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Terminology in the Translation of Two Texts on Structural Engineering

Susanne Karlsson

Abstract

This paper is about the handling of challenging terminology within the technical field of structural engineering. The translation of two texts on structural systems "Antiquated Structural Systems Series", published in *STRUCTURE magazine*, serves as the basis for this study. The analysis focuses on the search and textual strategies for a selection of difficult terms. The terms are divided into four groups: terms with no Swedish equivalent; terms with more than one Swedish equivalent; acronyms; and measurements. The analysis shows that the search strategies are the same, regardless of term type, and that they involve many steps, including looking for terms in dictionaries and term banks; comparing terms in encyclopedias and parallel texts; and confirming usage. The textual strategies that were helpful in the translation were procedures based on the theories of Vinay and Darbelnet (in Munday 2008) and Ingo (2007), such as literal translation, borrowing, calque, adaptation and addition. The result shows that the chosen textual strategy for each challenging term differed greatly and depended on, for example, context and translator preference.

Keywords: adaptation, addition, borrowing, calque, literal translation, search strategy, structural engineering terminology, technical translation, textual strategy

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1 Introduction

This paper is about the translation of technical terminology. Translation in general has probably been carried out ever since humans started writing and then communicating across language barriers. However, the discussion about translation, or its theory, is a more modern occurrence. The first translation discussion is attributed to the Romans Cicero and Horace in the first century BC, but translation theory as an academic discipline was not established until the 20th century (Munday 2008:7). Nowadays, several aspects of the translation process are discussed, and the handling of terminology is one of them.

The terms dealt with in this study come from the technical science of structural engineering. A technical text with terminology that belongs to a certain subject matter can be hard to understand for a person who is not part of that world. As a technical translator you need to know the specialized terminology of both the source language and the target language. If you lack that knowledge, the search for the terms that correspond to the ones in the source text could be a hard and time-consuming struggle.

Even if the translator has a basic understanding of the subject matter, there is still some type of terms that will most likely pose problems, for example, terms that have no equivalents in the target language, or terms that seem to have multiple correspondents. Furthermore, the options that a translator may have when dealing with culture-specific terms, such as non-international acronyms, could be many, and the process of choosing between them would probably be a hard one. The strategies and solutions that may be used when dealing with these types of terminology problems will be discussed in the analysis section of this paper.

1.1 Aim

The aim of this study is to analyze what search strategies and textual strategies may be used when translating texts from English to Swedish within the specific field of structural engineering. The focus will be on the translation of terminology.

By *search strategies* I mean the process of finding the equivalent terms. By *textual strategies* I mean the process of choosing between different linguistic alternatives (Chesterman & Wagner 2002:57). Theory on textual strategies will be discussed further in Section 1.4.1.

1.2 Method

In order to carry out this study, I first translated two English articles on structural engineering into Swedish. While doing that, I noted difficulties regarding terminology. The strategies used for translating the terms were then identified and categorized.

For the translation of terms in the source text (henceforth *ST*) the starting point was normally the Swedish-English dictionaries *Norstedts ordbok* (www) and *Tyda* (www). An even more valuable source was *IATE* (InterActive Terminology for Europe), the EU's multilingual term base (www). It provided the Swedish equivalents of several of the structural engineering and material terms found in the ST. Sometimes, however, *IATE* listed more than one option or no hits at all. To verify the terms found in *IATE*, and to look for those that were not found, I used texts on structural engineering in Swedish, particularly texts with drawings and pictures. Encyclopedias, such as the Swedish *Nationalencyklopedin* (www) (henceforth *NE*) and *Nordisk familjebok* (www) were a good place to start when verifying that a particular term referred to the same thing in both languages. It was more valuable, however, to consult expert web pages such as Jernkontoret (www) or Riksantikvarieämbetet (www). Numerous web pages of construction companies and technical handbooks were also consulted to verify that the terms used in the ST and the ones found for the target text (henceforth *TT*) were really equivalents.

To identify and categorize the textual strategies used in terms of the aim mentioned in Section 1.1 I used the translation model of Vinay and Darbelnet (as presented in Munday 2008) and the ideas on addition and omission of Ingo (2007). These theories will be described in Section 1.4. The results and analysis of the findings will be discussed and illustrated in Section 2.

1.3 Material

The material I used for this study consists of the ST, which includes two American texts on different historical structural engineering systems, and the TT, which includes the translated Swedish versions. The ST featured as parts of a series of ten articles called "Antiquated Structural Systems Series" published in the *STRUCTURE magazine* from September 2007 to January 2010. The two articles that serve as source material for this study, Part 8, "Wrought and Cast Iron", and Part 10, "Additional Antiquated Systems" (www.structuremag.org) were written by the structural engineer Matthew Stuart.

