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ARTICLE

Design for Producing Vertical Non-Loadbearing Masonry: Scope Analysis

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Abstract

The design for producing non-loadbearing masonry offers high potential for improving the design process in building construction. However, one of the problems worth mentioning is the lack of accurate definition of the scope, causing doubts about what, when and how it should be prepared, developed and delivered by the designers. The main purpose of this article is to investigate and analyse the application of the scopes of the designs of vertical non-loadbearing masonry (DPVM) in building construction using case studies in the cities of Recife and Sao Paulo in Brazil. The results obtained have shown that conformity (meeting the specifications) the reference scope adopted – the Brazilian Association of Design Managers and Coordinators (AGESC) handbook – averaged 61% (construction companies) and 57% (designers), while the agreement (personal opinion on the appropriateness of the specification) with the scope averaged 45% (construction companies) and 56% (designers). A wider difference was found between conformity and agreement among the construction companies compared to the DPVM designers. Lastly, it gives guidelines on the scope of how to use the AGESC handbook on DPVM, describing potential uses and stressing the contributions to greater integration between expectations and resulting products, to more rationally facilitate the design and execution of non-loadbearing masonry in building construction.

Keywords – Building; construction; design scope; non-loadbearing masonry

INTRODUCTION

DESIGN FOR PRODUCING VERTICAL NON-LOADBEARING MASONRY

The use of the design to produce vertical non-loadbearing masonry (DPVM) has been recommended as a mechanism of high potential for improving the design process in Brazilian building construction, contributing to overcoming design incompatibilities due to lack of integration among designers and executive difficulties. Although design undeniably contributes to the approach between product and production to further improve the production process of non-loadbearing masonry, many problems still exist with regard to its development and use (Corrêa and Andery, 2006; Maneschi and Melhado, 2010).

Aquino and Melhado (2005) list a set of problems relating to the process of design development and use to produce vertical non-loadbearing masonry in building construction, which ranges from the work team's resistance, lack of design coordination to the absence of considerations on the performance of non-loadbearing masonry. It was evident that many of the problems mentioned by Aquino and Melhado (2005) are the result of lack of precise definition of the range of scope of services involved in preparing the design for production.

According to the Brazilian Association of Design Managers and Coordinators (AGESC) (2008), many designs (large or small) begin with maladjusted agreements between their idealizers and those responsible for preparing the designs, raising doubts

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on what, when and how it should be prepared, developed and delivered by the designers.

Some international publications (NASA, 2000; Cho and Gibson, 2001; Fuentes, 2004; AIA Contract Documents, 2010; Cherry and Petronis, 2010) express concern about defining the scope in building construction, mainly with regard to both the scope of the project and the design itself.

Poor scopes are a major cause of failure of the projects, causing adverse effects on cost, time and quality (NASA, 2000; Cho and Gibson, 2001; Fuentes, 2004). The aforementioned authors, when discussing a specific indicator for assessing the project scope in building construction called Project Definition Rating Index, stress the importance of design scope, listing in category F the parameters required for the different technical design specialities.

The work done by the American Institute of Architects (AIA) (2010) is also worth mentioning, relating to development of contractual documents that define the relationship and work scopes relating to design and construction. According to AIA Contract Documents (2010), for more than 120 years these contractual documents are being systematically enhanced and recognized as standards for the North American construction industry.

When discussing scopes in greater depth, Cherry and Petronis (2010) emphasize non-definition of scope before starting to develop the design as one of the main sources of problems, unnecessary efforts and frustrated expectations between clients and designers. In a situation of this kind, there is a tendency of distortions in the contract, which encourage price competition without a clear relation with the actual provision of services associated to them, in addition to causing disputes between contracting parties and designers, thereby configuring losses in the quality of the process and project.

In this situation, the Brazilian associations representing the design sector – Brazilian Association of Structural Consulting and Engineering Services (ABECE), Brazilian Association of Building System Engineering (ABRASIP), Brazilian Association of Architecture Offices (AsBEA), with the participation of sectoral bodies representing the design contracting parties in the real estate and construction sector, Secovi-SP, Sindinstalação and SindusCon-SP – joined forces to prepare standards as a benchmark for design contracts.

The result of this collective work was a number of handbooks on scope of design and services, one of which concerns non-loadbearing masonry – the AGESC handbook on scope of design and services of non-loadbearing masonry (2008).

