

# Description, Sourcing and Methodology of Economic Data Contained on PCA’s State Map Web Page

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## Economic Profile Information: Section One

This section provides a brief historical snapshot of economic, demographic, and highway information that plays a critical role in driving public cement consumption, namely measures of overall economic activity, the health of state finances, and employment.

All concepts presented on this page are reported by government agencies on a quarterly or monthly basis – although often with a several month reporting lag. PCA members and regional promotion groups requiring more current information than reported on the web-map are encouraged to contact PCA Economic Research. All concepts presented on this page are also available within the PCA state cement forecast and projected on a five year forecast horizon.

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**Economic Growth Profile:** This section provides a brief historical context of the economic growth conditions that may shape construction spending within a specific state. There are typically two ways to measure state economic activity. The first measurement is Nominal Gross State Product (GSP). This is a similar concept to national GDP but constrained to the state level. The concept measures the value of all final goods and services produced within a particular state. Nominal GSP does not factor out inflation. The second measurement is Real Gross State Product. It is the same concept as nominal GSP but with inflation factored out. In this model, Real Gross State Product is stated in 1996 prices. While both concepts are widely used, PCA recommends using Real GSP since it is a better indicator of economic growth absent inflation – the key driver for construction activity. The sources of information used are provided below.

Economic Growth	Source
Real Gross State Product (Million 1996\$) - Annual Growth Rate	Bureau of Economic Analysis: Survey of Current Business Real Gross State Product Change in Percent Per Year
Nominal Gross State Product (Million) - Annual Growth Rate	Bureau of Economic Analysis: Survey of Current Business Nominal Gross State Product Change in Percent Per Year

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**Employment Profile:** This section provides a brief historical snapshot of employment conditions in a state. Aside from assessing conditions in state labor markets, employment conditions are often used as an alternative measure of overall economic conditions within a

state. For PCA’s purposes, total state employment also provides a base against which to measure the relative importance of cement and construction’s contribution to overall state employment. There are three basic concepts used to assess labor market conditions within a state, namely total labor force, total employment, and the unemployment rate.

**Labor Force:** Is an estimate of the total amount of persons willing and able to work within a state. The concept combines those employed and unemployed. Labor Force Participation Rate measures the proportion of the working age population that is actively engaged in the labor force. Over the past several years weak labor markets have prompted some persons to leave the workforce – neither employed nor seeking employment. As a result, this concept has become an important ingredient in assessing the health of a labor market. Total Employment: Is an estimate of total persons employed. Both of these estimates are based on a sample survey of households within each state. Employment Growth: Is an indicator of the direction and magnitude of employment growth. Unemployment Rate: measures the percent of the labor force that is not employed. The number of unemployed is estimated based on a sample survey of households, as is the number of employed. The sources of information used are provided below.

Employment	Source
Labor Force, Total Workers (1,000) Labor Participation Rate	Bureau of Labor Statistics: CPS Household Survey Labor Force/ Working Age Population
Employment, Total (1,000) - Employment Growth (1,000)	Bureau of Labor Statistics: CPS Household Survey Change in Employment Total by Year
Unemployment Rate (%)	Bureau of Labor Statistics: CPS Household Survey

**State Fiscal Profile:** This section provides a brief historical snapshot of the health of state finances. A strong fiscal position of a state typically leads to more robust public spending – including public construction activity. Keep in mind, roughly 90% of all public construction activity is performed at the state and local level.

There are two key concepts that form a picture of state fiscal health, namely state revenue collections and state expenditures. Both are stated in nominal terms (not adjusted for inflation). The net difference between revenues and expenditures yields either a fiscal surplus or fiscal deficit. The size of the deficit or surplus is the most common concept to measure the strength or weakness of a state’s fiscal position. The sources of information used are provided below.

