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**PUBLIC WORKS AUDITING – A COMPARATIVE
ANALYSIS BETWEEN U.S. AND BRAZILIAN
FEDERAL GOVERNMENTS' METHODS**

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ABSTRACT

Brazil is undertaking numerous large-scale projects in preparation for its hosting of the 2014 World Cup and the 2016 Olympic Games, as well as other infrastructure projects that are being carried out under the Growth Acceleration Program (Programa de Aceleração do Crescimento – PAC), all of them extremely necessary to the steady development of the country.

In this context, Public Works Auditing is a relevant activity to the successful achievement of these projects, as it aids the Federal Government on the identification of issues that might lead to negative results if not corrected at the right time, such as design errors in projects, overpriced bids contracted and low-quality constructions.

The responsibility of this role, in terms of internal control of the Brazilian Federal Government, lies with the Office of the Comptroller General (Controladoria-Geral da União - CGU). Although relatively new (created in 2003), this agency has developed great know-how in this branch, thus contributing to a greater efficiency of Brazilian public works. Nevertheless, there is a constant need for improvement, in order to achieve better results.

Considering that, a great reference for evaluation is the U.S. Federal Government, recognized worldwide for the quality of its public works, in part due to its performance in auditing these projects.

By comparing U.S. and Brazilian federal auditing methods on public works, it will provide a better evaluation of the CGU's weaknesses, and thus, point out strategies for improving the performance of the agency's auditing processes.

1. INTRODUCTION

Public Works Auditing is carried out by public control agencies in order to support governments to provide citizens high-quality public works, on a timely and fairly priced way. In Brazil, although the internal control agency of the Federal Government has developed procedures to perform this task, problems related to public works are still a highlight topic for the public sector. Design errors in projects, overpriced bids contracted and low-quality constructions belong to the daily news of all levels of the Brazilian governments.

That is not the case of U.S. public works, noticeably a better reference compared to the Brazilian ones. Although part of this success can be credited to U.S. public control agencies, it seems that U.S. public institutions that manage public works are better structured than the Brazilian ones. That demands a different Public Works Auditing approach, in order to contribute to this more effective outcome.

This paper aims to develop a comparative analysis between U.S. and Brazilian Federal Governments' auditing methods on public works, in order to provide a better evaluation of Brazil's weaknesses and point out strategies for improving their auditing processes. The first chapter comprises the concept of public works, looking at their relevance in Brazil as a necessary step to the country's development, as well as the major problems related with them. The second chapter features the internal control structure of the Brazilian federal government and their Public Works Auditing procedures, encompassing all stages of public works: design (plans, specifications and cost estimates), bidding (technical qualification requirement issues), construction and utilization. The third chapter addresses those same issues, this time based on the U.S. federal government. Finally, the conclusion draws the main findings of the paper and addresses limitations that might be overcome by future investigation.

2. ABOUT PUBLIC WORKS

2.1. Definition of Public Works

According to the American Public Works Association (APWA), when it comes to public works, one size definitely does not fit all. Because of the multi-faceted, ever-evolving nature of public works, defining the term becomes problematic. Even still, the association presents its own definition:

“Public works is the combination of physical assets, management practices, policies, and personnel necessary for government to provide and sustain structures and services essential to the welfare and acceptable quality of life for its citizens” (APWA 2013).

In Brazil, the Federal Court of Accounts (Tribunal de Contas da União – TCU) presents a very different definition that stems from the Brazilian Bidding and Government Contracts Rule, Law nº 8,666:

“Public works is considered every construction, renovation, manufacture, repair or extension of a commonweal” (TCU 2013).

There is, though, a more illustrative definition, which seems most adequate for the purpose of this study. It is described as follows:

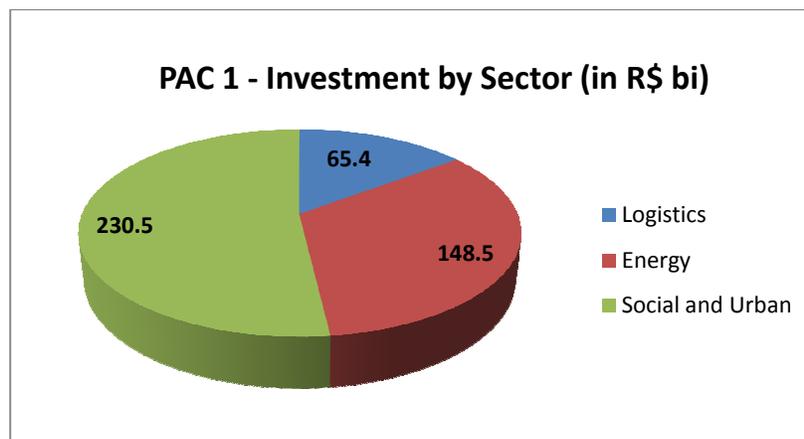
“Public works are a broad category of infrastructure projects, financed and constructed by the government, for recreational, employment, and health and safety uses in the greater community. They include public buildings (municipal buildings, schools, hospitals), transport infrastructure (roads, railroads, bridges, pipelines, canals, ports, airports), public spaces (public squares, parks, beaches), public services (water supply, sewage, electrical grid, dams), and other, usually long-term, physical assets and facilities” (WIKIPEDIA 2013).

2.2. Public Works in Brazil: Figures

Public works is a major issue in Brazil, not only nowadays, but in the last decade and in the ones to come. These infrastructure projects are extremely necessary to the steady development of the country. This need stems from the lack of appropriate infrastructure investment in the past. It jeopardizes the Brazilian economy, taking part in the so called “Brazil Cost,” as well as penalizing social welfare of its citizens, with unattended demand for households, public services (water supply, sewage, electricity, telecommunications) and public buildings, in order to enhance healthcare and education levels (hospitals, schools, universities, etc.). To face this issue, in 2007, the Brazilian federal government launched the Growth Acceleration Program (Programa de Aceleração do Crescimento – PAC), with massive investments all over the country. The program is now on its second stage. Despite this huge gap in infrastructure, Brazil is still undertaking numerous large-scale projects in preparation for its hosting of the 2014 World Cup and the 2016 Olympic Games, which makes the subject even more relevant.