AGESC HANDBOOK ON DESIGN SCOPE FOR PRODUCTION

The AGESC handbook on scope[1] (2008) provides for various activities relating to DPVM, comprising 61 services (types: essential, specific and optional) that form six stages in the design process. This group defines the general structure of scope of DPVM. Table 1 demonstrates the content of Stage D (Design for detailing specialities) in the AGESC handbook on design scope for producing non-loadbearing masonry (2008).

The result of the widespread discussion and participation of the sectoral agencies helped draw up a comprehensive set of services for the scope of non-loadbearing masonry design, which acts as a reference for application and adaptation to a certain project.

It is worth considering, however, that there is no evidence that the scopes of the existing services involved in preparing the design for production are being fulfilled or fully in line with the interests of the builders and designers.

OBJECTIVE

The main purpose of this article is to present the results of a case study survey relating to the investigation and analysis of the application of the scopes of design and services of vertical non-loadbearing masonry.

The conformity (meeting the specifications set out in the AGESC handbook) and agreement (personal opinion on the appropriateness of the specification set out in the AGESC handbook) on the scope of the DPVM between designers and builders were verified, which allowed forming a set of guidelines for implementation of the reference scope – AGESC handbook.

TABLE 1 Contents of stage D of the AGESC handbook on DPVM (AGESC, 2008)

SERVICES	
Essential	• Consolidated checking of designs of other specialities • Preparing the location map of the 1st row of masonry • Preparing the location map of points in building systems in contracted floor slabs • Preparing elevations of the walls for the contracted floors • Quantifying the non-loadbearing components for the contracted floors • Construction details for the contracted floor • Location map by coordinate axes • Consolidated checking of designs of other specialities • Preparing the location map of prefabricated components for contracted floors
Specific	• Preparing the structure fastening plan • Survey of the area of vertical non-loadbearing masonry • Executive procedure of complementary components of vertical non-loadbearing masonry • Executive procedure of vertical non-loadbearing with no details from the contracting party
Optional	• Executive procedure of components produced on site • Design for producing vertical non-loadbearing masonry for customizing units • Preparing the location map of the 2nd row for contracted floors • Floor compatibility • Executive procedure of complementary components of vertical non-loadbearing masonry

METHODOLOGY OF THE CASE STUDY SURVEY

The methodology for undertaking this survey consisted of the following steps.

Step 1 – Literature review addressing the insertion of design for production in the design and scope process of non-loadbearing masonry designs and services.

The literature review established the theoretical framework and determined the parameters of the questionnaire investigated during the fieldwork.

Step 2 – Preparation of the questionnaire for data collection. The references adopted for the questionnaire were based on the literature review, technical standards and the AGESC handbook on scope of design and services (2008) – manual specific to Brazil. Two questionnaires were drawn up, each applying to the construction companies and vertical non-loadbearing masonry designers responsible for the projects used for the survey. The questionnaire was formatted in two main parts: (1) design process and DPVM and (2) DPVM scope.

The questionnaire characterized the project and key agents participating in the development process DPVM: builders, designers and design coordinators. The first part of the questionnaire included the flow diagram of the design process, the characteristics of the process of coordinating projects and key constituents, the DPVM flowchart, the premises for the development of DPVM, whereas the second part of the questionnaire included the existence services listed in the handbook AGESC belonging to the scope of DPVM.

Step 3 – Undertaking a field investigation for applying the questionnaire in real estate construction firms to check the existence of the questionnaire's elements in four projects in the cities of São Paulo and Recife.

Overall, 4 construction companies (2 from Recife and 2 from São Paulo) and 3 designers (1 of the city of Recife and 2 of the São Paulo city) participated in the field investigation.

Step 4 – Analysis of the results and drawing up guidelines for applying the DPVM scope. The survey began in March 2010 and ended in August 2010, over a total six-month period.

With the results, it was possible to assess the effective scope of the DPVM (phases, steps and services) and the real need of improvement.

PRESENTATION AND ANALYSIS OF RESULTS

The four construction companies in the case study survey and their projects are identified by letters A, B, C and D, whereas the designer companies of vertical non-loadbearing masonry are identified by letters E, F, G and H.

