndContext

Test case identifier:	**Requirement 18. /conf/governanceFramework/general/goodPractice**
Test method:	`Check that the governance framework specifies a good practice and that it is followed.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/general/goodPractice

A.3.2 Conformance test subclass: Addressing stakeholders

Test case identifier:	**Requirement 19. /conf/governanceFramework/addresingStakeholders/identification**
Test method:	`Check that stakeholders are identified.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/identification

Test case identifier:	**Requirement 20. /conf/governanceFramework/addresingStakeholders/responsibilities**
Test method:	`Check that each stakeholder is assigned at least one responsibility, and that they are held accountable for their responsibilities.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/responsibilities

Test case identifier:	**Requirement 21. /conf/governanceFramework/addresingStakeholders/mandates**
Test method:	`Check that the responsibilities assigned to addressing stakeholders consider legal and other mandates.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/mandates

Test case identifier:	**Requirement 22. /conf/governanceFramework/addresingStakeholders/resourcing**
Test method:	`Check that the governance framework specifies how stakeholders are funded and resourced to fulfil their responsibilities.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/resourcing

Test case identifier:	**Requirement 23. /conf/governanceFramework/addresingStakeholders/sustainability**
Test method:	`Check that funding and resourcing of stakeholders in the governance framework is sustainable in the long run.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/sustainability

A.3.3 Conformance test subclass: Processes

Test case identifier:	**Requirement 24. /conf/governanceFramework/processes/specification**
Test method:	`Check that required processes for address assignment and maintenance are specified in the governance framework.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/specification

Test case identifier:	**Requirement 25. /conf/governanceFramework/processes/tasks**
Test method:	`Check that the responsibility for each task in a process has been assigned to a stakeholder, and that the stakeholders complete the tasks.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/stakeholders/tasks

A.3.4 Conformance test subclass: Addressing processes

Test case identifier:	**Requirement 26. /conf/governanceFramework/processes/addressing/initiationProcess**
Test method:	`Check that the governance framework specifies a process for initiating the assignment or maintenance of an address.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/processes/addressing/initiationProcess

Test case identifier:	**Recommendation 14. /conf/governanceFramework/processes/addressing/consultationProcess**
Test method:	`Check that the governance framework specifies a consultation process for assigning new address component values or changing them due to maintenance.` Test passes if constraint evaluates to be "true".
Reference:	/rec/governanceFramework/processes/addressing/consultationProcess

Test case identifier:	**Requirement 27. /conf/governanceFramework/processes/addressing/proposeValuesProcess**
Test method:	`Check that the governance framework specifies a process for proposing new values for address components or for changing them.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/processes/addressing/proposeValuesProcess

Test case identifier:	**Requirement 28. /conf/governanceFramework/processes/addressing/approvalProcess**
Test method:	`Check that the governance framework specifies a process for approving or rejecting proposed new address assignments or changes to an address due to maintenance.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/processes/addressing/approvalProcess

Test case identifier:	**Requirement 29. /conf/governanceFramework/processes/addressing/announcementProcess**
Test method:	`Check that the governance framework specifies a process for the announcement of a newly assigned address or changes to an address due to maintenance.` Test passes if constraint evaluates to be "true".
Reference:	/req/governanceFramework/processes/addressing/announcementProcess

Test case identifier:	**Requirement 30. /conf/governanceFramework/processes/addressing/communicationProcess**
Test method:	`Check that the governance framework specifies a process for communicating addresses in the physical world, following approval of assignment or maintenance of an address.` Test passes if constraint evaluates to be "true".
Reference:	/rec/ governanceFramework/processes/addressing/communicationProcess