State Finances	Source
Total State Government Revenue (Million \$) - Annual Growth Rate	BOC: Annual Survey of Government Finances Total State Government Revenue Change in Percent Per Year

Ratio: Revenue to Nominal GSP	Total State Government Revenue / Nominal Gross State Product
Total State Government Expenditures (Million \$)	BOC: Annual Survey of Government Finances
- Annual Growth Rate	Total State Government Expenditures Change in Percent Per Year
Implied Surplus/Deficit (Million \$)	Total State Government Revenue - Total State Government Expenditures

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## Demographic Profile Information: Section Two

This section provides a brief historical snapshot of demographic information that plays a critical role in driving cement consumption. Population is split into age groupings that are consistent with demographic drivers for important construction sub-markets, including school age population (education construction), driving age population (highway construction), apartment and first time home owner population (residential), and retirement age population (health construction). The direction and magnitude of population growth for each age grouping are expected to play a role influencing longer term construction activity. The sources of information used are provided below.

Demographic Profile	Source
Total Population - Growth - Growth Rate	Bureau of the Census and PCA Interpolation Change in Total Population by Year Total Population, Annual Percent Change
School Age Population (Ages 5-19, in Thousands)	Bureau of the Census and PCA Interpolation
Driving Age Population (Ages 15+, in Thousands)	Bureau of the Census and PCA Interpolation
Apartment Age Population (Ages 20-29, in Thousands)	Bureau of the Census and PCA Interpolation
First Time Homebuyer (Ages 30-39, in Thousands)	Bureau of the Census and PCA Interpolation
Retirement Age Population (Ages 65+, in Thousands)	Bureau of the Census and PCA Interpolation

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## Highway Profile Information: Section Three

Highway construction typically plays an extremely important role in most state's overall cement consumption. This section provides a brief historical snapshot of highway information regarding the size of each state's highway system, as well as measures of congestion and safety on each

state's highway. The highway congestion and safety concepts are the PCA Economic Research's estimates.

**Highway Congestion Estimates:** As population grows, additional usage stress is placed upon the existing state highway system. Presumably, there are practical limits to highway usage. As these limits are approached, expansion of the highway system becomes more probable. Three concepts have been designed to give a measure of the intensity in which state highway systems are used. Road Miles per Driver: This measure of highway congestion divides the number of Federal Aid Highway Lane Miles by the number of Licensed Drivers. Vehicles per Road Mile: This alternative measure of highway congestion divides the number of Federal Aid Highway Lane Miles by registered vehicles in state. Both of the above measures provide a basis to judge highway congestion based on the stock levels of drivers or vehicles. Neither of these measures, however, takes into consideration the intensity of drivers or vehicle road use. The final and preferred measure provided by PCA better addresses this issue. Vehicle Miles Traveled per Federal Aid Highway Lane Miles provides a basis of highway congestion based upon the flow of vehicle use.

## Highway Profile: Congestion

Functional, Lane Miles	U.S. Department of Transportation; Federal Highway Administration
Federal Aid Highway, Lane Miles	U.S. Department of Transportation; Federal Highway Administration
National Highway, Lane Miles	U.S. Department of Transportation; Federal Highway Administration

Congestion Measures	Source
Licensed Drivers (1,000)	U.S. Department of Transportation - Federal Highway Administration
Road Miles Per Driver	Licensed Drivers / Federal Aid Highway
Vehicles on the Road (1,000)	U.S. Department of Transportation; Federal Highway Administration
Vehicles Per Road Mile	Vehicles on the Road / Licensed Drivers
Vehicle Miles Traveled (VMT) (1,000,000) - VMT Per Vehicle	U.S. Department of Transportation; Federal Highway Administration Vehicle Miles Traveled / Vehicles on the Road

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**Highway Safety Estimates:** An alternative method to measure stress placed upon the existing state highway system is to estimate safety conditions. Total state highway fatalities and fatalities per licensed drivers are provided as estimates. The sources of information used are provided below.

## Highway Profile: Safety

Fatalities	U.S. Department of Transportation; Federal Highway Administration
Fatalities Per Thousand Drivers	Fatalities / Licensed Drivers

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## State Cement Profile Information: Section Four (A)

This section provides a brief historical snapshot of cement and related industry information within each state. State Cement Consumption is reported in thousands of metric tons for each state based on USGS data. State Concrete Consumption is estimated using USGS cement consumption information and multiplying by 4.41 to convert to thousands of cubic yards. Both concepts are also provided on a percent change basis to show consumption/demand growth trends.

