GTIN Guideline for the Construction Industry

Developed in collaboration with Statsbygg, BaneNor, Construction City, Helse Sør-Øst og Sykehusbygg

" Easier, faster, and more secure, right from the design of the building until it is handed over to the proprietor. **"**

GS1 Norway

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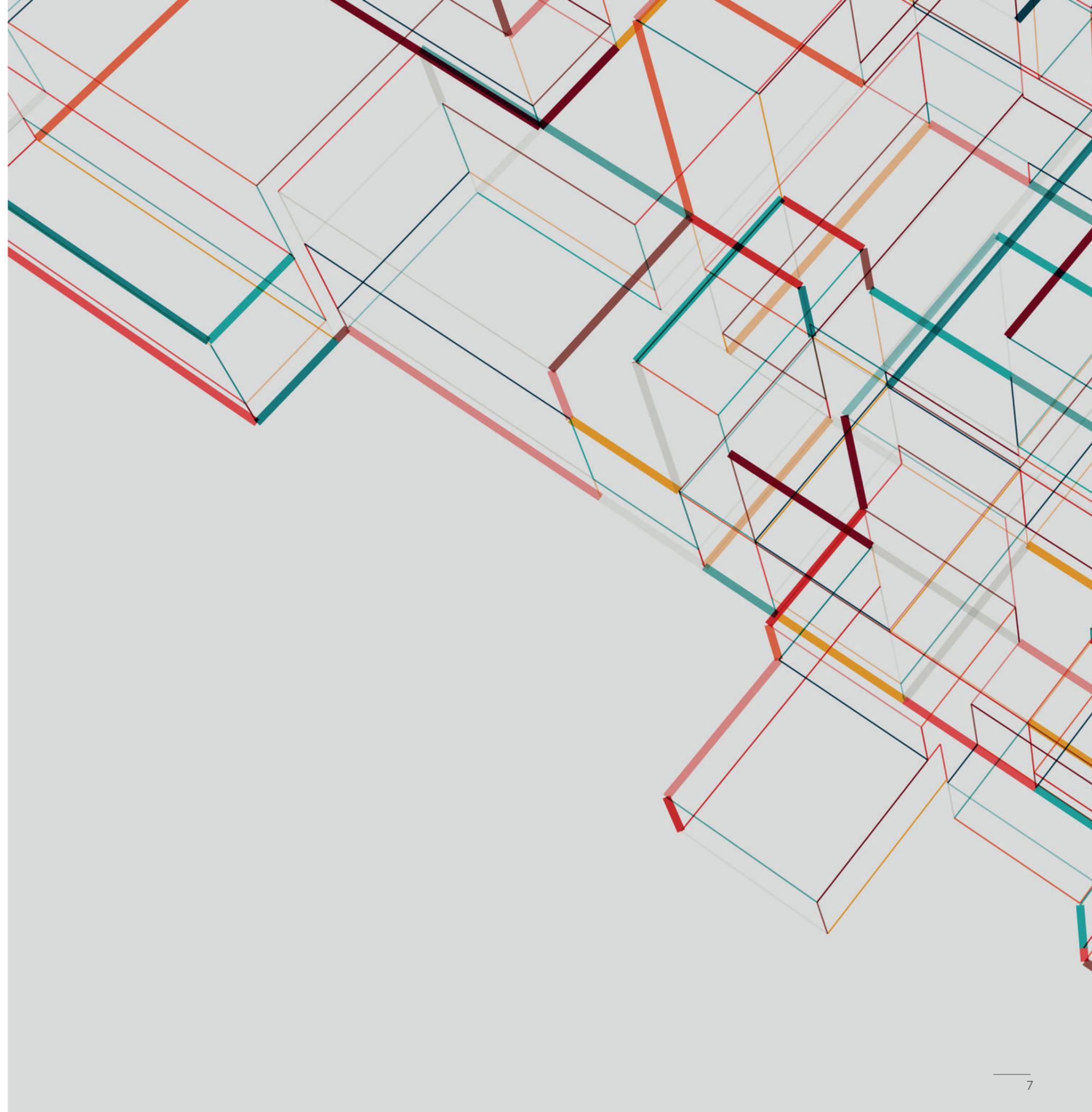| Editors	
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1. Introduction

Unique product identification is an important and prioritized area for the Construction industry. The purpose of a unique identification is to ensure that the flow of goods and information in the value chain becomes easier, faster, and more secure, right from the design of the building until it is handed over to the proprietor.

Statsbygg has demanded that all products included in a building / delivery must be identified with GTIN (Global Trade Item Number). GTIN is a global unique identification key that uniquely identifies a product / merchandise. GTIN is typically included in the barcode that is scanned at the checkout point in the stores but is also used in other parts of the value chain.

The purpose for the construction industry is to be able to use GTIN for lookup against internal / external databases to retrieve and ensure uniform documentation of the individual products included in the building. GTIN has been chosen as the identifier because it is a global standard that ensures a unique identification of all products regardless of origin, and that can be used by all parties in the value chain across functions and systems.

The guideline will focus on how GTIN can be generated for some selected product groups, and when in the processes this can be done. The use of GTIN and when this will be issued will vary with different product groups.

Furthermore, it will describe how GTIN can be used in documentation about the products until the handover of the building.

The parties behind the Guideline are Statsbygg, Bane NOR, Construction City, Helse Sør-Øst RHF, Sykehusbygg HF and GS1 Norway.

The project has involved several parties (subject / reference group) who contribute with input and quality assurance of the Guideline.

This version of the Guideline describes four main categories of products:

Four main categories of products:

1. Standard off the shelf products
2. Ready-mix concrete
3. Precast concrete elements
4. Doors and windows

Unique product identification is an important and prioritized area for the Construction industry

The product groups have been chosen because they represent different situations and challenges when it comes to using GTIN. The principles for the selected product groups can be transferred to other product groups.

It is the parties' intention that the Guideline will eventually include more product groups if it is considered necessary.

2. Summary

The authorities and the industry are requiring ever greater demands on documentation of products that are part of Construction projects. The information must be detailed and correct, and be available throughout the building's life cycle, from design to decommissioning.

This presupposes that the products have a unique common identification that is understood by everyone and works across functions and systems over time.

GTIN meets these requirements and is therefore chosen as the identifier.

Many products already have GTIN, but some product categories are particularly challenging. This applies to products that are produced based on specifications for the individual project, often referred to as one-of-a-kind products. The Guideline has chosen to describe ready-mix concrete, precast concrete elements, doors, and windows as representatives of these.

In addition, the project has chosen to describe the identification of products mentioned as standard off the shelf products.

GTIN will help make it easier to collect and retrieve MRO documentation and other information about products that are part of a construction project.

In addition, GTIN can be used in the supply chain for orders, delivery, and settlement, and to be able to track the product from production to assembly, decommissioning and recycling. Here we would especially encourage the use of EDI for the exchange of information where possible. The industry has its own EDI format NeB Supply which facilitates the use of GTIN.

The use of GTIN will also be able to form the basis for data collection for analysis and reporting at product level.

The parties call for GTIN to be used as an important building block in further digitalisation of the construction industry

The Guideline has chosen to describe off the shelf products, ready-mix concrete, precast concrete elements, doors and windows

3. Target group and purpose of the Guideline

The target group for the Guideline is the construction industry in general, but with the focus on the manufacturers of construction products.

The guideline will be an aid for everyone who produces, maintains, and exchanges product documentation, where requirements are set for the use of GTIN. GTIN shall be an aid to identify the products in such a way that GTIN can later be used as an identifier to retrieve documentation about properties of the products in internal or external registers.

The guideline is based on the demands and requirements that Statsbygg and other contracting parties make for the identification of products that are part of a Construction project. By complying with the recommendations / guidelines described in the Guideline, this will contribute to MRO information being utilised by the proprietor/ owner in a better way than today.

4. Content of Guideline

The primary purpose of the document is to guide the manufacturer in how to use a GTIN to identify a product, in such a way that this can later be linked to MRO information and BIM models at the proprietor/ owner.

The guideline will not describe how to physically label the various products included in the guideline, but a brief overview of this is given in Appendix D. We recommend contacting GS1 Norway if you want more information or assistance regarding labelling.

The guideline does not specifically describe the content of the MRO information.

> **The Guideline will show:**
>
> - How to obtain a subscription for the right to assign a GTIN and how to do this
> - When in the construction project a GTIN can be assigned for the mentioned product groups
> - How GTIN can be used in documentation in the various steps in the process leading up to the handover of the building

5. Use of GTIN, and linking to BIM model

GTIN is a globally unique number that identifies a product across the value chain.

This means that the same number can be used by all actors in all phases of the building's life cycle, from planning and engineering until the finished building, in the use phase, and finally in the decommissioning of the building.

GTIN is an important building block on the way to more digitalisation of the construction industry.

Digitalt Veikart 2.0 prepared by the Byggenæringens Landsforening (BNL) emphasises the importance of having a digital platform of components such as:

> **Some key uses:**
>
> - Lookup and obtain documentation of properties of the product, from internal or external databases.
> - Can be used in the supply chain to provide a unique identification of products that are ordered, delivered, and invoiced.
> - Can be used to track the product from production to assembly, reuse, and recycling.
> - Can be included in BIM models and thus ensure connection to the finished building.
> - The use of GTIN could form the basis for the collection of data for analysis and reporting within purchasing, service, complaints, etc. at product level.

> **In all these components, GTIN could play an important role**
>
> - Library with generic BIM objects at component and building component level.
> - National catalogue for product properties (Product Data Templates - PDT)
> - Common system for identification and labelling.
> - Common arrangements for the exchange of information from product databases
> - Access to «as built» information.

In all these components, GTIN will be able to play an important role in linking information about what has been delivered by products into a project, to documentation about the product.

Some key recommendations in Digitalt Veikart 2.0 are described in Appendix G.

The full report can be downloaded here: digitaltveikart_2020.pdf (bnl.no)
(In Norwegian)

Links between BIM object and GTIN

By connecting objects in BIM models with GTIN, it is possible to use the model as a tool to find documentation and get an overview of where in the building different product types are located. This will streamline planning of repairs, maintenance, and other work.

There are several ways to connect BIM objects to product information.

1. GTIN as a property of BIM objects. This ensures that each individual object instance in the model has a direct reference to the product type it represents in the physical building. The challenge with this method is that GTIN must be maintained in the model in addition to the product register.

OBJECT IN MODEL ⟷ **PRODUCT REGISTER**

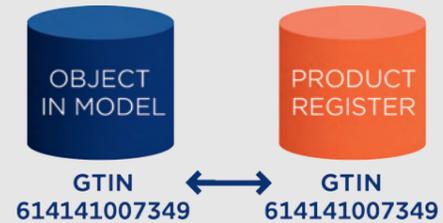**GTIN** 614141007349 ⟷ **GTIN** 614141007349

Fig. 5.1 Identification with GTIN

2. A generic code system that is added as a property to the BIM object, can among other things be used to connect to documentation in a product register including GTIN and product documentation. In Norway, the TFM-system (Interdisciplinary Marking System), whether it is Statsbygg's PA 0802, Standard Norway NS 3457-7, -8 and -9 or other dialects, is common in many projects. TFM coding of BIM objects is also used to track product documentation. This can be an advantage if the project still requires the use of TFM and manages to achieve good quality coding. The challenge is that it requires high quality TFM coding.

OBJECT IN MODEL ⟷ **PRODUCT REGISTER**

TFM ++B106=360.014.04-SQZ0023%SQZ.008.03 ⟷ **TFM** ++B106=360.014.04-SQZ0023%SQZ.008.03
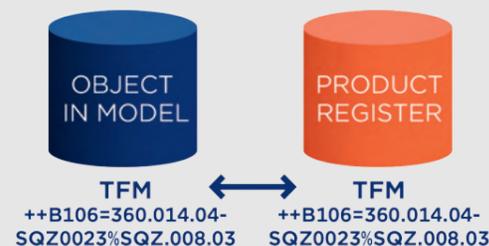
Fig. 5.2 Identification with TFM

3. The object instance's unique model identifier, Global Unique Identification (GUID). GUID is something the software itself establishes and the code, if generated correctly, should be unique. The challenge is that there is modelling software that changes the GUID even if the object has not been replaced. When editing a model in operation, make sure that the GUID is preserved. Otherwise, this link can be broken between objects and documentation.