The *STRUCTURE magazine* is published by a conglomeration of several organizations for structural engineering in the USA, and the majority of readers are American structural engineers. The ST addresses people interested in information about historical and outdated structural engineering systems. Thus, the purpose of the ST is to inform and help engineers who need specialized knowledge about old structural systems when they repair, reuse or renovate these systems.

The TT could be envisioned as being published as part of a series of translations describing old constructions and attitudes towards restorations around the world. The target reader would then be someone very interested in the field of construction, especially historical systems. One of the differences between the readers of the ST and the TT, however, is that the Swedish readers would not read the articles for the purpose of gaining information in order to use it when restoring, renovating or reusing, since some of the structures and systems presented do not exist in Sweden. For them, the TT would probably only serve as quaint information.

The ST consists of technical texts that aim at informing professionals and well-informed laypeople in the field of structural engineering. This means that the terminology in the ST is professional, as opposed to academic or popular (Newmark 1988:153), and the terminology in the TT should remain professional as well.

1.4 Theoretical background

In this section I describe and illustrate the translation theories relevant to this study. There is also a brief discussion of *terminology,* since this concept is of great importance for the subsequent analysis.

1.4.1 Translation theory

The theoretical basis for the analysis in this study is the translation model of Vinay and Darbelnet (as presented in Munday 2008:56-58). Vinay and Darbelnet divide translation strategies into two main categories, *direct translation* and *oblique translation*. Direct translation is then divided into three procedures, *literal translation*, *borrowing* and *calque*. Oblique translation is divided into four procedures, *transposition, modulation, equivalence* and *adaptation*.

Literal translation is explained by Vinay and Darbelnet as being a word-for-word translation. They also state that it is the number one procedure a translator uses when

translating between closely related languages (Munday 2008:57). An example of literal translation is *cast iron,* which is *gjutjärn* in Swedish.

Borrowing is a strategy used when there is no corresponding expression in the target language or when there is a need to "add local colour" (Munday 2008:56). An example of a borrowing is the word *curtain wall,* which is a term for a type of wall developed in the USA at the end of the 1800s.

Calque is the third and final procedure of direct translation, and Vinay and Darbelnet explain it as a type of borrowing, where a compound or a phrase is not borrowed but "transferred in a literal translation" (Munday 2008:56). An example of calque can be seen in the word *skyscraper*, which is *skyskrapa* in Swedish.

Sometimes it is not possible to use the strategy of direct translation, or the translator decides that it is not the best option. Vinay and Darbelnet's oblique translation strategies could then be used instead. Transposition is one of them, and it is a change of word-class without loss of meaning, for example *wet paint*, which is normally rendered as *nymålat* in Swedish.

Modulation is another oblique translation procedure, which is a change in perspective, for example, "drawings *don't exist*" which could be modulated into "ritningar *saknas*".

Equivalence is a procedure where the same meaning, information or situation is kept but worded differently, for example, *all gas and gaiters,* which could be translated into *prima liv, tipptopp* or something with the same pragmatic information.

Adaptation is Vinay and Darbelnet's fourth oblique translation procedure, which means that a cultural situation that exists in one language but not in the other is replaced in the TT with something that evokes the same response in the target reader. A common adaptation is the translation of measurements that differ between cultures, for example, "a *15-inch*-deep I-beam that weighs *67 pounds per foot*" would in Swedish be "en I-balk, *381 mm* bred och *100 kg/m*^{2} tung"

Sometimes a translator needs to, or thinks it is better to, change the structure of an expression while still keeping the sense. As already described above, Vinay and Darbelnet deal with the change of word class and call it transposition. At times, other kinds of structural changes are referred to as transposition too (Newmark 1988:85-88; Rydström 2010:6, 17). In the present study, however, transposition is used only for change of word class; for any other kind of structural change I use *structure change* in accordance with Chesterman's classification of textual strategies (Chesterman & Wagner 2002:60). An example of a structure change at the level of phrase is the translation of *ferrous metals* into *järnmetaller*.

The model of Vinay and Darbelnet focuses on the translation of existing words and phrases from the source language into the target language. But, in order to accommodate the target reader, an *addition* may be relevant. An addition is either part of a cultural adaptation of the TT, or part of making the language of the TT smoother (Ingo 2007:123-124). An addition is a textual strategy the translator decides to use because the TT may otherwise be difficult to understand for the target reader. It could be about a cultural difference that needs further explanation or about a presupposition that needs to be addressed. The decision to make an addition is a delicate one (Ingo 2007:124). The delicacy lies in the fine line between helping and belittling the target reader. The expression "a 15-inch-deep I-beam" could for example be translated with an "explanatory" addition "en 15 inches *(381 mm)* bred I-balk".

