The Language of Architecture and Civil Engineering

The Language of Architecture
and Civil Engineering

By

Ana Mª Roldán Riejos, Joaquín Santiago López and Paloma Úbeda Mansilla

With a Preface by Alberto Campo Baeza

CAMBRIDGE
SCHOLARS

P U B L I S H I N G

To our students

"Language is inadequate to formulate the exact meaning and the rich variations of the realm of sensory experience"
—Moholy-Nagy L. 1947, *The New Vision*, Witenborn, New York

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS, TABLES AND FIGURES

FOREWORD

In this volume, Ana M. Roldán-Riejos, Paloma Úbeda and Joaquín Santiago provide a comprehensive and in-depth overview of the language of architecture and civil engineering, by presenting several analysis tools and approaches. It draws on an impressive range of disciplines such as genre theory, register analysis, corpus linguistics and metaphor theory. The result is an inspiring volume which will be of interest to architects, civil engineers, linguists and language teachers. They first chapter begins by introducing the main types of architecture and civil engineering texts and genres and discusses the typical rhetorical functions and characteristics that may be found therein. It adopts a genre-based approach to the discipline and dicusses how meaning develops and is expressed in scientific-technical discourse, rightly pointing out the extent to which metaphor is used to develop and convey abstract concepts within these disciplines. Apart from linguistic matters, the multimodal nature of metaphor and its importance in academic discourse are considered. Thus providing useful information for practitioners and teachers of English for Specific Purposes on how to write appropriately in the different genres that are involved in the language of architecture and civil engineering. A particularly novel feature of the book is its chapter on corpus compilation and the use of freely-available corpus linguistic software (Antconc) which provides learners with the tools to take over their own learning and to tailor their linguistic input to their specific needs. This chapter, which is set out as a kind of 'how to' guide, would also be very useful for university teachers who are engaged both in teaching and researching in English for Specific Purposes. This book also offers useful suggestions for small action research projects that final year students might engage in with the support of their tutors. The book uses findings from functional grammar research to make suggestions to writers wishing to improve their rhetorical techniques. Areas that are covered include thematic progression, the use of adverbs and modal verbs, sentence arrangement, hedging and appropriate use of the passive voice. The discussion of metaphor and metonymy is particularly insightful as it draws the student's attention to both conceptual and linguistic metaphors and metonymies and looks at how they work together across stretches of discourse in order to create and convey meaning.

All in all, this book constitutes and excellent guide to teachers, practitioners and students alike, working in the fields of architecture and civil engineering. The book is clearly written with concise summaries and suggestions for further reading at the end of each chapter. It is expected to be a useful resource for teachers of English to students working in these disciplines as well as serving as an excellent self-study book for people already working in the field who need to communicate in English. The authors are experienced ESP teachers and researchers and it is easy to see that this book is the result of many years working in the field.

—Dr. Jeannette Littlemore
Senior Lecturer, University of Birmingham,
United Kingdom

PREFACE

(Spanish version)

WORDS AS BIRDS
Al igual que las palabras en alas de la Poesía son capaces de volar al cielo como los pájaros, las palabras montadas en la lengua de Shakespeare son capaces de llegar hasta el más recóndito lugar de este mundo, y más aún con las nuevas tecnologías.

Pues este libro, lleno de las palabras clave de Arquitectura e Ingeniería e Informática, en inglés, será un instrumento eficaz para escribir y hablar con precisión en inglés sobre estos temas específicos. Aquí se dan instrumentos a los arquitectos y a los ingenieros, a los profesores y a los estudiantes, para comerse el mundo... en inglés.

Estas palabras inglesas, precisas, harán posible que la comunicación se haga con precisión. La precisión exigible en la transmisión de los conocimientos y en la comunicación de la Arquitectura y de la Ingeniería. Tan universal es la lengua inglesa.

CERVANTES
Esta universalidad del inglés la entendió muy bien Cervantes, que parecía tan serio, cuando nada más terminar de escribir D. Quijote de la Mancha, encargo, él mismo, la traducción al inglés a un tal Shelton en 1612. Curiosamente el mismo año en que Homero era traducido también al inglés por vez primera por Chapman.