2.2.1. Growth Acceleration Program – PAC

In its first stage (PAC 1), from 2007 to 2010, the Growth Acceleration Program (PAC) established three macro sectors (Logistics, Energy, Social and Urban), with an invested amount of R\$444.4 billion (US\$266.7 billion – exchange rate Dec 31, 2010) (BRASIL 2012). Graph 01, below, illustrates the investment by each sector:



Graph 01 – PAC 1 - Investment by sector in period 2007-2010

The detailed outcomes of each sector are displayed in Tables 01 to 03, below, with their respective invested amounts:

Table 01 – PAC 1 – Logistics sector – detailed investment

Segment	Outcomes	Investment (R\$ bi)
Highways	6,377 km	42.9
Merchant marine	Financing of 301 vessels and 5 shipyards	17.0
Railroads	909 km	3.4
Airports	12 projects in 10 airports	0.28
Ports	14 projects	0.79
Waterways	10 terminals	0.04
	Tucuruí sluices	0.97

Table 02 – PAC 1 – Energy sector – detailed investment

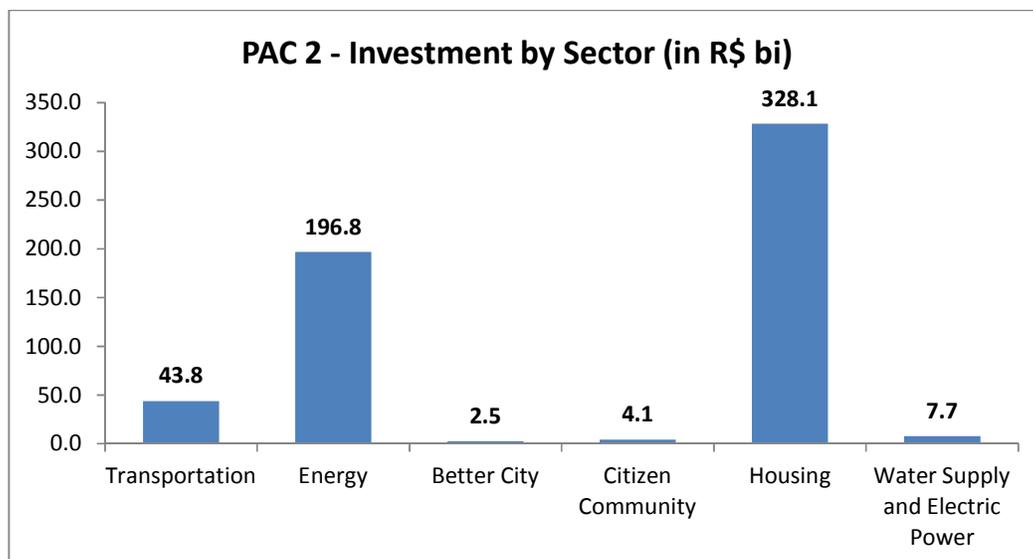
Segment	Outcomes	Investment (R\$ bi)
Oil & gas fields	Exploration & Production	57.1
Energy generation	10,851 MW	26.4
Refining	16 projects	23.6
Renewable fuels	87 power plants	10.1
Gas pipelines	3,776 km	19.1
Energy transmission	9,139 km	7.0
Liquefied Natural Gas - LNG	20,000 m3/year	3.1
Petrochemicals	-	2.1
Green diesel - HBIO	256,000 m3/year	0.05
Inventory studies	24,736 MW	0.05
Viability studies	14,789 MW	0.22

Table 03 – PAC 1 – Social and urban sector – detailed investment

Segment	Outcomes	Investment (R\$ bi)
Housing finance	-	216.9
Rural electrification	-	6.6
Water resources	23 projects, 7,945 water tanks, and sewage systems in 23 cities	2.0
Sanitation	1,225 projects	1.5
Metro systems	3 projects	2.7
Housing	374 projects	0.35

The second stage of the program (PAC 2), from 2011 to 2014, established six macro sectors (Transportation, Energy, Better City, Citizen Community, Housing, Water Supply and Electric Power), and foresees a total investment of R\$708 billion

(US\$302.2 billion - exchange rate Dec 31, 2013) by the end of 2014, from which R\$583 billion (US\$248.9 billion) corresponds to the last balance in December 2013 (BRASIL 2014). Graph 02, below, illustrates the updated investment by sector:



Graph 02 – PAC 2 - Investment by sector (2011- 2013)

The detailed outcomes by each sector are displayed in Tables 04 to 09 below:

Table 04 – PAC 2 – Transportation

Segment	Outcomes
Highways	3,080 km
Railroads	639 km
Airports	22 projects
Ports	21 projects
Waterways	19 projects
Equipment for county roads	5,071 backhoes, 2,801 graders and 1,756 dump trucks

Table 05 – PAC 2 – Energy

Segment	Outcomes
Energy generation	10,200 MW
Energy transmission	9,828 km and 32 electric substations
Oil & gas exploration and production	26 projects
Refining and petrochemicals	18 projects
Fertilizers and natural gas	8 projects
Renewable fuels	2 projects

Naval industry	Construction of 2 drilling rigs Contracted financing of 383 vessels and 13 shipyards
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Table 06 – PAC 2 – Better City

Segment	Outcomes
Sanitation	877 projects
Risk areas prevention	Floodwater drainage - 60 projects Slope containment - 10 projects
Urban mobility	7 projects
Paving	18 projects

Table 07 – PAC 2 – Citizen Community

Segment	Outcomes
Basic healthcare	1,404 units
Emergency healthcare	14 units
Nurseries and preschools	223 units
Sports courts in schools	481 units
Unified sports and arts centers	22 units

Table 08 – PAC 2 – Housing

Segment	Outcomes
Housing	2.2 million units contracted
Housing finance	1.4 million units contracted
Urbanization of precarious settlements	1,415 projects

Table 09 – PAC 2 – Water Supply and Electric Power

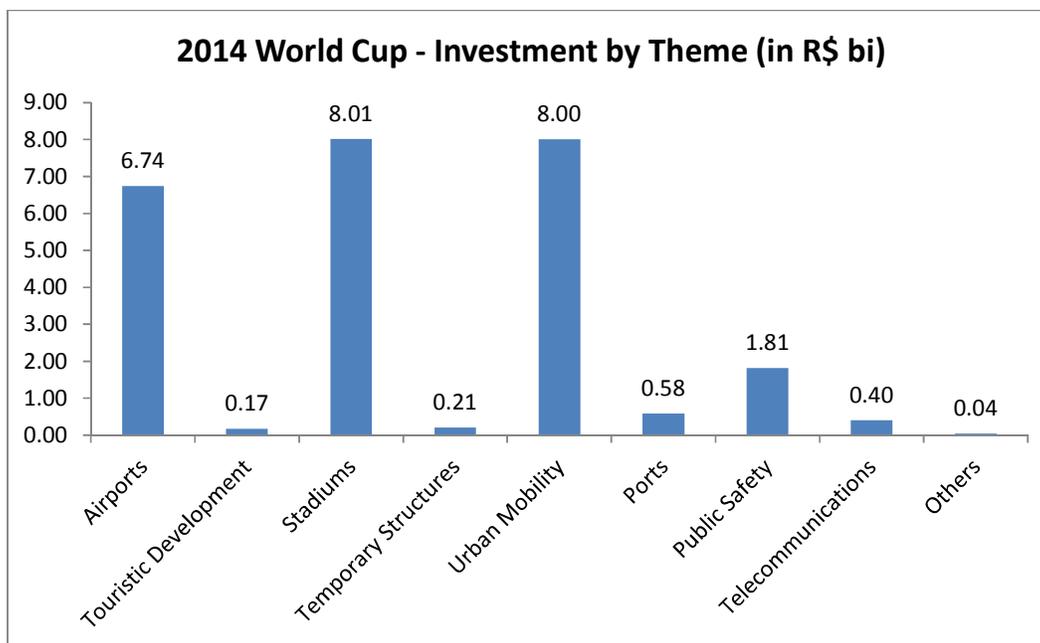
Segment	Outcomes
Water resources	25 projects, 50 sewage systems and 202 localities with water supply systems
Water supply in urban areas	652 projects
Rural electrification	455,300 houses attended

From the figures presented above, it is noticeable that Brazil – at least nowadays – is a vast building site, with all types of construction within its territory.

