



DANE
Para tomar decisiones



Design (DSO)
Methodology and Statistical Production Division
(DIMPE)

METHODOLOGY CENSUS OF BUILDINGS CEED

April 2013



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Bogotá, D.C., 2013

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PRESENTATION

The National Administrative Department of Statistics (DANE), as the coordinator entity of The National Statistical System (NSS), works to strengthen and consolidate the NSS. This is carried out through the production of strategic statistics; the generation, adaptation, adoption and dissemination of standards; the consolidation and harmonization of statistical information, and the connection of instruments, stakeholders, initiatives and products. These actions are carried out in order to improve the quality of strategic statistic information, and its availability, timeliness and accessibility to respond to users demand.

In this context DANE, aware of the need and obligation to provide better products for its users, developed a standard guide for the presentation of methodologies. The aim of this guide is to contribute with the visualization and understanding of statistical processes. Based on this instrument, the DANE designs the methodological documents about its statistical operations and investigations, which are available to both specialized users and public in general. In these documents, the technical characteristics of processes and sub processes pertaining to each research is presented in a standard, complete and easy-to-read manner; this way allowing its analysis, control, replicability and evaluation.

These series of guides promote the transparency, reliability and credibility of the technical expertise of DANE, for a better understanding, comprehension and use of statistical information. This information is produced according to the principles of coherence, comparability, integrality and quality of the statistics.

This document meets the standard adopted by DANE to present the set of methods and procedures through which the Census of Buildings (CEED) is constructed, providing to the users an informative and clear methodology.

INTRODUCTION

Since 1996, the DANE worked in the design of a methodology on the Census of Buildings, which was later implemented in 1997 in order to provide statistical tools and indicators that support and optimize the analysis of construction activity, and thus contributing to the good development of instruments that complement the existing ones for the direct calculation of economic aggregates and particularly the identification of construction sector GDP, in a quarterly basis.

The purpose of this statistical operation is to provide reliable and timely data on the construction activity to policymakers, investigators, public and private organizations, and public in general, in order to define its composition, development and production in the main country cities.

Since its origins, this statistical operation has made important progress on its methodological procedures, with the intention to count with the best approaches in terms of statistical monitoring of the phenomenon observed, and also having a permanent interest for both improving the processes and optimizing the use of available resources. Thus, since the development of the third census (July 1997), the DANE has implemented and adjusted the statistical method so-called longitudinal panel, which enables the detailed monitoring over time of each of construction works, either in progress or paralyzed, under investigation. Likewise, since July 2001 the monitoring of works finished and completely sold has been carried out, eliminating deductive and estimation processes, in order to obtain the main indicators on the construction sector by the direct observation and the prompt follow-up of each of the construction works under investigation.

This publication meets the need to document adequately this statistical operation, by presenting the methodology which is applied during the field work carried out monthly for subsequently releasing the results, based on a quarterly basis.

1. BACKGROUND

The DANE, regarding its permanent effort to provide the country with indicators containing strategic, reliable and timely information on the aspects that most influence the national economy and specifically the construction subsector, put into practice the design of the Census of Buildings in 1996. This effort is successfully implemented as a regular exercise since 1997, where the behavior and development of the construction activity is measured based on its own economic operators.

Broadly speaking, the behavior and evolution of construction sector was being calculated taking into account the construction activity reported by Construction Permits indicators, the Dwelling Construction Costs Index, and the apparent consumption of cement. However, the use and analysis in a short run of such indicators has limitations as they only provide a part of the statistical acquis for this sector.

In addition, it is well known that the construction sector is characterized by its dynamics and by their different inter-relationships with other economy sectors. The relevance of this sector is evident when it is considered as an important source of employment, as an important part in the GDP and by its participation in the creation of a substantial gross fixed capital formation.

The statistical operation counts with a geographical coverage of four urban areas: Bogota, Cali, Barranquilla and Pereira; and two metropolitan areas: Medellin “including Barbosa, Bello, Envigado and Itagüí” and Bucaramanga “including Floridablanca, Girón and Piedecuesta”.

In line with the development of the Census, the *longitudinal panel* statistical method was put into practice. This approach allows monitoring the same observation units over time.

In the first version, the coverage by construction work size included: for the case of stratum 1 and 2, the buildings in process lower than 100 square meters and the inactive construction works lower than 500 square meters.

In October 1999, the geographical coverage was expanded and the universe of study included the city of Armenia, in order to monitor the re-construction processes carried out in this city as a consequence of the January 25th 1999 earthquake.

In July 2001, the coverage of study was expanded by size of construction work in stratum 1 and 2, and all works that were found in process of construction in both strata were completely surveyed. Furthermore, with the intention to include the self-construction processes, questions regarding aspects such as: units for sale and prices of finished works were included, making a follow-up until the selling of the last unit.

In April 2002, five remaining municipalities were included in order to cover the metropolitan area of Medellín: Caldas, Copacabana, Girardota, La Estrella and Sabaneta.

In April 2004, the thematic coverage was expanded including variables such as: construction systems and labour force.

Since 2006, it was gradually implemented the use of Data Capture Devices (Dispositivo Móvil de Captura DMC) in the seven coverage areas.

From 2007, the cities of Cucuta and its metropolitan area “El Zulia, Villa del Rosario and Los Patios”, as well as Villavicencio, Ibagué, Manizales, Pasto, Popayán, Neiva and Cartagena were added up to the Census geographical coverage.

In 2008, the use of the Data Capture Device (DMC) was consolidated in all the fifteen cities covered in the statistical operation.

In April 2011, the thematic coverage is again expanded, including variables such as: plot's area, number of buildings constructed and number of floors by building “regarding its purpose or destination”.

In 2012, variables such as: formal works and the construction permit number of works surveyed were considered in the data collection process. Likewise, since that year, efforts were done to extend the geographical coverage. That is why, from the first quarter 2012, in the operation was included the monitoring of 18 municipalities additional to the current coverage: Cajicá, Chía, Cota, Facatativá, Funza, Fusagasugá, La Calera, Madrid, Mosquera, Sopó, Zipaquirá, Rionegro, Jamundí, Palmira, Galapa, Puerto Colombia, Turbaco and Malambo.

In the second quarter 2013 publication, the additional coverage of the above 18 municipalities was included; with historical data since the second quarter 2012.

2. STATISTICAL OPERATION DESIGN

2.1 THEMATIC DESIGN

2.1.1 Needs for information

The need for providing a complete outlook on the construction subsector is given due to its serial linking with the other economic sectors, its contribution as a source of job and value added, and to the gross fixed capital formation. Therefore, the identification of its behavior also allows to provide the information required to calculate the construction sector quarterly GDP.

Before the Census of Buildings was created, there was not information about the development, in a short term, of construction sector and it was only measured by using: the statistics on the Construction Permits, the Dwelling Construction Costs Index, and the indicator of apparent consumption of cement. It was therefore necessary to measure the construction activity in a direct way, by monitoring the construction works the cities with a higher dynamics.

This is the manner how the Census of Buildings allows observing the evolution of building construction, regarding destinations such as: houses, apartments, public administration buildings, hospitals, commercial premises among other. The data capture process of variables enables to obtain the information, ranging from the land preparation to the sale price of the building, by using the direct observation in a fieldwork where a complete coverage of construction works is carried out, regarding the municipalities included in the coverage.

The statistical operation has been thus defined as a planning and monitoring instrument useful for government policies in terms of housing and gross fixed capital formation. In addition, it is considered as the raw material for the calculation of Gross Domestic Product pertaining to the construction subsector.

2.1.2 Objectives

General Objective: to identify the current state of construction activity in order to establish its composition, evolution and production.

Specific Objectives

- To define the behavior and status of construction works over time, using the longitudinal panel as statistical technique.

- To determine the state and area of construction works in each inter-census period, in the coverage areas.
- To define the amount of square meters and the number of units by destination, in each inter-census period, in coverage areas.
- To identify the construction stage and the degree of progress “in percentage points” of destinations, in coverage areas.
- To define the construction system of destination “, in coverage areas.
- To define the amount and type of labour force used, in each inter-census period.
- To establish the amount of square meters and units used for dwelling purposes, according to the type of dwelling: Social Housing (VIS), Non social housing (No VIS) and priority housing (VIP).
- To define the amount of units started, according to ranges, by type of dwelling.
- To inquire about the value of square meters, considering the selling price and the direct cost, according to the destination.
- To monitor the units sold pertaining to those construction projects that are carried out to be offered in the real-estate market.
- To contribute with the measurement and calculation of main macro-economic aggregates.

2.2 SCOPE

The coverage of this statistical operation involves all the construction states (in process, Paralyzed – completed, Finished- completed, Paralyzed - incomplete and Finished-incomplete), which are presented according to the following aspects: stages, construction systems, destinations, socio-economic strata, and by urban and metropolitan areas (that comprise the geographical coverage of this statistical operation).

2.2.1 Reference framework

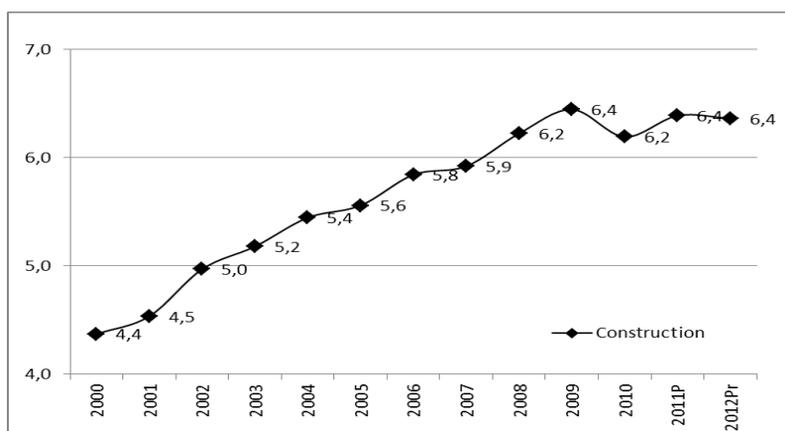
a. Theoretical framework

As mentioned above, the building subsector has a relevant participation in the economy. This can be expressed by its linkages and contributions in the construction sector's value-added and in the employment production.

As such, in the last 12 years, the construction sector's branch¹ has increased its share in the Gross Domestic Product – GDP, averaging 6.3 % in the last five years.