It should be mentioned that this information was provided spontaneously and separately by the design

coordinators of the construction companies and the companies that design vertical non-loadbearing masonry of each of the projects at the time of the interviews.

CHARACTERIZATION OF THE COMPANIES

The results obtained from characterizing the companies in the case studies are given in Tables 2 and 3.

Companies A, B, C and D operate in similar areas and are traditional in their markets with a lifespan of over 20 years. Except for company D, which is undergoing a certification process, all the others already have the ISO 9001 certificate and PBQP-H (Brazilian quality certification), with special mention of company C that is also ISO 14001 certified. Companies A and D have the largest quantity of works and designs in progress.

Companies E, F, G and H that design vertical non-loadbearing masonry have a diversified operating area, mainly as a result of the skills of their specialists in charge. The lifespan of companies E and F differs when compared with companies G and H. Company H is outstanding with regard to the number of designs in progress.

CHARACTERIZATION OF THE PROJECTS

The results from characterization of the projects belonging to the case studies are presented in Table 4.

The building process of the projects of companies A, B, C and D is characterized as traditional, with streamlined non-loadbearing masonry. The buildings vary in height, with the largest belonging to company B with 30 typical floors. It is clearly noticeable that the non-loadbearing masonry of the projects is streamlined by means of industrialized

TABLE 2 Characterization of construction companies

CHARACTERIZATION	CONSTRUCTION COMPANIES			
	A – RECIFE	B – RECIFE	C – SÃO PAULO	D – SÃO PAULO
Operating area	Construction and incorporation			
Lifespan	60 years	43 years	20 years	29 years
Certification	ISO 9001 & PBQP-H		ISO 9001, PBQP-H & ISO 14001	–
Projects underway/in design process	10/10	3/2	4/2	13/4

TABLE 3 Characterization of companies that design vertical non-loadbearing masonry

CHARACTERIZATION	DESIGNER COMPANIES			
	E – RECIFE	F – RECIFE	G – SÃO PAULO	H – SÃO PAULO
Operating area	Construction management & technology, DPVM	Construction management & technology, DPVM	Design coordination, IT management & DPVM	Design coordination & DPVM
Lifespan	4 years	4 years	10 years	8 years
Projects in design process	4	4	3	15

TABLE 4 Characterization of the projects

CHARACTERIZATION	PROJECTS			
	A	B	C	D
Building process	Traditional	Traditional	Traditional	Traditional
Type-floors	7	30	24	15
Masonry components	Concrete blocks and industrialized mortar	Ceramic blocks and industrialized mortar		Concrete blocks (different widths) and industrialized mortar

mortar and components with holes on the vertical, in addition to a family of sub-modules that can provide improved executive quality. Unlike the others, the company D project still has different block widths.

DESIGN PROCESS

DESIGN COORDINATION

The results relating to design coordination from the viewpoint of the construction company's design coordinator and DPVM designer are given in Tables 5 and 6, respectively.

When analysing Table 5, from the viewpoint of the construction company's design coordinator, the following characteristics of design coordination are worth mentioning:

- design coordinators of the construction companies are civil engineering university graduates with specialization course, except in company D;
- hierarchical subordination of design coordination in company D shows a wider distribution of tasks among the team responsible for the activity;
- all coordinators consider that the design process needs to be improved, quoting some development opportunities.

When analysing Table 6, from the DPVM designer's point of view, the following characteristics of the design coordination process are worth mentioning:

- DPVM designers are civil or architecture university graduates, mostly post-graduates;
- all are under the hierarchical subordination of the design coordinator;
- all coordinators consider that the design process needs to be improved, quoting some development opportunities;
- DPVM designers are seen to have an advanced university education; but both professionals see potential improvements in the design coordination process.