OBJECT IN MODEL ⟷ **PRODUCT REGISTER**

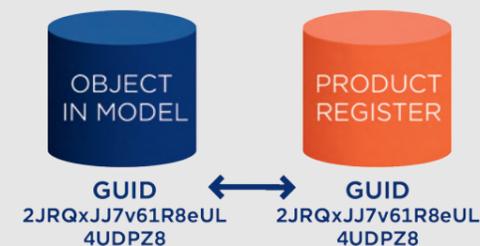**GUID** 2JRQxJJ7v61R8eUL 4UDPZ8 ⟷ **GUID** 2JRQxJJ7v61R8eUL 4UDPZ8

Fig. 5.3 Identification with GUID

4. A product register or other archive solution that establishes a proprietary link between object in model and documentation. The product register automatically establishes a link when the object is linked to documentation. The challenge is that the link is proprietary and that you lock the solution to one system unless you can export the model with links on an open format or interface.
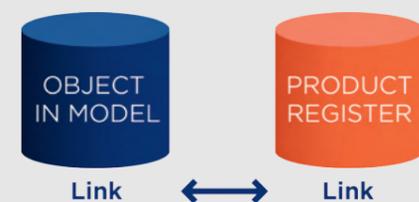

OBJECT IN MODEL ⟷ **PRODUCT REGISTER**

Link ⟷ **Link**

Fig. 5.4 Identification with link

Connecting GTIN to an object

When GTIN is delivered as part of product documentation, it remains to establish a link between GTIN and objects in the BIM model.

There are two superior different concepts for how to do this:

1. Connection between BIM object and GTIN is made when the product is installed on the construction site. This can be done by reading the product with a barcode scanner connected to a tablet where the BIM object is identified. The solution requires technology with a barcode scanner and model on a tablet on the construction site. It also requires disciplined method. The advantage is that the person who assembles knows which product is assembled and where the connections are made correctly. The method can be part of the executive quality assurance process.

2. Connection between BIM object and GTIN is made afterwards based on products registered in the project. The method has the advantage that the job can be done by one or a group of people who can work systematically in an office environment with large screens. It can be a challenge to know which products have been used were, especially on large projects. It often requires input and checking by the performer and will still be a source of error.
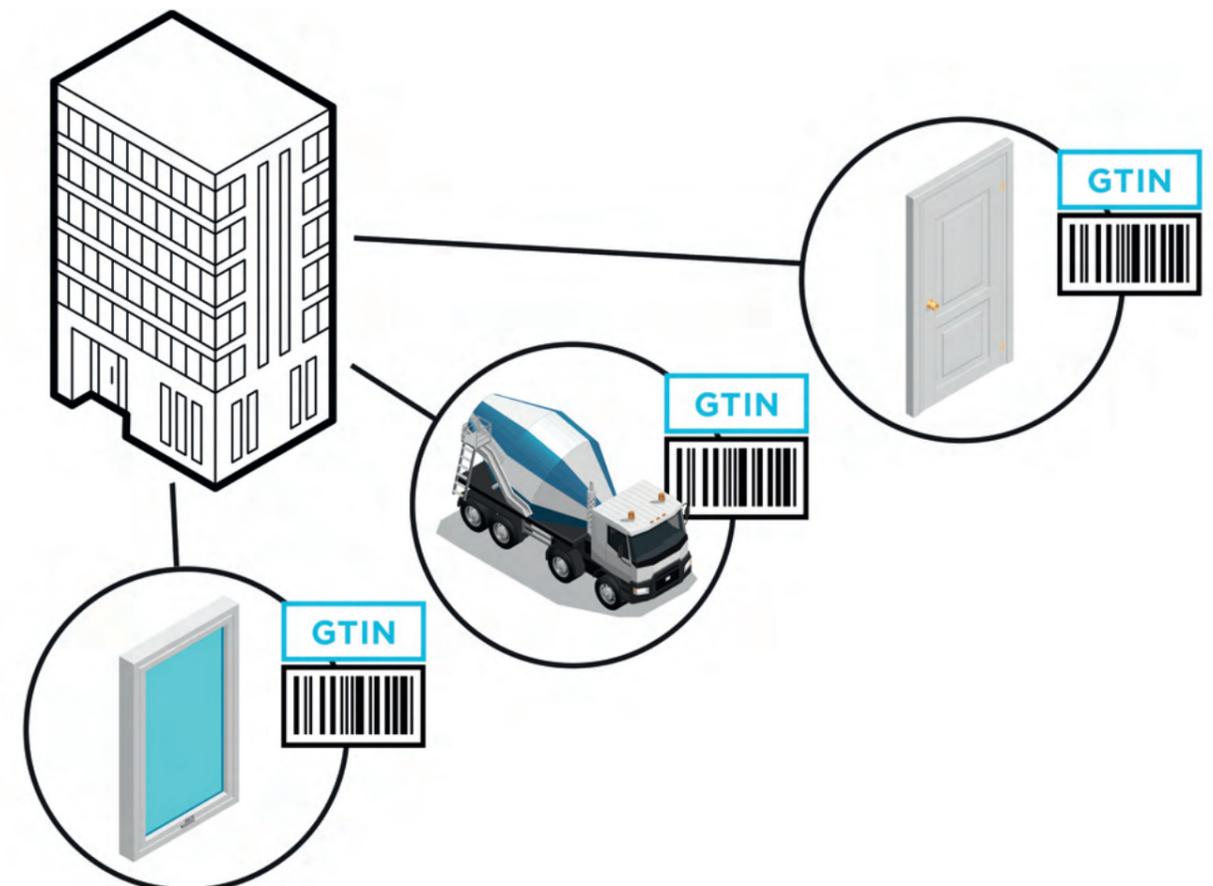
6. How the manufacturer obtains and assigns a GTIN

6.1 About GS1 and the GS1-system

GS1 Norway is a user-driven, not-for-profit organisation, and a member of a global organisation, GS1 - which develops, maintains, and offers open global standards for efficient flow of goods and information. GS1 is represented in 115 countries and over 2 million companies use GS1's standards.

GS1 Norway currently has more than 6.600 members and are expanding into more and more industries.

For the actors in a value chain to be able to communicate with each other in an effective way, it is required that they use the same «language». The GS1 system is such a common language, which can be understood across industries, product categories and national borders.

The GS1 system consists of many standards that work both individually and together.

6.2 Obtain a GS1 Company Prefix

To assign a GTIN, it is required that the manufacturer has a subscription to the GS1 Company Prefix. A GS1 Company Prefix is a number that provides a unique global identification of the manufacturer / brand owner, and which is used when the manufacturer is to assign GTIN to its products.

To obtain a subscription to a GS1 Company Prefix in Norway, click this link:

https://www.gs1.no/kom-i-gang/gtin-mer-enn-bare-et-nummer
(In Norwegian)

6.3 Assign a GTIN.

Once you have acquired a GS1 Company Prefix, you can assign GTIN to your products.

A GTIN consists of:

- GS1 Company Prefix
- Item Reference
- Check Digit

GS1 Company Prefix:

In Norway a GS1 Company Prefix consists of 6, 7 or 9 digits.

How many digits your GS1 Company Prefix consists of, depends on how many GTINs you report you need to create when applying for a subscription.

Which GS1 Company Prefix you have been assigned appears from the certificate you receive when registering.

Item Reference:

Consists of 6, 5 or 3 digits, respectively, depending on the number of digits in GS1 Company Prefix. The total number of digits in GS1 Company Prefix and Item Reference will always be 12.

It is strongly recommended to assign a continuous serial number to the products and not to build logic into this. I.e., that the first product is assigned Item Reference 000000, 00000 or 000, depending on the number of digits in the Item Reference.

The next product gets Item Reference 000001, 00001 or 001, and so on.

Check Digit:

The last digit in GTIN is always a Check Digit, calculated from the previous 12 digits. To calculate the Check Digit, click this link: gs1.no/kontrollsifferberegning
(In Norwegian)

Remember that you must keep control of the GTINs you assign, so that you do not assign the same GTIN to two different products.

The most used GTIN consists of 13 digits and is therefore called GTIN-13. In the example below, the structure of GTIN-13 is illustrated together with a 6-digit GS1 Company Prefix.

Fig. 6.1 Example of structure of GTIN-13 with 6-digit GS1 Company Prefix

6.4 GTIN Management Rules

GS1 has established a global regulatory framework that describes how the manufacturer should manage its GTIN. This depends on whether you can keep the existing GTIN on the product or must remove a new GTIN if you make changes to the product.

The main rule is that if you make a change to a product, it must be assigned a new GTIN.

Then it will often be a matter of discretion as to what is a change.

The starting point for assessing whether a change to a product entails a new GTIN or can retain the existing one:

- Is it expected that an end customer and / or trading partner will be able to distinguish the changed or new product from previous / current products?
- Are there legal requirements that require the product to be changed?
- Does it have a significant impact on the supply chain, e.g., how the product is sent, stored, or received?

If yes to at least one of these principles, the existing GTIN cannot be used and a new GTIN must be assigned to the product.

It is also not permitted to reuse a GTIN that has previously been used on a product, even if the product is no longer available or has been discontinued.

More about this is described here:
GS1_GTIN_Management_Standard.pdf
(English)

Note that the GTIN Management Rules are being revised in relation to the construction industry. Changes to the above may therefore occur. The revision will especially consider the use phase, in connection with maintenance, subsequent use, re-use, or decommissioning, and whether this will lead to changes in requirements for whether a new GTIN is to be removed or whether the existing GTIN can be used when changing specifications of a product.

"We participate in the project because we believe that it is important to put in place the requirement for GTIN. In this way, we ensure that there is good control over the entire document flow in projects and property management."

Sigmund Stikbakke
Project Manager Property Management
Helse Sør-Øst

[1] A GTIN can consist of 8, 12, 13 or 14 digits. More info can be found here:: GTIN (Global Trade Item Number)

7. Use of GTIN in construction projects

7.1 Use of GTIN in the individual processes

How GTIN is recommended for use in construction projects depends on which category the product is classified:

Standard off-the-shelf products

Some products are produced in large series, with identical properties, dimensions, and weights, and which do not change over time. These can be produced for stock and are traditionally sold through regular retailers. They are often also catalogued internally, and / or in other databases such as NOBB, NOBB - VAVVS or the EFO Database. For these products, a GTIN can be assigned before the item is produced, and used in the planning / engineering phase, can be used for ordering, and can later be used for lookup in internal or external databases for retrieving documentation on the products.

Special products

Other products are produced for one individual project, based on measurements or other defined specifications / performance descriptions, and are available in a limited number. For these products, it will often not be possible to assign a unique GTIN until later in the value chain, when all data about the product is known. These products place greater demands on documentation about the product to be registered and taken care of by the individual player during the process, as there will not always be publicly available databases for information look up over time.

The Guideline documents the use of GTIN for both above categories.

We have chosen to use the Norsk Stegnorm as a basis for describing the processes. This is a well-known approach in the industry to describe processes, roles, and information needs.

The guideline covers the steps in the process where identification of products using GTIN can start, until the building is handed over to the owner, together with documentation.
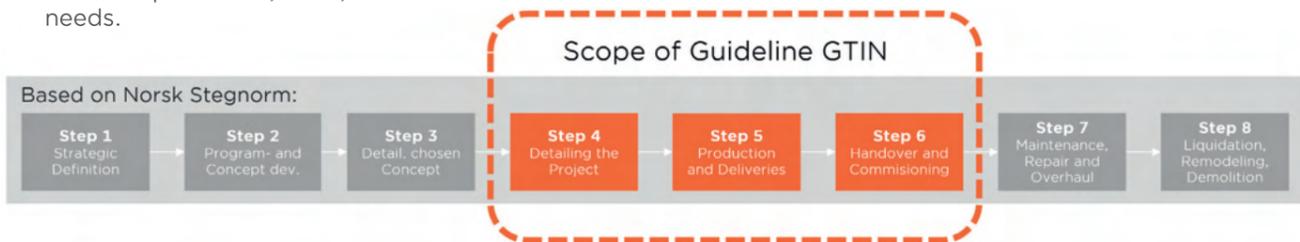

Fig. 7.1 Scope of Guideline in relation to Norsk Stegnorm

Step 4 Detailing the Project

The detailed design shall provide a basis for production based on suppliers' detailed system and product information. The material can be found as BIM, or as a description and drawings with the contractors' calculations. Depending on the contract, the foundation can also be made in close collaboration with the subcontractors and suppliers.

Step 5 Production and Deliveries

This step includes ordering, production and deliveries based on the documentation in step 4.

It is ensured that information about the product is captured so that MRO information can be prepared. Documentation must be available "as-built".

BIM is updated with changes and information from suppliers.