In the last 12 years the buildings subsector presents a share that fluctuates between the 2.0 % and the 3.2 % in the total GDP; meanwhile, in the last five years, its share averaged 3.0 %

Graph 1 Share of construction activity in the GDP Last twelve years



Source: DANE's Synthesis and National Accounts Division

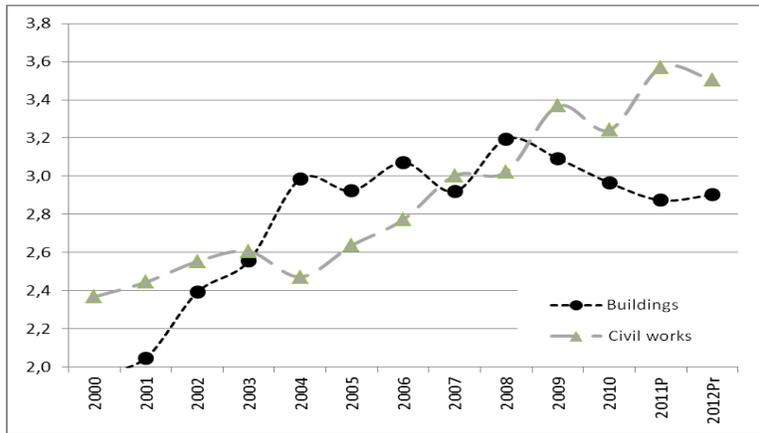
Pr Preliminary figures

P Provisional figures

Date: March/21st /2013

¹ The construction sector's economic branch is formed by the subsectors involving: construction of civil engineering works, the construction of complete buildings and parts of buildings; and the building conditioning.

Graph 2 Share of subsector "Buildings" in the GDP Last twelve years



Source: DANE's Synthesis and National Accounts Division

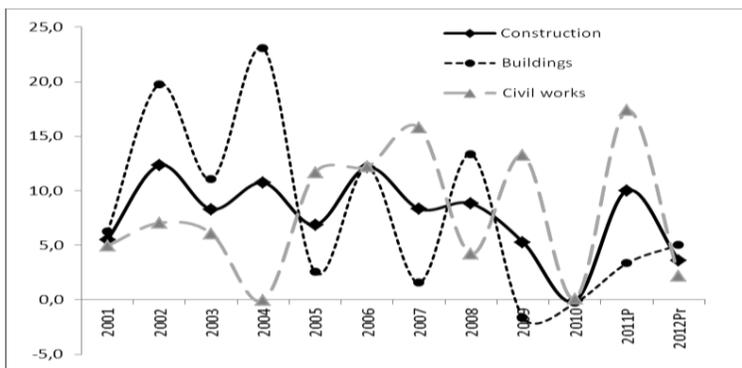
Pr Preliminary figures

P Provisional figures

Date: March/21st /2013

The variation or annual growth of buildings subsector's value added shows evident fluctuations, being the period from 2002 to 2004 the one with strong growth; having in 2004 a growth rate of 23,1 %. During the last two years in the series 2011 and 2012, this subsector mirrors an important recovering in the construction of buildings, after two years of having an evident contraction in which negative growth rates were evident.

Graph 3 Growth rates of activity branch "construction" and the two subsectors that comprise it. Last twelve years.



Source: DANE's Synthesis and National Accounts Division

Pr Preliminary figures

P Provisional figures

Date: March/21st /2013

Its cyclical behavior, its relevant dynamics, their inter-relationships with other economic branches and the need for complementing the analysis and monitoring of construction sector, makes it necessary to design and carry out the Census of Buildings, as a strategic statistics for both the sector itself and the country.

The most widely used instruments in the countries for collecting data on the construction sector are the administrative registers; specially, the construction permits. Such register represents a good framework to define where the building activity is concentrated. However, due to the delay these permits may have, since their creation to the beginning of construction works, it is important to carry out studies that allow to observe in a direct way the sector evolution, hence the need and usefulness to put into practice censuses of construction works.

Data capture of variables from the Census of Buildings allows obtaining information ranging from land preparation to the selling price of buildings. This is done based on the direct observation, through a field work where all the construction sites located in municipalities from the geographical coverage, are completely surveyed.

b. Conceptual framework

- **Works in process of construction:** those works that, at the census moment, are going through any kind of construction process. These works may present the following states:
 - **New works:** works whose construction process was started during the inter-census period. They represent the indicator through which the construction sector tendency, in terms of area, units and price evolution, can be evaluated.
 - **Works still in process:** works that were found as *in process of construction* during the last census, and even in the current census they have the same status. The identification of the framework's main features, in terms of works duration, their price evolution and the speed of construction process can be achieved using this group.
 - **Restarted works:** works that were registered as *paralyzed* during the last census, and now they have construction activity, in the current census.
- **Works which are included in the universe due to coverage expansion:** works which during the last census, were found to be in pre-construction activities (site enclosure, preparation, clearing, leveling, setting out etc); however, in the current census, the construction process of such works started "including excavation and foundation activities"
- **Works still inactive:** all those buildings which, during the last Census, were found to be paralyzed; and in the current census, they are still in the same state.

- **New works:** correspond to such buildings that, at the census time, were included in the group of works paralyzed even because they were classified as inactive in the last census or because they were found for the first time.
- **Finished works:** works that although were monitored in past censuses, the construction process of such ones is finished in the current census.

c. Legal framework

Act 9 1989 establishing the guidelines on municipal development plans, acquisition and expropriation parameters and containing other provisions.

Act 79 October 1993 regulating the application of Population and Housing Census in the National territory.

Act 142 July 1994 establishing the regime of domiciliary public services and containing other provisions. Article 102 defining socio-economic strata.

Act 388 1997 “regulated by National Decrees: 150 and 507 from 1999, 932 and 1337 from 2002; 975 and 1788 from 2004; 973 from 2005; 3600 from 2007; 4065 from 2008; 2190 from 2009; partially regulated by the National Decree: 1 160 from 2010”, modifying the Act 9 1989 and Act 2 1991, and containing other provisions essentially related to land planning.

Act 1450 2011 enacting the National Development Plan, 2010-2014

d. International benchmark

As mentioned above, the instrument widely used in countries for data capture on construction sector are the administrative registers; specially, construction permits. However, the United Nations Statistical Commission at its ninth session directed the attention of national statistical services *“to the need to develop, from housing censuses, the sort of benchmark statistics in housing that could be supplemented by current building and construction statistics and would provide a continuous up-to-date picture of the housing position needed for the consideration of housing programmes”*²

Likewise, the importance of housing or dwelling censuses is highlighted, by producing benchmark statistics on both the current situation of housing in order to define national housing programmes; and human settlements, as the sampling framework for the production of special statistics on dwellings and similars, in years between censuses.

² Official Records of the Economic and Social Council, Twenty second Session, Supplement No. 7 (E/2876), para. 117. Quoted in: Department of Economic and Social Affairs of United Nations, Principles and Recommendations for Population and Housing Censuses, Statistical Papers Series M No.67/ Rev 2, United Nations 2010.

Moreover, UN points out that *“Housing benchmark statistics are also critical for emergency planning for response to natural hazards (such as destructive storms, earthquakes, tsunami, and fires), or post-conflict situations. Following such situations, these statistics can be used to estimate the numbers of people and structures affected the need for emergency response, and reconstruction requirements”*³.

Based on this, the DANE`s Census of Buildings provides information on the evolution of buildings construction, in regards of tradable destinations “apartments, offices, commercial premises, houses and storehouses” and non tradable destinations: “schools, hotels, hospitals and healthcare facilities and others (churches, reception and social centers, etc.)”.

e. National benchmark

There are three sort of national references which are used to construct and contrast this statistical operation. The first reference corresponds to statistics produced by DANE on this sector, and the related statistics that helps to contextualize them. These are:

Statistics on Buildings – Construction Permits – ELIC⁴: This is a statistical investigation based on administrative registers, whose primary objective is to identify and present the potential of construction activity in the country, through the different variables involved in its measurement. It has a geographical coverage of 88 municipalities. This operation is consulted in order to carry out a context/analysis, and as already mentioned, such investigation represent a suitable framework to define where the construction activity is concentrated on.

The Statistics on Grey Cement has as main objective to provide monthly information about the evolution of national production and deliveries of grey cement, using variables such as: cement production, national deliveries in terms of distribution channel, type of package and geographical departments. The consistency and context of information from Census of Buildings is achieved primarily due to the variable “distribution channel”⁵ which is basically the segment to which the cement is delivered, during a given period.

The Dwelling Construction Costs Index – ICCV, measures the evolution of the average cost of inputs demand for the construction of dwellings, taking into account the variations in prices of such inputs at national level. Fifteen cities are surveyed by class of cost and

³ Department of Economic and Social Affairs of the United Nations, Principles and Recommendations for Population and Housing Censuses, Statistical Papers Series M No.67/ Rev 2, United Nations 2010. Page 12.

⁴ Construction permits corresponds to instruments for public administrative control, whose objective is to control in a coordinate way the growth of cities, as well as to ensure the fulfillment of regulations related to construction structure, reserve areas, beautifying works and roads construction.

⁵ Distribution channels are classified in six groups: concrete, trade, constructors and contractors, asbestos cement, prefabricated and “other”

sort of dwelling. This index enables the deep analysis and contextualization of this destination of construction “i.e. dwellings”.

Statistics on Dwelling Financing – EFVI: This statistical investigation allows to know the statistics related to the number and value of financed dwellings, whether new ones or used, bearing in mind the credit loans given by entities involved in long-term mortgage credit financing.

The second reference for the Census of Buildings’ corresponds to the news and unions; in particular, the Colombian Chamber of Construction “Cámara Colombiana de Comercio CAMACOL”⁶. This is a national non-profit union association which brings together at national level, the enterprises and natural persons related to the Construction Value Chain. These actors provide DANE with the information on sales and last news about constructors, in a quarterly basis.

Finally, the third sort of reference for the Census of Buildings corresponds to the regulations issued by the government pertaining to the country’s construction sector, which were partially mentioned in sub-paragraph c “Legal Framework”.

2.2.2 Design of indicators

2.2.2.1 Indicators for the presentation of results

Firstly, the Census of Buildings’ general structure is presented “general structure of area which is surveyed according to urban and metropolitan areas”, in a framework suitable to provide a general picture of each period.

In addition, the Census of Buildings provides different aggregations for each one of states of works that are surveyed in the area relevant for the statistical operation. It also presents the variations and contributions for some of them. The variations analyzed correspond to:

- Quarterly variation: percentage variation calculated between the reference quarter (k) and the immediately previous quarter (k-1).
- Annual variation: applied for construction works in process, works started, finished and paralyzed.
- Year to-date / twelve months variations: applied for construction works started and finished.

It is possible to observe the evolution of variable surveyed in different contexts by using quarterly and annual variations.

⁶ Taken from the website: <http://camacol.co>. Consultation carried out in May 2nd 2013.

Contributions, on the other hand, allow defining which variable had a higher influence in the behavior of the reference or target variable.

2.2.2.2 Quality Indicators for the statistical production

These indicators are considered as a tool for monitoring the evolution of all processes involved in the releasing of quality products associated with the statistical operation.

