

# Construction: Approach and Data Requirements

The International Comparison Program (ICP) is responsible for the production of purchasing power parities (PPPs) for both the national gross domestic product (GDP) and its subcomponents. Alternatives to market exchange rates, PPPs are intended to reflect price level differences across economies more accurately. Construction is one of the three categories under the gross fixed capital formation (GFCF) aggregate. Construction PPPs are currency converters that permit comparisons of construction volumes across economies.

In the report on the ICP 2005 results (World Bank 2008), construction is described as "comparison-resistant." It is difficult to identify a range of comparable and representative construction products or projects across all economies. As a result, the methods adopted for the calculation of PPPs are largely based on theoretical products or projects and require adjustments to bring them to a common basis. Designing the data collection, collecting the price data, and processing them therefore require special skills and knowledge.

The approach outlined in this chapter and used in ICP 2011 applies to construction work undertaken by formal construction contractors using modern materials; informal construction<sup>1</sup> is not part of the standard ICP price survey. Like the calculation of other price indicators, the calculation of PPPs requires a list (or lists) of items, prices for these items, and weights.

## APPROACH IN BRIEF

The construction category under GFCF is broken down into three groups, classes, and basic headings (BHs), as shown in table 12.1. The objective of the construction and civil engineering survey is to estimate PPPs for the three BHs and to further aggregate these up to the construction category.

The construction and civil engineering survey is based on an input approach in which economies price 50 basic and common resources for construction work that are selected to correspond with the main inputs to national construction output. In addition, respondents to a national survey provide information on relevance, resource mixes, typical markups and professional fees, and approximate project prices. These data are used to calculate and validate the construction and civil engineering PPPs.

The 50 basic and common construction resources are grouped into three subheadings:

- Materials: 38 material inputs
- Equipment: 5 types of equipment (hire rates with and without operator)
- Labor: 7 categories of construction labor.

The 38 material resources are allocated to the three basic headings (residential buildings, non-residential buildings, and civil engineering

**Table 12.1** Construction Expenditure, ICP 2011

Level	ICP code	Heading
Aggregate	150000	GROSS FIXED CAPITAL FORMATION
Category	150200	CONSTRUCTION
Group	150210	RESIDENTIAL BUILDINGS
Class	150211	<i>Residential buildings</i>
BH	150211.1	Residential buildings
Group	150220	NONRESIDENTIAL BUILDINGS
Class	150221	<i>Nonresidential buildings</i>
BH	150221.1	Nonresidential buildings
Group	150230	CIVIL ENGINEERING WORKS
Class	150231	<i>Civil engineering works</i>
BH	150231.1	Civil engineering works

Source: ICP, <http://icp.worldbank.org/>.

works). Therefore, items such as concrete and steel reinforcement appear in all three BHs, while other items, such as sheet roofing and sanitary ware, appear only in the residential and nonresidential buildings BHs. National experts are required to indicate whether a material is commonly used—in other words, whether the material in question is relevant for each type of construction. This process is carried out by deeming materials either relevant or not relevant for each basic heading.

Each basic heading has three subheading PPPs: materials, equipment, and labor. An unweighted country product dummy (CPD) is used to calculate PPPs for these subheadings. Aggregation of the subheading PPPs to the BH-level PPPs requires subheading expenditure data. These are calculated by breaking down the BH total expenditures over each subheading, using resource mixes as weights. After the subheading weights are established, the subheading PPPs can be aggregated to basic heading, class, group, and finally up to the level of construction category, using the selected aggregating method.

## REVIEW OF ALTERNATIVES

Various methods for deriving construction PPPs have been developed over the years. Some are still in use, and some have been abandoned.

But all of them, including the ICP 2011 approach described here, have shortcomings. This section briefly reviews the main features of the following methods:

- The project (bill of quantity)-based approaches are used by Eurostat and the Organisation for Economic Co-operation and Development (OECD) and have been adopted by member, associate, and candidate economies of the European Union and member and associate economies of the OECD. There are issues about the representativity of the projects selected and the extent to which all construction is represented, but the main concern is probably about the cost of the exercise.
- The method used by the Commonwealth of Independent States (CIS) involves collecting unit prices for construction inputs, which are then applied to model projects, with quantity weights for materials and products and labor (but not for equipment). The models are representative of "standard" project types, although they are less complete than the Eurostat-OECD bills of quantities. The projects are then weighted to represent basic headings and all construction output.
- The basket of construction components (BOCC) approach used in the ICP 2005 round involves a combination of basic inputs and more complex work items that were to be weighted on the advice of local experts. But there were difficulties with the establishment of weights and confusion over the mix of basic and complex items.
- Unit rates are estimates of the total price of projects expressed as an amount per square meter of built floor area for buildings and square meters or linear meters for civil engineering works. There is, however, uncertainty across economies about the rules of floor area measurement and what is included and excluded in the rates.