Step 6 Handover and Commissioning

The project is handed over, and it is ensured that all systems are set up correctly for the intended use. The MRO documentation is compiled, and it is ensured that there is an interaction between the operating system and the management system.

The delivery is a complete "as built" model, as well as MRO information including an MRO plan.

Generic information and process model

The illustration below describes a generic information and process flow.

The model is independent of product group, and generally describes what information is included in the various steps in the model.

Solid black arrows are how this is done today.

Dotted black lines are how the information exchange can be done when the PDT work is completed, and PDS is used for the exchange of information. As PDTs have so far not been defined, this is not discussed in more detail in the Guideline beyond a description of what PDT / PDS is and how it can be used, see Appendix E.
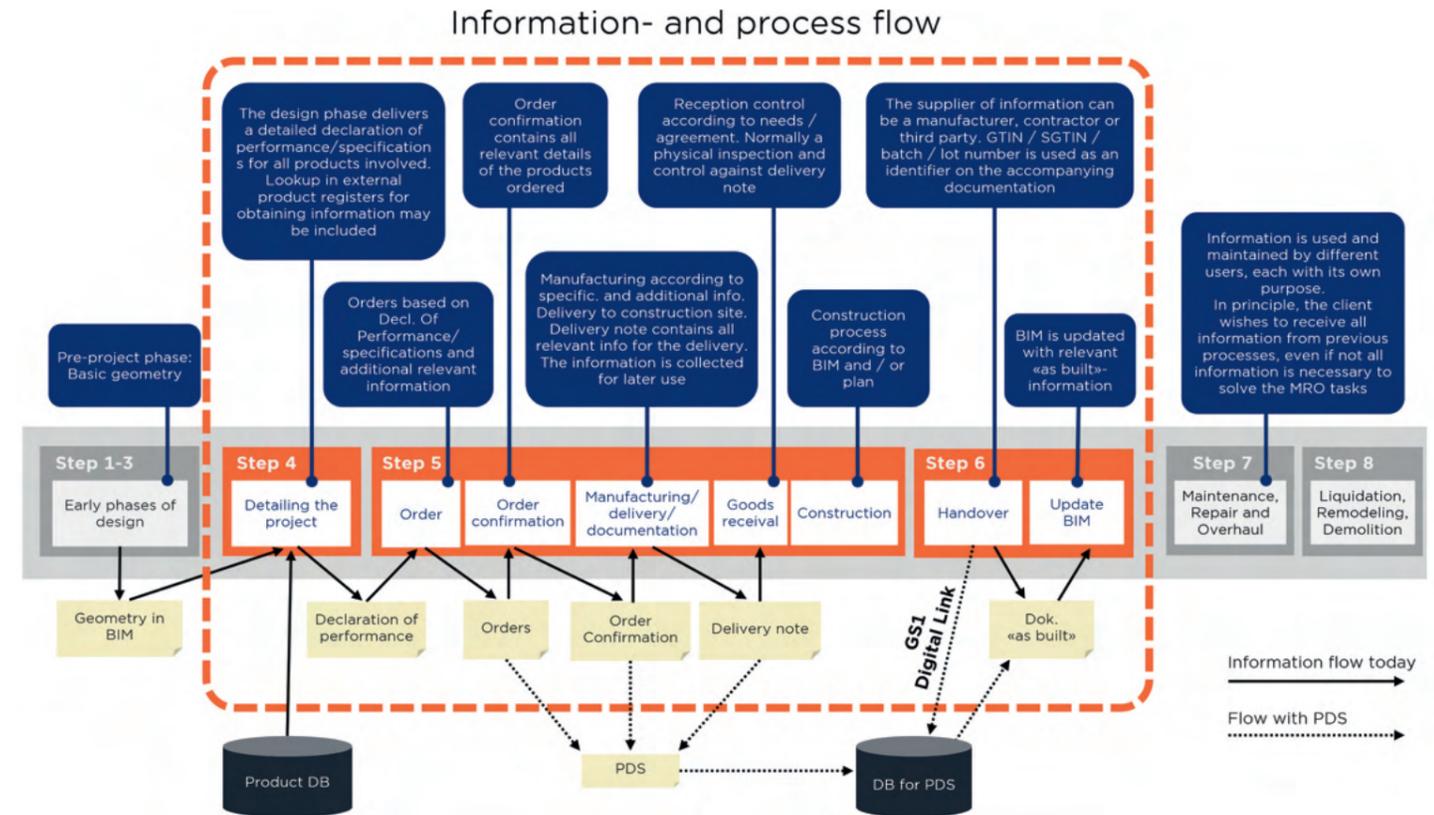
Fig. 7.1 Fig 7.2 Model for generic information and process flow

For better viewing, a larger version of the model can be seen in Appendix F.

> "It is important to put in place such a Guideline, also from a sustainability perspective. The documentation to which the GTIN standard contributes must be used throughout the building's life cycle. The GTIN standard will be able to make the daily operation of a building as resource efficient as possible and ensure an environmentally safe demolition of the building. If we know all the components of a building, we can reuse material from old buildings and ensure a safe treatment of the waste,

Benedicte Økland
CEO
Construction City

7.2 How GTIN could be used on standard off the shelf products

This chapter describes standard off the shelf products. These are usually products that are produced in (large) series, with identical properties, dimensions, and weight, and that do not change over time. These can be produced for stock, and can be sold through regular retailers, or other distribution channels.

For these products, a GTIN can be assigned when all the properties of the product have been decided.

They are often also catalogued at the manufacturer, retailer and / or in other databases such as NOBB, NOBB-VAVVS or the EFO Database.

GTIN can be used in the planning / engineering phase, can be used for ordering, and can later be used for lookup in internal or external document archives for retrieving documentation on the products.

7.2.1 Step 4: Detailing the Project

Standard off the shelf products have known properties that can be obtained via commercial product catalogues or via a retailer, manufacturer, etc. It is therefore possible to include specific products in detailed design at an early stage.

Use of GTIN with attributes:

If GTIN is present on the product, GTIN can be used to lookup / obtain information about the product and its properties.

If GTIN does not exist, and it is relevant to use this product in the project, the customer can request that the manufacturer assign a GTIN to it. GTIN can then be used actively in the detailed design, and in all further interaction between the parties, and further in the value chain.

7.2.2. Step 5: Production and deliveries

Procurement:
When ordering standard off the shelf products, GTIN can be used to identify the product. This provides a guarantee that you get what you order, as all properties of the product are known.

In the order confirmation, there is no need to exchange further information about the product, as all the properties of it are already known.

It is encouraged to use EDI when ordering and confirmation of the order. Use of GTIN is facilitated in the industry's own EDI format NeB Supply.

Use of GTIN with attributes:

The product is identified with GTIN in order and order confirmation.

Production:

A standard off the shelf product is produced for storage. All products with the same properties / specifications are identified with the same GTIN.

It is encouraged to assign and label products with a batch / lot number. This is an attribute of GTIN. The number will be common to a production lot of the same product and can be useful for example in connection with an error in production, when using batch / lot number you will be able to retrace all products that belong to the same production lot and can check if any defects also affect them. See Appendix C1 for more information on batch / lot numbers.

Use of GTIN with attributes:

All identical products with the same features and specifications shall be assigned the same GTIN.

The batch / lot number can be extracted as an attribute of the GTIN and labelled on the product for later tracking.

Delivery:

The delivery is documented in a delivery note. For identification purposes, it is not necessary to describe the product itself beyond GTIN and any name of the product. It may nevertheless be desirable for the product to be described with some more information to simplify reception control.

If the product has been assigned a batch / lot number, this must be included in the delivery note.

It is encouraged to use the EDI Despatch Advice when sending the delivery note. It is adapted for the use of GTIN and batch / lot numbers in the industry's own EDI format NeB Supply.

Alternatively, the delivery note can, for example, be made as a pdf and sent electronically as an attachment to e-mail as confirmation of delivery. Information about what has been delivered must be registered in a document archive and included as part of documentation on the product that is included in the relevant delivery / project.

Use of GTIN with attributes:

GTIN, together with batch / lot number, if applicable is included in the delivery note.

7.2.3 Step 6: Handover and Commissioning

Upon delivery of the building, documentation «as built» must be made available to the proprietor / owner.

All information about the products that have been delivered and that is necessary for future use and maintenance must be found in a document archive.

The Guideline does not decide in which way this information is to be exchanged, but 3 different concepts are described in Appendix B.

Use of GTIN with attributes:

GTIN, together with batch / lot number, if applicable is the key for lookup in the document archive for retrieving properties / specifications about the individual product.

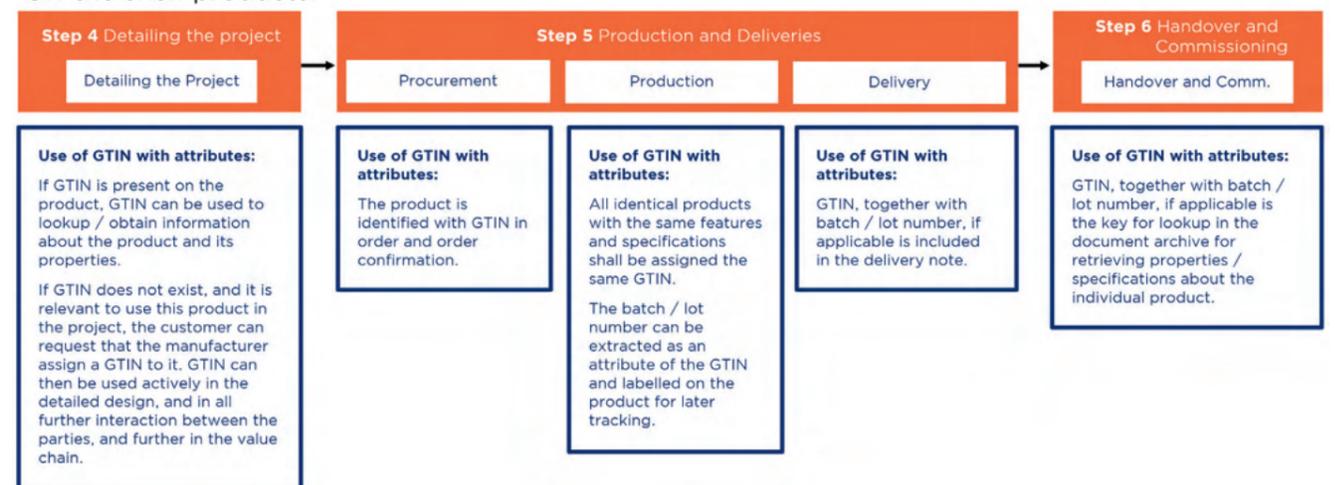### 7.2.4 Summary

Off the shelf products:

Fig. 7.3 Summary of off the shelf products

7.3 How GTIN can be used on ready-mix concrete

Ready-mix concrete (RMC) is concrete delivered in fresh (non-hardened) state to the construction site for in-situ casting.

7.3.1 Step 4: Detailing the Project

Concrete in a building/construction project normally will be described by a set of requirements related to the structural and durability performance during operation / service life. Detailed requirements related to a wide variety of special applications or functions may be included, e.g. cement type, heat generation, surface texture, x-Ray protection etc.

The most frequent design requirements include strength class and exposure class (durability). The exposure class performance implies minimum requirements (national competence) for the concrete mix design (independently of strength class), e.g. a maximum water/binder-ratio and possibly differentiated by cement type, for the design exposure environment. The strength class defines a statistically determined characteristic strength level.

The contractors may ad requirements relating to the execution of the concrete works, for the fresh or hardening state, e.g. depending on the selected casting process or season production conditions. The contractor may typically explore for tailor made properties, based on the concrete supplier's product catalogue normally sorted by strength class, exposure class, possibly also "low carbon class", EPD availability or other main characteristics.

Use of GTIN with attributes:

During the (structural) design stage of ready-mix concrete, it is normally not possible to refer to or apply a specific GTIN. The list of requirements will later be enriched with execution phase properties. GTIN should be issued when a detailed and unambiguous description (declaration) can be provided.

7.3.2 Step 5: Production and Deliveries

Procurement:

Ready-mix concrete is usually ordered from the manufacturer's product number, for example from a catalogue.

Additional information must be provided or elaborated together with the concrete supplier, such as fibre addition, addition of plasticiser, retarding chemicals, maximum heat generation, etc.

In the order confirmation, the manufacturer's product number will appear (if any), together with the performance descriptions and enrichments that have appeared in the order and in any subsequent dialogue between the parties.