Coverage Indicator

The coverage indicator is an instrument that monitors the field work development, in particular, the completion of data collection process; in order to have a support on its evolution during each of the three data collection stages. For the case of Census of Buildings, this data collection is carried out monthly, until completing one quarter. Its main purpose is to be used as a tool for monitoring the data collection evolution, enabling the definition of actions that contributes with timely fulfilling of data collection stages, in both DANE`s territorial branches and sub-headquarters.

$$ICO = \frac{NMR}{NMA} * 100$$

Where:

ICO = Coverage indicator that corresponds to each stage or month.

NMR = Number of cumulated covered blocks

NMA = Number of blocks assigned to be covered in the month.

Imputation indicator

The imputation indicator is created in each of the DANE`s territorial directorates and sub-headquarters. In this indicator, the percentage of the information about the variable prices, that was not collected during the field work and consequently was estimated, is determined. The main purposes of such indicator are: to be used as an instrument to monitor the imputation of prices during the collection stage and to know the percentage of imputed prices of construction works at regional level; i.e. in each territorial directorate and sub-headquarters.

$$IMPU = \frac{\textit{Total works imputed}}{\textit{Total works}} * 100$$

Where:

INPU = Imputation indicator which corresponds to each stage or month, for each territorial directorate or sub-headquarters.

Total works imputed = Number of construction works for which the price was estimated.

Total works = Total number of works, resulting from the sum of both the works in process and works finished.

Note: In the calculation of this indicator, the count of paralyzed works is excluded as the prices obtained for this state are imputed in all cases, given its nature. (Information obtained by direct observation).

Non-imputation indicator

Using this indicator, it is possible to know the percentage of prices that was directly obtained from respondents and can be used as a contrast instrument. The sum of both indicators (imputation and non-imputation) should be equal to 100.

$$NIMPU=100 - \frac{\text{Total works imputed}}{\text{Total works}}$$

Where:

NIMPU = Non-imputation indicator that corresponds to each stage or month, for each territorial directorate or sub-headquarters. This is the percentage of construction works prices or questionnaires that were collected in each census operation stage and were not imputed.

Total works imputed = Number of construction works for which the price was estimated.

Total works = Total number of construction works, resulting from the sum of both works in process and works finished.

Critique “information checking” indicator

Critique indicator is the evaluation of data collection and checking stages. The complete revision of information on the main construction works variables is done at this point, and it is applied in each of the DANE`s territorial directorates and sub-headquarters.

Data collection is carried out directly in the construction site or location in order to take the information needed for the characterization of such works. Once the data collection process is completed, the next step consists on analyzing the information collected in terms of internal consistency.

Its primary objective is to determine the quality index of data collection and critique processes involved in the Census of Buildings, in territorial directorates and sub-headquarters; thus achieving a continuous improvement based on the regular evaluation and monitoring of the indicators obtained.

$$ICRI = \frac{\sum Scores}{n}$$

Where:

ICRI = Critique Indicator, which corresponds to each stage or month.

Scores = Score obtained for each construction work or electronic questionnaire uploaded in the Data Capture Device (DMC)

n = Number of construction works checked.

Regional quality indicator

This indicator consolidates the quality results obtained by the processes carried out in DANE`s regional offices. The main objectives of this indicator are: to identify the general situation in the different operation stages pertaining to the Census of Buildings, through the identification of indicators and to get, in each (monthly) stage of census operation, the indicator that determine the fulfillment of quality criteria in each DANE`s territorial directorate or sub-headquarters.

$$ICAL = \frac{ICO + ICRI + NIMPU}{3}$$

Where:

ICAL = Quality indicator that corresponds to each stage or month.

ICO = Coverage Indicator that corresponds to each stage or month.

ICRI = Critique indicator that corresponds to each stage or month.

NIMPU = Non-imputation indicator that corresponds to each stage or month.

Quality indicator “DANE Central”

The special cases that were not satisfactory justified during the statistical production process can be monitored by using this indicator.

$$ICC = \frac{NORDC}{Total Num.} * 100$$

Where:

ICC = Central Quality Index

NORDC = Total number of special cases reported at DANE Central in the Verification Form.

Total Num. = Total number of construction works in the quarter: works in process, paralyzed or finished.

Reliability Indicator

The Reliability Indicator is quarterly calculated and is an instrument that helps to consolidate the quality results of all process of statistical production and also to monitor the development of activities in order to have a support about their evolution at the end of the quarter.

This indicator is calculated for each of areas involved in the statistical operation and its main task is to define the Census of Buildings` reliability indicator and also to use it as a tool for decision-making on aspects such as failure elimination and creation of strategies. This way, a continuous and sustainable improvement can be achieved by evaluating and monitoring the statistical operation.

$$ICON = \frac{ICO + NIMPU + ICAL + NIMPUC + ICC}{5}$$

Where:

ICON = Reliability Indicator that corresponds to the consolidation of all processes carried out during the quarter.

ICO = Coverage indicator.

NIMPU = Regional non-imputation indicator.

ICAL = Regional quality indicator

NIMPUC = Central non-imputation indicator, calculated by the Statistical Methodology Office.

ICC = Central Quality Indicator.

2.2.3 Results plan

Presentation of the Census of Buildings' general structure: general structure of the area surveyed by states of construction works, according to urban and metropolitan areas. Works in construction process: area in process, presented by metropolitan and urban areas and according to the destination. Quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Contribution to the quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Finally the area in construction process is presented by metropolitan and urban area, and according to socioeconomic strata.

New construction works: the area in which the construction work has started is presented by metropolitan and urban areas, and regarding the destination. Quarterly, annual, year-to-date and 12 months' variations and contributions of the new area are showed by metropolitan and urban area and according to the destination.

Inactive works: total paralyzed area is presented by metropolitan and urban areas, according to the destination. The new inactive area is presented by metropolitan and urban area, and according to the destination. The quarterly variation of inactive area is showed by metropolitan areas, according to the destination.

Finished areas: the finished area is showed by metropolitan and urban areas, according to the destination. The quarterly variation of finished area is also presented; by metropolitan and urban areas, according to the destination.

2.2.3.1 Design of output /results tables

Output tables are instruments relevant for the analysis of information; this is why its design is an important aspect to be considered. As previously mentioned, data dissemination is carried out bearing in mind different disaggregation levels and according to the variables of interest for the Census of Buildings; in particular, construction works' states. This is done in order to provide the users with a complete set of results that satisfy the sector's needs for information.

Output tables from the Census of Buildings can be found in the Press Bulletins and their annexes, which are released on a quarterly basis. Also, the historical series can be downloaded from DANE's website.

For a detailed revision of such instruments, see the document: Diseño de Cuadros de Salida / Design of Output Tables, available at DANE's intranet: DANENET.

Chapter II: contains data information on the construction company

II. INFORMATION ON THE CONSTRUCTION COMPANY

4. GENERAL DATA ABOUT THE CONSTRUCTOR OR THE CONSTRUCTION COMPANY

23. Name or corporate name _____

24. Address _____

25. Phone number _____ 26. E-mail _____

5. GENERAL DATA ABOUT THE PERSON OR COMPANY IN CHARGE OF SALES

27. Name or corporate name _____

28. Address _____

29. Phone number _____ 30. E-mail _____

Chapter III: the information related to the construction work's production can be registered in this chapter. The destination, the construction system, the construction stage, the data on the destination "dwelling" (if any), the use that will be given to the construction, its meters and its price are recorded here.

III. PRODUCTION DATA OF DESTINATIONS
(information on prices as well as data on areas should be filled out in thousands of Colombian pesos; avoiding decimal points)

6. PRODUCTION DATA OF THE DESTINATION

31. Destination ² _____

32. Construction system ³ (mark with an X, items are mutually exclusive)

1. Structural masonry

2. Confined masonry- portico

3. Industrialized prefabricated products

4. Other, which one? _____

33. Construction stage ⁴ _____

34. Degree of advancement _____ %

35. Is it a social housing? (1. YES - 2. NO) Yes 1 No 2

36. If the last answer was 1, continue:
Are you subsidized by the Government? Yes 1 No 2
(1. YES - 2. NO)

37. Is this destination intended for sale? Yes 1 No 2
(1. YES - 2. NO)

If the last answer was 2, mark with an X. Items are mutually exclusive

1. Renting 1

2. Donation 2

3. Own use 3

38. Total constructed area (covered) _____ m²

39. Total sellable area (including garage) _____ m²

40. Total area of common zones (covered) _____ m²

41. Unit area of garage (covered) _____ m²

42. Number of units of the destination _____

43. Number of units sold of the destination _____

44. Number of buildings under construction _____

45. Number of floors per building (not including basements) _____

47. Unit price of garage \$ _____ Type⁵

48. Selling price per m² \$ _____ Type⁵
(not including garage)

49. Direct cost per m² \$ _____ Type⁵
(including materials, labour force, equipment and sub-contracting)

Finally, data about the stages estimated for the work's construction are registered in this part. In addition, the number of units, the area, the value, type of finishing works estimated for the construction project, the spaces for common areas, as well as observations and the occupation of permanent personnel can also be recorded here.

DESCRIPTION OF PROJECTS (Mark with an X as it may apply)			NUMBER OF TOTAL UNITS PER PROJECT:	
PROJECT	PROJECTION	PROCESS	RELEASED	UNIT

No. UNITS	<input type="checkbox"/>	AREA 1	TOTAL A.	VALUE	
No. UNITS	<input type="checkbox"/>	AREA 2	TOTAL A.	VALUE	
No. UNITS	<input type="checkbox"/>	AREA 3	TOTAL A.	VALUE	
No. UNITS	<input type="checkbox"/>	AREA 4	TOTAL A.	VALUE	
No. UNITS	<input type="checkbox"/>	AREA 5	TOTAL A.	VALUE	
No. UNITS	<input type="checkbox"/>	AREA 6	TOTAL A.	VALUE	

PRIVATE PARK.	UNIT AREA	TOTAL AREA	
VISITORS PARK.	UNIT AREA	AREA TOTAL	
CABINETS	UNIT AREA	AREA TOTAL	

DESCRIPTION OF COMMON ZONES

OBSERVATIONS

CONSTRUCTION WORK STATUS (Brief Description)

FINISHING WORKS ESTIMATED:

Facade:	<input type="text"/>
Cover:	<input type="text"/>
Internal walls:	<input type="text"/>
Floors:	<input type="text"/>
Woodwork:	<input type="text"/>
WC/Kitchen:	<input type="text"/>

OCCUPATIONS OF PERMANENT PERSONNEL

Respondent Name(s)	<input type="text"/>
Occupations	Phone numbers
Census taker	Supervisor
Critique clerk	Data entry clerk

2.2.5 Guidelines, specifications or rules for validation, consistency and imputation

2.2.5.1 Guidelines, specifications or rules for validation and consistency

Data Capture Devices, DMC have a basic series of programmed validations, ensuring the quality and flow of some variables. The following validations can be found in the census questionnaire:

Variables that need to be obligatory filled out are established.