The opposite textual strategy of addition is *omission*. Sometimes the translator decides to omit redundant parts of the text in order to keep a good flow in the TT, or to omit information that has no relevance for the target reader (Ingo 2007:124). If a piece of information is relevant for the reader of the ST, but not for the reader of the TT, it could be omitted, as it has been in the following example: The phrase "…before *ASTM* began to standardize construction materials…" is changed into a passive construction without the agent (ASTM) "… innan konstruktionsmaterialen började standardiseras…". Since this procedure involves a loss of information it should be used with great caution (Ingo 2007:124).

1.4.2 Terminology

The definition of *terminology* in the *Oxford English Dictionary* is "the system of terms belonging to any science or subject". There are words and phrases in the technical material used for this study that are used only within the technical field and therefore defined as terms.

Newmark (1988:151) claims that a technical text contains about 5-10 percent terms and although that may be considered a low number it is still the most important thing that distinguishes technical translation from other types of translation. The translation of technical terminology is not confined by cultural barriers, and there are international efforts that try to standardize terms and confine one term to one concept or object (Ingo 2007:230; Laurén 1993:28ff.). The difficulty, however, is that many terms keep having multiple meanings in one or more languages, often in different fields; one example is *tie rod*, which can mean both *parallellstag* and *dragband* in Swedish depending on which object and technical field it refers to. According to Newmark (1988:152), concept-words are even more prone to multiple meanings, such as the German word *Kraft,* which can have the equivalents *force*, *power*, *strength* or *thrust* in English, all depending on which technical area they refer to.

Another difficulty when translating terminology is the issue of being aware of the systems of hierarchy and being able to choose from the appropriate level (Ingo 2007:101-102). In other words, the choice between hyponyms and hypernyms is important. In a technical text it is sometimes vital to distinguish between, for example, the hypernym *stress* and its subordinates *tensile stress*, *compressive stress* and *fatigue stress,* and at other times it is irrelevant; it depends on the context.

According to the ISO (International Organization for Standardization) a term is a "designation of a defined concept in a special language by a linguistic expression"; terms come in the form of both single words, for example *graphitization*, and phrases, for example *glass fiber reinforced concrete*. So, the use of *term* in this study includes both words and phrases that signify one concept.

2 Analysis

In this section I will present and discuss some of the search strategies and textual strategies used with terms that were particularly challenging during the translation process. In translating the ST, it turned out that the vast majority of terms had straightforward equivalents in the target language that could be easily obtained, either by means of dictionaries and term banks, or by means of general Internet search strategies, backed up by basic knowledge of the relevant field. An example of a term that is not listed in any of the main dictionaries or term banks, but that is nevertheless relatively easily dealt with, is *bowstring trusses* in (1) below:

(1)	Initially, these composite built-up girders were constructed as *bowstring trusses*	… i de bärande balksystemen. I början konstruerades dessa som *bågfackverk*

The noun *bowstring* in (1) acts as a premodifier, determining the type of truss. According to the general dictionaries *Norstedts ordbok* and *Tyda* it is equivalent to the Swedish word *bågsträng*. However, this is a building structure term and there is no such thing as a **bågsträngsfackverk*. Although neither *IATE* nor *Rikstermbanken* have *bowstring trusses* as an entry, a glance at any picture of a bowstring truss on Google, and especially on the website constructor.org, reveals to the professional, that it is a *bågfackverk*. A layperson can easily verify this in most handbooks on structural elements, for instance in *Arkitektens handbok* (Bodin *et al*. 2010).

Whereas most ST terms were relatively unproblematic, there were, however, still certain terms that did pose problems. These will be discussed in the following, under four different headings:

(i) Terms with no Swedish equivalent (Section 2.1),
(ii) Terms with more than one Swedish equivalent (Section 2.2)
(iii) Acronyms (Section 2.3), and
(iv) Measurements (Section 2.4)

The search strategy, i.e., how to find a Swedish equivalent and the textual strategy (see Section 1.4.1) for each term will be presented and the solution opted for will be discussed and motivated. Alternative solutions, where such exist, are also discussed.

2.1 Terms with no Swedish equivalent

The term *fiber stress* (2) could not be found in dictionaries or term banks and seemed to have no Swedish equivalent.

(2)	The allowable extreme *fiber stress* was indicated as 14,000 psi for wrought iron and 16,800 for steel.	Den högsta tillåtna *spänningen* angavs till 96 MPa för smidesjärn och 115 MPa för stål.