Use of GTIN with attributes:

For ready-mix concrete, it is normally not possible for the customer to refer to or use a GTIN when ordering. It is only in the order that the product is specified with enough details that the manufacturer can subsequently generate a unique GTIN for the ordered product.

In practice, this means that GTIN is not used in interaction between the parties until after the concrete has been produced.

Production:

Ready-mix concrete is produced according to performance descriptions / specifications as specified in the order and enrichments to this.

Detailed information must be recorded and taken care of for each production lot. The definition of a production lot is decided by the individual producer. For some, it may be everything that is produced on the same recipe for a given customer for a given project, while others choose further decomposition for, for example, each truck load.

A production lot can be identified by a batch / lot number. This is an attribute of GTIN. By entering a batch / lot number for each production lot, this provides opportunities for detailed documentation and subsequent tracking. See Appendix C1 for more information on batch / lot numbers.

Relevant information that must be documented for each production lot:

- Manufacturer and / or production facility (here GLN (Global Location Number) can be used for identification - see more info about GLN in appendix C.2)
- GTIN of the ready-mix concrete
- Batch / lot number as an attribute of GTIN
- Product register (ECHA Poison Center or similar) - references
- REACH references
- Law / regulatory requirements, others - references
- Requirements coming from engineering
- Requirements coming from construction company
- Manufacturers own declarations, others
- Other info links (guidelines etc.).

Use of GTIN with attributes:

Concrete with the same properties must be identified with the same GTIN.

Which properties this includes are decided by each individual manufacturer, but the Guideline recommends as a minimum that separate GTINs are to be assigned for combinations of:

- Strength class
- Exposure class
- Nominal upper aggregate size
- EPD properties values or low carbon class, if relevant
- Consistence class(es)

Variations due to admixtures / minor changes in the recipe, for example to consider casting or seasonal conditions, are captured by assigning different batch / lot numbers to the production.

These may include:

- Fibres
- Plasticiser
- Retarding chemicals
- Heat generation

GTIN, in combination with batch / lot number, if applicable, will give an unambiguous description of the product.

Delivery:

The delivery is documented in a delivery note. It describes the same info that is in the order confirmation as well as some formalities.

It must also contain the parameters / enrichments that the customer has subsequently initiated.

The ready-mix concrete must be identified with GTIN and batch / lot number, if applicable, for the current delivery.

The delivery note can be made as a pdf and sent to the customer as an attachment to the E-mail as confirmation that the delivery is in transit or sent in another agreed format. In future, delivery notes may be digitally communicated.

A delivery note with all details must be kept in a document archive at the manufacturer and/or customer (se section below).

Use of GTIN with attributes:

The ready-mix concrete is identified with GTIN and batch / lot number, if applicable, and is updated in the document archive along with other relevant information.

7.3.3 Step 6: Handover and Commissioning

Upon delivery of the building, documentation «as built» must be made available to the proprietor / owner.

All information necessary for future use and management can be found in the document archive. This includes all GTINs, and batch / lot numbers used.

Use of GTIN with attributes:

GTIN and batch / lot number, if applicable, will be key for lookup in the document archive for retrieving properties / specifications of the individual product.

7.3.4 Summary

Ready-mix concrete:

Step 4 Detailing the project	**Step 5** Production and Deliveries			**Step 6** Handover and Commissioning
Detailing the Project	Procurement	Production	Delivery	Handover and Comm.

Use of GTIN with attributes:

During the (structural;) design stage of ready-mix concrete, it is normally not possible to refer to or apply a specific GTIN. The list of requirements will later be enriched with execution phase properties. GTIN should be issued when a detailed and unambiguous description (declaration) can be provided.

Use of GTIN with attributes:

For ready-mix concrete, it is normally not possible for the customer to refer to or use a GTIN when ordering. It is only in the order that the product is specified with enough details that the manufacturer can subsequently generate a unique GTIN for the ordered product.

In practice, this means that GTIN is not used in interaction between the parties until after the concrete has been produced.

Use of GTIN with attributes:

Concrete with the same properties must be identified with the same GTIN.

Which properties this includes are decided by each individual manufacturer, but the Guideline recommends as a minimum that separate GTINs are to be assigned for combinations of:

• Strength class
• Exposure class
• Nominal upper aggregate size
• EPD properties values or low carbon class, if relevant
• Consistence class(es)

Variations due to admixtures / minor changes in the recipe, for example to consider casting or seasonal conditions, are captured by assigning different batch / lot numbers to the production.

These may include:
• Fibres
• Plasticiser
• Retarding chemicals
• Heat generation

GTIN, in combination with batch / lot number, if applicable, will give an unambiguous description of the product.

Use of GTIN with attributes:

The ready-mix concrete is identified with GTIN and batch / lot number, if applicable, and is updated in the document archive along with other relevant information.

Use of GTIN with attributes:

GTIN and batch / lot number, if applicable, will be key for lookup in the document archive for retrieving properties / specifications of the individual product.
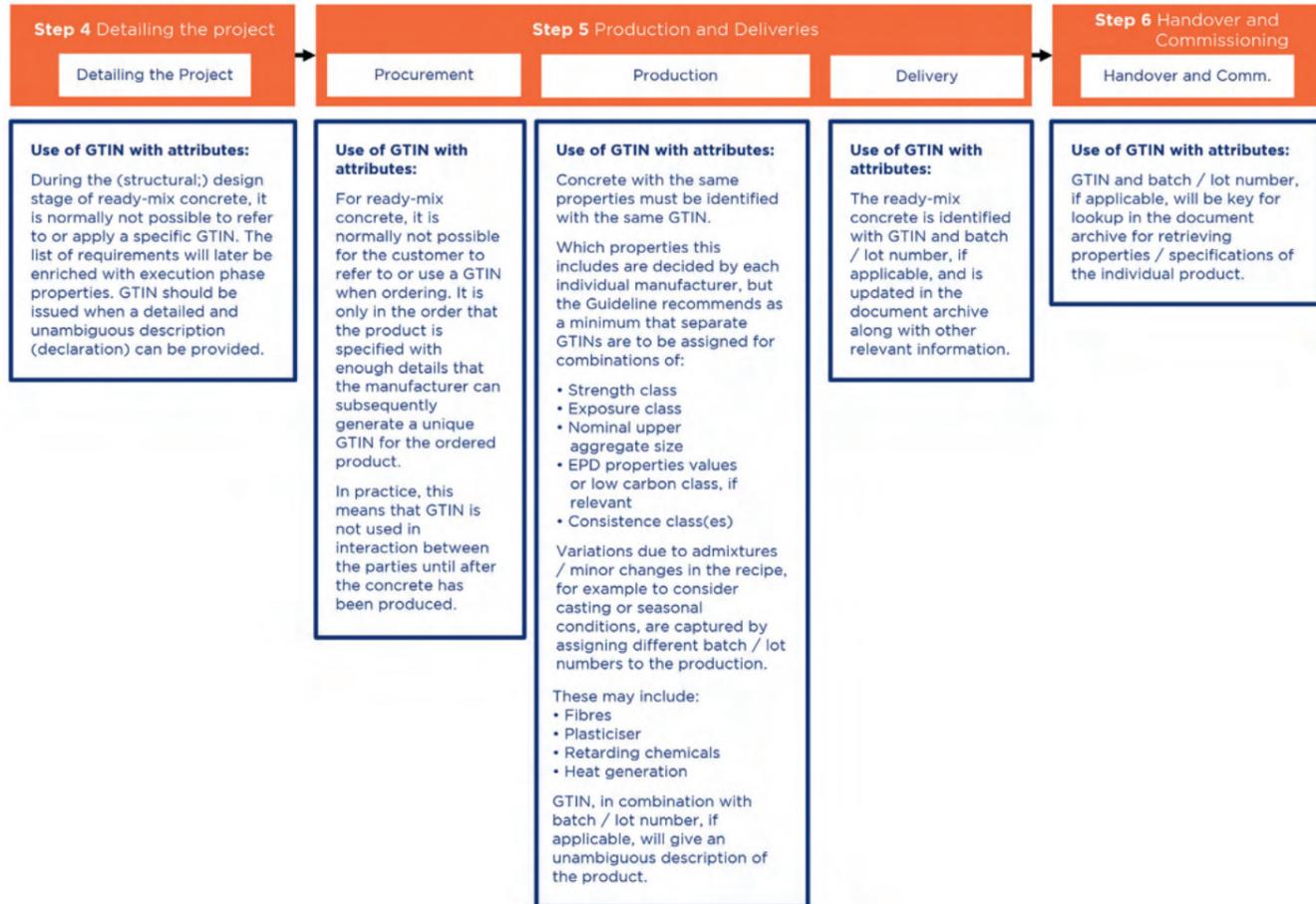
Fig. 7.4 Summary ready-mix concrete

> "The Guideline is important as all the actors who will either deliver, receive or use products for and in a construction must use the GTIN standard. With GTIN we can ensure correct information about the products that are part of a construction. It will be able to give us full control over the construction's content and ensure traceability of the products."

Steen Sunesen
Chief Architect
Statsbygg

7.4 How GTIN can be used on precast concrete elements.

The term precast concrete elements mean products that have been cast by the manufacturer, with defined properties, based on a specific specification for the individual project.

There are other concrete products with defined properties, and which are not project specific. These are mass-produced for stock and can be sold in various sales channels. Examples of this type of product can be pipe and pipe parts, troughs, slabs, curbs, guardrails etc. These products are defined in the Guideline as off-the-shelf products and are described in chapter 7.2.

For precast concrete elements, it is recommended to assign a GTIN when the final specifications have been agreed with the customer / client, and an agreement has been entered. In this way, you avoid assigning GTINs on products that will never be delivered, at the same time as you can use GTIN in the ordering phase.

Although there may be a significant number of different GTINs over time, this is an easy and convenient way to differentiate between different products. Each specification of a product will have its unique GTIN, where you can use the assigned GTIN to lookup in a register afterwards to retrieve the exact specifications that apply to the product.

Although a product is made with a unique specification, there may be several individuals (instances) of it. If there is a requirement for each instance to be able to be separated from each other, each instance can be assigned a serial number as an attribute of GTIN. Serial number is determined by the manufacturer.

For the serial number to be used for practical purposes, the serial number must be physically labelled on the product. More about serial number in appendix C.1, and labelling in appendix D.

It is recommended to attach a batch / lot number to each production batch if the product is produced in several instances in several productions. The number is an attribute of GTIN that allows you to track a production batch throughout the value chain and can be useful if problems or complaints should occur on a product, for example to be able to identify other instances of the product with similar errors. See more information on batch / lot numbers in Appendix C.1.
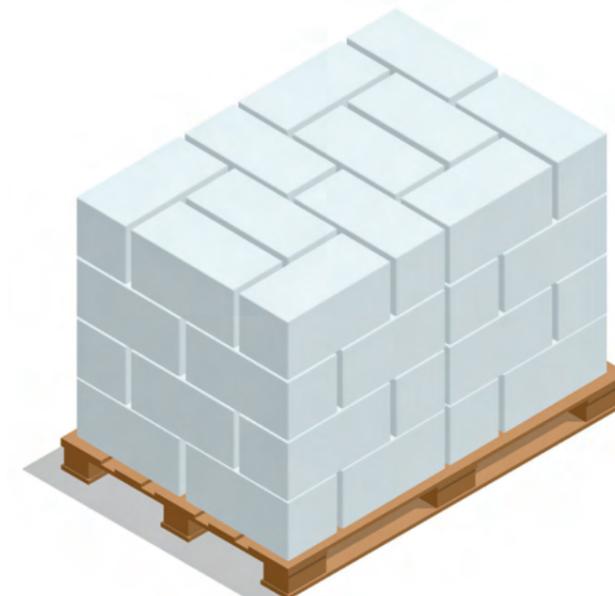
If the manufacturer currently uses internal numbers of the products in dialogue with the customer, this can be continued until an agreement has been settled. Once an agreement has been settled, the products are assigned a GTIN, the customer is informed, and the GTIN can then be used in ordering.

In further collaboration, and in subsequent paragraphs, GTIN is used on the product for identification.

7.4.1 Step 4: Detailing the Project

Requirements for concrete products that are to be included in a building will normally be described as performance requirements at an overall level but may also contain more detailed requirements.

The most frequent design requirements include strength class and exposure class (durability). The exposure class performance implies minimum requirements (national competence) for the concrete mix design (independently of strength class), e.g. a maximum water/binder-ratio and possibly differentiated by cement type, for the design exposure environment. The strength class defines a statistically determined characteristic strength level.

Contractors may ad requirements in addition to the requirements / performance descriptions set by the proprietor, in dialogue with the manufacturer.