Admissible codes for some variables are defined, giving a range of values admitted for each variable.

The questionnaire flow is conditioned, depending on the construction work status. For instance, if there is an inactive work, then it is not possible to collect data on labour force. Data collection operation is also determined, depending on the special case found in the construction work.

Warning alarms are displayed or fields are disabled, showing a message about atypical situations.

Minimum areas for each type of destination” are verified

Verification of the ranges of dwelling established for this investigation is carried out, according to their price.

The information registered in previous censuses on the construction works in process is used to make comparisons and follow-ups (longitudinal panel). For detailed information about the validations programmed in Data Capture Devices DMCs, see the document: Specifications on consistency- Census of Buildings / Especificaciones de consistencia Censo de Edificaciones, available at intranet website DANENET.

Once the information has been prepared to be uploaded in the software created for the Census of Buildings, such information is then validated by this software at the loading moment, thus generating more refined routines that cannot be loaded in DMCs, as data collection process would be too slow during the field work.

Additionally, the software offers specific routines that provide reports useful to check out the following aspects:

Geographical location: routine which is used to verify the location of zones and blocks. This way, the geographical feedback has no errors, ensuring both the quality of information and the development of future censuses in a safer manner.

Reports are created to revise and confirm previous and current prices, areas by destination, common zones and construction work`s stages.

Finally, analysts “critique clerks” carry out the revisions which cannot be programmed, particularly, in new works that lack any reference for their analysis. The most important revisions are: names and descriptions versus the construction work`s destination registered, the revision of all information on labour work due to its complexity, prices of new works, use of abbreviations defined for the address registration; revision of uses by contrasting them with the number of units. Also, this revision includes that non tradable destinations have common areas and vice versa, the meters of “dwelling” destination specifically in lower strata and the verification of new works found during the census activity, in paralyzed status.

2.2.5.2 Imputation

The imputation process is carried out to ensure data quality and integrity, regarding the following aspects: completeness, correctness and internal consistency. The imputation should meet the guidelines for critique and the criteria for validation and consistency which are thematically defined, in order to replace inconsistent, missing, wrong and atypical data.

In the case of non tradable destinations such as: schools, hotels, hospitals and health care centers, public administration buildings and other “churches, clubs, cinemas and similar”, direct costs are taken into account and a differential coefficient by destination is applied in order to obtain the market price. This is done at DANE`s headquarters.

The imputation is only carried out for the variable “construction work`s selling price of square meter”, for the case of tradable destinations: apartments, houses, offices, trade buildings and warehouses. Therefore, three stages that work as a systematic quality filter were defined: imputation during the field work, revision / verification / confirmation at DANE`s headquarters; and the imputation based on statistical approaches.

The information to be inferred is the one that cannot be obtained during the census time, even because it's a building for own use or because it is not for sale. The supervisor is the person in charge of the price estimation at field level, having a reference of at least three works surveyed. In the case of the destination “dwelling” there are specific indications to carry out the imputation; likewise, within such destination there are two subgroups where variables such as socio-economic strata and others (like the municipality, the area “urban or metropolitan” etc) are taken into account. Moreover, the analysis of estimation is carried out, using specialized media such as magazines and sector-based guides.

Estimations at field level are again checked at DANE`s headquarters, where analysis in terms of construction work`s features, area, type of building, stratum, destination and other is carried out, taking also into account the census taker observations. The analyst checks and compares the information on prices, with the corresponding behavior showed during a specific period, in a given municipality.

The software provides both lists of prices out of range and of new buildings, in order to carry out a general analysis.

In the case that data still present variations out of range with respect to the previous period, after applying above described filters and steps; there is a routine programmed in the statistical software SAS only applied for estimated data and for variations in such data, taking into account of 30 % positive or negative.

Using a simple imputation method (arithmetic mean), variations are further revised taking into account historical information at the level of work size, destination, municipality total stratum, area (urban or metropolitan) and questionnaire number. With this approach it can be verified that variations remain in the range expected, and then the average price is assigned for those prices that were not justified at local level. Finally the imputed registers are adjusted in relation with the database and bearing in mind three criteria: simple averages, mode and trend. Therefore, the adjustment applied depends largely on the relation between the price and the association variables.

Atypical or inconsistent data are detected quarterly in the database by contrasting them with historical data. In this way, prices are quarterly controlled through variables and consequently historical data of each construction work over time.

2.2.6 Nomenclatures and classifications applied

The only nomenclature used is the Political-Administrative Division of Colombia (División Política Administrativa de Colombia - DIVIPOLA). This is applied to identify the municipalities covered in the area of interest for the statistical operation. A large part of the remaining information collected is thus codified.

2.3 STATISTICAL DESIGN

The objectives from the investigation determine the application of a methodology which is based on the analysis of information collected from direct sources. The whole population is surveyed in this research .i.e. a census is carried out in the coverage areas, involving buildings in process, as well as inactive (paralyzed) and finished works.

Census approaches have the advantage of controlling adequately the observation errors; i.e. those errors derived from the direct register of data pertaining to each construction work.

During the execution of this investigation, the Longitudinal Panel approach was created in order to control and monitor in detail the construction works in each census application; until this works are finished and all their units are completely sold. It's worth mentioning that the words culmination or finishing does not lead to any construction process.

The main advantages in the application of this methodology are:

- The real duration of construction works included in the census framework can be identified.
- It is possible to carry out a direct observation on the speed of construction process in new works.
- The characterization of census framework, according to the states of construction works.
- Monitoring the evolution of prices, according to the destination.

The primary methodological aspects in the census procedure are presented as follows.

2.3.1 Basic components for statistical design

Universe: this is comprised by the total buildings located in the coverage areas which, at the census time, are in any construction process. Works paralyzed are included, as well as those projects whose construction activity has been finished and all their units have been completely sold and offered in the construction market. The following construction works groups comprise the target universe:

- **Works in construction process** all those works which, during the census time, are experiencing any construction process. Such works may have the following states:
 - *New works:* works whose construction activity started during the inter-census period. These are the indicator that allows to evaluate the sector's tendency in terms of: area, units and price evolution.
 - *Works still in process:* those construction works which were found as "in process" during the previous census, and they still have the same state in the current census application. It is possible to identify the main framework characteristics in terms of: works duration, price evolution and the speed of construction process by using this group. This group is divided as:
 - *Works included in the universe due to a coverage expansion:* correspond to works which in the last census were in previous or preliminary activities (site enclosure, preparation, clearing, leveling, setting out etc) before its construction. However, in the current census, their construction activity started, ranging from the excavation process to the foundation activity.
 - *Expansions:* construction process in which there is an addition of area inside a building, either horizontally or vertically, involving an alteration on its primary structure. In other words, there is a new structure in the construction site which is being erected with new concrete plates, new columns etc, and this new structure forms an integral part of the former construction work.

Expansions are characterized by keeping the same purpose and use of the former building. The information of such ones should be collected only for the case of works in construction process

For strata 1 and 2, "in destinations corresponding to apartments and houses", expansions are included when these are equal to the 50 % of the destination's initial area constructed. In the case of other destinations: commercial premises, warehouses, education, hotels, hospitals, public administration etc, regardless of strata, all sort of expansions are included. For strata 3 to 6, all types of expansion are also included.

Works already inhabited, located in strata 1, 2 and 3, in construction stages such as: masonry, plastering and finishing works Level 1/2 should not be included in

the investigation. Works which have been included in the previous censuses and have these mentioned characteristics should be continuously monitored until they have been finished.

- **Restarted works:** works that were found as paralyzed for the previous census, and now their construction process have been restarted for the current census.
- **Paralyzed works:** buildings which are not experiencing any construction activity, during the census application. It includes:
 - **Inactive works or new paralyzed works:** corresponds to the buildings included to the group of “paralyzed” during the census moment, even because they were inactive during the previous census or because they were found for the first time.
 - **Works still inactive:** all those buildings which were found paralyzed during the last census, and they continue in the same state for the current census.
- **Finished works:** Corresponds to such works that were being monitored in previous censuses, and in the current census their construction process is finished.

Target population: this is comprised by all works which, at the census time, are experiencing some construction process, in all socio-economic strata. They are monitored until all units, that belong to the project and are offered in the real-estate market, have been completely sold. All works found as inactive in strata 3 to 6 are included, as well as inactive works erected by formal construction companies, higher than 500 m², in strata 1 and 2. Similarly, all those works that were being monitored and whose construction activity was finished are also included in this group, regarding the defined geographic coverage areas.

Statistical framework: this is a census framework of construction works in 53 Colombian municipalities derived from: Bogotá, (13) urban areas and (2) metropolitan areas.

Works identified as “new” are included with their coordinates in Data Capture Devices; in order to update the cartography and this way such construction works can be found in digital cartography for the next quarter. This is done to distribute equally the workloads.

Definition of variables: the questionnaire is applied to those works in process, relevant for the investigation, and whose construction activity has started; in order to collect information on the following aspects:

- *Socio Economic stratum*: this is the socio-economic stratum in which the works are situated, i.e. the classification assigned by public utilities enterprises which is presented as follows:

Low – Lower	1
Low	2
Middle – lower	3
Middle	4
Middle – higher	5
High	6

- *Plot area / land*: It corresponds to the total square meters expected for the construction of works or projects, whether or not covered. This way, if the construction company is building a project, the plot area will be equal to the whole land intended to carry out the construction. For the case of dwelling macro-projects, when a large plot is divided into lots and different construction companies start their building projects, the interviewer shall inquire for the partial lot area where each project will be constructed as respondents in the construction site won't be able to know the initial plot's total area; in addition, construction companies only know the lot area they purchased.
- *Destination*: this is the set of activities for which the building or project was structured and constructed. Destinations are divided as tradable (from 1 to 5) and non-tradable (6 to 10).

- 1 Apartment
- 2 Offices
- 3 Commercial premises
- 4 Houses
- 5 Warehouses
- 6 Education purposes
- 7 Hotels
- 8 Hospitals / health care centers
- 9 Public Administration purposes
- 10 Other non-specified

- *Non tradable destination (or own use)*: Constructions in process, whose final objective is other than the sale. Among them we can find education buildings, hotels, hospitals and health care centers, public administration buildings and other (churches, events rooms, among other)
- *Tradable destinations*: Constructions in process intended for selling. In this group we find apartments, offices, commercial premises, houses and warehouses.