TABLE 5 Design coordination from the point of view of the construction company's design coordinator

DESIGN PROCESS	DESIGN COORDINATOR			
	A	B	C	D
1 Coordinator's educational background	Civil Eng., specialization	Civil Eng., specialization	Civil Eng., specialization	Architect
2 Immediate hierarchy	Technical director	Works director	Technical director	Project management
3 Coordination	Internal	Internal	Internal	Internal
4 Process indicators	No	No	No	No
5 Potential improvements of process	Yes, professionalization	Yes, process indicators	Yes, new procedures and shorter deadlines	Yes, interface w/incorporation, feedback works

TABLE 6 Characteristics of design coordination from the point of view of the DPVM designer

DESIGN PROCESS	DPVM DESIGNER			
	E	F	G	H
1 DPVM designer's educational background	Civil Eng., PhD	Civil Eng., PhD	Architect, Master's	Architect
2 Immediate hierarchy in coordination	Design coordination	Design coordination	Design coordination	Design coordination
3 DPVM designer's records	Minutes	Minutes	Minutes and plan notes	Minutes
4 Knowledge of construction company indicators	No	No	No	No
5 Potential coordination improvements	Yes, developing design guidelines		Yes, integration between designers	Yes, definitions by correct deadline

ELEMENTS OF COORDINATION

The main elements deemed pertinent to design coordination were listed, whose results showed that:

- the construction companies reported the existence of 54% of design coordination elements, compared to only 48% reported by DPVM designers;
- designers' proposals used as a contract instrument between the parties in all cases. The construction companies do not provide specific drafts;
- companies reported that the only element lacking in coordination was communication of post-occupation assessment results for DPVM designers; ratified by their perception on the non-use of post-occupation assessments in new designs and no feedback from customer satisfaction surveys.

DESIGN PROCESS FOR PRODUCING VERTICAL NON-LOADBEARING MASONRY

Figures 1 and 2 demonstrate the results relating to the existence of premises in DPVM development in the opinions of the construction company design coordinators and vertical non-loadbearing masonry designers.

When analysing the results in Figures 1 and 2 in percentage of the number of companies that confirmed the existence of premises, it may be considered that:

- From the construction company point of view 54% of premises exist in DPVM development, under the 71% of DPVM designers. The design coordinators of the construction companies were more critical of the premises under their responsibility, when compared with the DPVM designers;
- there is no specific indicator for DPVM assessment, a fact that could hinder the factual comparative assessment between the various designers that may be or will be working on development of DPVM of the construction companies;
- the main difference in the answers from the construction companies and DPVM designers relates to the simultaneous start of developing DPVM with the other design specialities.

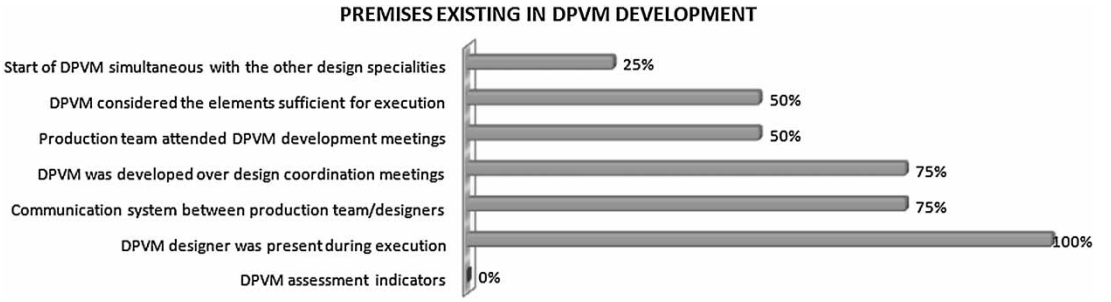

FIGURE 1 Premises in DPVM development from the point of view of construction companies

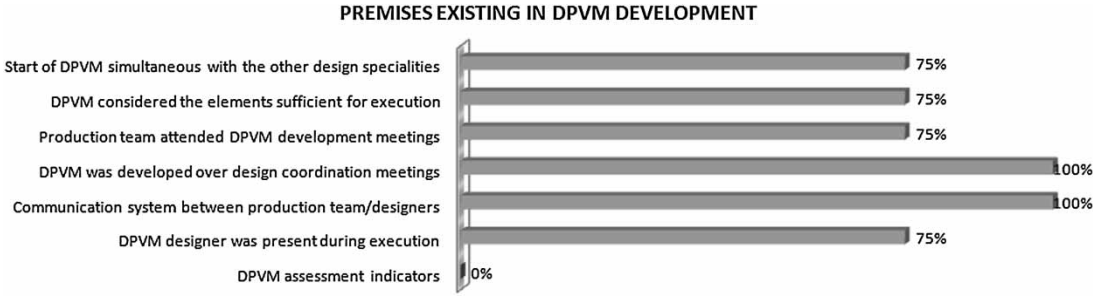

FIGURE 2 Premises in DPVM development from the DPVM designers' point of view

CONFORMITY TO THE BRAZILIAN ASSOCIATION OF DESIGN COORDINATORS AND MANAGERS' HANDBOOK (AGESC) ON DPVM SCOPE

Tables 7 and 8 show the results relating to conformity to the AGESC handbook on DPVM scope in function of the project and stages in the design process.