The contractor may typically explore for tailor made properties, based on the concrete supplier's product catalogue normally sorted by strength class, exposure class, possibly also "low carbon class", EPD availability or other main characteristics.

The proprietor / customer will normally send out a tender request which the manufacturer will consider. This could lead to a clarification process that can go back and forth several times, and which ends with the manufacturer specifying the content of the request and making an offer.

In the tender / clarification process, a product is often identified with an internal unique identifier, assigned by the manufacturer. When an agreement has been settled, this is replaced with a GTIN, and the customer is informed.

Use of GTIN with attributes:

The product is assigned a GTIN, provided that all properties / specifications about the product have been finally decided, and that a delivery agreement exists.

7.4.2 Step 5: Production and Deliveries

Procurement:

Precast concrete elements are usually ordered based on the manufacturer's product number but can now be replaced by GTIN as all properties of the product are known, and no additional information about the product is required in the order.

In the order confirmation, GTIN will identify the product.

It is encouraged to use EDI when ordering and order confirmation. Use of GTIN is facilitated in the industry's own EDI format NeB Supply.

Use of GTIN with attributes:

GTIN is used as identification of the product in order and order confirmation.

Production:

The ordered product is produced.

If there is a requirement for individual numbering, a serial number is generated and connected to the GTIN. Labelling is done according to Annex D.

It is encouraged to use batch / lot numbers to distinguish between different productions of the product.

Detailed information about the production must be compiled in a document archive, and can e.g., contain:

- GTIN of the product
- Serial number as an attribute of GTIN
- Batch / lot number as an attribute of GTIN
- Product register (ECHA Poison Center or similar) - references
- REACH references
- Law / regulatory requirements, others - references
- Requirements coming from engineering
- Requirements coming from construction company
- Manufacturers own declarations, others
- Other info links (guidelines etc.).

Use of GTIN with attributes:

The product is identified with GTIN, and serial number if the product is serialised.

Batch / lot number is linked to GTIN / serial number.

Delivery:

The delivery is accompanied by a delivery note. It must contain sufficient information for goods receipt to be able to identify the product and verify that the correct product has been received. If the serial number and / or batch / lot number have been assigned on the product included in the delivery, this must be included in the documentation.

It is encouraged to use the EDI Despatch Advice when sending the delivery note if this is possible. It is adapted for the use of GTIN and batch / lot numbers in the industry's own EDI format NeB Supply.

Alternatively, the delivery note can, for example, be made as a pdf and sent as an attachment to e-mail as confirmation of delivery.

Information about what has been delivered must be registered in a document archive and included as part of documentation on the product that is included in the relevant delivery / project.

Use of GTIN with attributes:

GTIN must be specified as a product identifier and linked to the documentation.

The manufacturer must register the GTIN, and the serial number and batch / lot number if applicable, in the document archive for the delivery.

7.4.3 Step 6: Handover and Commissioning

Upon delivery of the building, documentation «as built» must be made available to the proprietor / owner.

All information about the products that have been delivered and that is necessary for future use and maintenance must be found in a document archive.

The Guideline does not decide on how this information is to be exchanged, but 3 different concepts are described in Appendix B.

Use of GTIN with attributes:

GTIN, together with serial number and batch / lot number, if applicable, will be the key for lookup in the document archive for retrieving properties / specifications of the individual product included in the delivery.

7.4.4 Summary

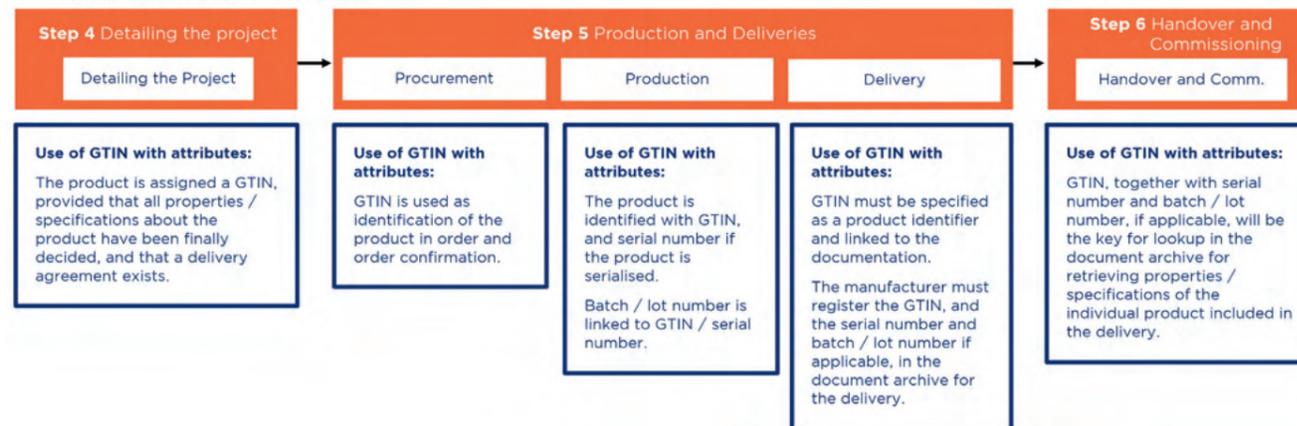**Precast concrete elements:**

Fig. 7.5 Summary of precast concrete elements

7.5 How GTIN can be used on doors / windows.

This chapter describes doors and windows. These are assumed to have similar handling in the value chain, in relation to what the Guideline is to describe.

Some production of doors / windows for storage may occur. These products can be assigned a GTIN when properties / specifications of the product are decided. The products can be catalogued both at the manufacturer and in other commercial databases. These products will then be included in what is referred to as off-the-shelf products and are described in chapter 7.2.

Most door / window products are based on specifications that apply to the individual building / project (one-of-a-kind). For these, it is recommended to assign a GTIN when the final specifications have been agreed with the customer / client. This is often when final order confirmation of an order is sent. Although this methodology can lead to a significant number of different GTINs over time, this is an easy and convenient way to distinguish different one-of-a-kind products. Each specification of a product will have its unique GTIN, where you can use the assigned GTIN to lookup in an archive / catalogue to retrieve the exact specifications that apply to the product.

Although a one-of-a-kind product is made based on a unique specification, there may be several individuals (instances) of it. If there is a requirement for each instance to be able to be separated from each other, each instance can be assigned a serial number. The number is an attribute that is in addition to the GTIN and is determined by the manufacturer.

For the serial number to be used for practical purposes, the serial number must be physically labelled on the product. See more information about serial numbers in Appendix C.1, and labelling in Appendix D.

It is encouraged to attach a batch / lot number to each production batch if the product is produced in several instances in several productions. The number is an additional attribute to GTIN which provides the opportunity to track a production batch throughout the value chain, and which can be useful if problems or complaints should arise on a product, for example to be able to identify other instances of the product with similar errors. See more information on batch / lot numbers in Appendix C.1.

Today's practice where the manufacturer assigns internal specific numbers of the projects and products offered, can easily be continued. In dialogue between producer and customer / client, the manufacturer's internal identification is initially used. When the order has been received and the order confirmation is to be sent, the manufacturer assigns a GTIN on the product, and links this to the internal number.

In further collaboration, and later in the supply chain, GTIN is used on the product for identification.

GTIN can also be used when re-ordering the same product, as the manufacturer has the link between GTIN and the internal number the manufacturer has used in his systems.
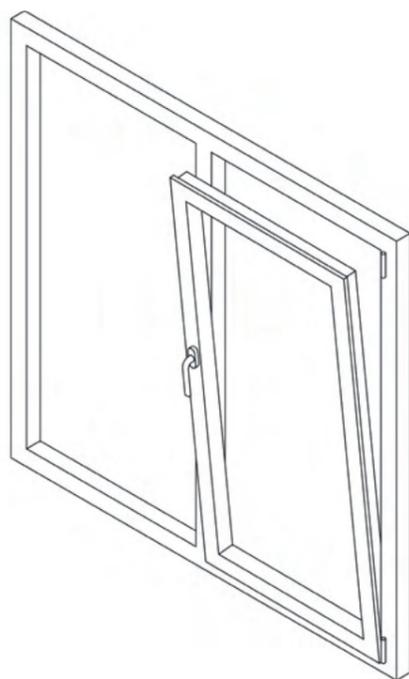
7.5.1 Step 4: Detailing the Project

When designing, the proprietor specifies services and properties that doors / windows must have. This can typically be:

- Functional requirements
- Material and qualities
- Door / window type, physical dimensions, fire, and sound requirements
- Number of each
- Form / drawings from architect / designer, with location (facade / plan)
- Standards / regulations to be complied with

In addition, there may be specific requirements / requests from the contractor / proprietor for the delivery as:

- Progress / delivery plan
- Packaging and labelling
- Fastening details / fasteners
- Requirements in connection with MRO documentation etc.

In some cases, there may be requirements for doors / windows to be individually labelled. This may, for example, apply to fire windows / doors, which are visibly signposted and sometimes must have a visible unique identification.

The proprietor/ customer will normally send out a tender request which the manufacturer will consider. This could lead to a clarification process that can go back and forth several times, and which ultimately ends with the manufacturer specifying the content of the delivery and making an offer, which the proprietor accepts or rejects.

In the tender / clarification process, products are often identified with internal unique identifiers, assigned by the manufacturer.

Use of GTIN with attributes:

GTIN is not normally in use at this stage.

If GTIN is to be used, all properties and specifications must be known by both the manufacturer and the customer / client.

7.5.2 Step 5: Production and Deliveries

Procurement:

An order / call-off is normally made by referring to the relevant product, usually identified by the manufacturer's internal number.

In some cases, there may be changes in the requirements specification of the product after the design has been completed. This is registered in the order, and specifications of the product are updated.

An order confirmation is issued. This includes a full specification of the individual products to be produced and delivered.

Use of GTIN with attributes:

If GTIN has not been assigned for the product, the manufacturer's internal identification is used in the order.

In the order confirmation, the manufacturer converts the internal identification of the product to a GTIN. This GTIN will now be used in all further interaction between the parties and will also be used in the further processes and in all documentation up to the handover of the building with associated documentation.

If there is a reorder of a product that has been assigned a GTIN, and there are no changes to the requirements specifications of the product, GTIN can be used in the order.

"We are part of the project as we want to be forward-looking in the work with the digitalisation of the construction industry. Open global standards such as GTIN are an important basis for this digitization. The result is an efficient flow of information in a construction process, and can provide efficient operation and maintenance."

Kristin Lysebo
Subject area manager BIM
Bane NOR

Production:

The ordered product is produced according to agreed specifications.

If there is a requirement for individual numbering, a serial number is generated and connected to GTIN. The product is labelled with a serial number.

If the product is produced over time, or different production technical solutions are used, or that for other reasons it is desirable to separate different productions of the product, a batch / lot number is used to separate these.

> **Use of GTIN with attributes:**
>
> All produced windows and doors must be identified with GTIN. This must be included in the documentation of the product.
>
> Serial number is generated and connected to GTIN if there is a requirement for individual numbering.
>
> If the batch / lot number is assigned, this is linked to GTIN, and also serial number if applicable.

Delivery:

The delivery is accompanied by a delivery note. It must contain sufficient information for goods receipt to be able to identify the product and verify that the correct product has been received. In practice, this is often information previously sent in the order confirmation. If the serial number and / or batch / lot number has been assigned on the product included in the delivery, this must be included in the documentation.

For some types of doors / windows, installation instructions will also be included.

Delivery note can be made as a pdf and sent electronically as an attachment to E-mail.

The delivery is normally notified by sending an E-mail / SMS to the contractor that the delivery is in transit.

Normally no special control measures upon receipt other than that it is checked for external damage and that the shipment matches the delivery note.

Information about what has been delivered must be registered in a document archive and included as part of documentation on the product that is included in the relevant delivery / project.

> **Use of GTIN with attributes:**
>
> GTIN must be product identifier and linked to the documentation.
>
> The manufacturer must register the GTIN, and the serial number and batch / lot number if applicable, in the document archive for the delivery.

7.5.3 Step 6: Handover and Commissioning

Upon delivery of the building, documentation "as built" must be made available to the proprietor/ owner.

All information about the products that have been delivered and that is necessary for future use and maintenance must be found in a document archive.