Tan lejos llegaron las palabras del Quijote, que, Jefferson, el tercer presidente de los Estados Unidos que era arquitecto, reñía a su hija María porque "no estaba leyendo D. Quixote de la Mancha" como él le había indicado.

COMUNICACIÓN
Y si el dominio de la lengua inglesa es importante, todavía lo es más cuando se usa el ordenador donde el inglés es imprescindible.

Cuando en mi ordenador aparecen emails en chino o en japonés, o en lenguas que yo no entiendo, los borro inmediatamente. No así con las muchas cartas que vienen en inglés, como lo más natural del mundo. Además hay palabras en castellano que parece no serían fáciles de traducir, como infalible e inefable, y en inglés son inffalible and ineffable. Tan sencillo como eso. Claro que brújula, plomada y nivel, los tres

instrumentos imprescindibles para un arquitecto, son "compass", "pluma" y "spirit level".

Cuando se tradujo mi libro "La idea construída" al inglés, el primer borrador decía "The constructed idea". Tuve que insistir en que mi intención era transmitir "The built idea", la idea construida, como la idea de un arquitecto que se materializa en un edificio construido. Este "The built idea" que lleva ya más de 20 ediciones en Castellano, 4 en portugués, 1 en francés y 1 en inglés editada por japoneses, va a ser editada por una editorial china en inglés. Con una gran tirada para, inmediatamente ser traducida y difundida en chino.

DOCENCIA

Hay situaciones en las que es necesario para los arquitectos y los ingenieros y los estudiantes de estas áreas, tener un inglés perfecto. El mejor posible, no sólo en la gramática, sino en los términos técnicos. Cuando se ejerce la docencia o se dan conferencias en el extranjero. Yo he dado mis conferencias en Japón o en Noruega o en Alemania en inglés. Y mi docencia en Penn no podría haberla dado en otra lengua que no fuera el inglés.

Aún recuerdo las risas de los asistentes cuando en mi primera conferencia en Italiano, en Italia, hablé de una "coperta a due aque" que significa una "manta a dos aguas" que no significa nada. Debí decir "tetto a due falde" que es, en correcto italiano, la traducción de la "cubierta a dos aguas". En estas materias hay que hablar con palabras exactas para transmitir bien las ideas. Y también para aprender, para estudiar.

FINAL

Que alguien elabore un libro que ponga al día los términos técnicos necesarios para los estudiantes, los arquitectos y los ingenieros, es un regalo. Este es un libro que debería haber aparecido hace tiempo en el mercado y que, ahora, hay que agradecer a sus autores. Un libro que nos da alas para poder volar con las nuevas tecnologías y que no debe faltar en ninguna biblioteca universitaria.

(English version)

WORDS AS BIRDS

As words, like birds, can swirl up in the air on the wings of Poetry, so can they ride on the back of Shakespeare´s language to reach the most secluded places in this world, especially with the help of new technologies.

Thus, this book full of English words key in Architecture, Engineering and Computing shall be an efficient tool to write and speak accurately in English about these specific fields. The way is open for architects and engineers, professors and students to take the world by storm.

With precise English words communication can therefore be precise too. Precision is required to transmit knowledge and to communicate Architecture and Engineering. The English language is that universal.

CERVANTES

The English language's universality was well understood by Cervantes, so severe in appearance, when upon completing *Don Quixote of La Mancha*, he commanded himself a translation into English to Shelton in 1612. Curiously enough, that very same year Homer was also translated into English for the first time by Chapman.

Don Quixote's words reached such a scope that Jefferson, the third US President, who happened to be an architect, used to tell his daughter off because "she wouldn't read her *Don Quixote of La Mancha*" like he had prescribed her.

COMMUNICATION

Not only is the command of English important, it is paramount when using computers for which English is essential.