The criteria adopted for calculating Total 1, Total 2 and Total 3 were the following:

- Total 1: Corresponds to the mean of the averages of positive conformity to the services at each stage in the design process;
- Total 2: Corresponds to the sum of weighting the averages of positive conformity at each stage in the design process. The weights used when weighting were attributed to the quantity of essential services at each stage in the design process in relation to total essential services at all these stages, namely: A – 4 services (11%), B – 3 services (8%), C – 14 services (37%), D – 14 services (37%), E – 2 services (5%) and F – 1 service (3%);
- Total 3: Corresponds to the mean of the averages of positive conformity to the services at each stage in the design process, considering all projects.

TABLE 7 Conformity to the AGESC handbook on DPVM scope per project

PROJECTS	CONSTRUCTION COMPANIES		DPVM DESIGNERS	
	TOTAL 1 (%)	TOTAL 2 (%)	TOTAL 1 (%)	TOTAL 2 (%)
A	62	69	62	67
B	64	77	62	67
C	50	58	24	43
D	27	41	40	49
Average	51	61	47	57

TABLE 8 Conformity in function of the stages in the design process

STAGES IN THE DESIGN PROCESS	CONSTRUCTION COMPANIES TOTAL 3 (%)	DPVM DESIGNERS TOTAL 3 (%)
Stage A – Concept of product	13	0
Stage B – Definition of product	33	39
Stage C – Identifying and solving design interfaces	71	67
Stage D – Design details	71	66
Stage E – Design post-delivery	68	60
Stage F – Job post-delivery	50	50

The following is found when analysing the results obtained in Table 7:

- irrespective of Total (1 or 2), conformity to the handbook on scope from the construction company's point of view is greater than that for the DPVM designers, although with just a slight difference. Probably the designers are more critical when adopting the handbook because of their greater knowledge of the established activities relating to each service;
- considering only Total 2, it is found that conformity to scope varied between 41 and 77% (construction companies) and between 43 and 67% (designers);
- considering only the media of the Total 2, it is found that conformity to scope was 73% in the Recife construction companies compared to 49.5% in São Paulo construction companies. The conformity to scope was 67% in the Recife designers compared to 46% in São Paulo designers.

When analysing the results in Table 8, stages C and D have the highest percentage of conformity for all respondents, while stage A has the lowest. Probably little is still known of the benefits of the pertinent activities established in the concept phase of the product.

Extending the view of the results, the lowest percentage of conformity is associated with the first and final stages of the design process. It is possible to imagine that the DPVM designers do not feel part of these stages, bearing in mind that when they occur they are not so present, a view shared by the construction companies.

AGREEMENT REGARDING THE AGESC HANDBOOK ON DPVM SCOPE

Tables 9 and 10 show the results relating to agreement in relation to the AGESC handbook on

TABLE 9 Agreement per project

PROJECTS	CONSTRUCTION COMPANIES		DPVM DESIGNERS	
	TOTAL 1 (%)	TOTAL 2 (%)	TOTAL 1 (%)	TOTAL 2 (%)
A	54	46	61	60
B	29	38	61	60
C	48	37	63	54
D	44	59	39	49
Average	44	45	56	56

TABLE 10 Agreement in function of the stages in the design process

STAGES IN THE DESIGN PROCESS	CONSTRUCTION COMPANIES TOTAL 1 (%)	DPVM DESIGNERS TOTAL 1 (%)
Stage A – Concept of product	19	63
Stage B – Definition of product	53	14
Stage C – Identifying and solving design interfaces	49	61
Stage D – Design details	44	53
Stage E – Design post-delivery	48	68
Stage F – Job post-delivery	50	75

DPVM scope in accordance with the project and stages of the design process.