The Guideline does not decide in which way this information is to be exchanged, but 3 different concepts are described in Appendix B

> **Use of GTIN with attributes:**
>
> GTIN, together with serial number and batch / lot number, if applicable, will be the key for lookup in the document archive for retrieving properties / specifications of the individual product included in the delivery.
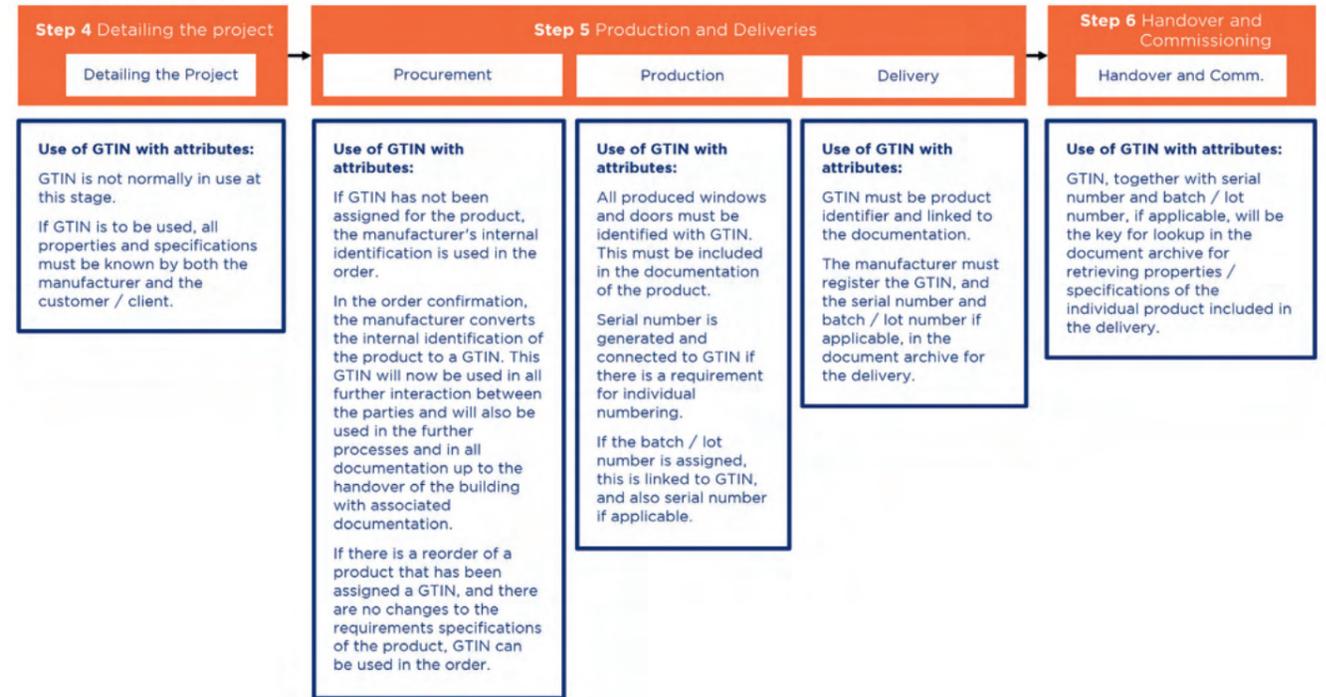
7.5.4 Summary

Doors/windows:

Fig. 7.6 Summary doors / windows

8. Guideline management

All the involved parties of this Guideline have a joint responsibility for the administration and correct use of the Guideline. This includes assessing proposals and input on changes and possible extensions of the Guideline, as well as questions about use. So far, the parties have agreed that GS1 Norway will be the executing party in this. This means that all inquiries are directed to GS1 Norway, which either answers them itself, or forwards the inquiry to the correct contracting party.

> **Contact information for question about the Guideline**
>
> 📞 + 47 22 97 13 20
>
> @ veilederGTIN@gs1.no

APPENDIX

A Statsbygg's «SIMBA» requirement - GTIN as a feature in IFC models

Statsbygg has in its «SIMBA» BIM requirements (https://sites.google.com/view/simba-bim-krav) adapted with specified "placeholders" for inserting GTIN as a feature in IFC 2x3 or IFC 4 models.

Statsbygg's requirement from SIMBA 1.3 is that GTIN must be included as part of the documentation on purchased construction parts / components where this is possible. One possible way to fulfil this is to add it as a property to the model itself.

GTIN in IFC 2x3 models

As of primo 2021, the vast majority of IFC models are still delivered in IFC 2x3 format (more specifically IFC2x3 TC1 or ISO / PAS 16739: 2005). Although a gradual transition to IFC4 is expected as the software is certified for IFC4 export, extensive use of IFC 2x3 models is still expected for several years to come.

In IFC 2x3, there are two properties that are defined as relevant for use with GTIN. The first is the **"ArticleNumber"** property under the **"Pset_ManufacturerTypeInformation"** property set. Here is the actual GTIN number, as defined by GS1.

PropertySet Definition:

PropertySet Name	Pset_ManufacturerTypeInformation
Applicable Entities	IfcElement
Applicable Type Value	
Definition	Definition from buildingSMART International: Defines characteristics of manufactured products that may be given by the manufacturer. Note that the term 'manufactured' may also be used to refer to products that are supplied and identified by the supplier or that are assembled off site by a third party provider. This property set replaces the entity IfcManufacturerInformation from previous IFC releases.

Property Definitions:

Name	Property Type	Data Type	Definition
ArticleNumber	IfcPropertySingleValue	IfcIdentifier	Article number or reference that may be applied to a product according to a standard scheme for article number definition (e.g. UN, EAN)
ModelReference	IfcPropertySingleValue	IfcLabel	The name of the manufactured item as used by the manufacturer.
ModelLabel	IfcPropertySingleValue	IfcLabel	The model number and/or unit designator assigned by the manufacturer of the manufactured item.
Manufacturer	IfcPropertySingleValue	IfcLabel	The organization that manufactured and/or assembled the item.
ProductionYear	IfcPropertySingleValue	IfcLabel	The year of production of the manufactured item.

Fig. A1 Excerpt from the IFC standard documentation for the property of GTIN in IFCx3

It is stated that this property set is applicable to all IfcElement entities, i.e., IfcElement and all entities at levels below this in the IFC hierarchy. In practice, this means all physical products (construction parts and components) in the building (e.g., gypsum boards, concrete floors, columns, beams, windows, doors, ventilation ducts, radiators, motors, dampers, pumps, valves, sensors, light fittings, sockets, switches, elevators, etc.) purchased as commodities that have a GTIN.

The other, is cases where you also want to set requirements for serial GTIN (SGTIN). IFC 2x3 has a property that is generally intended to be used for serial numbers, and this can then also be used for a serialised GTIN, i.e., the individual occurrence of one of the physical products in the building. The property is called **SerialNumber** and is in the property set **Pset_ManufacturerOccurrence.** In the cases where it is used, it is the entire SGTIN number that is to be entered here, i.e., both the GTIN number indicating the commodity and the serial part indicating the specific instance.

PropertySet Definition:

PropertySet Name	Pset_ManufacturerOccurrence
Applicable Entities	IfcElement
Applicable Type Value	
Definition	Definition from buildingSMART International: Defines properties of individual instances of manufactured products that may be given by the manufacturer.

Property Definitions:

Name	Property Type	Data Type	Definition
AcquisitionDate	IfcPropertyReferenceValue	IfcCalendarDate	The date that the manufactured item was purchased.
BarCode	IfcPropertySingleValue	IfcIdentifier	The identity of the bar code given to an occurrence of the product
SerialNumber	IfcPropertySingleValue	IfcIdentifier	The serial number assigned to an occurrence of a product
BatchReference	IfcPropertySingleValue	IfcIdentifier	The identity of the batch reference from which an occurrence of a product is taken.

Fig. A2 Excerpt from the IFC standard documentation for the serial number property in IFC2x3

GTIN in IFC 4-models

The correct order to enter GTIN in IFC 4 (more specifically IFC4 ADD2 TC1 or ISO 16739-1: 2018) is not very different from IFC 2x3, but the naming differs somewhat. IFC 4 also states "Global Trade Item Number" in clear text in the standard itself.

6.4.4.9 Pset_ManufacturerTypeInformation

PSET_TYPEDRIVENOVERRIDE / IfcElement

▼ **Natural language names**

EN Manufacturer Type Information

▼ **Properties**

buildingSMART Data Dictionary
PSD-XML

Name	Type	Description		
GlobalTradeItemNumber	P_SINGLEVALUE / IfcIdentifier	EN	Global Trade Item Number	The Global Trade Item Number (GTIN) is an identifier for trade items developed by GS1 (www.gs1.org).
ArticleNumber	P_SINGLEVALUE / IfcIdentifier	EN	Article Number	Article number or reference that is be applied to a configured product according to a standard scheme for article number definition as defined by the manufacturer. It is often used as the purchasing number.
ModelReference	P_SINGLEVALUE / IfcLabel	EN	Model Reference	The model number or designator of the product model (or product line) as assigned by the manufacturer of the manufactured item.
ModelLabel	P_SINGLEVALUE / IfcLabel	EN	Model Label	The descriptive model name of the product model (or product line) as assigned by the manufacturer of the manufactured item.
Manufacturer	P_SINGLEVALUE / IfcLabel	EN	Manufacturer	The organization that manufactured and/or assembled the item.
ProductionYear	P_SINGLEVALUE / IfcLabel	EN	Production Year	The year of production of the manufactured item.
AssemblyPlace	P_ENUMERATEDVALUE / IfcLabel / PEnum_AssemblyPlace	EN	Assembly Place	Enumeration defining where the assembly is intended to take place, either in a factory or on the building site.

Fig. A3 Excerpt from the IFC standard documentation for the property of GTIN in IFC4

6.4.4.8 Pset_ManufacturerOccurrence

PSET_OCCURRENCEDRIVEN / IfcElement

▼ **Natural language names**

EN Manufacturer Occurrence

▼ **Properties**

buildingSMART Data Dictionary
PSD-XML

Name	Type	Description	
AcquisitionDate	P_SINGLEVALUE / IfcDate	EN Acquisition Date	The date that the manufactured item was purchased.
BarCode	P_SINGLEVALUE / IfcIdentifier	EN Bar Code	The identity of the bar code given to an occurrence of the product.
SerialNumber	P_SINGLEVALUE / IfcIdentifier	EN Serial Number	The serial number assigned to an occurrence of a product.
BatchReference	P_SINGLEVALUE / IfcIdentifier	EN Batch Reference	The identity of the batch reference from which an occurrence of a product is taken.
AssemblyPlace	P_ENUMERATEDVALUE / IfcLabel / PEnum_AssemblyPlace	EN Assembly Place	Enumeration defining where the assembly is intended to take place, either in a factory, other offsite location or on the building site.

Fig. A4 Excerpt from the IFC standard documentation for the serial number property in IFC4

Since the property sets (Pset_) are not part of IFC's core model, it is entirely possible to use e.g., IFC4-based Psets in an IFC 2x3 model. Statsbygg has chosen to do this for GTIN, to avoid that the placeholder for GTIN has two different names in the two cases. You therefore use IFC4's property set where the GTIN property is called "GlobalTradeItemNumber" regardless of whether it is IFC 2x3 or IFC4 models.

GTIN in Statsbygg's "SIMBA" requirement sets.

"SIMBA 1.3" is Statsbygg's template for BIM requirements for projects started in 2020 and until "SIMBA 2.0" is introduced. The template can, if desired, be adapted to the individual building project's operational needs. The SIMBA 1.3 requirements set is based on machine validation of IFC 2x3 models (preferably with IFC 4 feature sets). "SIMBA 2.0" is a new set of requirements that is entirely based on IFC 4, and which will be introduced as soon as the certification of software for IFC 4 exports has come far enough.

In Statsbygg's "BIMQ" requirements database, the GTIN placeholder looks like this (If an "X" is set in a column, it means that it is a requirement in the relevant case). Here is a small section from SIMBA 1.3 for the requirements for doors (IfcDoor), where the placeholders for GTIN and SGTIN are shown.

Fig. A5 Screen dump from Statsbygg's BOM requirements database

B Concepts for deliveries and handling of GTIN together with BIM model

GTIN can be delivered and maintained in several ways. There are also several ways to connect objects in a model with GTIN on the product that the BIM object represents. Common to them is that both technology and method are early in development. There is not much experience in the area, and it is expected that it will develop a lot in the time ahead.

The following describes some basic concepts for connecting GTIN to BIM model. The concepts try to be solution neutral.