**State Clinker Capacity:** Clinker capacity provides an estimate regarding the cement industry's contribution to state commerce as well as a very rough proxy for state cement supply. Clinker is a pre-ground stage of cement production. Capacity estimates are stated in thousand metric tons and are based on kiln production from the latest PCA Plant Information Survey. This information was rolled forward and adjusted for plant expansions and closures to estimate state clinker capacities for years in which the survey was not conducted as well as for future years.

Clinker capacity estimates are a very raw measure of a state's cement supply and some caution must be used with this data set. In many states, a portion of a plant's production will be shipped out of state while neighboring states may be shipped in state. Finally, use of this data as a supply estimate is completely lacking information regarding import volume, so capacity and supply should by no means be used interchangeably.

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## State Cement & Related Industries Profile: Section Four (B)

This section is comprised of four primary categories, including a state profile on the cement industry, ready-mix industry, and other cement industry, which is largely comprised of block and pre-cast producers. The fourth category sums up all cement related industries, namely concrete contractors and masonry contractors. Data contained in this section is based primarily on information from the Bureau of Census' Survey of Manufacturers. This information is a snapshot taken every five years by the Economic Census survey. PCA interpolates for the intervening years and extrapolates for years after the most recent Economic Census (2007), based on current trends and other available economic indicators of the status of the cement industry. All industries surveyed by the Economic Census are coded by the North American Industry Classification System (NAICS). For the purposes of this model, all cement industries of interest had direct NAICS correlates, with the exception of other cement industry, which was computed as the summation of concrete block, brick, and pipe manufacturing, other cement

manufacturing, and the residual obtained from taking total cement and concrete manufacturing less the sum of the accounted for aforementioned categories plus cement and ready-mix manufacturing.

It should be kept in mind that the Census data is based on company surveys. As a result, some rather significant survey errors have been observed. Frequently, for example, a state will report a very high number (sometimes in the hundreds) of cement manufacturing facilities in operation within state. This information contradicts information from the PCA Plant Information Survey, as well as other reliable sources. PCA believes that the survey taker, presumably a ready-mixer, misclassifies their operations as those of a cement manufacturer during the survey.

At issue is the data integrity of the principal data base (Census of Manufacturers). Rather than pass through known errors, PCA developed several data screens to identify significant reporting outliers. After a case-by-case review, PCA has employed various methods to adjust Census information. While this implies a difference between the information reported by PCA and that reported by the Bureau of Census, we believe that the resulting information is a more accurate reflection of cement related business activity within each state. These adjustments are detailed in the following sections, based on quantity of interest. Only the cement industry and ready-mix industry data underwent these adjustments; the other cement and related industry categories were preserved, to the extent possible as some data were withheld to protect the privacy of survey respondents. The estimation of missing data points is also described below in detail for each quantity of interest. In general, when data were withheld, regional average ratios were multiplied by available data to estimate quantities of interest that were not disclosed.

**Number of Establishments:** Information regarding the number of establishments is first taken directly from the Bureau of Census manufacturing surveys conducted in 1997, 2002, and 2007. These years serve as a benchmark; PCA interpolates for the intervening years and extrapolates for years past 2007. Information regarding cement manufacturing plants within a state is also taken directly from PCA's Plant Information Survey; these counts will essentially replace the cement manufacturing establishment counts from the Census after the adjustments have been made.

The Census data is then adjusted accordingly, under the assumption that an overstatement of cement manufacturing establishments by the Census represents a misclassification of ready-mix establishments. Also, although occurring less frequently, an understatement of cement manufacturing establishments by the Census is assumed to imply that actual cement manufacturers were erroneously counted as ready-mixers, resulting in a corresponding overstatement of ready-mix establishments. To adjust the data surplus cement establishments were reassigned to the ready-mix category, and cement establishment shortages were corrected by reassigning ready-mixers to the cement category. Fortunately there were no cases in which the data for number of establishments were withheld, since disclosure of such counts is non-informative to competitors. Adjustment of establishment counts was relatively simple since the PCA Plant Information Summary provided a direct and reliable basis for correction.