The following is found when analysing the results in Table 9:

- irrespective of Total (1 or 2), the agreement regarding the scope handbook in the opinion of the DPVM designers is greater than that of the construction companies, with a slightly higher difference of 10%. Probably the fact that the DPVM designers have more knowledge of the handbook contribution to the result, even more so considering that the majority participated in the concept of the handbook in question;
- considering only Total 2, it is noticeable that the agreement of scope varied from 37% to 59% (construction companies) and from 49% to 60% (designers);
- considering only Total 2, the highest percentage of agreement is attributed to project D (construction companies) and projects A and B (designers), while the lowest agreement is attributed to projects C (construction companies) and D (designers). Note here the different opinion between the construction company and the designer of project D;
- considering only the media of the Total 2, it is found that agreement to scope was 42% in the Recife construction companies compared to 48% in São Paulo construction companies. The conformity to scope was 60% in the Recife designers compared to 51.5% in São Paulo designers.

When analysing the results in Table 10, major differences can be found in the opinion of the construction companies and DPVM designers. While the construction companies have more agreement with stage B, the DPVM designers have more agreement with stage F. In relation to less agreement, the differences are also present since the construction companies have less agreement with stage A and the DPVM designers have less agreement with stage B, the latter being the main difference.

GUIDELINE FOR APPLICATION OF SCOPES OF THE DESIGNS AND SERVICES OF VERTICAL NON-LOADBEARING MASONRY

The AGESC handbook on scope of vertical non-loadbearing masonry designs and services (2008) is unequivocally the top and most comprehensive national reference on this subject. It is, however, necessary for the main users of the technical content, namely designers and contracting parties, to progress in the application of the AGESC scope handbook (2008).

The following comments are intended guidelines on how to use/apply the AGESC handbook on scope of vertical non-loadbearing masonry designs and services.

(a) It can be used more than once in the design process.

When forming the design team, still at the stage of hiring the designers, it can be used as a reference to define DPVM activities and services, establishing the

operating coverage, objectives and responsibilities of the stakeholders.

During the design process it can be used to monitor the activities/services undertaken at each stage, setting a benchmark standard to assess the DPVM status in the period of interest.

Depending on the time of contracting the DPVM in the design process, the AGESC scope handbook (2008) lists the activities/services that can still be undertaken. Similarly, it can be used to point to defects regarding the DPVM content when analysing designers' proposals.

(b) Help in developing the design plan.

It can help the design coordinator and other designers (design team) to determine and hierarchize the activities/services considered crucial for developing the design plan. It also helps to standardize the terminology used, helps design team communication and to establish control points in the design timetable, defining the conclusion of a group of activities/services or stage, for approval and formalization by the client (entrepreneur or construction company).

(c) Definition of the DPVM scope.

The AGESC scope handbook (2008) provides the various activities relating to DPVM, consisting of 61 services (essential, specific and optional) that form six stages in the design process. This group defines the general structure of scope of DPVM. When defining the DPVM scope, all selected activities, irrespective of the initial classification of the service established in the AGESC scope handbook (2008), now belong to an essential service. In this sense, it also helps align and converge objectives between the entrepreneurs, designers and executors. Another important tool that may be provided concerns the activities that are mentioned throughout the AGESC handbook, since each can be a target of a specific checklist consisting of all the necessary elements for checking the scope of the DPVM, measuring progress, assessing the risks of non-conformity and redirecting efforts to integrate this set of absent activities. Moreover, the activities listed in the AGESC scope handbook (2008) are the starting point for those companies interested in standardizing their services in the development of DPVM.

(d) Checking DPVM scope.

Checking conformity to the AGESC scope handbook (2008) is a way to assure the contracting party that the DPVM considers the set of elements required for the vertical non-loadbearing masonry. Therefore, developing an indicator to check the integrity of the DPVM scope is a valuable tool, as discussed in relation to Total 2, which permits monitoring the conformity with the pre-established scope, in this case, the AGESC scope handbook proper (2008). In order to appropriate the aforementioned indicator (Total 2), here referred to as Indicator of the Non-loadbearing masonry Design Scope (INMDS), the following formula can be adopted:

$$\text{INMDS} = \sum_{F}^{A} Pi \times \overline{Si}$$

where i is the stage in the design process (A, B, C, D, E and F); Pi the ratio between the quantity of essential services at each stage in the design process and the total quantity of essential services; and $\overline{Si}$ the average of positive conformity of existing services (essential, specific and optional) at each stage in the design process.