A search on *IATE* rendered *fiberspaendning* in Danish and *Biegefestigkeit* in German. *Fiberspänning* is not used in Swedish handbooks on strength and stresses, but there are two hits on Google, both in academic papers. On the other hand, the German entry *Biegefestigkeit* made me wonder if it might have something to do with *böjhållfasthet*. A search on Google generated several hits where it was stated that *fiber stress* and *bending stress* are the same (Ambrose & Parker 1994:96), as evident in the following definition of *fiber stress*:

> The tensile or compressive stress on the fibers of a fiber metal or other fibrous material, especially when fiber orientation is parallel with the neutral axis. Local stress through a small area (a point or line) on a section where the stress is not uniform, as in a beam under bending load. (McGraw-Hill 2003)

This definition corresponds well to the formulas for stress-calculations in a beam under bending load in regular Swedish handbooks on strength and stress, where *fiber stress* corresponds to *normalspänning* and *the extreme fiber stress* to *den maximala spänningen*

(Bodelind & Persson 2004). Since the stress is in the fiber regardless, I have opted for the term used in the authoritative handbook *Hållfasthets- och materialtabeller* (Bodelind & Persson 2004).

The textual strategy is to use a type of near-equivalent in the form of a hypernym, *spänning*, which can have subordinates like *dragspänning*, *tryckspänning*, *böjspänning* etc. I chose the hypernym *spänning* in (2) because it is a safe choice, since it seems questionable whether there is a Swedish subordinate option equivalent to the English *fiber stress*.

Another term without a straightforward Swedish equivalent was *gunshot manufacturing towers* (3), which could not be found in any of the dictionaries, *IATE* or *Rikstermbanken*.

(3)	… such as firewatch towers and *gunshot manufacturing towers* that employed drilled and socketed rock foundation anchors and infill masonry walls …	Exempel på sådana konstruktioner var brandtorn och *hageltorn* som förankrades i berget och byggdes med murverksväggar.

A Google search for my translational guesses *ammunitionstillverkningstorn* and *hageltillverkningstorn* gave nothing. Since I did not know exactly what a *gunshot manufacturing tower* was, I looked it up in Wikipedia and – together with a Google search – it became evident that the more common English term was *shot tower*. Unfortunately, that entry could not be found in the English-Swedish dictionaries or term banks either. In the Wikipedia article, however, there was a list of famous *shot towers*, such as the one in Pispala in Finland. On the Wikipedia page on Pispala, the Finnish name of the tower was stated, *Pispalan haulitorni*, which gave me *hageltorn*, and that word brought forth two important sources. The first source was *Svenska Akademiens ordbok* (*SAOB*). The definition for *hageltorn* in *SAOB* was: "(i fackspr.) för hageltillvärkning avsett, (i allm. 30–35 m.) högt torn gm vilket man låter smält bly falla ned droppvis, för att det under fallet skall stelna till hagel". This explanation corresponds well to the English definition of shot tower (*Oxford English Dictionary*). The second source was *Nordisk familjebok*, where the term was found under the entry for *hagel*:

> Vid Falu grufva tillverkas hagel på sådant sätt, att den smälta massan sållas öfver gruvans öppning och faller i vatten vid dess botten. Under vägen i luften erhålla haglen den runda formen. På andra ställen finns särskilda "hageltorn" uppbyggda. (1883)

There were no hits, however, in encyclopedias, such as *NE*. Since the shot tower was a phenomenon used for a brief period of time in the 1800s, and those still standing today are mainly tourist attractions, it may not come as a surprise that the term is difficult to find. In the few Google hits on Swedish pages, where it is evident that the item in question is a *shot tower,* like on the pages referring to the Pispala shot tower, the object is simply called *torn*.

One of the reasons why I chose to use the term *hageltorn* despite its general absence in current sources was the authoritativeness of the old sources. Another reason was the accessibility of the term; if the target reader wants to research the word, it is the term *hageltorn* he or she needs. However, the ST does not use *shot tower*, which is the more common term and the literal translation of *hageltorn*. Instead it uses an explanatory noun phrase, *gunshot manufacturing towers*. Newmark (1988:153-154) states that the translator's first option should be a literal translation and that the translator should not use a more specific term if the ST does not. In this respect I have used the wrong solution, since I have chosen the textual strategy of a compulsory structure change on the phrasal level, and I might be accused of not having resisted "the temptation of translating a descriptive [term] by a technical term for the purpose of showing off [my] knowledge" (Newmark 1988:153). Instead, I ought to have settled for a more literal translation strategy and used *torn för hageltillverkning*, *ammunitionstillverkningstorn*, or some other construction that more literally corresponds to the chosen ST expression. However, Newmark's perspective is thirty years old and the focus today is slightly different. The more modern outlook, in general, is that the translator should think more of the choices that fit the aim of the text, but also the structure and context at hand (Chesterman & Wagner 2002:40ff, 64). In example (3), the term *hageltorn* is structurally mirroring *brandtorn* in the TT and is therefore a more idiomatic solution than the others, and through the use of the shorter alternative the overall word count is furthermore kept low. In this latter respect the choice is also part of a strategy of compensation (Ingo 2007:86, 168); it is well known that a translation usually ends up being longer than the ST (Chesterman & Wagner 2002:30f), in the case of the present TT, there are so many places where the target language is wordier than the source language, that when there is a chance to keep things short without losing meaning, it may be worth taking it. This would be a very important argument if the aim of the TT was to be published, since there is normally a limit of length to consider.