- *Building*: independent and separated construction comprised by one or more units. They are independent because they have a direct access to streets, roads, paths and common circulation spaces; and also separated because they often have walls to mark out the areas and in this way distinguish them from other constructions.
- *Construction system*: Set of elements, materials, techniques, tools and procedures specific for each type of building in particular. In this statistical operation, the following systems have been defined:

Structural masonry
 Confined masonry / portico
 Industrialized prefabricated system
 Other

- *Construction stage*: corresponds to the different processes involved in a building construction. In this statistical operation, the following construction stages were defined:

Excavation and foundation
 Structure and coverage
 Masonry and plastering
 Finishing works / level 1
 Finishing works/ level 2
 Finishing works/ level 3

- *Degree of progress in construction stages*: This is the percentage value assigned to the progress of construction stage in which the work is.
- *Labour force*: the amount of personnel employed in the construction work during the inter-census period. At this point, the following classification should be taken in consideration:
 - *Permanent*: personnel which is included in the construction company`s payroll with a direct linkage, attained to the construction work and hired by means of an indefinite contract.
 - *Temporary*. Corresponds to the amount of personnel which is occasionally hired to carry out specific tasks in the construction site. In this case, the payment is mutually agreed and workers do not have a direct relation with the construction company or the work owner.
 - *Family personnel*: the number of employees with family links, carrying out activities in the construction site. In this case, there is no remuneration for the work performed.

- *Social housing (Vivienda de Interés Social)*: Housing unit that meets the quality standards in terms of urban, architectural, and construction design. Its value shall not exceed one hundred and thirty five current monthly legal minimum wages (135 SMLMV)⁷. “It is understood by social housing those constructions created to ensure the right to housing for those on low incomes. In each National Development Plan, the national government have to define the type and price of solutions addressed to these population⁸.”
- Use: classification used to identify the intention for why the building is constructed. This intention could be for sale or own use, only if its destination corresponds to “own use”. In this variable, the following “uses” items can be considered

Renting
Donation
Own use

This classification is mutually exclusive, therefore, only one option can be chosen provided that the use corresponds to “own use”.

- *Total area constructed*: corresponds to the destination`s total meters found in process of construction. The area constructed only includes the building`s covered spaces, even if they are of common or private.
- Total sellable area: this is the sum of construction areas from all sellable spaces (including the garage and all sorts of rooms) composing the destination. Common areas and external parking lots are excluded from this group.
- Unit area of covered garage: corresponds to the covered garage area, including the cabinets (if any). In the questionnaire`s answer box, square meters of garage shall be filled out, independently of the amount of garages the building has.
- *Total area of common zones*: corresponds to the total sum of all common spaces “covered and shared” in the construction or destination concerned. This includes halls, stairs, and circulation areas, roads for parking lots, trash chutes, social areas and access areas (stairs and elevators).

⁷ Article 1 Decree 075 of March 23rd 2013 establishing the compliance of percentages of ground intended for Social Housing Programmes for lands attained to development urban treatments and urban renovation and containing other provisions.

⁸ Article 44 Law 9 1989 establishing the guidelines on municipal development plans, acquisition and expropriation of goods, and containing other provisions.

- *Number of buildings in the construction site:* corresponds to the number of structures which are being constructed during the survey application. For the case of apartments, commercial premises and offices, this variable corresponds to the number of towers or buildings which, at the census time, are in any construction process.
- *Number of floors per building:* The information on the number of floors in each building under construction should be collected.
- *Number of units in the destination:* corresponds to the total number of units that owns the destination.
- *Number of units sold:* the total number of units which were sold, by destination, at the census moment.
- *Number of units for garage purposes:* corresponds to the total units used for covered parking, by destination. Uncovered parking lots are not under study, in this investigation.
- *Unit price of garage:* corresponds to the unit price per garage and its cabinet (if any), in the destination.
- *Square meter price:* This is the value of each square meter in the building, during the census time. In other words, the average price of square meter in the destination (not included the garage)
- *Selling price:* correspond to the price of buildings during the census application, including the utility margin.

Tradable destinations should be valued at selling price, i.e. the market price, which includes the following components:

Plot

Urbanism costs

Direct costs (materials, labour force, subcontracting)

Indirect costs (taxes, fees)

Financial costs (interest rates, monetary correction “adjustment”)

Costs of sales (sales-based commission, advertising)

Utility margin

- *Cost of sales (direct cost for m2 of the destination):* This is the sum of required products itemized in the bill of quantities, multiplied by their unit prices. Normally, it includes items such as:

Direct labour work

Materials

Equipment and subcontracting

A questionnaire involving variables such as: building destination, total building's area constructed, construction stage, degree of progress, price and type of value is applied, by direct observation, to works which have paralyzed its construction activity during the inter-census period.

For works found as "started" (in process or paralyzed) in previous periods, a follow-up process is applied considering variables such as: units sold, units to be sold, labour force, construction stage, degree of progress, selling price or direct cost, and restart date. Such variables allow "by means of the panel approach" to carry out and updating and a progress report of works.

Data Sources: correspond to the buildings found as "in process of construction", as "inactive works", and as "works finished, whose units have been completely sold"; in 53 Colombian municipalities in an area divided as follows: Bogotá, (13) urban areas, and (2) metropolitan areas. Inside this area, the ideal respondent would be: project supervisors, architects and engineers, master builders, project owners or the construction companies. For the case of variables "*price*" and "*units sold*", ideal respondents would be the sales rooms or owners.

Geographical coverage: nowadays, this is comprised by 53 Colombia municipalities divided as follows: Bogotá, thirteen (13) urban areas and two (2) metropolitan areas:

- Bogotá
- UA of Cundinamarca: Soacha, Cajicá, Chía, Cota, Facatativá, Funza, Fusagasugá, La Calera, Madrid, Mosquera, Sopó and Zipaquirá.
- UA of Cali, Yumbo, Jamundí and Palmira.
- UA of Barranquilla, Soledad, Puerto Colombia, Galapa and Malambo.
- UA of Pereira, Dosquebradas.
- UA of Armenia.
- UA of Cartagena and Turbaco.
- UA of Neiva.
- UA of Ibagué.
- UA of Villavicencio.
- UA of Pasto.
- UA of Popayán.
- UA of Manizales and Villamaría.
- MA of Medellín, Bello, Envigado, Itagüí, Barbosa, Copacabana, Caldas, La Estrella, Girardota, Rionegro and Sabaneta.

- UA of Cúcuta, Los Patios, El Zulia and Villa del Rosario.
- MA of Bucaramanga, Girón, Floridablanca and Piedecuesta.

The geographical coverage of this statistical operation was gradually created as follows:

Since April 1997, the following areas were included:

UA of Bogotá D.C. and Soacha
 MA of Medellín, Bello, Itagüí, Envigado and Barbosa
 UA Cali and Yumbo
 UA Barranquilla and Soledad
 MA of Bucaramanga, Floridablanca, Girón and Piedecuesta
 UA of Pereira and Dosquebradas

Since January 2000:

UA of Armenia

Since January 2002:

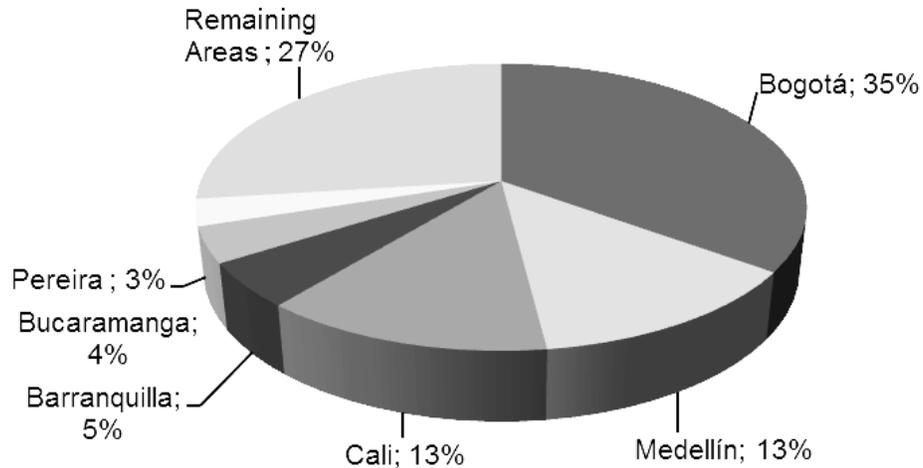
Sabaneta, Estrella, Caldas Copacabana, Girardota,

Since July 2007, the following areas were also included:

MA of Cúcuta, Los Patios, Villa del Rosario and el Zulia
 UA of Manizales and Villa María
 UA of Cartagena
 UA of Villavicencio
 UA of Pasto
 UA of Popayán
 UA of Ibagué
 UA of Neiva

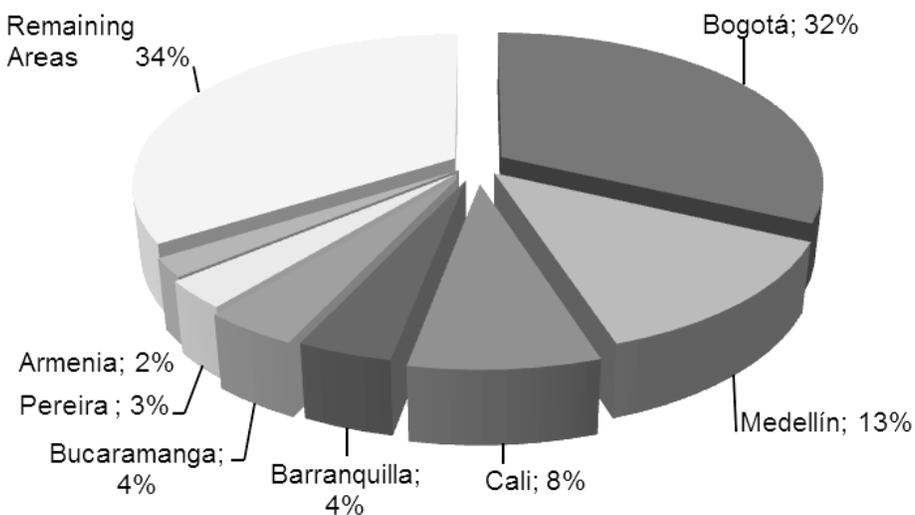
As part of the selection process, consolidation of data on Construction Permits was carried out during 47 years, until 1997: date when the statistical operation was applied. In the cities selected (excluding Armenia, which was included in the geographical coverage since October 1999), it has been evidenced an important share in the construction sector, on average by 73 % (graph 4).

Graph 4 Construction permits, national summary showed by coverage.