The CIS method is closest to the ICP 2011 approach, but it is less explicit about resource mixes and markups. Implementation of the Eurostat-OECD method involves a substantial effort and cost, and for that reason alone

probably was not considered for the ICP survey. The BOCC method was unsuccessful in 2005 largely because the relationship between simple and complex items was unclear, and it was not possible to obtain reliable system weights. Square meter rates are useful but inadequate as a basis for the calculation of PPPs. All of the project-based methods have the problem of reflecting tender rather than outturn prices, and the extent of "cost drift" varies significantly across economies. The main advantages of the ICP 2011 approach are that it is relatively simple to collect the necessary price and supporting data, and it is relatively inexpensive to implement.

The construction output, or tender or bid, prices reflect construction prices at a point in the future when the resources will be purchased and the work undertaken. They are, therefore, price forecasts—the actual base date depends on the duration and nature of the project. Resource prices—the prices collected in the proposed approach—are current as of the date they are collected.

## SELECTING ITEMS

As with other PPP calculations, this exercise requires that a set of "product baskets" be identified to serve as the basis for weights and prices. The criteria for selection of material and product items in the baskets are as follows:

- Common across most economies in terms of use in construction
- Significant in terms of value used in construction in most economies
- Simple to describe and likely to be understood in most economies.

Numbers of items and individual items are selected by reference to input-output tables and lists of items used in published construction price features.

The table in annex A sets out the three categories of items selected for construction materials and products, equipment, and labor. Items in the table marked with an asterisk are identical to the basic items in the 2005 ICP BOCC survey documentation. This approach allows an

"overlap" with the 2005 method. The table in annex B allocates materials and products to basic headings on the basis of their likely use in that type of construction work.

## ESTABLISHING WEIGHTS

Two types of weights have to be considered:

- Weights for the subheadings—that is, the resource mixes (materials, equipment, and labor) in each basic heading. These are reported by the respondents to the construction survey or are determined centrally for groups of economies by the Global Office or regional coordinating agencies.
- Weights that represent national accounts expenditure values for each basic heading. These are provided by the national statistical offices as part of their national accounts expenditure data reporting to the ICP.

Resource mixes of materials, equipment, and labor for the three basic headings in different groups of economies depend on the skills and technology available in an economy and other factors. Average values can vary from economy to economy and, within economies, across types of work. There can be trade-offs between the skill levels and the price of labor (highly skilled labor is usually expensive, but the quantity of workers required is relatively low, and vice versa), but that is not always the case. There are also trade-offs between labor and equipment inputs (capital/labor substitution), but there is relatively little information on that in most economies.

In most economies and in most types of work (although not necessarily in civil engineering works), materials represent the greatest proportion of construction value (typically, 50–75 percent); labor the next greatest (20–40 percent); and equipment the smallest proportion (5–20 percent). In civil engineering works, the relative significance of labor and equipment can be reversed, and materials may not be the most significant component.

The value of construction work in each basic heading varies from economy to economy and from year to year. In larger, more mature economies, there may be long-term

regular patterns in construction investment, whereas in smaller and less developed economies the mix can vary substantially from year to year. Of the three basic headings, civil engineering works tends to be the most variable, particularly in smaller or less developed economies, where a dominant type of work can influence the mix in any year. For example, roads and tunneling have a relatively low material mix, but are not likely to be undertaken every year. Economies go through phases of construction investment, depending on some combination of the state of the general economy, government policy, the volume and nature of development aid programs, and other factors.

## PRICING RULES

The prices provided should be those paid by construction contractors to their suppliers. For materials and products, these are typically the prices paid, after discounts, to manufacturers or intermediaries (agents or merchants), including all nonrecoverable taxes and excluding all recoverable taxes such as the value added tax (VAT). For equipment, prices should be the rental charges paid to hire companies or internal hire rates, and for labor the cost to the contractor of employing workers. Informal payment arrangements for labor are common in construction—for example, some payment is in the form of wages, subject to taxes and on which employers' costs are incurred, and other payments are in cash (and respondents to the construction survey should bear this in mind when determining what an "average" wage is).

Prices should be provided for items that are commonly available and commonly used in the economy. They should not be provided for items that match the item description precisely if that involves pricing a "special" item either not generally available in the economy or available only at a premium price.

Economies are asked to provide annual and national "average" prices in national currency. Annual averages are prices that are an average over the survey year (midyear prices are acceptable) and that average different price levels

across the economy and across different types and sizes of projects. While striving to select the appropriate average prices, economy respondents should remain mindful of the following rules:

- *Geographical location.* Construction prices can vary across economies (particularly large ones) because of factors such as local resource and distribution costs; geographic, seismic, or climatic conditions; and local market conditions. Indeed, sometimes these variations can be significant. Respondents should consider the extent of geographical variations when pricing items and make a judgment on what is a realistic national average.
- *Site context.* Construction prices can vary, depending on site conditions. Examples are constrained city center sites, greenfield sites adjacent to urban areas, and remote sites that are difficult to access. When pricing items, respondents should assume reasonable site contexts with good access.
- *Size of projects.* The size of projects can influence the cost of resources, particularly materials and equipment. For example, large quantities and long periods of hire can reduce unit costs and vice versa. Prices should be provided for medium-size projects—that is, projects that are not unusually small or large.