Yet another example of a term that seems to have no equivalent in Swedish is *cage construction* in (4).

(4) Load-bearing brick masonry walls were Bärande tegelväggar ersattes så småningom

eventually replaced by *cage* and skeleton wrought iron and steel frame *construction*, often using cast iron columns. *Cage construction* involved the use of brick façade walls that were as thick as those used for load-bearing construction; the only difference was that the frame and supporting columns, including those that would eventually be embedded in the brick masonry façade wall, were first erected ahead of the masonry.	av smidesjärnsskelett, ”*smidesjärnlådor”* och stålstommar, ofta i kombination med gjutjärnspelare. Tillsammans med ”*lådkonstruktionerna”* använde man tegelfasader som var lika tjocka som bärande tegelväggar; den enda skillnaden var att stommen och stödpelarna, även de som skulle muras in i tegelfasadsväggen, i början uppfördes före murverket.

The standard primary search strategy of looking for the term in dictionaries and term banks gave nothing for *cage construction*. Even if the term itself, together with context, reveals what type of thing a cage construction is, a proper definition was needed in order to know what to look for in Swedish parallel texts. However, even with a proper understanding of the term, I still could not find a Swedish equivalent. Then I employed another strategy and asked two friends, an architect and a structural engineer, but they could not give me an answer either. The next strategy, which was rather time-consuming, was to look for texts on early American skyscrapers and information on the Wainwright Building (which is the text book example of a building with a cage construction). The majority of books and web pages I found on the matter simply referred to the structure as an early example of *stålskelett* or *stålstomme*, (ignoring the fact that the first ones were actually made of cast and wrought iron). Even a detailed handbook like Cornell's *Byggnadstekniken* (1970) uses the more generic term *skelettekniken*, and in a Swedish translation of a book on architecture, the translator uses the expressions *ett ramverk helt i stål* and *den gallerliknande stommen* (Norwich 1976:226). It may not come as a surprise that it is difficult to find an established translation for the term *cage construction* since the object the term refers to can only be found in early skyscrapers, and we did not have any in Sweden in the late 19th century. Later, when we started to build high-rises, we used completely different building techniques (Woldemariam 2010).

Having come to the conclusion that there is no established Swedish term in this context, I have to look for alternative ways of translation, and there are several translation solutions possible. One is to refer to the cage, as well as the skeleton wrought iron construction with the

generic term *smidesjärnsskelett.* However, since the text is specialized, it is probably of interest to the reader, and respectful towards the American engineering technique of the time, to distinguish between the two slightly different structure systems.

A second choice would be to use the text strategy of calque and transfer *cage construction* into *burkonstruktion* or *lådkonstruktion*. This would seem to be a good solution because it ought to give the readers the "right" association. The content of the text also helps paint the picture of the cage construction.

A third option is the textual strategy of borrowing *cage construction* and then adding an explanation. This could be a good choice, although a little clumsy. The chosen solution is to use *"lådkonstruktioner"* within quotation marks – the form of the cage construction is namely the same as other *lådkonstruktioner* in the field of structural engineering – and the quotation marks, hopefully, point to the fact that this is not an established term. This strategy corresponds to Newmark's (1988:90) procedure *translation label* where inverted commas are used to point out a "provisional translation".

The ST is about outdated structural systems in the USA, and its focus is on the structures used in the early days of the high-rise building. This means that several terms are named after American companies and/or people that designed these structures or supplied the materials. These structures were used for a short period of time, maybe a couple of years only. In the ST there is a list of floor systems that were common in the late 1800s, and they are named after companies and people associated with the structures. These specific floor systems were never used in Sweden and we do not have any terms of our own for them. Two of these American terms with no equivalents in Sweden can be seen in (5), namely the *Fawcett System* and *Acme Floor-Arch*.