Concept 1 – GTIN is in the building owner's product register.
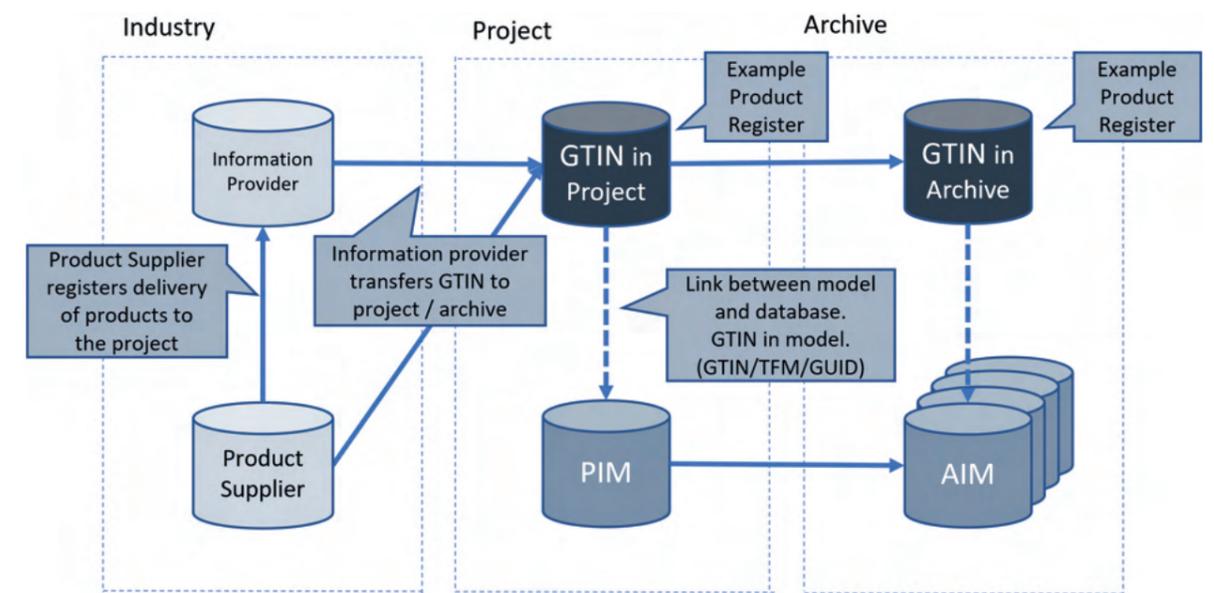
Fig. B1 - GTIN is in the building owner's product register.
(PIM = Project information model, AIM = Byggverket's information model, operation)

Explanation of figure 1:

1. GTIN is established by the product manufacturer or product supplier.

2. GTIN is delivered to the project either directly from the product supplier or via an information supplier.

3. The project establishes its own server for receiving product documentation, including GTIN.

4. Initially the purchaser and later the manager owns the GTIN information, and is responsible for maintaining it.

5. Link to project model (PIM) can be made with an identifier or link between product register and objects in model. Link can be URL. Identifier can be GTIN, TFM code or another identifier e.g., GUID.

6. (Applies to both concepts 1 and 2): If GTIN is used in the model to connect to GTIN in the product register, you get a 1:1 ratio between these. At the same time, however, this means that GTIN must be maintained in both the model and product register. If TFM is used for connection, the component type or component instance is to be connected. Connecting the component types presupposes that all instances with the same generic type in TFM represent the same product type.

The solution is suitable for managers who want to own and maintain the product documentation themselves and who have their own system for handling receipt, connection, and maintenance themselves.

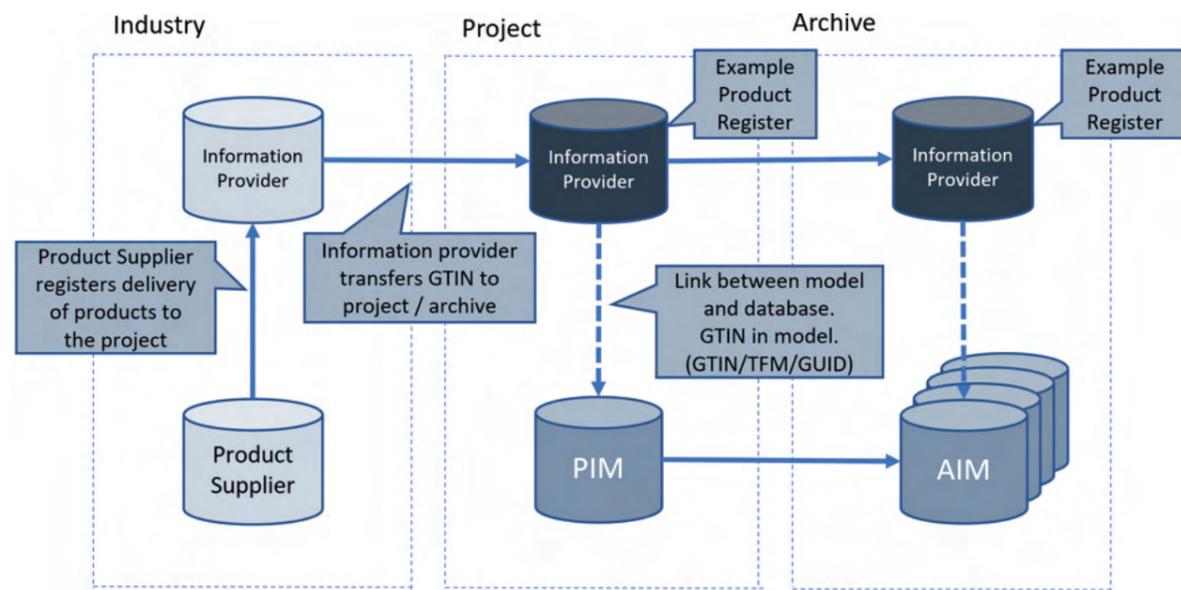**Concept 2 - GTIN is in an external supplier's solution.**

Fig. B2 - GTIN is in an external supplier's solution.
(PIM = Project information model, AIM = Byggverket's information model, operation)

Explanation of figure:

1. GTIN is established by the product manufacturer or product supplier.

2. GTIN is delivered to the project via an information provider.

3. The information provider owns and maintains GTIN information.

4. Link to project model (PIM) can be made with an identifier or link between product register and objects in model. Link can be URL. Identifier can be GTIN, TFM code or another identifier e.g., GUID.

The solution is suitable for managers who do not want to receive, connect, and maintain product documentation themselves.

Concept 3 - GTIN is in model
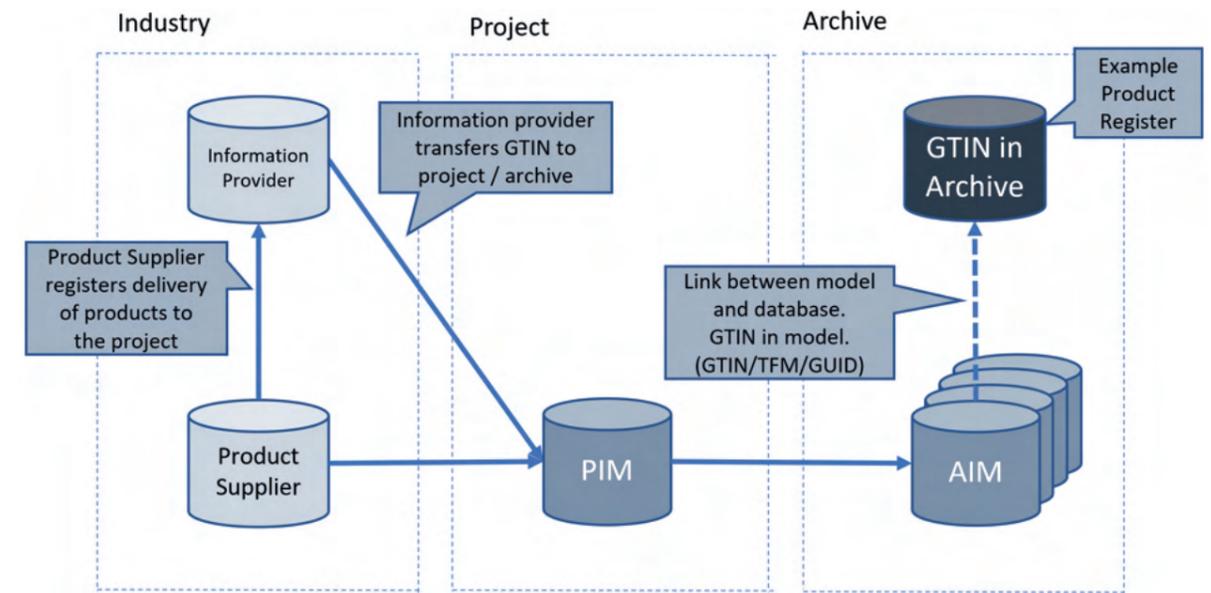
Fig. B3 - GTIN is in model.
(PIM = Project information model, AIM = Byggverket's information model, operation)

Explanation of figure:

1. GTIN is established by the product manufacturer or product supplier.

2. GTIN is delivered to the project via an information provider.

3. GTIN is registered directly on the object in the model. The model is used in the project phase as a GTIN register.
    a. Method for registration of GTIN in the model can be done by reading of e.g., RFID / QR code on the product and connection to the model with a mobile device.

4. In the operational phase, GTIN in model (AIM) is linked to the product register.

The solution is primarily suitable for smaller projects where a manageable number of products are delivered and where there are no resources to establish a product register or establish an agreement with the information supplier in the project phase.

C Attributes to GTIN, and other relevant GS1 standards

C.1 Attributes to GTIN

SGTIN (serialised GTIN)

In some cases, it is desirable to be able to distinguish identical products from each other. This is done through an individual numbering (serialisation) and is achieved by adding an attribute to GTIN. The attribute consists of up to 20 alphanumeric characters for free use. The attribute must be linked to a GTIN. GTIN thus becomes a SGTIN (Serialised Global Trade Item Number).

To utilise the advantage of the opportunity that lies in the serial number, this must be labelled on the physical product. See Appendix D for how this can be done.

Batch-/lot-number

If a product is produced in several instances in several productions, it can be useful to identify each production lot with a batch / lot number.

This makes it possible to track a production lot throughout the value chain and can be useful if there are problems or complaints about a product, where it may also apply to several instances of the same product produced in the same lot.

Batch / lot numbers can also be used to distinguish different production lots from each other, for example where production may have slightly different recipes or be produced in slightly different ways, but where it is perceived by the end user that it is the same product.

The number is an additional attribute to GTIN and must be linked to GTIN.

The number is 20 alphanumeric characters and is determined by the manufacturer.

To utilise the advantage of the opportunity that lies in the batch / lot number, this should be labelled on the physical product if possible. See Appendix D for how to label.

The Guideline encourages the use of batch / lot numbers wherever possible.

C.2 GLN – Global Location Number

Global Location Number (GLN) is a global numbering system for unique identification of legal entities and physical locations.

A legal entity is characterised by the fact that it has been assigned an organisation number.

Examples of physical locations are warehouses, collection points and delivery addresses.

GLN is a 13-digit number that contains the country prefix, serial number, and check digit.

Apart from the country prefix, GLN has no hierarchical structure.

GLN is an identification number that must only be linked to the individual location/ entity. Other information is normally stored in the users' computer systems such as customer registers, supplier registers etc.

GLN can be used in barcodes.

For more info about GLN, and how to apply for a subscription, click here: https://www.gs1.no/gln (In Norwegian)

GLN - structure in Norway		
Country prefix	Serial Number (10 digits in total)	Check Digit
70	8SSSSSSSSS	C
Meaning:		
70	Country prefix for Norway	
8	Fixed digit defined by GS1 Norway which means that this is a GLN	
SSSSSSSSS	Sequential Number for each GLN, issued by GS1 Norway	
C	Check digit, calculated the same way as all other GS1 check digits	

Fig. C1 GLN – structure in Norway

C.3 GS1 Digital Link

When there is a PDT for the product group, and PDS is used for exchanging information about the deliveries, this can be done via GS1 Digital Link.

GS1 Digital Link is a URL to a web page at a manufacturer, contractor, or commercial player, whereby entering the key information in a URL you can look up directly in the PDS and retrieve documentation. Key information here can be GTIN, in combination with serial number, and / or batch / lot number if applicable.

The key information can be entered in a traditional barcode, in a QR code, in a Datamatrix code or as a URL text string.

For more information on how GS1 Digital Link can be used, contact GS1 Norway!

D Labelling of products

Labelling of products is intended to be able to physically identify products in an unambiguous way. Many products may seem similar, but have different properties, and which are important to be able to distinguish to use the right product in the right place.