Purchasers' prices for materials and products, equipment hire, and labor are sought from expert construction respondents in each economy. A single average price is sought for each item. Respondents are also asked to provide markups for each of the basic headings to cover general and preliminary items and contractors' overheads and profit and an allowance for professional fees for each of the basic headings.

In addition to input prices, markups, and allowances for professional fees, the survey form asks for unit output prices for different types of work representing the three basic headings. These are used as checks on the main survey data. Respondents are also asked to indicate the importance of each material or product in each basic heading in their economy.

## PRICING OF EQUIVALENT MATERIALS

Materials included in the construction and civil engineering survey are selected on the basis of their common use across economies. However, listed materials are not always available or used in all economies, and in some cases equivalent materials must be selected and priced.

When equivalent materials are being priced, it should always be clearly indicated in the survey questionnaire. For example, when economies do not have clay and use alternative materials for bricks, prices for the alternative bricks should be provided and the alternative description noted. However, when economies do not use bricks at all but only use concrete blocks, prices for concrete blocks should not be provided because they cannot be treated as equivalent to bricks. In this case, then, the brick item would not be priced. Another example is that in some economies, copper pipe is not used; steel and plastic pipes are used instead. In this case, steel pipe can be treated as equivalent to copper pipe, and the respective prices would be provided and the alternative description noted. Plastic pipes are not considered equivalent to copper or steel pipes.

## RELEVANCE

Classification of items as relevant or not relevant should take into account the following points:

- If a material is available and commonly used in *all three basic headings*, it should be priced and classified as relevant by inserting "1" in each BH's relevance column.
- If a material is available and commonly used in *only some basic headings*, it should be priced and classified as relevant (1) for those BHs for which the material is relevant and not relevant (0) for those BHs for which the material is not relevant.
- If a material is available but not relevant for *any of the basic headings*, a price should be provided, but the material should be classified as not relevant (0) for all BHs.
- If a material is not available and not used, it should not be priced, and it should be classified as not relevant (0) for all BHs.

## PROJECT PRICES

Construction PPPs should be calculated using input prices for material prices, equipment hire rates, and costs of labor. Project prices, if and when reported, are used as a validation check for the input-based PPPs.

All reported prices should be annual average prices. Midyear prices can be treated as annual averages. The questionnaire on project prices also refers to a midpoint in a range of prices. This means that if an economy has a range of midyear prices for a given project, the middle price would be selected and reported. In practice, it may be useful to ask economies to provide several prices per location and then take the midpoint (or average) per location, which would then be used to determine the national midpoint or national average.

Reported project prices should be those charged by construction contractors and paid by purchasers such as housing developers. Reported prices should not include costs related to external works. External works are the construction works often included in contracts but outside the external walls of the building concerned. Examples are boundary walls, footpaths, landscaping, car parking, and utilities outside the building. They are excluded because they are site-dependent and extremely variable in scope.

## IMPLEMENTATION

Those implementing the ICP 2011 construction and civil engineering survey received a specific Excel questionnaire. The following materials were also available for conducting the survey:<sup>2</sup>

- This chapter and chapter 19, Validation of Construction and Civil Engineering Data, of this volume
- Construction materials catalog
- Additional guidance for the conduct of the survey
- "Construction Survey: Notes on Selection Criteria for National Experts"
- "Presentation on Construction and Civil Engineering: Operational Aspects."

The ICP 2011 construction and civil engineering questionnaire provided item specifications for the 50 basic and common resources for construction work and templates for the price and metadata collection. The questionnaire had seven worksheets:

1. *Introduction*: To report general information on the respondent, base date for prices, and geographical base of the national average price level
2. *Notes*: Notes and guidance for the conduct of the survey
3. *Materials*: To provide unit prices for the material inputs, importance information, and comments
4. *Equipment*: To provide unit prices for the equipment hire and comments

5. *Labor*: To provide unit prices for the labor costs, comments, and supplementary information on labor rates
6. *Project prices*: To provide optional information on the unit cost for project prices for validation purposes
7. *Support*: To provide information on the resource mixes, contractors' markups, and professional fees

Annex C presents the respective worksheets and the related guidance.

Resource mixes were estimated centrally by the Global Office using income groups as a proxy for the resource allocation. However, an economy may have decided to provide economy-specific estimates for the resource mixes.