(5)	Other common floor systems included: *Fawcett System* and *Acme Floor-Arch* – clay lateral cylindrical tile flat-end construction arch. Rapp Floor and McCabe Floor - gauge-steel inverted tees …	Andra vanliga bjälklagssystem: ***Fawcett System*** och ***Acme Floor-Arch*** – Bjälklagsvalv av rörformat tegel vars undersida är platt. Teglet är placerat diagonalt mellan stålbalkarnas underflänsar. **Rapp Floor** och **McCabe Floor** – Bjälklag med små T-balkar (38 mm) som ligger upp och nervända …

The strategy of borrowing was used in (5) because there are no obvious translations for these terms, since they consist of proper names. An alternative solution would be to keep the proper names and use the strategy of calque or literal translation for the appellative parts, for instance, *Fawcett-systemet* and *Acmes bjälklagsvalv*, but since these defining terms seem to be part of the names, due to the initial capital letters, this solution was discarded.

Furthermore, the explanation of the structure systems is rather sketchy in the ST, as can be seen from the text after the terms in (5), so a decision was made to add information. As mentioned above, the pragmatic strategy of adding information is a delicate one. As Ingo states, it should only be used when really needed (2007:134). In this example the main reason for the rather extensive addition is the fact that, although I am an informed layperson on the subject matter, I could not envision the systems, based on the explanations. Instead, I had to go back to the source book used by the ST author to fully grasp the concepts. I then assumed that the target readers would be as puzzled as I was if the explanation was translated literally; therefore I decided to add information – or more accurately: to fill out the links between the adjectives and nouns in the ST.

2.2 Terms with more than one Swedish equivalent

The term *ferrous metals* in (6) turned out to be more problematic than anticipated because it seemed to have more than one Swedish equivalent.

(6)	*Ferrous metals* used in construction can be categorized into three principal iron-carbon alloys, based on approximate carbon content	*Ferrolegeringar* som används för byggnadskonstruktion kan delas in i tre huvudgrupper av järn-kol-legeringar beroende på ungefärlig kolhalt

Most entries in *IATE* translate *ferrous* into *järn-*, and compounds with *ferrous* are evenly distributed between *ferro-* and *järn-*. *NE* gives both *järnhaltig* and *järn-* as options for *ferrous*. On the other hand, the entry for *ferrous metal* in *IATE* gives *ferrolegering*, and the opposite, *non-ferrous metals*, is either translated into *icke järnmetall*, *icke järnhaltiga metaller* or *andra metaller än järn*. *Tyda* has one alternative to *ferrous metal* and that is *järnmetall*.

Instead of choosing the literal translation of *järnmetaller*, the different alternatives provided by the dictionaries and *IATE* prodded me to do some further research of the definitions of the three options *järnmetaller*, *järnhaltiga metaller* and *ferrolegeringar*.

According to *NE järnmetaller* refers to the chemical elements iron, cobalt and nickel. Assuming that this is the case, it would be better to use *järnhaltiga metaller*, since the content in the text is about alloys and not elements. Furthermore, *NE* defines *ferrolegering* as an alloy containing at least 4 percent iron and different amounts of one or more elements, for example, copper, manganese and carbon. Thus, the equivalent term, based on the context of the ST and definitions of the terms, is *ferrolegeringar*. This example confirms the statements on how difficult it is to translate a specialized text full of terminology unless you are an expert yourself (Ingo 2007:226; Newmark 1988:160).

The textual strategy in (6) is a literal translation, but also a matter of choice of equivalent. The three options are near-synonyms and differ in the amount of iron-content, which means that the equivalent translation ought to be the one that corresponds with the iron-content of the ST term.

Another term with multiple possible equivalents in Swedish is *"curtain"* in *"curtain" masonry brick walls*. As shown in (7) I made the choice to use *icke-bärande* tegel*ytter*väggar, but might as well have chosen *"curtain"*, *förhängs*vägg or *utfackningsvägg*.

(7)	The minimum thickness for *"curtain"* masonry brick walls	Minimitjockleken för *icke-bärande* tegel*ytter*väggar

In *IATE* there are two options stated for *curtain walls*: *förhängsvägg* and *utfackningsvägg*. In *Norstedts ordbok* there is one option, *icke bärande vägg*. A Google search gives no hits on *förhängsvägg*, about 3,900 on *utfackningsväggar* and 1,500 hits on *curtain walls* on pages written in Swedish. Searching for *icke-bärande väggar* would be pointless since a result would include an unknown amount of hits pertaining to 'inner walls' in addition to those actually pertaining to 'outer walls', the latter of which is the only kind of wall that *curtain walls* refers to. A rough-and-ready browse through the first ten pages of the Google hit pages for *utfackningsväggar* reveals that the term *utfackningsväggar* to a large extent deals with walls of small houses, and the first ten pages of the Google hit pages for *curtain walls* reveal that the borrowing *curtain walls* corresponds more directly to the American *curtain walls,* which are typical of high rises and skyscrapers. To complicate matters even further, a search in *Svensk-engelsk byggordbok* (1990) reveals that the term *utfackningsvägg* could be

translated into *external panel wall*, *curtain wall* or *infill wall*, and the term *icke-bärande fasad* into *curtain wall*.

