

# DESIGNING A TECHNICAL PROJECT OF COMMON TELECOMMUNICATIONS INFRASTRUCTURE

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# Foreword

This book has been written to help students who are following the “Telecommunications Infrastructures” course, which is a mandatory subject in the Master in Telecommunications Engineering at the Engineering School of Linares, Universidad de Jaén.

“Designing a Technical Project of Common Telecommunications Infrastructure” has been devised to complement the previous book (“Common Telecommunication Infrastructures”) that was written to introduce the Spanish regulation related to this issue. In this case, a real example of a common telecommunications infrastructure technical project is presented. Therefore, this book is intended to provide students with explanations on how these kinds of technical projects could be designed.

In this respect, this book presents the different parts in which a CTI technical project must be broken down: report, plans, specifications and, budget and measures. Therefore, the structure of this book has been matched accordingly so that each chapter corresponds to each part of the technical project.

Additionally, every single common telecommunications infrastructure technical project should include a cover with specific information related to the project, the developer and the engineer. In this book this cover is provided at the end of this foreword in order not to interfere with the mandatory index and its structure required by the regulation.

To provide students with specific explanations and to make it clear that these explanations are not part of the technical project, a specific format like the following one has been used.

### **EXPLANATION**

Explanations considered necessary by authors are included in colored boxes like this one. Therefore, the reader must bear in mind that this content is not part of the technical project and has only been included to provide explanations on different issues.

It is important to point out that this technical project tries to meet the minimum quality requirements set by the Official Professional Association of Telecommunication Engineers (Colegio Oficial de Ingenieros de Telecomunicación):

- The technical project will be written with clear language, with no vague or ambiguous terms and will be bound so as to contribute to improving its appearance and presentation, as well as its handling.
- It will have separators for each section: Report, Plans, Specifications and, Budget and Measures. In addition, it will have a general index indicating the page number of each point.
- The original signature of the author, in the copies that are presented on paper, must appear at least on the cover, at the end of each section and in all the plans and diagrams, together with his or her name and surnames, qualification and associate number.
- The technical project will comply with all the requirements established in Royal Decree 346/2011, March 11 and Order ITC/1644/2011, June 10. Its structure and content must

correspond faithfully with the model established in Annex I of the aforementioned Order.

- The first time an acronym or abbreviation is used that is not considered in the legal regulations of Common Telecommunications Infrastructures, its meaning will be presented in brackets.
- The use of future tense will indicate mandatory requirements. Non-mandatory proposals will be expressed by conditional tenses.
- In general, following, the Spanish Standard UNE 157001 “General criteria for the preparation of projects” is recommended, as far as possible.

## TECHNICAL PROJECT OF COMMON TELECOMMUNICATIONS INFRASTRUCTURE

Technical Project of Common Telecommunication Infrastructures for the building: 10 dwellings in Linares, Jaén (Spain)			
<b>Description</b>	No. Floors:	No. Dwellings:	No. Premises / Offices: 0
	4	10	
<b>Location</b>	Kind of street:	Name of street:	
	Avenue	13 Champions League	
	City: Linares		
	Zip code: 23700	Province: Jaén (Spain)	
	Geographic Coordinates (degrees, minutes, seconds):	38°5'9.521" N	3°38'37.989 W
<b>Developer</b>	Name or business name: Rodrigo Díaz de Vivar		
	TIN (Tax Identification Number): 11111111-Y		
	Address:	Kind of street: Avenue	
		Name of street: Colada y Tizona, 28	
	City		Linares
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	Phone: 555-5555 55		Fax:
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# Report

## EXPLANATION

The report describes the purpose of the project, the included services, the initial data, calculations and their results, which determine the features and quantity of the materials or equipment to be used, and their location in the different networks that make up the CTI (Common Telecommunication Infrastructures).

The description of the building should be as detailed as possible, placing it in its surroundings. In the section “Application of the Law of Horizontal Property”, the community or communities of owners who share the CTI will be described, and where appropriate the establishment of easements for the use of non-common elements of the building will be described.

In the section “Purpose of the Technical Project”, the legal provisions fulfilled by the project will be indicated. In the event that any technical solution other than those foreseen in regulations is adopted, taking into account the Second Additional Provision of Royal Decree 346/2011, this circumstance together with its vindication will be mentioned at this point, and included in

the corresponding point of the report, ensuring that the functionality of the installation is not diminished. It will also be indicated in this section that the project is written according to the information provided by the developer and the building designer (architect), in order to obtain the license for the start of the construction works. Nevertheless, taking into account the period of time that normally passes until said license is obtained and the procedure for the enquiry and information exchange between the CTI project manager and the telecommunications operators established in article 8 of Royal Decree 346/2011, prior to its execution, it may be necessary to update the CTI project. This update will be carried out by the CTI project manager, if any, or by a Telecommunications Engineer, at the time of the Rethinking process prior to the construction works starting.