## Annex A

### List of Resources: Construction Materials and Products, Equipment, and Labor, ICP 2011

Construction Materials And Products	
Aggregate for concrete*	Clean, hard, strong crushed stone or gravel free of impurities and fine materials in sizes ranging from 9.5 to 37.5 mm in diameter
Sand for concrete and mortar*	Fine aggregate washed sharp sand
Softwood for carpentry	Sawn softwood sections for structural use pretreated to national standards (e.g., 50 mm × 100 mm)
Softwood for joinery	Dressed softwood sections for finishing (e.g., 18 mm × 120 mm)
Exterior plywood*	Exterior quality plywood 15.5 mm thick in standard sheets
Interior plywood*	Interior quality plywood 12 mm thick in standard sheets
Chipboard sheet	Interior quality chipboard 15 mm thick in standard sheets
Petrol/gasoline	Standard grade for use in motor vehicles
Diesel fuel	Diesel fuel for use in construction equipment
Oil paint	Oil-based paint suitable for top coat finishes to timber surfaces
Emulsion paint	Water-based paint suitable for internal plaster surfaces
Ordinary Portland cement*	Ordinary Portland cement in bags or bulk delivery
Ready mix concrete*	Typical common mix, 1:2:4 cement, sand, and 20–40 mm aggregate, 20N/mm <sup>2</sup>
Precast concrete slabs	Precast concrete paving slabs 600 mm × 600 mm × 50 mm thick
Common bricks	Ordinary clay bricks, suitable for render or plaster finish (e.g., 215 mm × 100 mm × 65 mm thick—715 bricks/m <sup>3</sup> )
Facing bricks	Medium-quality self-finished clay bricks for walling (e.g., 215 mm × 100 mm × 65 mm thick—715 bricks/m <sup>3</sup> )
Hollow concrete blocks	Hollow dense aggregate concrete blocks, 7N/mm <sup>2</sup> (e.g., 440 mm × 215 mm × 140 mm thick—76 bricks/m <sup>3</sup> )
Solid concrete blocks	Solid dense aggregate concrete blocks, 7N/mm <sup>2</sup> (e.g., 440 mm × 215 mm × 140 mm thick—76 bricks/m <sup>3</sup> )
Clay roof tiles	Clay plain smooth red machine-made or similar tiles per square meter of roof surface area (e.g., 265 mm × 125 mm tiles)
Concrete roof tiles	Concrete interlocking tiles per square meter of roof surface area (e.g., 420 mm × 330 mm tiles)
Float/sheet glass	Standard plain glass, clear float, 4 mm thick
Double glazing units	Factory-made, hermetically sealed medium-size units, 0.5–2.0 m <sup>2</sup> with 4 mm glass, 12 mm seal
Ceramic wall tiles	152 mm × 152 mm × 5.5 mm thick white or light-colored for medium-quality domestic use
Plasterboard	12.5 mm paper-faced, taper-edged plasterboard in standard sheets
White wash hand basin	Average quality white vitreous china domestic wash hand basin for domestic use, wall hung (excluding taps, trap, and pipework)
High-yield steel reinforcement*	Reinforcing bars up to 16 mm in diameter (excluding cutting and bending)
Mild steel reinforcement*	Reinforcing bars up to 16 mm in diameter (excluding cutting and bending)
Structural steel sections*	Mild steel I beams approximately 150 mm deep and approximately 19 kg/m
Sheet metal roofing	Twin skin roofing panel comprising color-coated steel or aluminum profiled sheeting outer layer, 100 mm insulation, internal liner sheet
Metal storage tank	Metal storage tank capacity 15 m <sup>3</sup> ; thickness of steel, 5 mm; typical size, 3.75 m × 2 m × 2 m
Cast-iron drain pipe	150 mm in diameter with mechanical coupling joints
Copper pipe	15 mm copper pipe suitable for mains pressure water
Electric pump	Electric pump for pumping water; temperature range, 5–80°C; flow rate, 10 L/sec; head pressure, 150 Pa
Electric fan	Electric exhaust fan for interior installation; flow rate, 1,000 L/sec; head pressure, 250 Pa

*table continues next page*

## Annex A (Continued)

Air-conditioning equipment	Air-cooled liquid chiller, refrigerant 407°C; reciprocating compressors; twin circuit; integral controls cooling load, 400 kW
Stand-by generator	Diesel generating set for stand-by use, three-phase 24 V DC, 250 KVA output
Solar collector	PV solar panels with peak output of 650 W, supply panels only, typically 4.5 m <sup>2</sup> total area
Electricity	Typical average commercial tariff
<b>Construction Equipment</b>	
Wheeled loader and excavator	1.0 m <sup>3</sup> loader capacity, 2.35 m wide shovel, 6.0 m maximum dig depth
Tracked tractor	Crawler dozer, 159 kW with "U" blade
Skid steer loader	Tipping load, 2,000 kg; travel speed, 11.1 km/hr.
Tandem vibrating roller	Self-propelled 5 tonne double vibratory
Compact track loader	Rated operating capacity, 864 kg; travel speed, 11.4 km/hr.
<b>Construction Labor</b>	
General (unskilled) laborer**a	General (unskilled) laborer**a
Bricklayer*b	Bricklayer*b
Plumber*b	Plumber*b
Carpenter*b	Carpenter*b
Structural steel worker*b	Structural steel worker*b
Electrician*b	Electrician*b
Machine (equipment) operator*b	Machine (equipment) operator*b

Source: ICP, <http://icp.worldbank.org/>.