As soon as I get an email in Chinese or Japanese or in another language I can't understand, I delete it right away. That is not the case of the many letters written in English for they are naturally taken in. Moreover, there exist words in Spanish that might seem hard to translate such as "*infalible*" or "*inefable*" and which simply translate into "infallible" and "ineffable". However, "*compass*", "*pluma*" and "*spirit*

When my book "*La idea construida*" was translated into English, the first draft was titled "The constructed idea". I had underlined that my intention was to transmit "the built idea", not unlike an architect's idea coming true in the shape of a finished building. "The Built Idea" has over 20 editions in Spanish, 4 in Portuguese, 1 in French, 1 in English done by

Japanese publishers and it will be edited by a Chinese publisher in English to be translated and distributed in Chinese.

LECTURING

In certain situations, architects, engineers and students in this field need to have a perfect command of English. The best they can, not only in terms of grammar, but also regarding technical terms. This is especially true when lecturing or giving conferences abroad. I have given lectures in English in Japan, Norway and Germany. My lectures in Penn could have been given in no language other than English.

I still remember the attendants of my first conference in Italian, in Italy, sniggering when I mentioned a "coperta a due aque" which means a "double-watered blanket" and has no meaning whatsoever (I should have said "tetto a due falde" which translates correctly to "gable roof"). In fields such as these, the right words are necessary to transmit ideas successfully. This is also true when learning or studying.

FINAL

Having someone compiling in one book and updating all the specific technical terms needed by students, architects and engineers is a gift. This book should have been launched into the market long ago and makes its authors worthy of our recognition. This book gives us wings to fly again on the wings of new technologies and shouldn't be missing in any university library.

—Alberto Campo-Baeza

ACKNOWLEDGMENTS

ABBREVIATIONS

ACE   Architecture and Civil Engineering
CL   Corpus Linguistics
ESP   English for Specific Purposes
LACE   Language of Architecture and Civil Engineering
LSP   Languages for Specific Purposes
RCC   Reinforced Cement Concrete

INTRODUCTION

This book has been written with three concentric audiences in mind, the most central being linguists and Languages for Specific Purposes (LSP) practitioners. The next ring includes those architects and civil engineers willing to deeply understand and to be aware of the use of their professional language from a comprehensive approach that takes into account cognitive, social and pedagogical factors. This would enable them to adapt it to their needs and to exploit it conveniently. The outer ring comprises architecture and civil engineering students who partake in a wide scope content and conceptual core, and who may use English as an academic and professional vehicle of communication now or in future work scenarios. According to the European Commission, language learning is a lifelong skill that needs practical tools of which this book could be a useful example.

The structure of the book has been designed to be read and used independently of its content outline by anyone interested in these areas. The book is divided into six chapters; each of them being the result of previous research carried out from various interdisciplinary angles, and has been addressed from the language and communication approach. Another innovative feature of this work is that new approaches to language and linguistic studies have been incorporated and addressed. For example, recent findings on Corpus Linguistics and Cognitive Linguistics, such as metaphor, meaning interpretation and lexical collocation analysis have been highlighted. Text studies and new electronic genres such as academic and professional e-mails have also been considered. The arrangement of the chapters follows a similar format; each one based on theoretical background contents, and has been written in a clear and accessible style. The chapters also contain a practical section with examples and follow-up tasks inspired or taken from authentic engineering and architectural materials such as journals (including electronic ones), essays, research textbooks, etc.

In sum, this volume has been designed to cover and highlight, both for the novice and the expert, the main features that shape and define the type of communication and main genres that architects and civil engineers use and deal with throughout their training and careers.

CHAPTER ONE

MESSAGE ORGANIZATION IN THE LANGUAGE OF ARCHITECTURE AND CIVIL ENGINEERING

This chapter deals with:

- ✓ The main types of architecture and civil engineering texts and genres.
- ✓ The typical sections they may contain.
- ✓ The rhetorical functions and characteristics that may be found in LACE.

Do you know that...?