The sound and television broadcasting signals that must be distributed are those that meet the conditions established in articles 4.1.6 and 4.1.7 of Annex I. In particular, the channels broadcasted by the repeaters corresponding to the area where the CTI is installed should be distributed. Just when it is verified that the signals broadcasted by the local repeater do not meet the minimum levels of field strength established in the aforementioned article, the distribution of the corresponding channels to another zone or autonomous community will be allowed.

The attenuation calculations will be included from the header amplifiers to the user sockets. The indication of the best (least attenuation) and worst (highest attenuation) of each dwelling shall be valid, since the attenuation values of the remaining user sockets are between these limits.

In the corresponding points, reference will be made to the section of plans showing the location of the elements for collecting signals and the entry handhole. In addition, at each point, reference will be made to the Specification section in which the technical characteristics of each of the elements are specified.

To conclude, at the end of each sub-section of the Report, a summary table will be included with all the elements that make up the CTI.

Remember that this part has been carried out bearing in mind Ministerial Order ITC/1644/2011, June 10. Annex I, and the Royal Decree 346/2011, March 11.

## 1.1 GENERAL INFORMATION.

### 1.1.A details of the developer.

#### EXPLANATION

It is important to point out that the information related to the developer is fictitious.

Name: Rodrigo Díaz de Vivar.

TIN: 1111111-Y

Address: Colada y Tizona, no. 28. 23700 Linares (Jaén) (Spain)

Telephone: 555-55 55 55

E-mail: miocid@ujaen.es

1.1.B Description of the building or housing development, indicating the number of blocks, portals, stairs, floors, dwellings per floor, rooms in each house, commercial premise, office, etc.

Building with:

Blocks: 1

Floors: 4

Dwellings/floor:

Third Floor: 2 dwellings

Second Floor: 3 dwellings

First Floor: 3 dwellings

Ground Floor: 2 dwellings

Total: 10

This building has no premises or offices. In addition, there are no common enclosures in the building except the garage, which is located in the basement. The building is located at Champions League, 13 at 23700 Linares (Jaén).

Floor	Number of enclosures per dwelling		
Third floor	A: 3	B: 3	
Second floor	A: 5	B: 5	C: 3
First floor	A: 5	B: 5	C: 3
Ground floor	A: 5	B: 5	

Table 1.1. Number of enclosures per dwelling.

### 1.1.C Application of the Horizontal Property Law.

#### EXPLANATION

In order to know the scope of the Horizontal Property Law 8/99, articles 2, 13 and 20 must be taken into account. When applicable, it will be indicated that the building is or can be leased for more than one year. In addition, the number of owners' communities shall be indicated. Common elements of the building, especially the garage and basement, as well as needed easement rights in order to implement the technical project, which shall be described in specification section 3.1.F.

Law 49/1960 of July 21 on Horizontal Property, which was modified by Law 8/1999 of April 6, is applicable to the building to which this project is addressed.

The building is a unique owners' community. The garage represents a common element in the building. However, this circumstance does not imply any kind of easement rights in order to implement the technical project.

### 1.1.D Purpose of the Technical Project.

The purpose of this technical project is none other than to comply with Royal Decree 1/1998 of February 27 on common infrastructures in buildings for access to telecommunications services and establish the technical conditions that must be met by the installation of CTI, in accordance with Royal Decree 346/2011, of March 11, concerning the Regulation related to common telecommunications infrastructures for access to telecommunication services inside buildings and Order ITC/1644/2011, of June 10, of the Ministry of Industry and Tourism and Commerce, which implements the aforementioned Regulation.



Likewise, there will be compliance with Law 10/2005, of June 14 (BOE 06/15/2005), on urgent measures for the promotion of Digital Terrestrial Television, liberalization of cable television and the promotion of pluralism.

### EXPLANATION

If, at any point in the project, any solution different to those considered in the Regulation were adopted, in application of the Second Additional Provision of Royal Decree 346/2011, this circumstance will be stated at this point. In addition, the report will include, in the corresponding section, the justification for the solution adopted, ensuring that any functionality is not diminished.

The common telecommunications infrastructure consists of the elements needed to initially satisfy the following functions:

- a) The collection and adaptation of terrestrial sound broadcasting and television signals, and their distribution to the connection points located in the different dwellings or premises of the building, and the distribution of satellite signals, of sound broadcasting and television to the aforementioned connection points. The sound broadcasting and terrestrial television signals susceptible to being collected, adapted and distributed will be those contemplated in sections 4.1.6 and 4.1.7 of Annex I of the aforementioned Regulation, broadcasted by the authorized entities within the corresponding area.
- b) Provision of access to the public available telephony service and access to broadband telecommunications services, provided by public telecommunications networks, through the necessary infrastructure that allows for the different dwellings to connect to the networks of authorized operators.