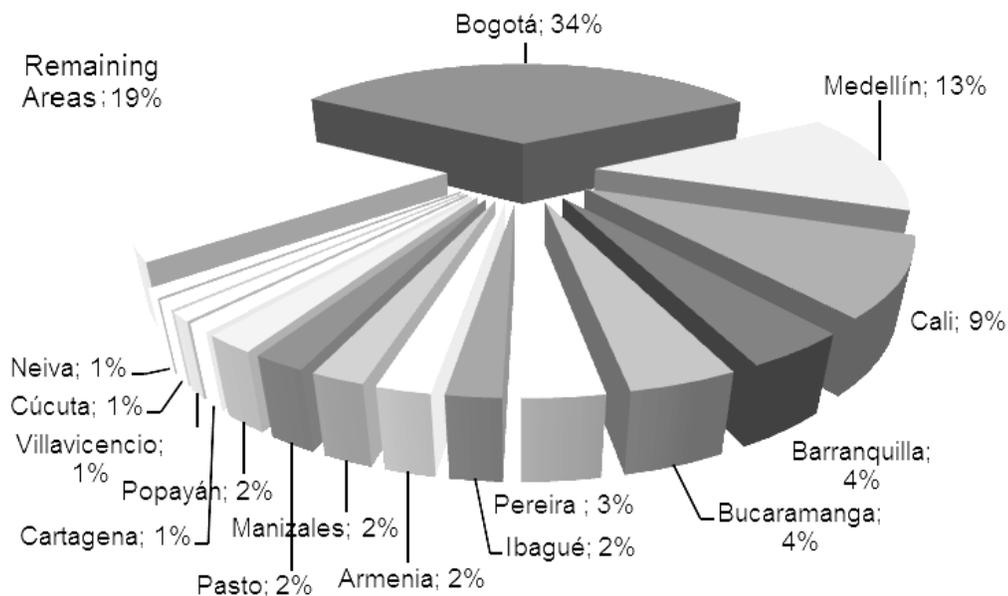
As part of the revision process in terms of representativity in zones under investigation, and considering the indicator of Construction Permits from 1997 to 2004 (Graph 5), it can be observed that in this period (included Armenia city) the metropolitan areas covered in this statistical operation represent the 66 % of construction activity.

Graph 5 Construction permits, coverage representativeness in the Census of Buildings 1997 – 2004.



In order to expand the coverage of this investigation, the cities included in the ICCV (Índice de Costos de la Construcción de Vivienda / Dwelling Construction Costs Index) statistical operation were taken as a reference, as well as the representativeness of cities under study in the Construction Permits statistical operation. From 1997 to 2006 (graph 6), it can be observed how in this period the areas included in the Census of Buildings CEED represent the 81 % of construction activity.

Graph 6 Construction Permit, coverage representativeness in The Census of Buildings 1997 - 2006.



Since the first quarter 2012, the idea of expanding the coverage of this statistical investigation was considered, by collecting and monitoring the information from 18 more municipalities: Cajicá, Chía, Cota, Facatativá, Funza, Fusagasugá, La Calera, Madrid, Mosquera, Sopó, Zipaquirá, Rionegro, Jamundí, Palmira, Galapa, Malambo, Puerto Colombia, and Turbaco. In order to complement the information taken from the metropolitan municipalities of Cundinamarca, two more metropolitan areas were considered: the metropolitan area of Barranquilla and Cali. For the case of Bogotá, it was taken into account as a special case. For this purpose, the indicator of movement showed by these municipalities in the Construction Permits investigation was considered. The results of this new expansion were released in the second quarter 2013.

Coverage by size of construction work: the census is applied in the coverage areas under study, regarding the works in process of construction from all socio-economic strata (from 1 to 6).

For the case of expansions, the census coverage depends on the building use: expansions are included when there is an addition or alteration in terms of structural

design, inside the area constructed. All sort of expansions are included for all destinations considered in the investigation: commercial premises, warehouses, education, hotels, hospitals, public administration buildings and other. For strata from 3 to 6 expansions in destinations such as apartments and houses are also included.

Expansions in buildings in strata 1 and 2 whose destination corresponds to apartments and houses are not included, when the area of expansion is lower than 50 % of the initial area constructed.

Paralyzed projects carried out by formal construction companies are included for all strata, as well as self-construction works in strata 3, 4, 5 and 6. In addition, self-construction works paralyzed or inactive are also included for strata 1 and 2, when they are higher than 500 square meters.

Works finished are included for all socio-economic strata. Projects finished and intended for sale are monitored until all their units have been completely sold.

Civil engineering works are excluded as they are in the scope of another investigation.

Modifications, understood as the process of repairing a building without changing its structural design, are excluded from this statistical research. Modifications do not imply an increase in the area constructed. .

Abandoned works i.e. those constructions apparently paralyzed but dilapidated and abandoned for a long period of time, can be detected by direct observation.

Total or partial demolitions are excluded. Nevertheless, these will be subject to measurement, when a new construction project starts over the demolition area.

Geographic disaggregation: urban and metropolitan areas.

Thematic disaggregation: information is released as follows:

- *Census of Buildings' general structure:* general structure of the area surveyed by states of construction works, according to urban and metropolitan areas.
- *Works in construction process:* area in process, presented by metropolitan and urban areas and according to the destination. Quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Contribution to the quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Finally the area in construction process is presented by metropolitan and urban area, and according to socioeconomic strata.
- *New construction works:* the area in which the construction work has started is presented by metropolitan and urban areas, and regarding the destination. Quarterly,

annual, year-to-date and 12 months' variations and contributions of the new area are showed by metropolitan and urban area and according to the destination.

- *Inactive works:* total paralyzed area is presented by metropolitan and urban areas, according to the destination. The new inactive area is presented by metropolitan and urban area, and according to the destination. The quarterly variation of inactive area is showed by metropolitan areas, according to the destination.
- *Finished areas:* the finished area is showed by metropolitan and urban areas, according to the destination. The quarterly variation of finished area is also presented; by metropolitan and urban areas, according to the destination.

2.3.2 Statistical units

- *Observation unit:* corresponds to the location where the construction project is taking place, for housing (single-family or multi-family) or non residential purposes (offices, commercial premises, warehouses, hotels, hospitals and health care centers, education purposes, public administration purposes and other).
- *Analysis unit:* project under process of construction either for housing (single-family or multi-family) or non-residential purposes (offices, commercial premises, warehouses, hotels, hospitals and health care centers, education purposes, public administration purposes and other).

2.3.3 Reference and data collection period

Reference period: for all variables, the reference period corresponds to the day when both the observation and the interview takes place at the construction site.

Data collection period this is carried out at regular time “monthly”, starting the first working day in the month and during 20 consecutive days, from Monday to Saturday. In a quarterly basis, each month represent a data collection stage.

2.4 DESIGN OF EXECUTION PLAN

2.4.1 Training system

Training is put into practice each time hiring processes are carried out. In addition, as a complementary activity, during each quarter there are re-training activities for all staff involved in the field work. Training process is formed around the statistical operation concepts, the use of instruments, administrative aspects; and in general, around all topics involved in this statistical research.

It is expected that the training activities lead to a consensus which is needed for the identification of different sort of projects, study categories, and also for both defining and sizing the areas pertaining to the construction works visited.

Training courses includes the following topics:

- Presentation of the statistical operation
- Quality management system.
- Objectives and main methodological aspects.
- General methodology and data collection approach.
- Organization chart, functions of staff hired.
- Presentation, analysis and handling of the main data collection instruments (Data Capture Device, formats and different forms)
- Precision of concepts related to the variables selected.
- Personal introduction and interview techniques.
- Physical procedure for field work distribution
- Handling of cartography and mapping updating procedures.

In addition, the training process is supported by a large selection of documents including guidelines, manuals, methodologies, guides and similars in order to carry out a permanent consultation. In these documents, the main processes, tasks and other relevant aspects related to the census application are described.

2.4.1.1 Field testing

The statistical activity must meet the census needs or requirements, in terms of the specific characteristics found during field testing operations. The specifications, guidelines and final procedures to be applied in order to find and optimal quality in each of the stages involved in the statistical operation are modified or consolidated based on field testing. The Census of Buildings used field testing as an instrument to create a structure, to evaluate and to ensure aspects such as: quality of methodology, general consistency, connection between the answers collected and the nature of questions asked, etc. Similarly, field testing is used to support the interview procedures, performances and other elements related to field operations.

In relation with the characteristics derived from this instrument, field testing was applied as an integral system which evaluates the training process. Additionally, field testing provides, among other, the following advantages:

- To observe the performance of personnel summoned, in theoretical training sessions,
- To verify and support the personnel knowledge about instruments for data collection and monitoring, as well as the concepts attained to the statistical operation,
- To carry out further clarifications,
- To detect failures in both the interview sequence and in the field work operation,
- To check the material collected by determining whether it meets the quality standards of information, and thus taking it as final material to be taken into account.

2.4.2 Preparatory activities

Personnel selection: this statistical operation adopts the general procedures established for the staff selection and hiring, and also the general features defined in DANE's internal resolutions which are normally updated on an annual basis.

For the case of field operation staff, it was determined that when four or more persons need to be hired, an invitation process shall be carried out based on a national staffing selection system created by DANE. To log on to this system as user, see the DANE's website: <http://www.dane.gov.co> and follow the corresponding links. On the website, there is a manual describing the general instructions on the invitation process for the field operation staff hiring.

2.4.3 Design of instruments

Aside from the Census of Buildings questionnaire, this statistical operation counts with other instruments for engaging the data collection process and the quality control of information. Likewise, there are guides or manuals on data processing where detailed information about the main activities carried out during the development of the statistical construction is described. The main documents are presented as follows:

- Documents on thematic design: Methodology for the Thematic Design, Methodology for the Updating of Price Intervals, Data Consistency Specifications, Data Validation Specifications and the Methodological Sheet.
- Documents on statistical design: Methodology on the Statistical Design.
- Guides for the construction of coverage and information-quality indicators.
- Census software documents and user manuals.

- Guides for statistical production such as: the functional model; glossary of terms; documents describing the processes ranging from organization and preparation to preparatory activities for information release; data collection manuals; critique and codification manuals, census preparation papers, among other.
- In the case of field work control, DANE designed and applied the *Control Form for Daily Registration of Construction Works, per Census Taker: Coverage and Quality Control CEED*.

2.4.4 Data Collection Process

Operation approach: the data collection strategy used in the Census of Buildings is the “census sweep” i.e. each work team completely covers the sector assigned, block by block, in order to survey all construction works included in the universe of study. For all cases, the field work team will have access to the construction site and will stick a label indicating that the work has been visited.

In order to carry out the data collection approach used in this investigation, an schedule was created for each DANE`s territorial directorate and sub-headquarters, defining the data collection days and a general agenda of stages involved in the development of the census operation.

For carrying out the data collection process in the different cities under investigation, a general vertical structure created by the operation support staff, supervisors and census takers is applied.

Vehicles are used by all the fieldwork staff in order to improve the performances of each work team involved in data collection.

The operation support staff has a vehicle which is used in the development of all activities related to coverage and information-quality control. During the tours, while there a revision of the census operation, this staff also compares cartography in order to evaluate the coverage of the sector selected.

Each supervisor checks the information captured by census takers once this has been transformed at DANE Central. This is the first information filter.

During the critique process, the operation support staff validates each of variables under investigation, analysing in detail price estimations. This is done using analysis supplementary instruments such as: specialized magazines, newspapers, etc; in order to match and verify their consistency.