The analysis of any piece of written information can be made in different ways depending on our aim and expectations about the text. Traditionally, two approaches have been used to disclose the inner texture of a text, namely the "top-down" approach and the "bottom-up" approach. The first one consists of exploring the overall organization of the text, e.g. focusing on major graphic parts, textual functions and structural conventions (macro-level). Thus, we get familiar with the different structures of a journalistic article, a doctoral thesis, an engineering report, an abstract, or an instruction manual. By contrast, the bottom-up approach is concerned with the analysis of the different components of the text, such as the choice of words or the syntactic arrangement (micro-level). Obviously, both levels of analysis can be used to study any ACE text.

The notion of *genre* basically refers to the macro-level organization of discourse. This applies to written or spoken genres, though the present work will rather focus on the former ones. It is through the study of genres that we are able to see "the big picture" of any piece of discourse and to make sense of the organization of messages. Here is a list of some of the most common LACE academic and professional *genres*, some of them are dealt with in subsequent chapters of this book.

❖ Abstract	❖ Report
❖ Research work	❖ Thesis
❖ Professional e-mails	❖ Business Letters
❖ Journal Articles	❖ Resume/CV
❖ Specifications	❖ Instructions

Table 1-1.

According to John Swales, "The principal criterial feature that turns *a collection of communicative events into a genre is some shared set of communicative purposes*" (Swales, 1990: 46). Most genres use conventions related to communicative purposes, for example, a business letter may start by referring to a published job position, because its purpose would be to apply for a specific job and its requirements. These conventions are shared by the addressee (the company offering a job) and the sender (the person applying). In an argument essay, the writer would emphasise their thesis since the aim is making a point. Thus, the specific social goals become main foci when genre is discussed. It also implies that before writing, the context of a situation should be considered and analyzed in order to anticipate the linguistic features that are required. Some examples of genres may be more prototypical than others, depending on their structure, formal aspects, etc. however, for genre membership some basic resemblance should remain, which according to Swales would be its communicative purpose (Ibid.49-50).

I. An example of academic genre: abstracts

An abstract is a summary consisting of a limited number of words referred to a completed research work. If done well, it makes the reader want to learn more about that research. It usually precedes research articles published in specialised journals and its length in LACE may range from 100-250 words.

These are some basic components of an abstract in any discipline:

1) Stating the problem/motivation: Why are we concerned about the problem? What practical, scientific, theoretical or artistic gap is that research trying to fill? E.g. To study the location of a new building in a historical town central area.

2) Methods/procedure/approach: What did we actually do to get these results? E.g. we analysed 3 bridges, completed a series of short projects, interviewed 17 architects)

3) Results/findings/product: As a result of completing the above procedure, what have we learnt/invented/created? E.g. we have shown the advantages of a type of concrete or material.

4) Conclusion/implications: What are the larger implications of our findings, especially for the problem/gap identified in step 1? E.g. we provide the environmental implications of inserting a dam in a specific site.

When the abstract forms part of a journal article or paper to be published, it is common to add four or five *keywords* at the end which make reference to the main ideas expressed in the text.

Example of ACE abstract:

In this paper the Italian CNR-GNDT vulnerability index for masonry buildings was modified to apply in confined masonry buildings and to obtain a reasonable relationship with the wall density per unit floor index. With this purpose, a sample of twenty-four confined masonry buildings with three and four storeys built during the last twenty-five years for social housing programs was used. A relationship has also been obtained between the value of the proposal index and the damage observed in the March 1985 Central Chile subduction earthquake (M_s=7.8).

Keywords: *Seismic vulnerability; Confined masonry buildings; Relationship vulnerability index–damage.*

Source: Kenneth, A., Gent, F., Gian, M., Giuliano, M., Maximiliano, A., Astroza, I., Roberto, E. (2008) 'A seismic vulnerability index for confined masonry shears wall buildings and relationship with the damage', *Engineering Structures*: 2605-2612.