2.2.2. 2014 World Cup

The 2014 World Cup, which Brazil will host this Summer 2014, demands large-sum investments, not only in the stadiums' construction, but also in related themes

influenced by the tournament, like urban mobility, tourism and public safety. The updated forecast investment reaches R\$25.96 billion (US\$10.82 billion - exchange rate Feb 19, 2014), segmented in the following themes (Graph 03) (BRASIL 2014):



Graph 03 – 2014 World Cup - Investment by theme (February 2014)

Of this amount, R\$22.71 billion (87.5%) is related to investments already contracted, from which R\$12.8 billion (49.3%) has been spent. In terms of financing sources, the Brazilian federal government is held mainly responsible (56.4%, or R\$14.65 billion), either by direct investment or by financing state and local governments. Relating to our subject, once again, almost all World Cup investment is focused on public works.

The number of projects by theme is displayed in Table 10, below:

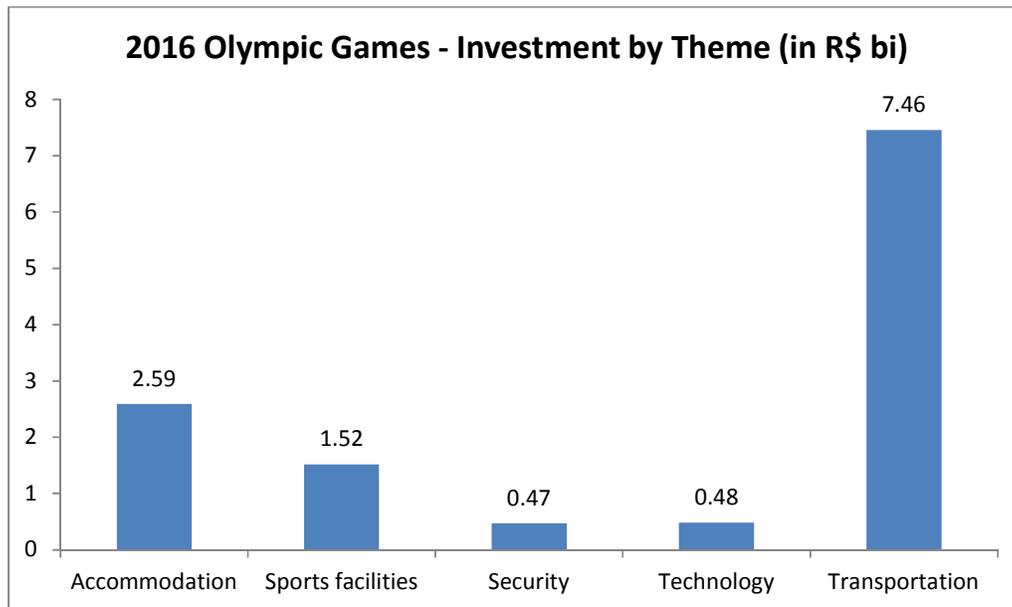
Table 10 – 2014 World Cup – Projects by Theme

Theme	Projects
Airports	29
Touristic Development	90
Stadiums	12
Temporary Structures	6
Urban Mobility	45
Ports	6
Public Safety	40

Telecommunications	72
Others	3
TOTAL	303

2.2.3. 2016 Olympic Games

The 2016 Olympic Games will be hosted by the city of Rio de Janeiro, with further investments needed in the event itself (accommodation and sports facilities), as well as in related areas, such as transportation. The initial forecasted investment reaches R\$12.52 billion (US\$5.22 billion - exchange rate Feb 19, 2014), segmented in the following themes (Graph 04) (BRASIL 2014):



Graph 04 – 2016 Olympic Games - Investment by theme (February 2014)

Different from the World Cup, the Brazilian federal government's share in investment accounts for only 30% of the amount (R\$3.8 billion), although most of it is still directed to public works.

2.3. Public Works in Brazil: Relevant Issues

The expressive amount of investment in public works previously displayed evidence for the current relevance of the subject in a financial view.

On the other hand, the Brazilian public sector still lacks qualified management in order to avoid relevant issues that negatively affect the outcomes of public works, such as design errors in projects, overpriced bids contracted and low-quality constructions. The consequences are obviously even worse: inefficiency in public spending, delays on schedule for concluding projects, or even unfinished constructions. Deadline delay issues play an even bigger role when it comes to the World Cup and Olympic Games' projects, which are impossible to be postponed, due to the unalterable event periods. In the end, the most badly affected are Brazilian citizens, who do not obtain their urgent desired needs on time, even though paying much more than necessary.

The main reason for these problems stem from the deficiency of the project designs, a chronic issue in Brazil. A diagnosis from the Brazilian Federal Council of Engineering and Architecture (Conselho Federal de Engenharia e Arquitetura – CONFEA) associates it mainly with 30 years of previous low-level public investments, as well as the dismantling of technical structures and staffs in all government levels during this period, with a consequent loss of technical and planning culture in the public institutions (Melo 2008). In order to present some statistics to turn these issues into real numbers, Table 11, below, shows the most common findings in public works audits carried out by TCU in the last three years (TCU 2011, TCU 2012, TCU 2013):

Table 11 – Most common findings in TCU public works audits – 2011-2013

Findings	2011	2012	2013	Average
Overpricing/Overcharging	54.8%	41.5%	25.7%	40.7%
Defective project	53.9%	45.0%	21.3%	40.1%
Competition restraints in bidding	19.6%	15.5%	14.0%	16.3%
Deficient or silent oversight	8.3%	12.0%	10.3%	10.2%
Inadequate or incomplete budget	13.9%	10.5%	7.4%	10.6%

As shown above, defective projects account for more than 40% of the construction contracts audited, virtually the same average percentage of overpricing/overcharging, most of the times related to each other. But these figures do

not represent the certainly worse condition of Brazilian public works. The reason for this is that the Federal Court of Accounts selects its sample of construction contracts to be audited based on criteria established by the annual Budget Guidelines Law (Lei de Diretrizes Orçamentárias – LDO), with one of the priorities being large-scale projects (BRASIL 2012). In this way, as TCU audits focus on this selection, it leaves out the smaller projects, which represent the bigger share, most of them managed by state and local governments. The latter are in the worst conditions, as more than 90% of these public institutions do not have a single engineer on its staff (EBC 2011).

2.4. Benefits of Public Works Auditing in Brazil

Within this context, Public Works Auditing is a relevant activity to the successful achievement of infrastructure projects, as it aids the federal government on the identification of these issues, in order to help find solutions that might bring these projects back on desired budget and schedule. Aside from these benefits, Public Works Auditing in Brazil also results in positive financial numbers. TCU estimated an accrued economy of R\$13.2 billion for the public works audited by the institution in the period of 2005-2011 (Silva 2011). For 2012 and 2013, the estimated benefits accounted for another R\$3.5 billion (TCU 2012, TCU 2013).