The simplest form of labelling is to apply the GTIN, serial number and batch / lot number directly to the product. This makes it easy to read and understand, which product this is but has the disadvantage that it cannot be used in IT systems without the information having to be registered manually.

Other more digital and future-oriented solutions are to label this with a barcode, QR code, Datamatrix code or RFID tag. This enables machine readability of information about the product directly into the recipient's systems, reduces errors and can be used actively in the management of the building.

A Guideline has previously been created on how to tag a product with an RFID tag or GS1 Datamatrix code. It is available on GS1 Norway's website, and you can download it here.

Note that there are certain guidelines for using a serial number if the product is to be marked with an RFID tag.

For physical labelling of products, it is highly recommended to contact GS1 Norway!

E What is PDT/PDS

This description is based on information from the Editorial Board in SN / K 374, dated Aug. 2020.

Machine-readable product information is the basis for a digital construction industry

To digitise the construction industry, the building material manufacturers / suppliers must offer machine-readable product information. Machine readability is ensured by developing standardised product data templates (Product Data Template - PDT) for information on properties.

By using a common data structure, the information about the properties can be shared and used by all actors throughout the life cycle of building and construction projects.

Standardised product data templates

Together with Standards Norway, the Norwegian construction industry is now developing standardised data templates for machine-readable product information. When information about the properties of specific products is entered into a data template, we get a product data sheet (PDS).

The information in the machine-readable product data sheets defines the products digitally, and are the digital building blocks we need in, for example, a BIM-based process.

One data template is developed for each product group. The data template contains all relevant properties for the relevant product group or object type.

When the building material manufacturers must state the properties of their products, they must use the data template for the relevant product group and fill in the necessary information about the product.

The Norwegian work with product data templates follows international standards from CEN and ISO

NS-EN ISO 19650-1 and NS-EN ISO 19650-2 describe rules for information management in BIM.

NS-EN ISO 23386 defines the term 'property' and describes how the properties are to be controlled to ensure machine readability and automated information exchange.

NS-EN ISO 23387 defines the data structure to be used to group the properties of products and objects in data sets so that they can meet specific information needs.

All properties are unambiguously defined and have a reference to measurement method of calculation method. All properties also have a GUID (Globally Unique Identifier) which is a unique, machine-readable identifier. The GUIDs are downloaded from the buildingSMART Data Dictionary (bSDD).

The data templates that are developed indicate the properties required by the harmonised product standards of the EU.

These properties must be disclosed to be able to use the CE mark on the products and legally sell them.

The data templates also indicate environmental information based on the EPD standard NS-EN 15804.

This environmental information is crucial for us to be able to calculate the CO_2 emissions from building materials and buildings.

The data templates are also expanded with other information, including market data (ETIM data).

Data templates are also developed for product groups that are not covered by harmonised standards.

These templates must also contain environmental information and be gradually expanded with other information.

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Data templates are also developed for product groups that are not covered by harmonised standards.

These templates must also contain environmental information and be gradually expanded with other information.

Product data structure's structure product information

The work of developing computer templates for machine-readable product information does not involve developing new documentation requirements but structuring existing product information and making it available for digital use.

The building material suppliers must be responsible for the product information and the digital product data sheets providing correct information.

There is no requirement for the product information to be registered in closed product databases

But it is expected that central product databases such as NOBB, EFO and the NOBB - VAVVS database have a desire to convey the machine-readable information to all users in the construction industry and offer tools that help users in choosing the right product.

Environmental properties are important content in the product data templates.

Going forward, increasing demand for product documentation and especially information on environmental properties is expected. Consideration for the circular economy and CO_2 emissions means that we must consider more product properties than before.

A link must be established between the BIM models and the environmental information of the selected products.

After completion, the BIM model from the design phase will live on as a digital twin and be maintained throughout the rest of its life cycle.

F Model for generic information and process flow
Fig. 7.2 Model for generic information and process flow

Information- and process flow

The design phase delivers a detailed declaration of performance/specifications for all products involved. Lookup in external product registers for obtaining information may be included

Order confirmation contains all relevant details of the products ordered

Reception control according to needs / agreement. Normally a physical inspection and control against delivery note

The supplier of information can be a manufacturer, contractor or third party. GTIN / SGTIN / batch / lot number is used as an identifier on the accompanying documentation

Orders based on Decl. Of Performance/ specifications and additional relevant information

Manufacturing according to specific. and additional info. Delivery to construction site. Delivery note contains all relevant info for the delivery. The information is collected for later use

Construction process according to BIM and / or plan

BIM is updated with relevant «as built»- information

Information is used and maintained by different users, each with its own purpose.
In principle, the client wishes to receive all information from previous processes, even if not all information is necessary to solve the MRO tasks

Pre-project phase: Basic geometry

Step 1-3
Early phases of design

Step 4
Detailing the project

Step 5
Order | Order confirmation | Manufacturing/ delivery/ documentation

Goods receival | Construction

Step 6
Handover | Update BIM

Step 7
Maintenance, Repair and Overhaul

Step 8
Liquidation, Remodeling, Demolition

Geometry in BIM

Declaration of performance

Orders

Order Confirmation

Delivery note

GS1 Digital Link

Dok. «as built»

Product DB

PDS

DB for PDS

Information flow today

Flow with PDS

G Recommendations from Digitalt Veikart 2.0

Components of a digital platform can be:

- Library with generic 3D objects at component and building component level.

  - If a model is to be adapted for e.g., robotisation, all details must fit into the model. Generic objects that contain these details can be more efficient. These objects must be linked to properties defined in agreed data templates.

- National Catalogue for product properties (Product Data Templates - PDT)

  - Manufacturers of goods and other players in the construction industry must have access to an agreed set of templates for properties of products in the Norwegian market. This must be linked to a Nordic and European level.

    - An important thing that must be solved together is to develop product data templates (PDT) for building materials and building systems. Then the manufacturers of goods and other players in the construction industry can have access to an agreed and unambiguous set of machine-readable properties. These product data templates will be the basis when the proprietor and contractors set, among other things, environmental requirements, as well as the basic structure for product databases. Several product owner organisations are now actively working to establish an organisation that can take responsibility for developing, managing, and distributing these product data templates to the market. The work is based on two new standards EN ISO 23386 and EN ISO 23387.

- Common system for identification and labelling.
  - Projects, structures, and components of the structure must be labelled according to a common system to ensure traceability.

- Common arrangements for the exchange of information from product databases
  - Product databases are developed as commercial solutions in the market. There will therefore be a need to search and order products regardless of which product database they are registered in.

- Access to "as built" information.
  - Both private and public actors have an interest in relevant information about buildings being available after they have been built. This can be done in a common database or in a coordinated scheme for a distributed system.

Recommendation to the proprietor

It all starts with the proprietors and owners. The requirements set by these affect the entire construction process. It will be natural to take as our starting point our own sustainability strategy and digitalisation strategy for the company. For the specific construction project, one should start by identifying the digital solutions you already have, and which will apply to the new project. Then you should describe which processes you want to digitise and quantify the rationalisation gain. It is important to check that the supplier's digitisation strategy is not in conflict with its own strategy based on Norwegian and international standards in the area. Also make sure that the subcontractors act in accordance with this. It is important to demand solutions that prevent work-related crime, damage to personnel and property and that raise the environmental standard, and not least solutions that ensure traceability, good logistics, minimised waste, and increased reuse. If you have ordered digital twin for construction and digital twin for operation, it must be established the same takeover procedure for these as for the physical building.

Recommendation to the owner and user of commercial buildings

Those who own and use commercial buildings must also establish as their starting point their own sustainability strategy and digitisation strategy for the company as a whole and for the building in question. It is recommended to establish "slim-BIM" for the entire building portfolio for ongoing enrichment of digital knowledge about own buildings. It is important to describe what is to be entered into the slim-BIM and how this is to be done.

Note - all coding and all components in building automation and administrative digital solutions should be vendor independent and they should communicate freely with your other solutions.

Finally, it is important to notify suppliers that there will (in the long term) be requirements for machine-readable product information (PDT) for all components of your buildings.

Recommendation to supplier

If you are a supplier, you do the following based on your own digitalisation strategy: You identify and secure your own rationalisation effects that contribute to increased earnings. You identify the requirements for digital solutions that the proprietor sets for the project. Where you do not already have such solutions, such must be obtained, or alternative solutions approved by the proprietor. You should confirm or deny the rationalisation gain in the requested solutions. Check that your subcontractors' digitisation strategy is not in conflict with the proprietor's requirements and your own strategy based on Norwegian and international standards in the area. If you are to supply digital twins for construction and digital twins for operation, the same takeover procedure must be established for these as for the physical building. Identify and offer digital solutions that can give you a competitive edge. The solution must not conflict with the proprietor's digitisation strategy.

Recommendation to contractor (supplier present at construction site)

In addition to recommendations given to all suppliers, every contractor should develop a digitisation strategy for efficient and safe operation of their own construction site. This should consider that you have control over the right competence and number of staff - the right person in the right place at the right time. You should also have control over the staff to prevent work-related crime. You should have a "Safe-job analysis" in place with procedure descriptions that ensure good safety, health and working environment, and you should choose solutions that ensure traceability, good logistics, minimised waste, and increased reuse.

EBA – Entreprenørforeningen bygg og anlegg:

Requirement to document purchased goods in "as built" situation with GTIN code.

Byggevareindustrien:

The digital development in the construction industry places greater and greater demands on the industry. These are requirements that apply to:

- Extensive environment and property documentation and requirements for CO_2 accounting where all products are included.

- Always full traceability of the goods. "Seamless" exchange of all item information

- Reuse of materials

Better and more easily accessible product documentation.

H Glossary and definitions

Term	Definition/meaning
Batch-/lot-number	Unique number for a production batch, as determined by the ma-nufacturer
BIM	Building information model.
Digitalt Veikart 2.0	Report from BNL with advice and recommendations to leaders in the Construction industry, which will contribute to a more efficient and sustainable Construction industry in the long run
Document archive	Collective term for a database / archive where documentation about a product that is part of a delivery is stored. Can be a PDF, PDS, product catalogue, etc.
Exposure Class (durability)	Exposure class (durability) indicates a performance that entails minimum requirements for mix design, e.g. maximum water/bin-der-ratio (which may be differentiated, for example, depending on the type of cement) in the relevant exposure environment.
GLN	Global Location Number - Location number used to uniquely iden-tify physical locations, legal entities, or various roles in a trading transaction.
GS1 Digital Link	Concept for being able to look up in a database for access to infor-mation, based on what is specified in a web link or Datamatrix / QR code / barcode.
GTIN	Global Trade Item Number – Unique identification of a product or service
GUID	Global Unique ID – Code generated by the system and ensures that the occurrence can be uniquely identified.
MRO	Maintenance, Repair and Overhaul
Norsk Stegnorm	A step-oriented description of the various processes that are part of the building's lifetime from need / idea arises, until it is comple-ted.Norsk Stegnorm has been prepared by Bygg21, Norsk Eiendom, Difi and Entreprenørforeningen Bygg og Anlegg (EBA), with active participation from Statsbygg.
PDS	Product Data Sheet. Which values are related to the properties de-fined for a specific product according to PDT.
PDT	Product Data Template. A template to describe the characteristics that can be associated with a given product or product group.
Strength class	Strength class indicates the strength of the concrete.
TFM	Interdisciplinary marking system. Marking system, classification and identification of systems, types, and components. Based on ISO 81346. The name «interdisciplinary marking system» comes from the original system developed by Statsbygg. New revision of the system from Standard Norway is covered by SN 3457-7, -8 and -9 as well as guidance. Informal, popular common name for these is NS-TFM.
URL	Uniform Resource Locator. Address of a web site

Fig. H1 Glossary and definitions

About GS1 Norway

GS1 - The Global Language of Business!

GS1 Norway is a not-for-profit organization that locally administers the global multi-industry system of identification and communication for products, services, assets and locations - the GS1 System.

GS1 Norway was created to help Norwegian business enterprises become more efficient; our fundamental role is to allocate GS1 numbers and barcodes, maintaining internationally accepted trading standards. This, in turn, allows Norwegian organizations to adopt world's best practice supply chain management techniques.

We are one of over 100 GS1 member organizations across 150 countries, and operate in multiple sectors and industries. Our standards are the most globally used supply chain standards, and there are over 6.600 users in Norway.

Follow us on Linkedin @GS1Norway
Read more about GS1 standards in the construction sector www.gs1.no/vare-bransjer/bygg (In Norwegian)
Download the GTIN Guideline for the Construction Industry: www.gs1.no/vare-bransjer/bygg/veileder-gtin-for-byggenaeringen