To sum up, the reasons why I have opted for the term *icke-bärande väggar* over the other options are: first, because the term *"curtain"* is within quotation marks in the ST and thereby signifying that these non-load-bearing walls are not the usual *curtain walls* but precursors. Second, because the important issue in the context is the fact that, for the first time, the exterior walls (the façades) are not bearing any load and by choosing *icke-bärande* this is made clear. Third, because in the authoritative *Svensk-engelsk byggordbok* (1990) *icke-bärande fasad* only has one suggestion and that is *curtain wall*.

At a first glance the term *tegelytterväggar* may seem clumsy in the chosen expression *icke-bärande tegelytterväggar*, but it is quite common to find this type of compounds in Swedish technical texts (Laurén 1993:48, 98).

Also, a secondary choice between *ickebärande*, *icke bärande* and *icke-bärande* had to be made. All three variations exist in reliable texts on structure systems, but Terminologicentrum (TNC) recommends *icke-bärande*, "Bindestreck är tydligast och lämpligast för facktermer" (1999), and that is the reason why I chose that construction.

2.3 Acronyms

In the ST there are a couple of acronyms (abbreviations formed from the initial letters of the full name) standing on their own, that is, they are not explained. To the American engineer who reads the ST these acronyms are very familiar. However, they are perhaps not as familiar to the reader of the TT and therefore the translator needs to address this issue. In (8) an example from the material is shown.

(8)	Also, before *ASTM* began to standardize construction materials in the late 1890s, the quality of irons, steels and cementious products varied greatly.	Dessutom varierade kvaliteten på järn-, stål- och cementprodukter oerhört mycket innan konstruktionsmaterialen i slutet av 1890-talet började standardiseras av *American Society for Testing and Material (ASTM)*

The chosen textual strategy is to add only the full name of the organization to inform the curious Swedish target readers what the acronym stands for. No further explanation is needed since the context clearly states what type of organization it is. In the sentence it says that "konstruktionsmaterialen […] började standardiseras av American Society for Testing and

Material (ASTM)" and since the readers are presumably very familiar with standardizing organizations, this makes it obvious to them, what *ASTM* is, even if they do not know the specifics. Actually, the context is so clear that an omission could be possible instead ... *innan konstruktionsmaterialen började standardiseras i slutet på 1890-talet*. That solution, however, is less optimal, since it would imply that there was no sort of standardization prior to the 1890s, when in fact there were local ones in cities and even within manufacturing companies (Ketchum 1924).

Another type of strategy that could be used in (8) is the addition of an explanation, such as *ASTM (motsvarande SIS)* or ...innan *den amerikanska standardiseringsorganisationen ASTM* började .... For either of these solutions to be used the translator needs to be sure, first of all, that the two organizations are really equivalent. Second, this type of addition makes the translator visible and one has to take that fact into consideration. For many years, the ideal has been that the translator should remain invisible. Nowadays, a slight tendency to loosen that rigid view is noticeable (Chesterman & Wagner 2002:30ff.; Ingo 2007:18; Newmark 1988:93). With that in mind, and along with the fact that it is very common to use the latter type of addition in newspapers, the strategy of adding the explanation *den amerikanska standardiseringsorganisationen* before the acronym *ASTM* is an equally good solution.

Sometimes the translation of an acronym demands the strategy of adaptation. In this case, the equivalent of the American *ASTM* would be the Swedish *SIS* (Swedish Standards Institute). Obviously, the reason for not using this strategy here is that the TT is about antiquated structural systems in the USA, and not in Sweden.

In the end, it may seem as it is more a matter of taste than solid arguments that determines which textual strategy to choose in (8). The different reasons, for or against certain choices, which I have mentioned above are not very well-founded. That does not mean that they are bad choices though, only subjective, and that it is basically the translator's preference that decides what option is picked.

Another example of a term acronym in the ST that posed a challenge in the translation process is shown in example (9). The preferred solution here is different from the one used in example (8) because this one involves the further addition of an explanation.

(9)	In addition, the establishment of *ASCE* in 1852 helped to promote the rapid spread of technical information, such as records of	Dessutom kom grundandet av *det amerikanska civilingenjörsförbundet ASCE* (år 1852) att främja den snabba spridningen av teknisk information, i form av rapporter från

	experiments with cast and wrought iron performed in England by Hodgkinson and Fairbairn.	experiment med gjutjärn och smidesjärn som utförts i England av Hodgkinson and Fairbairn.