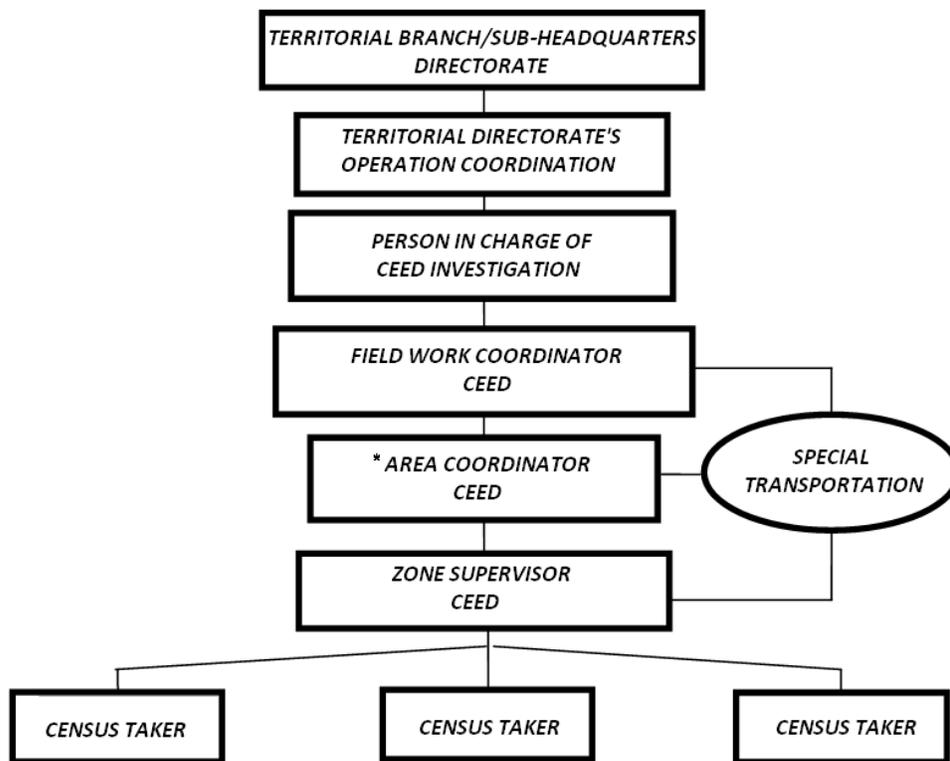
Those variables outside of parameters or ranges established are validated, filtered and technically justified at the moment of consolidating data in the software and also when the special cases generated by this software are reported.

On the other hand central team (both Thematic and Logistics staff) is in charge of the general guidance of Census of Buildings. Its responsibility consists on defining, coordinating and guiding all conceptual, methodological, operation and administrative aspects. The central team can be found at DANE's Methodology and Statistical Production Division.

This statistical operation requires a decentralized design given its nature. Therefore, each DANE's territorial directorate and sub-headquarters has its own operation support staff which is in charge of both carrying out the census operation and also contributing with the investigation's administrative management.

Personnel at territorial directorates and sub-headquarters are responsible for guiding the census operation, especially with regard to technical, operation and administrative aspects. The conformation of the Census of Buildings' operation staff is presented below:

Figure 1. Organization chart for field work staff



* Zone Coordinator. It only applies for the cities of Bogotá, Medellín, Cali and Bucaramanga. For the remaining cities, the functions of Zone Coordinators are performed by Field Work Coordinators.

Operation support staff: this group is in charge of training the personnel and also of organizing and guiding the field work in cartographic sectors. Similarly, they are responsible for carrying out quality controls for information (in sectors which have been completely covered), making the corresponding observations when necessary, and conducting coverage controls in sectors already covered “swept”.

Supervisor: person responsible for leading data collection staff during the field work operation, having a relation of two or three census takers per each supervisor. Likewise, this individual is in charge of reaching an absolute coverage in a sector assigned.

Census taker: individual responsible for collecting the information required in the construction site.

Information analyst “critique”: person who works at office making the corresponding phone calls in order to confirm, support and validate information collected.

Census sweep “coverage” approach is carried out from inside out, bearing in mind the following divisions:

Urban sector: cartographic division usually equivalent to a neighborhood and comprised by 1 and 9 sections. In mapping terms, it can be identified by a four-digit number enclosed in a rectangle. Their boundaries are pointed out by a wide line or by lines separated with points. This sector is identified by four digits.

Urban section: cartographic division approximately equivalent to 20 consecutive blocks belonging to the same sector or neighborhood. It can be identified with a number enclosed in a circle. Their boundaries are defined with separated thin lines. Section is identified by two digits.

Block: land’s plot, with or without buildings, delimited by for vehicles or pedestrians transit roads i.e. streets, avenues, routes etc. As urban sections, blocks are identified by two digits.

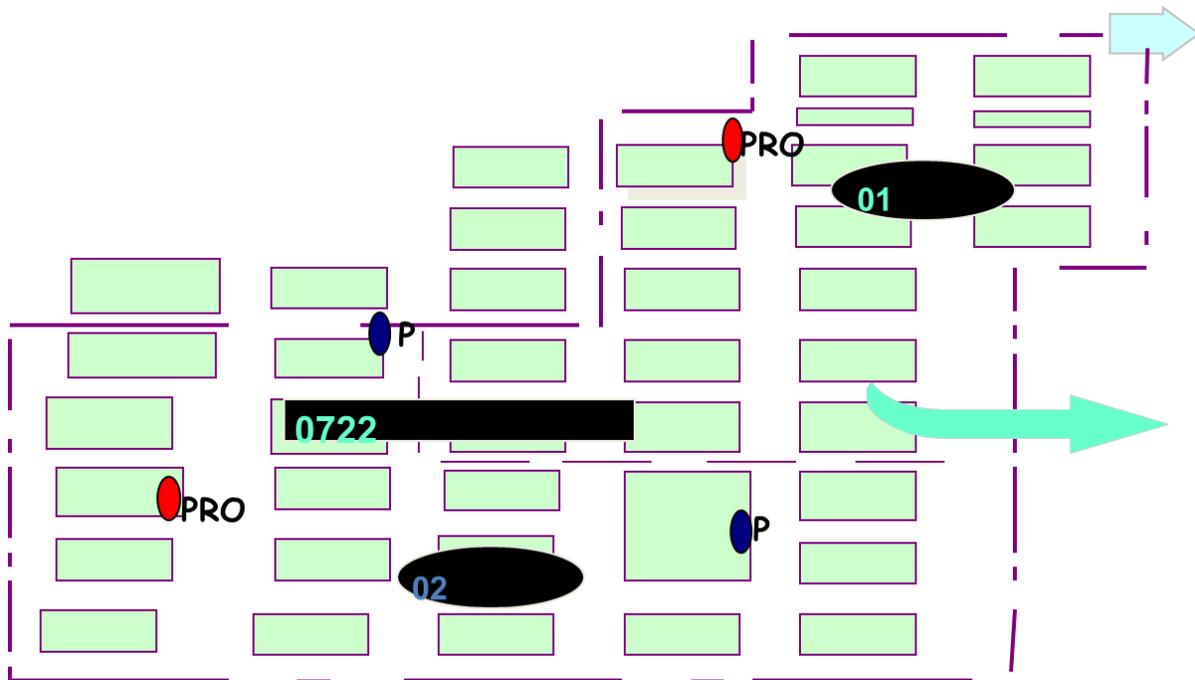
Class: this category may refer to these three values:

- Urban area: urban areas are known to be comprised by sets of consecutive buildings or structures grouped in blocks. They are mainly delimited by streets and/or avenues. They often are provided with essential utilities such as: water, sewage, electricity, hospitals, schools, etc.
- Population center “*centro poblado*”: concept created by DANE for statistical purposes in respect of the geographic location of population settlements. This is defined as a concentration of minimum twenty “20” consecutive dwellings, even neighboring or detached, located in the rural area of a municipality or a Departmental Jurisdiction “Corregimiento Departamental”. Such concentration is provided with urban characteristics such as demarcation of vehicle and pedestrian transit roads

(hamlets “caseríos”, police stations “inspecciones de policía”, villages “corregimientos”, etc.)

- Rural area: characterized by the scattered distribution of dwellings and farms in this area. It does not have a proper demarcation or nomenclature of streets, roads, avenues and similar; neither is provided with public utilities nor other services inherent in urban areas.

Figure 2. Census “sweep” coverage scheme



Calculation of performances: the performances estimated and defined for the development of the statistical operation range between 25 and 30 minutes for the survey application in a new construction work, and between 10 and 15 minutes for the survey application in a work under monitoring process. The survey length is strongly influenced by the complexity of the construction work.

Additionally, in order to organize the field work operation, the amount of works visited should be analyzed according to the last census report, and should be compared with the average amount of works that have to be visited. Likewise, the missing or excessive workload should be redistributed according to the proximity of cartographic sectors. It should be ensured that the adjustment is carried out based on the corresponding cartography, in order to see that distributions or adjustments over the dispersion values are done according to near sectors, and having a special care that two groups or two census takers do not have the same sectors. In short, the final adjustment has to be done

according to the same criteria in terms of zones distribution, trying to ensure that construction works volume are equal for all workgroups or census takers.

Census cartography: mapping is an important instrument in the planning and execution of data collection operations belonging to the Census of Buildings.

Census sector-division helps to a better assignation of field work and thus its better location in the geographic space, this way ensuring quality and facilitating coverage controls and activities during the statistical operation development.

In order to put into practice the Census of Buildings field operation, the DANE's cartographic sectorization "sector-division" is applied. This was created exclusively for census purposes, for carrying out data collection and processing.

The following cartographic material is applied to develop the statistical operation:

- Plans per Census sector.
- Set of plans with a scale of 1/5.000 each.
- General plans distributed per cities.
- Plans used in previous census.

In all censuses, the work group identifies works under construction process in the cartography, using the letters **Pc** and for works paralyzed, they use the letter P. This contributes with the revision and codification of works in the questionnaires. In the same way, census sector plans are used as work material, which are easy to handle due to their dimensions.

On the other hand, in cases when blocks are segregated from other similars and where there are construction works in process, the work group draws plans of segregated blocks, leaving the same code of former ones.

When new blocks are found in areas already divided by blocks, the work group carries out free hand drawings of new blocks and the same code of former areas is assigned.

In cases where new blocks are assigned codes following the DANE's methodology i.e. the assignation of the last block's code, but at collection moment the information is not gathered by the software, the Geostatistics Information Division is responsible for assigning the respective code prior the sending of both the database and the cartography with the special cases registered.

Once the operation is completed and as final stage in mapping process, each territorial directorate and sub-headquarters have to send clean cartography pointing out the additions of new blocks and the location of construction works, in plans on a scale 1/5000

not used during field works. Similarly, the final information collected on variables such as building destination, square meters constructed, average price for square meters, inactive area etc, need to be geographically referenced and released in special publications.