Note: Items marked with an asterisk (\*) are identical to the basic items in the ICP 2005 basket of construction components (BOCC) survey documentation.

a. This group of construction workers undertakes simple, routine tasks in support of activities performed by more skilled workers. They usually have received little or no formal training. Examples of tasks they might undertake include loading and unloading materials, digging and filling holes and trenches, spreading gravel and related materials, and cleaning and tidying sites and site facilities.

b. This group of skilled construction workers has received training in their trade consisting of one or more of the following: an apprenticeship, on-the-job training, or training in a technical college or similar institution.

## Annex B

### Materials and Products Used in Basic Heading Work Types, ICP 2011

Material or product	Use in residential building	Use in nonresidential building	Use in civil engineering work
Aggregate for concrete	X	X	X
Sand for concrete and mortar	X	X	X
Softwood for carpentry	X	X	X
Softwood for joinery	X	X	
Exterior plywood	X	X	X
Interior plywood	X	X	
Chipboard sheet	X	X	
Petrol/gasoline	X	X	X
Diesel fuel	X	X	X
Oil paint	X	X	
Emulsion paint	X	X	
Ordinary Portland cement	X	X	X
Ready mix concrete	X	X	X
Precast concrete slabs	X	X	
Common bricks	X	X	X
Facing bricks	X	X	
Hollow concrete blocks	X	X	X
Solid concrete blocks	X	X	X
Clay roof tiles	X		
Concrete roof tiles	X		
Float/sheet glass	X	X	
Double glazing units	X	X	
Ceramic wall tiles	X	X	
Plasterboard	X	X	
White wash hand basin	X	X	
High-yield steel reinforcement	X	X	X
Mild steel reinforcement	X	X	X
Structural steel sections	X	X	X
Sheet metal roofing	X	X	
Metal storage tank		X	X
Cast-iron drain pipe	X	X	X
Copper pipe	X	X	
Electric pump		X	X
Electric fan		X	
Air-conditioning equipment	X	X	
Stand-by generator		X	
Solar collector	X	X	X
Electricity	X	X	X

Source: ICP, <http://icp.worldbank.org/>.

**Annex C**  
**Construction and Civil Engineering Questionnaire, ICP 2011**

**1. Introduction Worksheet**

1	Country:	
2	Currency:	
<b>Survey respondent</b>		
3	Name:	
4	Employer:	
5	Type of employer:	(please specify)
	consultant <input type="radio"/>	academic <input type="radio"/>
	research <input type="radio"/>	government <input type="radio"/>
	other <input checked="" type="radio"/>	
6	Contact details:	
7	Telephone no:	8 E-mail address:

**Purpose of the survey**

The purpose of this survey is to collect midyear national average prices as paid by contractors for resource inputs to construction work. The prices will contribute to the preparation of purchasing power parities (PPPs) for construction as part of a worldwide exercise coordinated by the World Bank and called the International Comparison Program (ICP). PPPs are currency converters (as an alternative to market exchange rates) that permit comparisons of construction volumes across countries to be made.

**Base date for prices**

Prices should be averages for the year 2011 or midyear prices.

9 Please tick one box only  Prices averaged over the year  Midyear prices

**National average price level**

The geographical base for this survey should be the national average for the country but, if this is not the case, please enter below the geographical base used in the survey and an adjustment factor to bring prices to a national average.

10	Geographical base		11	National average factor	E.g., 0.98, 1.00, 1.05, etc.
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**Completion of the survey**

Please refer to the Notes page for detailed instructions on completion of the survey.

## 2. Notes Worksheet

### General notes

i. The intention is to identify and collect prices for locally available, commonly used materials and products that are equivalent, if not identical, to the items described in the survey documents. The following notes are intended to assist in selecting and pricing the survey items.

### Item descriptions and units

ii. Specified materials and products: Item descriptions in the survey are intended to provide a clear description of the item to be priced. There is, however, a tension between the tightness of the specification and the content of the item to be priced—the tighter the specification, the more country specific it becomes. If a precise match to the specified material or product is not commonly available or used, the nearest commonly available and used equivalent should be priced and an appropriate note inserted in Column 10.

iii. Proprietary products: Generally, item descriptions in the survey do not use proprietary names but respondents can provide proprietary names in Column 10 if that simplifies the note.

iv. Detailed dimensions of materials: Generally, metric dimensions are stated in the survey documents, but these can be replaced by Imperial – or other – dimensions if these are more common in the country. Detailed dimensions of material and products will vary, both between and within countries; for example, the dimensions of bricks and blocks or timber sections. Survey respondents should select the nearest locally available and commonly used equivalent to the item described in the survey—and where that varies from the survey description, it should be noted in Column 10.

v. Units of measurement: Again, metric units are generally used in the survey documents but other units can be inserted. Alternative units of measurement can also be provided; for example, m<sup>2</sup> for plywood is preferred but a price per sheet indicating the dimensions of the sheet (length and width) is acceptable; similarly, cement is indicated as per tonne but per kg or per 50 kg bag is acceptable. The items and units should be as normally used in the country. Preferred units are indicated in Column 4 (Column 3 in the case of labor); alternative units should be inserted in Column 5 (Column 4 in the case of labor) and, if any notes are required, these should be inserted in Column 10.

vi. The units indicated for equipment hire are "per hour" but if other units are normally used, for example, "per day" or "per week," these should be indicated in Column 5. If the units are per day or per week, please indicate in Column 8 the typical numbers of hours worked per day or per week. It is assumed that equipment will be hired with an operator; if this is not the case, please indicate this in Column 8.

vii. The units indicated for labor are "per hour" but if other units are normally used, these should be indicated in Column 4 and the typical numbers of hours worked per alternative unit stated in Column 5.