There are two reasons for this choice. First, the context does not show as clearly as in example (8) what the *ASCE* is. Second, the *ASCE (American Society of Civil Engineers)* is probably not known to the Swedish reader, as opposed to *ASTM*, which most likely is. As a consequence, an addition has been made: the explanatory addition of *det amerikanska civilingenjörsförbundet*. A spelling out of the acronym in the form of *(American Society of Civil Engineers)* could also be added to help the readers even further, but that solution has been discarded because it makes the sentence heavy and clumsy.

2.4 Measurements

There are a number of measurements used in the ST, two examples of which are given in (10) and (11):

(10)	As a result, it was common to use cinder concrete with compressive strengths under *1,000 psi*.	Därför var det vanligt att man använde slaggbetong med en tryckhållfasthet på under *6,9 MPa.*
(11)	The largest beam listed was a *15-inch*-deep I-beam that weighed *67 pounds per foot*	Den största balken i listan var en *381 mm* bred I-balk som vägde *100 kg/m*.

When it comes to stresses, the measurement in Sweden is N/m^2 (Newton per square meter) or MPa (megapascal), whereas in the USA it is psi (pounds per square inch) (Pärletun 2005:3).

The TT options are to transfer the American measurements into Swedish ones; to borrow the American ones; to keep the American measurements but add the Swedish ones within brackets; to adapt the measurement but keep the American ones within brackets; or to keep the American measurements and add a conversion table at the beginning or end of the TT. Naturally, parallel texts that are originally written in Swedish only have the Swedish measurements, and since there are no translated articles in the Swedish parallel magazines, the only comparison that can be made is with translated books. However, the strategies differ

greatly in those, and all the above solutions can be found. The solution I chose – to adapt the measurements – was based on the argument that the target reader works with the megapascal-measurements and can thus quickly compare the historical numbers with the current ones that the reader has a sense for.

There is one exception to the general strategy of adapting the measurements, however. This exception can be found in the inserted tables and drawings where the original American measurements are kept and a conversion number is given in the table's caption – see example (12).

(12)	Table 1: Minimum Building Code Thickness of Brick Masonry Walls - Inches.	Tabell 1. Minsta tjocklek på tegelväggar enligt byggnormerna. *(1 inch = 2,5 cm)*

This textual strategy of borrowing and adding is motivated by the fact that most tables and pictures taken from American texts and inserted into Swedish articles and books on structural engineering have kept the original measurements within the figure and added a conversion number. The reason behind this could be the trouble it takes to edit within the formats of scanned tables and pictures.

3 Conclusion

The aim of this study was to analyze the search strategies and the textual strategies used in the process of translating a specialized text on structural engineering from English into Swedish. The focus was on terminology and, for the purpose of determining search strategies and textual strategies used for the translation of terms, two texts on antiquated structural systems in the USA published in *STRUCTURE magazine* and written by the structural engineer Matthew Stuart were translated into Swedish.

The textual strategies used in the translation were procedures based on the theories of Vinay and Darbelnet (in Munday 2008) and Ingo (2007). The search strategies included looking for terms in dictionaries and term banks; defining and comparing terms in encyclopedias, parallel texts and books; confirming usage through Google searches and browsing texts and books on the subject matter; and asking people who are active within the specialized field of structural engineering.

In the analysis, the terms that posed particular challenges in the translation process were selected and discussed. The strategies used for the translation of each of these terms were

described and alternative solutions discussed. For the TT, a final solution was chosen and the reasons for that choice were stated.

Several problematic terms proved challenging because they denoted phenomena that were in use, and talked about, in another culture than the Swedish one. In addition, these phenomena were, mostly, confined to an era about a hundred years ago. As a consequence, some of these terms have no Swedish equivalents. The present study shows that this issue was dealt with in different ways and no common strategy for all the terms was used. Instead, the textual strategies ranged from phrase structure change and hyponymy to calque and borrowing.

For some terms established equivalents were found, but the difficulty was not in finding them. The challenge was that, in the initial search phase, they seemed to have more than one literal translation. The problem was to investigate and determine which one of them should be used in the given context. The strategies here included an extensive search for authoritative definitions and a consideration of the material context.

Other problematic terms were acronyms. The challenge that these terms posed were also of cultural and pragmatic character and the solutions differed depending on the perceived target readers' estimated knowledge and previous encounters with these acronyms. However, the chosen textual strategy always included some sort of addition.

The last type of term dealt with was measurements and the preferred textual strategy was to use adaptation. One exception was stated and that was the measurements within tables, which were not altered; a conversion number was added instead.

This study dealt with technical terminology translated from one professional text to another, to be published in magazine form, within the community of structural engineering. Another interesting focus would be to discuss an adaption of the texts into a more popular style for a wider, general public.

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