The CTI is supported by the channeling infrastructure dimensioned according to Annex III of Royal Decree 346/2011, which guarantees the possibility of incorporating new services that may arise in the near future.

A frequency plan has been established for the distribution of terrestrial television and radio broadcasting signals of licensed entities that, without manipulation or conversion of frequencies, allows for signals not included in the initial installation to be distributed through the provided conduits, so that the existing services are not affected and the channels devoted to other services that may be incorporated in the future are respected. The disappearance of analog TV and the incorporation of terrestrial digital TV entails the use of the frequencies 195.0 MHz up to 223.0 MHz (C8 to C11, BIII) and 470 MHz up to 694 MHz (C21 up to C48, BIV and BV), which will be used as a priority for the distribution of digital sound broadcasting and digital terrestrial television signals.

## 1.2 ELEMENTS OF THE COMMON TELECOMMUNICATION INFRASTRUCTURE

### EXPLANATION

All information, calculations or results will be included here as per the technical characteristics of the materials involved in the installation and their location.

### 1.2.A Collection and distribution of terrestrial television and sound broadcasting.

#### a) Design considerations

After analyzing the electromagnetic environment in the area where the building will be built and performing the necessary field measurements, the field levels have been evaluated, which in the current situation can be considered as incidents on the antennas and which can be adequate so that the signals are distributed with the quality levels established in section 4.5 of Annex I of Royal Decree 346/2011. The chosen design will guarantee an input signal level higher than 47dBmV for COFDM (Coded Orthogonal Frequency-Division Multiplexing) signals.

The antennas have been selected in order to obtain, at their output, an adequate signal level of the different broadcasted services. The type of antennas that will be used is indicated in section 1.2.A.h.1), and the electrical and mechanical features are established in section 3.1.A.b).

The channels will be amplified in the header equipment, located in the UETF (Upper Enclosure of Telecommunication Facilities), by means of single-channel amplifiers in order to avoid intermodulation between them. Its noise figure, gain and maximum output level have been selected to guarantee the quality levels required by Royal Decree 346/2011. The output level of the amplifiers will be adjusted, as described in section 1.2.A.g.4, so that the aforementioned quality levels for the broadcasting and television services are met.

Following the provisions of Annex I of Royal Decree 346/2011, the distribution networks will be installed in duplicate, thus guaranteeing the arrival of two coaxial cables to the UAP (User Access Point). The distribution network is made up of tree-branch topology, seeking the best possible balance in the whole 5-2150MHz band, by means of the derivators that are described in the corresponding sub-section of the specifications. The interior user networks have been designed with a star topology, placing a distributor at the exit of every UAP with sufficient outputs to service the rooms (not including bathrooms and storage rooms) that exist in the dwelling.

### EXPLANATION

If there are any premises, these should be described. Efforts will be made to have a signal level at the output of the taps similar to those of the next floor up, in order to ensure that as many user sockets can be installed in premises as in the homes.

#### **b) Terrestrial sound and television broadcast signals received at the receiving antenna site.**

In the location of the antennas, the programs indicated below are received from licensed entities. Depending on the signal level measured in the area where the building is located, for the terrestrial programs that are received and

by applying the appropriate corrections, depending on the expected height for the location of the antennas (18 m) and the gain of the selected antennas, the input signal values are provided for the channels to be distributed, as shown in Table 1.2. No unlicensed program is received, therefore, there are no interfering channels.

Name	Channel	Frequency (MHz)	Signal Level (dB $\mu$ V)
RGE1	22	482	70
RGE2	39	618	71
MPE1	32	562	68
MPE2	35	586	67
MPE3	25	506	70
MPE4	26	514	72
MPE5	45	666	69
MAUT	42	642	70
LOCAL CHANNEL	41	634	68
FM	Channel in 87.5 up to 108 Band		70 (typical value)
DAB	Channel in 195 up to 223 Band (channels 8-11)		58 (typical value)

Table 1.2. Expected Input Signal Levels.

This table includes the DTT multiplex channels that have been assigned, for the geographical area of Jaén, by Royal Decree of 391/2019, June 21, which approves the National Technical Plan for Digital Terrestrial Television and certain aspects are regulated for the release of the second digital dividend.

## EXPLANATION

In this point, it is important to highlight that this project includes not only the first “digital dividend”, but also the second one, which will come into effect on June 30, 2020.

The digital dividend is the process by which the radio spectrum dedicated to TV is reduced as a result of the greater efficiency of free Digital Terrestrial Television broadcasts and by which, this spectrum is assigned to mobile payment communications services.