II. An example of professional-academic genre: Reports

There are many types of academic or professional reports. In LACE you may need to write a report on a particular work to present to your boss or maybe you have to write a report for a team of engineers or for a mixed audience that includes other professions of non-experts in the field. When preparing a report, these are important factors to bear in mind. Typically, the structure of a report would cover the following:

1. **Introduction**: It provides a general overview of the work. It usually includes a literature review on the project to be developed, or specifies background reading on the project. The introduction also shows previous preparation before commencing the work. This section will enable you to explain what makes your project interesting and distinct from previous works as well. The introduction can be finished with the aims of the project.
2. **Methodology**. The procedure followed may now be written, explaining with as much detail as required for the reader to understand everything that was done: work execution, problems encountered with precise data and numerical figures. It is usually written in past tense and using passive voice. Appendices are sometimes generated during the writing of the core of the report.
3. **Results/Discussion**. In these two sections, both textual and visual information are included: graphs, diagrams, maps, that may contain information to explain work development, expected or unexpected outcomes and on how possible problems were solved.
4. **Conclusions**. The conclusion will highlight the most relevant parts of the work by stating concisely major aspects of the results and discussion. The conclusions should not include new material. This section basically condenses the content of earlier sections. Ideally, it should be written bearing in mind readers who may wish to become familiar with your work without knowing the fine details.
5. **Appendices.** Finally, a summary may be written. This is not new material either, and should include key points from the introduction and the conclusions.

Furthermore in the field of architecture report genres, we can find a sub-genre design report where we can find further reports such as feasibility report, sustainability report, conservation area report, listed building consent report, traffic report, ecology report etc.

Basically these sub-genres consist of a "design statement", page section and previous named reports depending on the purpose of the project submission. However the most frequent used report genre for students in an academic context is the descriptive report of a project.

To see examples of ACE reports, you can click the following link:
<http://www.civil.usyd.edu.au/publications/2004rreps.shtml#r835>

Each academic and professional genre may contain rhetorical functions according to the text type and to the communicative intentions of the author, as we can see below:

III. Main rhetorical functions of ACE texts and the genres they may belong to

a)   **Descriptive**

If we have to describe a *building site* where a structure will be built, then the main function of the text will be descriptive. Therefore we may use verbs of 'non-change' (e.g. *to be, to stand, lie, rest,* etc.) and adverbs of place *(away, up, in, down, underground, outdoors, outside)*. Technical descriptions tend to be neutral, exact and impersonal. Depending on what we are describing, descriptions can be:

i) Mechanism/Location description

It may explain the arrangement and shape of an object in space or the ins and outs of a particular location where a structure will be built. Typically, the parts of mechanism description answer the following questions:

- What is it?
- What is its function?
- What does it look like?
- How does it work?
- What are its main parts?

Thus, the description of a building location would answer these questions:

- Where is it? What will its function be?
- What is its orientation and shape?
- What type of area is it (industrial, residential....)
- What problems may the building entail?
- What type of planning regulations may apply?

An example of this type of description may be describing what a crane consists of. Such a description may involve movement. Complex motions are better handled with process description.

ii) Process description

It explains the arrangement of a sequence in sequential order. It is similar to mechanism description, except that the part-by-part becomes step by step, answering questions such as:

- What is it?
- What is its function?
- Where and when does it take place?
- Who or what performs it?
- How does it work?
- What are its main steps?

For instance, we may describe how a bulldozer operates or how a work in a building site progresses.

Descriptions can be used in various technical genres, for instance research journal articles, they could be a part of a report, or used in technical manuals and textbooks.

b) Narrative

If we need to write a report about the steps needed when building a *dam*, for example, then we are talking about a narrative text. Narrative texts types deal mainly with changes in time, i.e. with actions and events. Typical text type markers would be verbs that denote 'change' as well as expressions of time (time-sequence signals); likewise adverbs of place could also be used. Genre type: the narrative function is typically used in technical reports.

c) Instructive

If we are going to give precise information about how to operate with a *paving machine* in highway construction, or about enforced *environmental regulations*, then instructive texts will be used. In this type of text either the imperative mood or the passive voice with modal verbs *must or should* are usually used. Genre type: Technical manuals, leaflets with technical specifications.