3. PUBLIC WORKS AUDITING IN BRAZILIAN FEDERAL GOVERNMENT – INTERNAL CONTROL STRUCTURE AND METHODS

As the main purpose of this paper is to make a comparison between Brazilian and U.S. federal governments' methods when it comes to Public Works Auditing, it focuses on the internal control structures of the Executive branches of those countries who are held responsible for the function of that auditing, namely the Office of the Comptroller General (Controladoria-Geral da União – CGU) in Brazil and the Offices of the Inspectors General (OIG) in the United States. This chapter encompasses the CGU structure, its government auditing principles and Public Works Auditing procedures.

3.1. Internal Control in Brazilian Federal Government: CGU

The Office of the Comptroller General (CGU), enacted by Law n. 10,683 (BRASIL 2003), is the internal control agency of the Brazilian Federal Government in charge of defending public assets and enhancing management transparency through internal control activities, public audits, corrective and disciplinary measures, corruption prevention and combat, and coordinating ombudsman's activities (CGU 2014). It integrates the Brazilian Presidency's structure.

Within the agency's simplified organization chart presented below (Figure 01), the Federal Internal Control Secretariat (Secretaria Federal de Controle Interno – SFC) is the unit responsible for the audits and inspections carried out by the agency, among them the auditing of public works.

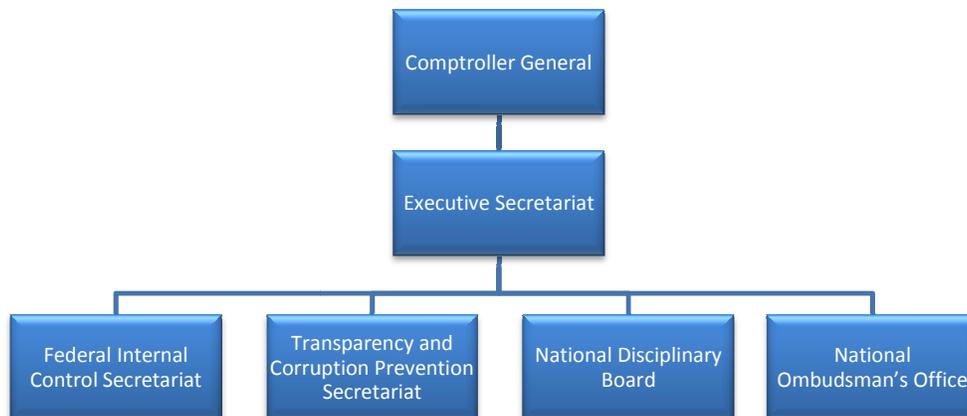


Figure 01 – CGU – Simplified Organization Chart

As the CGU is a central agency, it supports all federal ministries (with exception of Ministries of Defense and External Relations, and Chief of Staff, which have their own internal control structures). That results in a wide variety of public policies accompanied by the institution, like education, health, transportation, energy, etc.

As already seen, there are public works under construction in all these sectors in Brazil, funded by federal resources. Again, the government agency responsible for auditing these public works is CGU.

3.2. Government Auditing Principles adopted by CGU

Before going specifically into Public Works Auditing methods, it is necessary to clarify the government auditing principles adopted by CGU, which directly influences all its audit procedures, including those of public works. The most relevant principles to our study are related to audit timing and types of government auditing.

In terms of audit timing, there are three different moments in which it can be made: previous, concomitant and subsequent (RAMIS 2013). CGU is allowed to audit expenditures in all these stages, from authorization to effective payment, although it is not mandatory that the agency acts in all stages. In that way, it can decide when it is most effective to carry out the audit process.

Concerning types of government audits, the International Organization of Supreme Audit Institutions (INTOSAI), establishes three main types: financial, performance and compliance audits. It describes them as follows (INTOSAI 2013):

*“**Financial audit** focuses on determining whether an entity’s financial information is presented in accordance with the applicable financial reporting and regulatory framework. This is accomplished by obtaining sufficient and appropriate audit evidence to enable the auditor to express an opinion as to whether the financial information is free from material misstatement due to fraud or error.*

***Performance audit** focuses on whether interventions, programmes and institutions are performing in accordance with the principles of economy, efficiency and effectiveness and whether there is room for improvement. Performance is examined against suitable criteria, and the causes of deviations*

from those criteria or other problems are analysed. The aim is to answer key audit questions and to provide recommendations for improvement.

Compliance audit focuses on whether a particular subject matter is in compliance with authorities identified as criteria. Compliance auditing is performed by assessing whether activities, financial transactions and information are, in all material respects, in compliance with the authorities which govern the audited entity. These authorities may include rules, laws and regulations, budgetary resolutions, policy, established codes, agreed terms or the general principles governing sound public-sector financial management and the conduct of public officials.”

CGU’s audits on public works include procedures of all these types, with an emphasis on the compliance audit.

3.3. Public Works Auditing Methods in CGU

Basically all methods applied in Public Works Auditing at CGU are the same adopted by the external control institution of the Brazilian Federal Government, the Federal Court of Accounts (TCU). In general, these methods derive from observation of laws and regulations, as well as legal decisions issued by TCU about this subject.

In order to focus on the technical issues related to Public Works Auditing, which are specific for this type of audit, the following framework, based on professional experience on the subject, aims at the main features checked by CGU in each stage of the public works timeline (Figure 02).



Figure 02 – Main features in public works timeline – by stage

A brief description of the stages presented above and its related features helps understanding the framework.

- Design stage: Prior to the bidding process, it is the stage at which the project of the public work is developed. Key auditing features placed on plans and specifications, and on its cost estimates.
- Bidding stage: Consists the bidding process, subdivided into the internal phase, where the Request for Proposal – RFP is produced, and the products of the prior stage are inserted; and the external phase, which encompasses the advertising of the RFP, opening and judgment of bids, and finally the award of the contract. For Public Works Auditing, a main feature relies on the evaluation of technical qualification requirements at the RFP.
- Construction stage: This stage encompasses the period of construction of the public work, from authorization to its start, to its final delivery to the contracting institution. Main Public Works Auditing concerns construction work, change orders and contracting agency oversight.
- Utilization stage: It covers the effective operative period of the public work. Public Works Auditing focuses on the defective work of the construction.

The following topics describe an overview of the procedures adopted by CGU in all of those features described above.

3.3.1. Design Stage

3.3.1.1. Plans and specifications

As described in the previous chapter, a defective public work project will most certainly result in negative outcomes. That said, when auditing public works, CGU's procedures give attention to this issue, verifying the completeness of the designs, according to the article 6, item IX, of Law nº 8.666, which states the project as below (BRASIL 1993):

“Set of necessary and sufficient elements, with adequate precision level, to characterize the work or service, or group of works or services, subject to

bidding, prepared based on indications of preliminary technical studies, to ensure technical feasibility and adequate treatment of the environmental impact of the enterprise, and enables assessment of the cost of the work and the definition of the methods and the implementation period.”

As there is no comprehensive legal description of the minimal demanded items of a public works project, there is a current consensus between Brazilian Public Works Auditing institutions in federal (TCU and CGU) and state levels (State Courts of Accounts), on adopting project guidelines established by the Brazilian Institute of Public Works Auditing (Instituto Brasileiro de Auditoria de Obras Públicas – IBRAOP) in its technical guidance OT - IBR 001/2006 (IBRAOP 2006).