### Prices

viii. Prices provided should be those paid by construction contractors to their suppliers. In the case of materials and products, that will typically be the prices paid after discounts to manufacturers or intermediaries (agents or merchants), including all nonrecoverable taxes; in the case of equipment, it should be the rental charges paid to hire companies or rates paid for internal hire; and, in the case of labor, the cost to the contractor of employing the workers. Informal payment arrangements for labor are common in construction—for example, some payment is in the form of wages, subject to taxes and on which employers' costs are incurred, while other payments are in cash—and respondents should bear this in mind when determining what is an "average" wage. There is space for notes on pricing after the material, plant, and labor sections, and it is important that these are completed by respondents.

ix. Prices should be provided for items that are commonly available and commonly used in the country; they should not be provided for items that match the item description precisely if that involves pricing a "special" item, either not generally available in the country or only available at a premium price.

x. The survey seeks annual and national "average" prices in national currency. Annual averages mean prices that are an average over the survey year (midyear prices are acceptable) and that average different price levels across the country, across different types and sizes of projects. The following notes are intended to help respondents select appropriate average prices for their country.

xi. Geographical location: Construction prices can vary across countries, as a result of local resource and distribution costs, geographic, seismic or climatic conditions, local market conditions, and so forth, particularly in large countries; sometimes these variations can be significant. Respondents should consider the extent of geographical variations when pricing items and make a judgment on what is a realistic national average.

xii. Site context: Construction prices can vary depending on detailed site conditions; for example, constrained city center sites, greenfield sites adjacent to urban areas, and remote sites that are difficult to access. When pricing items, respondents should assume reasonable site contexts with good access.

xiii. Size of projects: The size of projects can influence the cost of resources, particularly materials and equipment—large quantities and long periods of hire, for example, can reduce unit costs and vice versa. Prices should be provided for medium-sized projects, that is, projects that are not unusually small or unusually large.

### 3. Materials Worksheet

#### Construction materials and products

Respondents should indicate by inserting an asterisk, in columns 7, 8, and 9, the importance of each item in the work categories R = residential, NR = non-residential, and C = civil engineering. Here, importance means "in common use." Items that are available but are not commonly used should not be asterisked.

See  
pricing  
notes

1	2	3	4	5	6	7	8	9	10
Ref	Item	Specification notes	Preferred unit	Alternative unit	Unit price	R *	NR *	C *	Notes and comments
1	Aggregate for concrete	Clean, hard, strong crushed stone or gravel free of impurities, and fine materials in sizes ranging from 9.5 to 37.5 mm in diameter.	m <sup>3</sup>						
2	Sand for concrete and mortar	Fine aggregate washed sharp sand	m <sup>3</sup>						
3	Softwood for carpentry	Sawn softwood sections for structural use pre-treated (to national standards) eg., 50 mm × 100 mm	m <sup>3</sup>						
4	Softwood for joinery	Dressed softwood sections for finishing eg., 18 mm × 120 mm	M <sup>3</sup>						
5	Exterior plywood	Exterior quality plywood 15.5 mm thick in standard sheets	m <sup>2</sup>						
6	Interior plywood	Interior quality plywood 12 mm thick in standard sheets	m <sup>2</sup>						
7	Chipboard sheet	Interior quality chipboard 15 mm thick in standard sheets	m <sup>2</sup>						
8	Petrol/gasoline	Standard grade for use in motor vehicles	litre						
9	Diesel fuel	Diesel fuel for use in construction equipment	litre						
10	Oil paint	Oil-based paint suitable for top coat finishes to timber surfaces	litre						
11	Emulsion paint	Water-based paint suitable for internal plaster surfaces	litre						
12	Ordinary Portland cement	Ordinary Portland cement in bags or bulk delivery	tonne						(metric tonne 1000 kg)
13	Ready mix concrete	Typical common mix 1:2:4 cement:sand:20–40 mm aggregate, 20 N/mm <sup>2</sup>	m <sup>3</sup>						
14	Precast concrete slabs	Precast concrete paving slabs 600 × 600 × 50mm thick	m <sup>2</sup>						
15	Common bricks	Ordinary clay bricks (suitable for render or plaster finish) eg., 215 mm × 100 mm × 65 mm thick (715 bricks/m <sup>3</sup> )	m <sup>3</sup>						
16	Facing bricks	Medium quality self-finished clay bricks for walling, eg., 215 mm × 100 mm × 65 mm thick (715 bricks/m <sup>3</sup> )	m <sup>3</sup>						
17	Hollow concrete blocks	Hollow dense aggregate concrete blocks, 7N/mm <sup>2</sup> , eg., 440 mm × 215 mm × 140 mm thick (76 bricks/m <sup>3</sup> )	m <sup>3</sup>						
18	Solid concrete blocks	Solid dense aggregate concrete blocks, 7N/mm <sup>2</sup> , eg., 440 mm × 215 mm × 140 mm thick (76 bricks/m <sup>3</sup> )	m <sup>3</sup>						
19	Clay roof tiles	Clay plain smooth red machine-made or similar tiles per m <sup>2</sup> of roof surface area eg., 265 mm × 125 mm tiles	m <sup>2</sup>						
20	Concrete roof tiles	Concrete interlocking tiles per m <sup>2</sup> of roof surface area eg., 420 mm × 330 mm tiles	m <sup>2</sup>						