Data collection and filtering during field work: data capture is done using the Data Capture Device (DMC). This information is then consolidated and transformed (transcribed and decrypted). The execution of such process allows transcribing information from auxiliary tables to a target data base.

As part of the verification process during field work operation, the following steps are taken into account for works in construction process having a new questionnaire number:

- The cartographic sector where the construction work is located must be registered in a cartographic table which is provided by DANE´s Geostatistics Information Division DIG.
- The work should be carried out by a constructor or a construction company.
- If the construction work is for sale, a person or enterprise in charge of sales must exist.
- The work should be intended to construct at least one destination.
- The destination`s area constructed should be equivalent to both the sellable area and the area for common zones.
- The construction stage the destination is experiencing should correspond with stages defined by the methodological staff.

For the case of works in process of construction which have an existing questionnaire number assigned in previous censuses (i.e. works found in follow-up lists), the following verification steps are applied:

- The construction work or project cannot increase its previously recorded number of destinations.
- Constructed, sellable and common zones areas cannot be higher in each census application.
- The construction stage the destination is experiencing in the current census should not be sequentially lower than the construction stage registered in the previous census.
- The square meter price in the current census should not be either higher or lower than the parameter defined by DANE`s methodological staff.

Among verifications applied for incomplete paralyzed works, the following three ones are the most relevant:

- The cartographic sector the construction work is located should be registered in the cartographic table provided by DANE's Geostatistical Information Division.
- The work should be intended to construct at least one destination.
- The construction stage the destination has reached should correspond with stages defined by methodological staff.

Among verifications applied for incomplete paralyzed works, already registered in former censuses (i.e. works that can be found in follow-up lists), the following two are highlighted:

- The area constructed cannot be higher each census application.
- The construction stage the destination is has reached in the current census cannot be lower than the construction stage registered in the previous census.

2.5 SOFTWARE DESIGN

For the Census of Buildings, information software was designed integrating both data capture activities (Data Capture Device and capturing software) and detection/correction of inconsistencies for thus obtaining a database with information filtered. In this sense, the application allows to update and consult data from current periods and also from previous ones, this way monitoring the statistical unit throughout its construction process. As a result, a fast and timely access is obtained in order to determine the structure of the sector's production and the evolution of main variables.

Processes described were designed based on interactive programs. The application validates the respective questions to facilitate analyst's job.

The application was developed based on the programming language VISUAL FOXPRO Version 6.0 for WINDOWS "the same language as database manager system". This was designed in graphical environment where direct help messages are displayed, and can be executed in a single-user and multi-user environment.

In the application, the interfaces for correction, addition and elimination of questionnaires are designed having as much relation as possible with the physical design of questionnaires or follow-up lists, for an easy operation from users. On the other hand, this software allows the consolidation of information captured in Data Capture Device - DMC.

For using this application, it is important to have both a user name and a valid password. An infinite number of users can be enabled.

Data capture is carried out during the field collection process, using the DMC. This information is then transformed and loaded in the application for thus creating the report of special cases which were found throughout the process and then carry out data verification, justification and modification.

Backups are sent by territorial directorates and sub-headquarters to DANE Central. Once information from each city has been tested for consistency, such files are consolidated in a historical database containing the information from second quarter 1997 to current date.

This application has the option of creating as many backups as required by application managers at DANE's territorial directorates and sub-headquarters. Likewise, there is an option for restoring backups when necessary.

Apart from the possibility of carrying out online controls for data collection, this application also provide reports on special cases, as a process subsequent to recording, in order to verify the consistency among variables. Such special cases describe particular states or circumstances identified in construction works that need to be verified, due to their atypical or unexpected conditions.

Once the solution for these special cases is defined, data are adjusted using the application, until the desired consistency and quality is technically achieved.

Data consolidation is carried out at DANE Central. There is a consolidation of data from all territorial directorates and sub-headquarters and also a verification in terms of consistency among all files comprised in database.

Once these files are consistent, DANE's methodological staff carries out macroeconomic and statistical analysis, checking prices and square meters per city, stratum and destination, among other variables.

The application offers a consolidation process where all records registered for the current census, from each of territorial directorates and sub-headquarters can be gathered. This way, at DANE Central there is a database containing the information on all construction works visited in the areas considered in the statistical operation's current coverage.

Subsequently, output tables are created as follows:

Once DANE's Thematic Staff approves information after its analysis, base tables are created in order to prepare the information that will be released in press bulletins from the corresponding census. On the other hand, a file used by the DANE's Geostatistics Information Division is created for producing cartographic maps at sector level, where data on prices and square meters constructed by destination are included.

Is at DANE Central's server where historical series are stored and also available for users. The area responsible for the custody of such information is the DANE's IT Division.

2.6 DESIGN OF METHODS AND MECHANISMS FOR QUALITY CONTROL

Mechanisms to ensure quality of information begin at field work preparation. As a previous stage to control the quality of data collected, DANE Central's IT Division prepares the application that shall be loaded at Data Capture Devices. This application is updated with all information required for capturing new construction works, and also with information about works which are already under monitoring process in past censuses, this way avoiding data duplicity.

This is achieved by defining parameters for data collection of new construction works such as geographical area and a construction work identifier, which is the key to identify each construction work inside databases.

In order to make sure that the construction works which were included as new ones have not been captured in previous censuses, one expert engineer from DANE Central sends a list of works for so avoiding double-records in DMCs, in each stage. In addition, information captured in DMCs should be validated, matching it with the *Control form for daily registration of construction works, per census taker*, to detect possible errors and thus correct them immediately.

Supervisor or Field Coordinator is the only person authorized to finish the applied survey in DMCs.

DMC files should be sent to DANE Central twice in a week in the afternoon, for their transformation and subsequently uploading to the Census application. This information is then re-directed to territorial directorates and sub-headquarters for its analysis and final validation in terms of special cases. For additional information on this stage, please consult the *Manual on Information Controls* which can be found at DANE's intranet.

For measuring the effectiveness and quality of information in all statistical operation production stages, seven indicators were designed and above described in subparagraph 4.2.5. *Design of indicators*.

Additionally, for this statistical research, a timeliness control was designed. This is a standard instrument used to monitor either releases of information or flows of statistical operation in their most important milestones. This control is called *Roadmap of timeliness indicators for press bulletins on a monthly, quarterly and biannually basis*, which is filled out quarterly to monitor the timely release of publications.

2.7 DATA ANALYSIS DESIGN

2.7.1 Statistical analysis

The statistical analysis carried out in this investigation is based on a descriptive model. This approach brings users the description and evolution of the general structure of the panel used for construction works in process, inactive or finished in each quarter. Based on this, the following aspects “as well as others”, can be determined:

The amount of area started in each inter-census period, the identification of current states of construction works and their uses; the construction stage and the degree of progress of works, to determine the amount of square meters finished, and the construction system employed in projects comprising the universe of study.

Finally, information on: quarterly variations, annual variations for works in construction process, works started, finished and paralyzed, as well as twelve months variations and year-to-date variations are presented.

2.7.2 Context analysis

Once statistical analysis is carried out (descriptive and in terms of variations), a second analysis about all factors involved in the “object of study” is carried out in order to better interpret or understand their evolution. Based on this, for the application of this statistical operation, the following aspects are considered in order to put into practice the context analysis:

Information on the construction sector from unions, associations, specialized magazines, media, as well as other statistical investigations created by DANE are taken into account. Such investigations includes: Statistics on Construction – Construction Permits-, Dwelling Financing, Home Mortgage Portfolio, Statistics on Grey Cement, Dwelling Construction Costs Index – ICCV- the New Dwelling Price Index – IPVN- among other.

2.7.3 Experts committee

Two committees are performed for The Census of Buildings. The first one is the Technical Committee which is continuously carried out, and where all processes and results inherent to this investigation are evaluated. Two representatives from all work teams involved in the statistical operation participate in such committee, as well as representatives from both the DANE`s Technical Sub-direction and Direction, and finally the Methodology and Statistical Production Division`s Director.

On the other hand, there is an External Committee where academics, unions and entities from National Governments participate. Its primary objective is to evaluate methodological changes raised during the statistical operation. In addition, the needs and requirements of

information from users are analyzed in this committee, for thus improving the statistical operation.

2.8 DISSEMINATION DESIGN

2.8.1 Data repository administration

DANE counts with information servers ensuring data storage, maintenance and dissemination. In this sense, in territorial directorates where data collection processes are carried out, daily backups are generated throughout the field work operation. Meanwhile, at DANE Central, quarterly databases are stored and protected after processing, filtering and validating them. The IT staff assigned for the Census of Buildings is in charge of protecting such databases in a server provided for this purpose.

2.8.2 Dissemination products and instruments

Once the Census of Buildings` statistical production is concluded, data dissemination is carried out taking into account different disaggregation levels and considering the analysis variables of interests. This is done in order to provide users with a compendium of results that meets the needs for information in the construction sector.

Information is released in Press Bulletins and annexes on an expired quarter basis. This information is and structured as follows: In March, results from IV quarter are presented, in June: I quarter; September: II quarter; and December: III quarter. Information is considered as preliminary for one year, and historical series are made available at DANE`s website. In addition, requirements for information submitted by both international and national entities or users are met at DANE`s Data Bank. Results from the Census of Buildings are presented based on the following structure:

- *Census of Buildings` general structure:* general structure of the area surveyed by states of construction works, according to urban and metropolitan areas.
- *Works in construction process:* area in process, presented by metropolitan and urban areas and according to the destination. Quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Contribution to the quarterly variation of area in process, showed by metropolitan and urban areas and according to the destination. Finally the area in construction process is presented by metropolitan and urban area, and according to socioeconomic strata.

- *New construction works:* the area in which the construction work has started is presented by metropolitan and urban areas, and regarding the destination. Quarterly, annual, year-to-date and 12 months' variations and contributions of the new area are showed by metropolitan and urban area and according to the destination.
- *Inactive works:* total paralyzed area is presented by metropolitan and urban areas, according to the destination. The new inactive area is presented by metropolitan and urban area, and according to the destination. The quarterly variation of inactive area is showed by metropolitan areas, according to the destination.
- *Finished areas:* the finished area is showed by metropolitan and urban areas, according to the destination. The quarterly variation of finished area is also presented; by metropolitan and urban areas, according to the destination.

For additional information on the means for data dissemination pertaining to this statistical operation, see: Design of Output Tables – Census of Buildings (CEED), available at DANE's intranet.

2.9 DESIGN OF EVALUATION

Permanent contact with media, unions and also committees contribute to update the needs for information submitted by users of this Census data. This way, the inclusion of new variables that offer a greater precision in analysis carried out to the construction sector can be presented on a regular basis and taking into account the needs identified or the circumstances surrounding this sector that make it necessary to evaluate permanently the information released, among other actions.

3. RELATED DOCUMENTATION

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