Basically, it describes the necessary public works project elements (drawings, technical specifications, calculation reports, schedule, cost estimate), as well as the minimum elements expected for each plan (architectural, structural, electrical, etc.) in particular types of public works (buildings and highways).

As already shown, there is a high percentage of defective Brazilian public works projects. Thus, carrying out this procedure is necessary. When this procedure is applied, CGU often notices an absence of mandatory designs related to a public work, and even simple drafts being wrongly used as projects in the bidding process.

A defective project is harmful to all stakeholders involved. As far as the government is involved, such defections may have probable impacts on building quality, issues related to scheduling and especially cost. This scenario results in unnecessary complicated management, and even difficulties in producing its annual budget. Indeed, these complications are magnified if supplemental resources from other governmental levels are needed.

Concerning the bidders, as they lack the minimum information necessary to understand what they are supposed to build, like technological solutions or material quality, there is a direct effect on their cost estimates and subsequent bids. Not to mention that this might also lead to benefit bidders that obtain information not provided to the others, an asymmetry which reduces competitiveness and opens space to corruption practices.

Finally, the taxpayers and benefited citizens of that public work, the most affected by the defection, will wait more and pay more for the same outcome, sometimes even of inferior quality.

This way, the sooner eventual design errors are recognized by the audit team, the less negative effects will spread over the public work timeline. Even though the evaluation of the project produces better results in an early stage, it is also checked by CGU in other stages of the public work timeline, in order to help understand findings that are subsequent to these flaws.

In addition to the auditing the design, CGU also verifies whether or not the agency running the public works has conducted an adequate environmental study on the project's impact on its surrounding environment, according to resolutions of the National Council of Environment (Conselho Nacional do Meio Ambiente – CONAMA) nº 001/1986 (BRASIL 1986) and nº 237/1997 (BRASIL 1997), as well as Law nº 6,938 (BRASIL 1981).

This procedure stems from the same reasons presented before, but especially from long delays that eventually occur in the construction schedule of Brazilian public works inserted in this condition, mainly due to interruptions ordered by environmental agencies or court decisions.

Finally, as in Brazil, most of the issues are related to projects, their technical liability is another item checked by CGU. Effectively, the legal document for assigning this responsibility is named Annotation of Technical Responsibility (Anotação de Responsabilidade Técnica – ART), and is issued by the Regional Council of Engineering and Architecture (Conselho Regional de Engenharia e Arquitetura – CREA), based on Law nº 6,496 (BRASIL 1977).

In this case, the verification lies on the fact that, eventually, a public institution does not register the ART, and by doing this no one is legally responsible for it, and the design will be considered as produced by that public entity as a whole, thus dispersing liability for eventual problems. Obviously, this finding is closely related to defective projects, as most engineers would not accept being assigned to an ART of a questionable project like this, putting their careers into risk.

3.3.1.2. Cost estimates

Although being part of the project, many audit findings are based on cost estimates, in a way that it deserves special attention. CGU's procedures focus on the following aspects: unit costs, indirect costs, line items and technical liability.

Unit costs

Since 2000, the LDOs annually establish that cost estimates of projects financed with federal resources must attempt to official reference cost systems (BRASIL 1999). This legal requirement was made permanent by enact of Decree nº 7,983 (BRASIL 2013).

In other words, the total cost of an estimate ought not to surpass the total cost based on the same line items of that estimate, the latter being calculated by changing the estimate unit costs of the former for the unit costs of those official systems.

This is not an immutable rule, as it predicts an allowance to exceed the official global cost, by presenting a formal justification, with the technical rationale to clarify it.

The regulation also predicts line items whose makeup costs are not present in the official reference cost systems, by that requiring that those makeup costs adopt input prices of the official systems.

In this case, CGU checks the compliance of the cost estimates to the aforementioned rules, and also of the contracted budget of the winning bidder, as the same requirements apply to that document.

As a result of this checking, if it is identified the adoption of higher prices in any of these documents (cost estimates and contracted budgets), then it is characterized as an overpricing, which might turn into a real loss if the contractor is effectively paid on that basis.

Overpricing is often verified by CGU in its audits, as well as the absence of relevant information to establish the cost estimates, mainly the makeup costs. It is also worth mentioning that, in all these non-compliance situations, hardly a formal justification is presented.

Indirect costs

Indirect costs integrate, together with profits, the BDI (Benefícios e Despesas Indiretas), which is a percentage applied to total direct cost estimate, in order to achieve the total cost estimate.

Although the TCU has been demanding its presentation and composition from public institutions and bidders in various court decisions in the last decade, only since 2011 the LDOs have annually established it as mandatory (BRASIL 2010), being

permanently demanded by enact of Decree n° 7,983 (BRASIL 2013). These regulations also oblige that direct costs do not incorporate the BDI, as well as define the types of indirect costs expected in that index.

CGU checks this requirement based on two main occurrences: duplicate costs in both parts of the cost estimate, and the adoption of direct costs as a percentage of indirect costs.

Duplicate costs being applied both in the direct and indirect costs, if not corrected before payment, will obviously result in overcharging. Most of the times, this happens when bidders are not demanded by contracting public institutions to present their BDI composition, but only its closed value in terms of percentage. As sometimes cost estimates produced by a public agency include indirect costs as part of the direct costs, it will not be able to identify the eventual duplicate cost built-in in the bidder's BDI.

The adoption of direct costs as a percentage of indirect costs in the BDI might also lead to eventual overcharges, or even undercharges, as it does not reflect the true cost of that item, especially when there are change orders in the contract.

Line items

According to Law n. 8,666, a detailed cost estimate must be produced, with line items based on appropriate unit costs. Despite this, some budgets are eventually presented with line items simply informing its total cost, without further explanation about how that value was estimated.

This issue has the similar described effects of a poor design, with emphasis on the loss of competitiveness to bidders, as the lack of adequate information about the cost estimates would hamper them to elaborate more accurate bids.

One example might be a simple line item with a generic description "Electrical installation", and a sum cost attached to it. The item could include only simple elements, like wires and lamps, as well as could involve more complex sub items, such as generators or transformers.

This way, as the bidder does not comprehend exactly which costs (and respective quantities) are related to that line item, budgeting it is a real guessing, considerably magnified if the poor design affects directly that item, and/or if that item

represents a relevant percentage of the total cost. And once again, asymmetry of information could lead to corruption practices.

Technical liability

The same obligation related to technical liability lies on the cost estimate produced based on the project. In this case, legal requirement for ART is more recent, since 2009 it is annually established as mandatory by LDOs (BRASIL 2008), being permanently demanded by enact of Decree n° 7,983 (BRASIL 2013).

The observation of this requirement stems mainly from the fact that cost estimates are often carried out by the technical sectors of Brazilian public agencies, and not by the project authors, thus being not legally included in the ART related to that project.

3.3.2. Bidding Stage

Although the Brazilian Bidding and Government Contracts Rule (Law n° 8,666) establishes the regulation for the entire bidding process, most of it is standardized for all types of acquisitions, varying in terms of the method of bidding adopted (sealed competitive bidding, request for prices, invitation, contest, and auction) and its type (lowest price, best technique, technique and price, and higher bid or offer) (BRASIL 1993).