Some further comments are pertinent to the INMDS:

- it can be used as a benchmark to compare earlier DPVMs and new DPVMs;
- it can be used both by the contracting party and designer jointly or separately to check the status of the DPVM scope defined initially;
- it can be used as a decision-making parameter, releasing the documents/plans of activities/services for undertaking a job.

(e) Control of the changes in the DPVM scope.

When there is some change in scope from that existing in the AGESC scope handbook (2008), it is easier to identify the activities/services that were not initially defined and the effort required to develop

them. It is essential to define the scopes of any new activities/services, as learning for future DPVM.

CONCLUSIONS

Solving problems arising from the absence of precise definition of the design scope coverage has appeared as one of the main requirements to improve the design process. Lack of definition of the scope of vertical non-loadbearing masonry designs and services is not an exception, since there are still doubts, stress and misunderstandings between the agents involved on what must be part of the designs and the level of details required.

In the international context there has been ongoing development of the topic over the years, showing standards of contracts with well-defined scopes, now common to civil construction, in addition to the development of application methodology and monitoring of the progress of scopes by means of indicators.

In the national context, the Brazilian benchmark on the subject – AGESC handbook on scope of vertical non-loadbearing masonry designs and services (2008) – was developed more recently, and it is believed that the stakeholders are still in the earlier stages of its knowledge and application. It was evident that there is a lack of data to corroborate the level of use of the handbook in question and details that the services are being effectively provided at each stage of the design's development.

The case study survey focused on checking conformity in projects and harmonization of the aforementioned handbook with the opinions of the construction companies and DPVM designers. With regard to conformity and agreement with the benchmark adopted – the AGESC handbook on DPVM scope (2008) – the results obtained demonstrated that the conformity of the scope averaged 61% (construction companies) and 57% (designers), while agreement was 45% (construction companies) and 56% (designers). A wider difference was found between conformity and agreement among the construction companies compared to the DPVM designers.

Comparing the difference in results between the two cities, conformity to scope was greater in Recife than in São Paulo (both construction companies and designers), while agreement to scope was greater in São Paulo (construction companies) and Recife (designers).

Lastly, it is believed that the guidelines proposed for application of the handbook on scope of vertical non-loadbearing masonry designs and services will contribute to further integration with the products desired by the stakeholders, facilitating a more streamlined development of the actual design and providing the service and, consequently, the quality of the execution of vertical non-loadbearing masonry in buildings.

NOTE

1 Further information by consulting the site: http://www.secovi.com.br/minisites/manual/Main.php?do=Inicial&refresh=true.

REFERENCES

AIA Contract Documents, 2010, Produced by The American Institute of Architects [available at www.aia.org/contractdocs/index.htm] [accessed January 2010].

Aquino, J.P.R., Melhado, S.B., 2005, 'Diagnóstico das dificuldades no uso de projetos para produção de vedações verticais', Boletim Técnico da Escola Politécnica da USP, BT/PCC/394, São Paulo.

Associação Brasileira de Gestores e Coordenadores de Projetos (AGESC), 2008, *Manual de escopo de projetos e services de vedações* [available at www.manuaisdeescopo.com.br/Mainphp?do=ListaManual&refresh=true] [accessed December 2008].

Cherry, E., Petronis, J., 2010, *Architectural Programming* [available at www.wbdg.org/design/dd_archprogramming.php] [accessed December 2010].

Cho, C.S., Gibson, E.G., Jr., 2001, 'Building project scope definition using project definition rating index', *Journal of Architectural Engineering ASCE* **1**, 115–125.

Corrêa, C.V., Andery, P.R.P., 2006, 'Dificuldades para a implementação de projetos para a produção de alvenaria: um estudo de caso', *Gestão & Tecnologia de Projetos* **1**, 104–125.

Fuentes, P.A.U., 2004, 'Validation of the Project Definition Rating Index (PDRI) for MIT building projects. 2004, 95 f', Dissertation (Master's), Massachusetts Institute of Technology, Massachusetts.

Maneschi, K., Melhado, S.B., 2010, 'Scope of design for production of partition walls and facade coverings', *Architectural Engineering and Design Management* **6**, 3–17.

National Aeronautics and Space Administration, 2000, *PDRI Project Definition Rating Index – Use on NASA Facilities*, NASA, Houston.