see  
pricing  
notes

1	2	3	4	5	6	7	8	9	10
Ref	Item	Specification notes	Preferred unit	Alternative unit	Unit price	R *	NR *	C *	Notes and comments
21	Float/ sheet glass	Standard plain glass, clear float, 4 mm thick	m <sup>2</sup>						
22	Double glazing units	Factory made hermetically sealed, medium-sized units 0.5 to 2.0 m <sup>2</sup> with 4 mm glass, 12 mm seal	m <sup>2</sup>						
23	Ceramic wall tiles	152 × 152 × 5.5 mm thick white or light colored for medium quality domestic use	m <sup>2</sup>						
24	Plasterboard	12.5 mm paper-faced taper-edged plasterboard in standard sheets	m <sup>2</sup>						
25	White wash hand basin	Average quality white vitreous china domestic wash hand basin for domestic use, wall hung (excluding taps, trap, and pipework)	each						
26	High-yield steel reinforcement	Reinforcing bars up to 16 mm diameter (excluding cutting and bending)	tonne						
27	Mild steel reinforcement	Reinforcing bars up to 16 mm diameter (excluding cutting and bending)	tonne						
28	Structural steel sections	Mild steel I beams approximately 150 mm deep and approximately 19 kg/m	tonne						
29	Sheet metal roofing	Twin skin roofing panel comprising color coated steel or aluminium profiled sheeting outer layer, 100 mm insulation, internal liner sheet	m <sup>2</sup>						
30	Metal storage tank	Metal storage tank capacity 15 m <sup>3</sup> , thickness of steel, 5 mm, typical size, 3.75 m × 2 m × 2 m	each						
31	Cast iron drain pipe	150 mm diameter with mechanical coupling joints	m						
32	Copper pipe	15 mm copper pipe suitable for mains pressure water	m						
33	Electric pump	Electric pump for pumping water, temperature range, 5–80°C, flow rate 10 litres/second, head pressure, 150 Pa	each						
34	Electric fan	Electric exhaust fan for interior installation, flow rate, 1,000 litres/ second, head pressure, 250 Pa	each						
35	Air-conditioning equipment	Air-cooled liquid chiller, refrigerant 407c; reciprocating compressors; twin circuit; integral controls cooling load 400 kW	each						
36	Stand-by generator	Diesel generating set for stand-by use, three-phase 24V DC, 250 KVA output	each						
37	Solar collector	PV solar panels peak output 650 W, supply panels only, typically 4.5 m <sup>2</sup> total area	each						
38	Electricity	Typical average commercial tariff	kW/hr						
39	Please provide any other useful comments on the construction materials and products market:								



## 5. Labor Worksheet

### Labor rates

Labor rates should reflect the cost to the contractor of employing the labor and should include, in addition to pre-tax wages to the worker, any additional costs to the employer for accident/health insurance, pensions, and so forth. Labor rates should also include any "off the books" or "envelope" payments that are typically made to construction workers in your country. Please indicate in the Notes and comments column typical employment conditions for different types of workers, for example, permanently employed, daily paid, and so forth.

*see pricing notes*

1	2	3	4	5	6	7
Ref	Item	Preferred unit	Alternative unit	Number of hours	Unit price	Notes and comments
1	General (unskilled) laborers [1]	Hour				
2	Bricklayer [2]	Hour				
3	Plumber [2]	Hour				
4	Carpenter [2]	Hour				
5	Structural steel worker [2]	Hour				
6	Electrician [2]	Hour				
7	Machine (equipment) operator [2]	Hour				

*Notes:* [1] This group of construction workers undertake simple and routine tasks in support of activities performed by more skilled workers. They have usually received little or no formal training. Examples of tasks that they might undertake include loading and unloading of materials, digging and filling holes and trenches, spreading gravel and related materials, cleaning and tidying sites and site facilities.

[2] These skilled construction workers have received training in their trade comprising an apprenticeship, on-the-job training, or training, in a technical college or similar institution.