In that way, there are a wide variety of procedures applied by CGU to verify the compliance of a public works bidding process to this law, most of them checked in any acquisition, related to the Request for Proposal – RFP, its advertising, the bidding sessions, decisions of the acquisition commission, and the award of the contract.

Considering that, the main issue specifically related to public works during the bidding stage is the RFP, more precisely, its section that defines the technical qualification requirements, since the others (legal, financial and fiscal) are general. That section establishes the minimal technical qualification to be presented by any bidder in order to be allowed to join the bid.

CGU verifies this demand mainly due to eventual findings of technical qualification requirements of RFPs which are unbalanced to the real requirements to build those public works, most of times the former exceeding the latter ones. That

results in a loss of competitiveness, as less companies will be able to comply with that unreal demand.

As an example, let us consider a technical requirement of previous experience in landscaping services for a common building project, in which the service represents a slight fraction of the cost estimate. In that case, despite the ability of many potential bidders to build that public work, the insertion of a requirement with no material relevance in the budget might exclude most of them, if they do not comply with it.

Corruption practices also arise from this issue, as public agents might arrange previously with bidders of their interest to insert specific requirements based on their experience, in order to move other potential bidders away.

About this subject, the TCU, based on its legal precedents, issued the Súmula 263, which states the rightful requirements as the ones based on parcels of greater technical relevance and significant value of the object (TCU 2011).

3.3.3. Construction Stage

When Public Works Auditing gets to the construction stage, there are three main features observed by CGU: construction work, change orders and contracting agency oversight.

Construction work

In order to check the compatibility between invoices paid to the contractor and the construction work effectively done, CGU performs a construction inspection, measuring the most significant items of the contract. This procedure is applied during the construction work or after its conclusion.

The rationale for this action derives from usual overcharging identified in those audits, basically as result of the following sources, described in the technical guidance OT - IBR 005/2012 (IBRAOP 2012):

- *Overcharging by quantity: the financial damage characterized by measuring quantities greater than those actually used / provided;*

- *Overcharging by quality: the financial damage characterized by a deficiency in the execution of engineering works and services resulting in decreased quality, life cycle or safety.*

Considering each source of overcharging above described, typical findings of CGU are more related to quantity issues, as some of the services require less labor technical skills and specific measurement tools to be verified, like the total square feet of walls in a building.

Change orders

Change orders are commonly verified in Brazilian public works, especially because of the already described low-quality projects designed.

This issue is also magnified by a specific requirement of LDOs annually since 2009 (BRASIL 2008), permanently demanded by enact of Decree n° 7,983 (BRASIL 2013), which establishes that any change order must preserve, at least, the initial total discount offered by the winning bidder in its contracted budget, in comparison to the cost estimate.

This worry stems from a common audit finding of CGU, named “spreadsheet game” in Brazil. According to OT - IBR 005/2012, it is defined as “*contractual changes due to amendments which modify the contracted budget in favor of the contractor, by changing the percentage difference between the total value of the contract and the cost estimate, demanding a review of the covenant to keep the advantage over the reference price*” (IBRAOP 2012).

When this occurs, then overcharging is accounted for the financial damage induced by the breakdown of the initial economic and financial balance of the contract to the detriment of Public Administration.

Another sources of overcharging verified in this procedure derive from changing contractual financial clauses, like: alteration of clauses generating anticipated receipts, distortion of the schedule, unwarranted extension of the contract term with additional costs for public administration or irregular price readjustments (IBRAOP 2012).

Contracting agency oversight

The evaluation of contracting agency oversight over the contractor is another key issue addressed by CGU in its audits. This stems from the fact that a defective oversight is strongly related to most of the overcharging findings in construction stage.

In its findings, it is often verified that, although there is a formal designation of a public official as responsible for oversight of a construction contract, indeed there is no real accurate oversight.

Many reasons might explain this, like the absence of workforce in that public agency to assume the task, or even a lack of interest from its top management to address the issue as a priority.

That means that defective oversight is another open field for corruption practices, as it can facilitate overcharging and its subsequent financial benefits to both contractors and public officials in collusion.

3.3.4. Utilization Stage

The utilization stage comprises the period after the public work is finished, and effectively handed to the public agency which will operate it. In this stage, CGU also checks for defective work in a construction inspection.

The legal foundation for it lies in the Article 69 of Law nº 8,666, which states (BRASIL 1993):

“The contractor is obligated to repair, fix, remove, reconstruct or replace, at its expense, in whole or in part, the object of the contract that derives from true defects or inaccuracies resulting from the implementation or materials used.”

The same law also reaffirms the contractor’s civil liability for the soundness and safety of the work or service, in the terms of the Brazilian Civil Code (Law nº 10,406), which by its turn define this liability for a 5-year period (BRASIL 2002).

Despite that, it is usual, in CGU’s audits findings, the detection of defects in public works, even in recently concluded ones.

Some issues presented in the previous stages can be related to these flaws, like design errors of bad projects or deficient contracting agency oversight.

4. PUBLIC WORKS AUDITING IN U.S. FEDERAL GOVERNMENT – INTERNAL CONTROL STRUCTURE AND METHODS

This chapter presents U.S. federal governments' internal control structure, its government auditing principles and Public Works Auditing methods.

4.1. Internal Control in U.S. Federal Government: OIG

The Offices of the Inspectors General (OIG), enacted by Inspector General Act of 1978, present the following purpose (USA 1978):

*“(1) to conduct and supervise audits and investigations relating to the programs and operations of the establishments listed in section 12(2);
(2) to provide leadership and coordination and recommend policies for activities designed (A) to promote economy, efficiency, and effectiveness in the administration of, and (B) to prevent and detect fraud and abuse in, such programs and operations; and
(3) to provide a means for keeping the head of the establishment and the Congress fully and currently informed about problems and deficiencies relating to the administration of such programs and operations and the necessity for and progress of corrective action;”*

Opposite to CGU, OIG are offices that are part of Cabinet departments and independent agencies of the U.S. federal government, currently in a number of 73 statutory OIGs (USA 2014).

For this reason, there was a need to select one OIG among those to proceed with the evaluation. Focus was given in choosing an OIG located in a department strongly related to public works, in this case the Department of Transportation.

4.1.1. OIG – Department of Transportation (OIG-DOT)

The OIG of the Department of Transportation (OIG-DOT) was one of the first twelve OIG enacted by the Inspector General Act of 1978 (OIG-DOT 2014), and lies in the highlighted spot on the organization chart of the DOT (Figure 3) (NetAge 2014).