d) **Expository**

If we are explaining the various stages of *concrete* placing or providing information about ideas to design a cable-stayed bridge, then we are probably using an expository text. Usually, the main ideas are explained by means of supporting details, by giving examples and specific data. Typical verbs for the identification and explanation of objects and ideas are: *to refer to, be defined, be called, consist of, contain* etc. If we have to establish a relation to previously mentioned facts and ideas, we may use expressions such as: *namely, incidentally, for example, in other words*, etc. A similarity to preceding phenomena can be expressed by: *similarly, also, too*; additional information can be indicated by expressions like: *in addition, above all, moreover*, etc. This function is typically used in genres such as expository essays, summaries, also being frequently used in textbooks.

e) **Argumentative**

When writing to give reasons for a new theory, idea, or viewpoint that we intend to show to other engineers or architects, we are probably using argumentative texts. Reasons for or against a number of topic are put forward. The ultimate goal is usually to win the reader/audience round to the author's side. This is a leading contrastive text structure, and expressions like *but, by contrast, however, yet, still, in any case, so*, etc. work as its linguistic signals. However, the basis of any argumentative text is provided by expository passages, by the explanation of facts, concepts, developments or processes. While comments tend to be subjective in character, scientific arguments seek to be objective. The argumentative function may be used in journal articles, abstracts, or parts of a report.

Let us focus now on some major characteristics of architecture and civil engineering texts:

IV. Typical features of ACE texts

a)   **Use of text and visual information**

ACE texts often include lots of visuals that help to illustrate and cast light on the meaning expressed. Visual display is part of the training that architects and engineers receive and therefore it is a feature in designs, projects, and a basic part in their communication. Visuals may consist of

charts, diagrams, pictures, drawings, graphs, etc. Visual information frequently includes explanatory texts to guide about the type of visual information exposed, or stating why that information may be relevant. In this sense, explanatory texts reinforce visuals. According to Trimble, visuals "provide us with detail difficult to explain in words" (Trimble, 1985: 103). On the other hand, numerical data, graphs and sketches form part of architects and engineers training, thus it is important to give clear clues to interpret them. Furthermore, visuals may help to exemplify instructions, descriptions, reports, laboratory experiments or any other type of technical discourse.
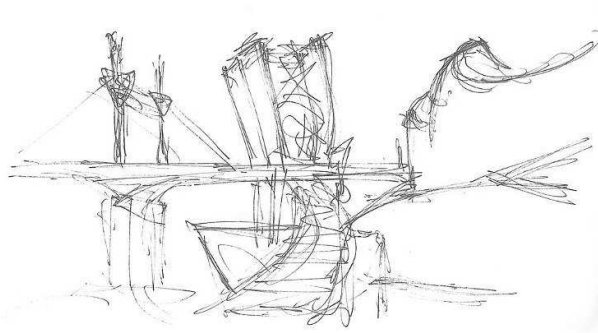
Ex. 1-1 Sketch Guggenheim Museum Bilbao (Spain) by Frank Ghery

For instances, in architecture and engineering contexts drawing are produced to provide a better idea either about the project itself or a about detail. A sketch can be nowadays entirely computer-generated.
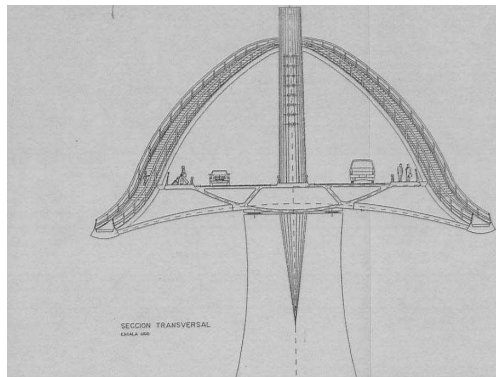
Ex. 1-2 Sketch Puente de Ourense (Spain) by Alvaro Varela