### Supplementary questions on labor rates

8 To help us ensure comparability with rates from other countries, please confirm that the above rates are as follows:

Gross (i.e., the cost of labor to the contractor as described above) or Net (i.e., the rates paid to workers)

*select Gross or Net*

9 If you have reported Net rates, please indicate the overall percentage adjustment for Gross labor costs against Net labor rates

10 Please provide any other useful comments on the local construction labor market:

## 6. Project Prices Worksheet

### Approximate project prices

Please provide approximate all-in unit prices for the project types listed below. Please also indicate below the table notes on the methods of measurement used. Generally, prices for buildings should exclude external works, furniture, loose or special equipment, and fees for professional services. Prices for civil engineering works should allow for average excavation and earthworks in good ground. Where there is a known range of prices, please take a midpoint.

		Preferred unit	Alternative unit	Unit rate	Notes and comments
<b>Residential buildings</b>					
1	Single-story average quality detached house masonry (brick or block) or timber frame	m <sup>2</sup> floor area			
2	Two-story attached house, mass market, center unit in terrace/ row of four units, otherwise as above	m <sup>2</sup> floor area			
3	Low rise apartment, mass market, concrete frame, brick or block infill, walk-up	m <sup>2</sup> floor area			
4	High rise apartment, average quality, concrete frame, brick or block infill	m <sup>2</sup> floor area			
<b>Nonresidential buildings</b>					
5	High rise office/administrative building, ±20 story, medium quality, air-conditioned, concrete frame	m <sup>2</sup> floor area			
6	Medium rise office/administrative building, ±10 story, medium quality, air-conditioned, concrete frame	m <sup>2</sup> floor area			
7	Primary school one or two story, approx. 12 classrooms	m <sup>2</sup> floor area			
8	Factory/warehouse building, single story, steel frame and coated steel cladding and roofing	m <sup>2</sup> floor area			
<b>Civil engineering work</b>					
9	Highway (not motorway) with tarmac surface on level good ground	m <sup>2</sup>			
10	Length of concrete sewer pipes, 0.5 m diameter, average 2 m depth	m length			
11	Length of concrete sewer pipes, 1 m diameter, average 3 m depth	m length			
12	In the space below, please provide notes on measurement of floor area, for example: is floor area measured over or within external walls; does it include or exclude voids such as service ducts, stair voids, and lift shafts; and does it include the plan area of internal walls? In the case of shared apartment buildings, is the area of common parts—stairs, lifts, storage, corridors, and so forth outside individual apartments—included; is the area of balconies included, in whole or in part; and is the area of attached or underground parking included? Please also note any other special features of either methods of measurement or pricing.				

Reported prices should not include costs relating to external works. External works are construction works often included in contracts, but outside the external walls of the building concerned. They will include things like boundary walls, footpaths, landscaping, car parking, and utilities outside the building. They are excluded because they are site dependent and extremely variable in scope.

Item 3 "Low rise apartment": Low rise apartment refers to a residential building with approximately 5 floors. If exact match is not found, the closest projects to a 5-floor apartment should be priced.

Item 4 "High rise apartment": High rise apartment refers to a residential building with approximately 20 floors. If exact match is not found, the closest projects to a 20-floor apartment should be priced.

Item 9 "Highway": Highway projects to be priced should be for major inter-city roads.

## 7. Support Worksheet

### Supporting Information

#### The mix of construction resources

What proportion of overall construction project value is taken by the main inputs to construction work (materials and products, labor and equipment) in the following types of projects? Other inputs—general site costs, head office overheads, profit, and so forth—should be spread across the main inputs. Please indicate approximate percentage values.

		Residential buildings	Nonresidential buildings	Civil engineering works
1	Construction materials and products			
2	Construction equipment			
3	Construction site labor			
	Total project value	100%	100%	100%

#### Contractors' markups

What percentages should typically be added to contractors' input costs to arrive at contractors' bid prices or construction purchaser prices? Please indicate approximate percentage values

	Cost headings	Residential buildings	Nonresidential buildings	Civil engineering works
1	Total markup of which:			
2	General site costs and temporary works			
3	Head office overheads			
4	Profit			
5	Other contractors costs (please specify)			

#### Professional fees

What percentage additions should be allowed for both pre- and post-contract services on different types of work? Professional fees will typically comprise pre- and post-contract services, including architectural and engineering design, technical supervision, project management, and other specialist services, but national rules and practices must be taken into account. Please enter the total amount as a percentage of the contractor's cost (which will include the contractor's markup described above). The intention is to arrive at the end user or purchaser price for construction work.

	Cost headings	Residential buildings	Nonresidential buildings	Civil engineering works
1	Overall percentage addition for professional services			

2 Any other notes or comments?

Source: ICP, <http://icp.worldbank.org/>.

## NOTES

- For informal construction, the relevant expenditure values should be included in the economy's national accounts.
- Most of these materials are available on the ICP website at <http://icp.worldbank.org/>.

## REFERENCE

World Bank. 2008. *Global Purchasing Power Parities and Real Expenditures: 2005 International Comparison Program*. Washington, DC: World Bank. <http://icp.worldbank.org/>.