U.S. DEPARTMENT OF TRANSPORTATION

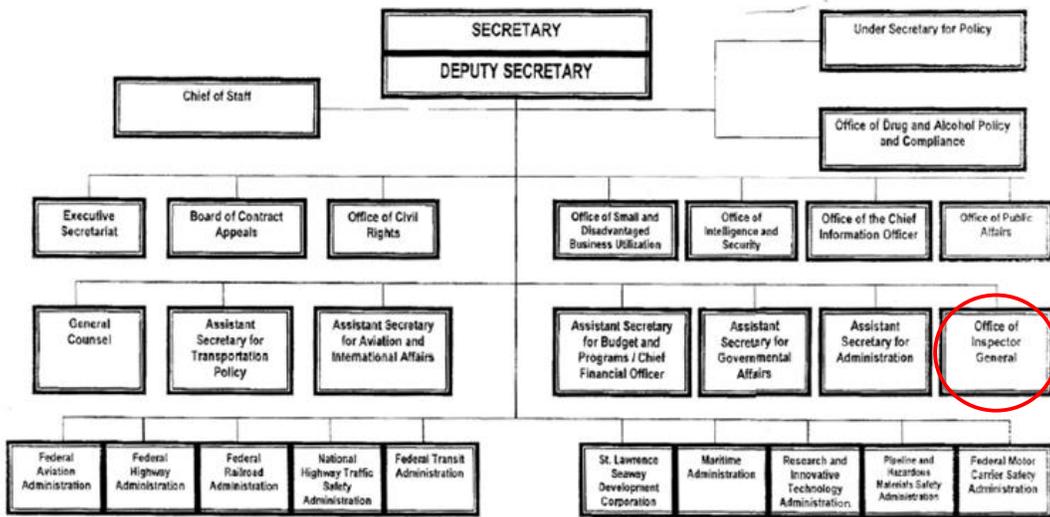


Figure 03 – DOT – Organization Chart

As stated in the OIG-DOT vision, it works within the Department of Transportation to promote effectiveness and head off, or stop, waste, fraud and abuse in departmental programs, through audits and investigations. OIG also consults with the Congress about programs in progress and proposed new laws and regulations (OIG-DOT 2014).

A closer look at the organization chart of the OIG-DOT (Figure 4) helps identifying that the division related to audits is the Office of Audits and Evaluations, led by the Principal Assistant Inspector General for Auditing & Evaluation. It is divided according to the following DOT program areas: Aviation; Financial and Information Technology; Highway and Transit; Rail, Maritime, Hazmat Transport and Economic Analysis; and Acquisition and Procurement (OIG-DOT 2014).

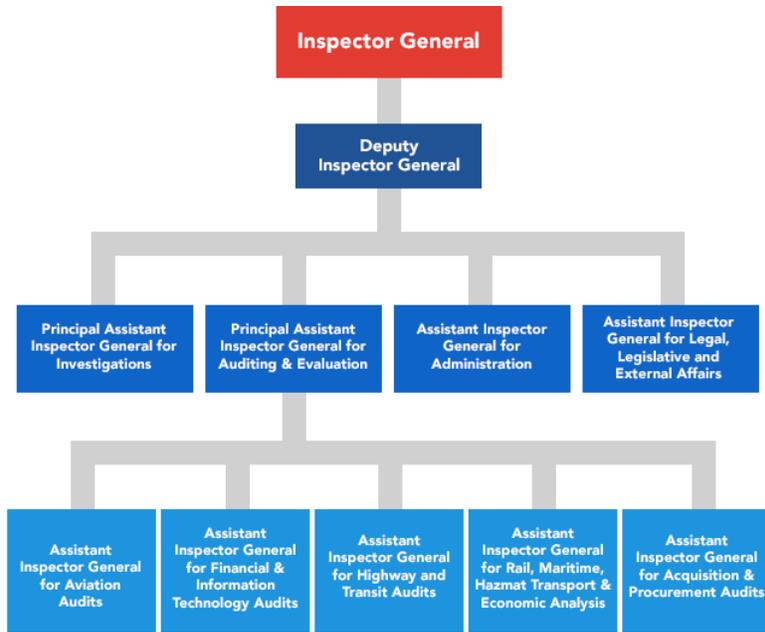


Figure 04 – OIG-DOT – Organization Chart

4.2. Government Auditing Principles adopted by OIG-DOT

In terms of audit timing, OIG-DOT also audits expenditures in all stages (previous, concomitant and subsequent). As for types of government audits, it carries out financial, compliance and performance audits as well. When it comes to Public Works Auditing, though, OIG-DOT focuses on the performance type, although compliance issues are checked by the institution in its audits.

4.3. Public Works Auditing Methods in OIG-DOT

Before going further in the description, additional filtering must be made, as DOT deals with federal funding in all modes of transportation. In that way, the Federal Highway Administration (FHWA) was selected, as it has the biggest share of the Department’s annual budgets, and is also the DOT agency mostly related to public works, by providing stewardship over the construction, maintenance and preservation of the U.S. highways, bridges and tunnels.

For the purpose of this paper, it is also worth mentioning that the U.S. federal public policy on highway construction adopts a decentralized model, in which FHWA transfer federal funds to State governments (represented by their State transportation

departments), who effectively manage and oversee them, according to the Title 23 of the United States Code – Highways (23 U.S.C.), § 106 (c), as follows (US 2014):

“Assumption by States of Responsibilities of the Secretary.

(1) NHS projects. - For projects under this title that are on the National Highway System, including projects on the Interstate System, the State may assume the responsibilities of the Secretary under this title for design, plans, specifications, estimates, contract awards, and inspections with respect to the projects unless the Secretary determines that the assumption is not appropriate.

(2) Non-NHS projects. - For projects under this title that are not on the National Highway System, the State shall assume the responsibilities of the Secretary under this title for design, plans, specifications, estimates, contract awards, and inspection of projects, unless the State determines that such assumption is not appropriate.”

According to the same Code (23 U.S.C., § 106 (g)(4)), States are also responsible for overseeing Local Public Agencies (LPA’s, local governments of cities and counties within their areas), ensuring that they meet all Federal requirements during the design and construction of Federal-aid highway and bridge projects (USA 2014).

As it will be presented ahead, this decentralization policy seems to have an influence on the way OIG-DOT audits these projects. The description of procedures is based on an interview with an OIG-DOT high official, as well as on audit reports produced by that Office (OIG-DOT 2011, OIG-DOT 2012).

4.3.1. Design Stage

4.3.1.1. Plans and specifications

Section 109 of 23 U.S.C. establishes the legal foundations for the setting of standards, further developed by Title 23 – Highways of the Code of Federal Regulations (23 C.F.R.), Part 625 – Design Standards for Highways (USA 2014), where a thorough description of the references is presented. Plans and specifications funded with federal resources shall comply with them, in order to obtain approval from FHWA (23 C.F.R., §630.205).

When OIG-DOT verifies this compliance, it does in a broader way, by identifying if there are deficiencies related in the reports elaborated by the FHWA Division Offices, the regional offices of FHWA responsible for the oversight of the State transportation departments of their states.

This difference from the CGU procedure might be based on the assumption of OIG-DOT that oversight of FHWA Division Offices over plans and specifications is effective, part of it due to their qualified technical staff, thus being assessed as a low-risk activity by the audit agency.

4.3.1.2. Cost estimates

As part of the design, along with plans and specifications, cost estimates must attend to the same law and regulation previously cited. In addition to that, FHWA developed guidance for it, named “Guidelines on Preparing Engineer’s Estimate, Bid Reviews and Evaluations”, which gives orientation on elaborating the estimate (FHWA 2004). FHWA Division Offices also help States to improve their estimating procedures.

A major difference between Brazilian and U.S. legal systems about costs and prices in public works is the absence of a national reference cost system in the latter. Each State or LPA produces its own cost estimates, which are further evaluated and approved by FHWA.

For the assessment of the bids, the adoption of a price ceiling based on cost estimates is much more flexible in the U.S. than in Brazil. States can define their own procedures on accepting or rejecting bids, taking into account factors like the number of competitive bids, percentage of the lowest bid to the cost estimate, etc. The aforementioned guideline, although not mandatory to be followed by States, presents suggestions on this subject. It must be said, though, that States shall obtain concurrence from the FHWA Division Offices in most of their acts in this assessment, until the award of the contract (23 C.F.R, §635.114).

As there is no fixed price ceiling for bidding, OIG-DOT evaluates the accuracy of the cost estimates provided by a State (or LPA) compared to the contracted bid, over a specific period of time. A higher average divergence between these numbers might imply that cost estimates are being underperformed, or that competitiveness is being affected by bid rigging.

4.3.2. Bidding Stage

As described in the same section of the last chapter, the main issue specifically related to public works during the bidding stage is the technical qualification requirements of the RFP. In that way, this will remain the focus of this stage.

According to 23 C.F.R., in its section entitled “Licensing and qualification of contractors” (§635.110), State Transportation Departments (STD’s) must obtain prior approval of the FHWA Division Offices for their procedures and requirements related to qualifying and licensing contractors. Legal demand on the technical capability of the bidder to perform that public work is presented as follows (23 C.F.R., §635.110 (d)):

“Requirements for the prequalification, qualification or licensing of contractors, that operate to govern the amount of work that may be bid upon by, or may be awarded to, a contractor, shall be approved only if based upon a full and appropriate evaluation of the contractor's capability to perform the work.”

About this issue, OIG-DOT does not check it in its audit procedures. It assesses that eventual questioning of unbalanced technical qualification requirements would naturally arise from unsatisfied bidders on a competitive environment. In those specific cases, the complaints would be addressed to the competent institutions, among them OIG-DOT itself, this time represented by its Office of Investigations.

4.3.3. Construction Stage

Same features of Public Works Auditing described in the same section of last chapter (construction work, change orders and contracting agency oversight) are verified by OIG-DOT in its procedures, as it follows.

Construction work

When auditing the construction work, OIG-DOT does not measure it by itself, in order to identify eventual overcharging. It will check progress payments, by verifying if there are sufficient engineering calculations and other documents, like field diaries, to

support whether the oversight team had appropriately measured the quantity paid, pointing out eventual unsupported costs.

OIG-DOT also audits the quality assurance program adopted by the contracting agency, as required by 23 C.F.R. §637, in order to identify if they have performed tests to ensure that all materials and workmanship meet contract specifications and requirements.

Change orders

Change orders shall go under FHWA Division Offices approval, as defined in 23 C.F.R. §637.120 (a) (b):

“(a) Following authorization to proceed with a project, all major changes in the plans and contract provisions and all major extra work shall have formal approval by the Division Administrator in advance of their effective dates. However, when emergency or unusual conditions justify, the Division Administrator may give tentative advance approval orally to such changes or extra work and ratify such approval with formal approval as soon thereafter as practicable.

(b) For non-major changes and non-major extra work, formal approval is necessary but such approval may be given retroactively at the discretion of the Division Administrator. The STD should establish and document with the Division Administrator's concurrence specific parameters as to what constitutes a non-major change and non-major extra work.”

OIG-DOT verifies change orders by identifying the cost analysis developed by the contracting agency in order to justify that change, pointing out eventual unsupported costs, if that information is not provided or unclear.

Contracting agency oversight

It is worth mentioning again that oversight of Federal-aid highway projects belong to States, with stewardship of FHWA, represented by its Division Offices (23

U.S.C., §106(c)). This is reinforced by the Code of Federal Regulations, which establishes STD's as the supervising agencies as follows (23 C.F.R. §635.105 (a)):

“The STD has responsibility for the construction of all Federal-aid projects, and is not relieved of such responsibility by authorizing performance of the work by a local public agency or other Federal agency. The STD shall be responsible for insuring that such projects receive adequate supervision and inspection to insure that projects are completed in conformance with approved plans and specifications.”

In that case, OIG-DOT checks the stewardship of FHWA over STD's, as well as procedures and controls established by the latter, in order to verify if they are fulfilling their responsibilities.

4.3.4. Utilization Stage

Concerning the utilization stage, as OIG-DOT does not focus on physical construction inspection in the construction stage, the same applies, with no evaluation of the Office about this subject.

5. CONCLUSIONS

As presented in this paper, Public Works Auditing performed by the Brazilian internal control agency (CGU) adopts an extensive list of procedures focused on compliance issues. By its turn, the evaluated U.S. internal control agency (OIG-DOT), although eventually checking for non-compliances, aims performance issues in its audits.

One reason for this thorough Public Works Auditing carried out by CGU is the lack of adequate technical structures and staff of the Brazilian contracting public agencies, compared to their similar in the U.S. As a consequence, the Brazilian agencies do not fulfill their responsibilities correctly, and CGU feels the need to constantly check for issues that, in fact, should be performed by those agencies, like verifying the completeness of a design or measuring the construction work. That also results in inefficient frequent double-checking procedures by both institutions. Actually, the adoption of these procedures by CGU should be only eventually necessary, in order to evaluate the contracting agency's oversight quality, based on a previous risk-assessment analysis.

Thus, CGU could help solve this issue by aiding the Brazilian federal government to establish regulations and/or guidelines for public agencies that deal with federal-aid public works, in order to demand an adequate technical structure and staff, as well as clear requirements on public works projects. That would involve not only regulations to federal agencies that manage and oversee federal funds, but also to state and local agencies that carry out federal-aid public works. A good example stems from the evaluated U.S. public policy on federal-aid highways, in which U.S. federal laws and regulations, along with FHWA's sets of policy, guidance and information, provide comprehensive information to all stakeholders involved. Obviously, the enforcement of these regulations is fundamental to their effectiveness, what could be considered a concern when it comes to Brazil, in which legal and regulatory compliance is not a general rule.

Another reason for this divergence in Public Works Auditing methods arises from the level of confidence in public institutions of both countries. As in Brazil corruption practices are still usual in the public sector, public control agencies (like CGU) often identify corruption issues by performing compliance audits. Nevertheless,

as the purpose of this paper is focused on the technical aspect of the subject, a solution to this matter is out of scope.

Regarding to limitations of this paper, the main one lies on describing the Public Works Auditing methods of the U.S. federal government. As only one of its internal control agencies was selected (OIG-DOT), these procedures cannot be generalized as the same adopted by other OIG's.

The same sampling limitation applies to the focus on OIG-DOT audit procedures on public works carried out by one of the DOT's agencies (FHWA). Besides representing a narrow group of public works (mainly highways, bridges and tunnels), FHWA follows a decentralized model adopted in the U.S. federal public policy for these public works, in which it transfers federal funds to State governments, who effectively manage and oversee them. In this case, Public Works Auditing methods were designed in a way that probably differs to procedures applied to other types of public works, as well as for federal resources spent by the federal public agencies themselves.

Based on those concerns, further studies could evaluate procedures adopted by other OIG's of the U.S. federal government, preserving preference on federal agencies with high expenditures on public works, but selecting those that deal with other types of public works and/or adopt a centralized expenditure policy, in order to check different approaches in Public Works Auditing.

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