**Number of Employees:** Information regarding the number of employees is first taken directly from the Bureau of Census manufacturing surveys conducted in 1997, 2002, and 2007. These years serve as a benchmark; PCA interpolates for the intervening years and extrapolates for years past 2007. If the cement manufacturing establishment count provided by the Census matched the plant count in the PCA Plant Information Summary, no cement or ready-mix plants were redistributed so no adjustments were necessary and Census employee counts were left unaltered; however, if plants had been redistributed to correct the number of establishments,

then of course employees must be redistributed as well. The chief difficulty in doing so was that the PCA Plant Information Summary contains no information on cement employees, so a less precise methodology utilizing employees per plant ratios was employed.

If cement manufacturing establishments were overstated, as was more frequently the case, then the number of cement manufacturing employees reported by the Census was actually a mixture of cement and ready-mix employees. As a result the true ratio of employees per cement establishment was confounded and made indeterminable. Although the ready-mix industry in this case would be missing establishments and employees, its employees per ready-mix establishment ratio was still reliable since there were no foreign employees included in its Census count. To estimate the number of ready-mix employees mistakenly included with Census cement employees, the number of surplus Census cement plants (ready-mix plants misclassified as cement plants) was multiplied by the employees per ready-mix plant ratio. This number was then subtracted from Census cement employees and added to Census ready-mix employees to yield adjusted employee estimates. An identical, but reversed, procedure was applied when cement manufacturing establishments were understated by the Census; in this case the ratio of employees per ready-mix establishment was obscured and the number of missing cement plants was multiplied by the employees per cement plant ratio to estimate the number of cement employees misclassified as ready-mix employees.

A similar procedure was employed to estimate missing or withheld Census employee counts. Averages of employees per establishment ratios were computed for all U.S Census regions by including all states which had both the number of establishments and employees available (even if these counts had been adjusted for consistency as described above). Separate ratios were computed for each cement or cement related industry category. Estimates of employees were obtained by multiplying the establishment count by the regional average ratio of employees per establishment for a given industry.

For non-Census years, the number of employees was interpolated in a linear fashion.

**Payroll:** Payroll data were obtained in a similar fashion to employee counts. Payroll information is first taken directly from the Bureau of Census manufacturing surveys conducted in 1997, 2002, and 2007. These years serve as a benchmark; PCA interpolates for the intervening years and extrapolates for years past 2007. First survey years were adjusted. Again, if the cement manufacturing establishment count provided by the Census matched the plant count in the PCA Plant Information Summary, no cement or ready-mix plants were redistributed so no adjustments were necessary and Census payroll was left unaltered; however, if employees and plants had been redistributed to correct the number of establishments, then of course payroll must be redistributed as well, which was accomplished using pay per employee ratios. If cement manufacturing establishments were overstated, adjusted payroll estimates were obtained by multiplying the number of surplus cement employees (ready-mix employees misidentified as cement employees), as calculated above, by the pay per ready-mix employee ratio, then subtracting this number from the Census cement payroll and adding it to the Census ready-mix payroll. States with understated cement manufacturing plants underwent similar adjustments to their payrolls. Additionally, if payroll data for a state's industry was not disclosed by the Census, the number of employees was multiplied by the industry specific regional average ratio of pay per employee to yield a payroll approximation.

Finally, after adjustments had been made to Census years, the average wage per employee was again computed with the adjusted employee and plant counts. The average wage was

interpolated linearly for intervening years, and this average wage was multiplied by the interpolated employee counts to obtain payroll estimates for non-Census years.

**Production:** Data on production were obtained using different methods for the three different manufacturing industries. For the cement industry, Portland cement production data were gathered from the USGS Annual Minerals Yearbook; however, rather than reporting production on a state level basis, the USGS grouped some neighboring states together into small regions to prevent data from being withheld due to manufacturer privacy. To separate the cement production of a region into its component states, each state's share of the region's total clinker capacity was computed and multiplied by the region's total cement production to obtain an approximation of cement production in a given state.

Ready-mix cement production was estimated as a fraction of state concrete consumption. To estimate the portion of concrete consumption that represented ready-mix production, data from the USGS Annual Minerals Yearbook on Portland cement shipments by district (region) and type of customer (e.g. ready-mixer, contractor, etc...) were obtained and the ready-mixers' share of total cement shipments was computed for each region. States not included in any district were assigned to nearby or economically similar regions in order to estimate their ready-mix ratios. These ratios were then multiplied by total concrete consumption to yield an approximation of state ready-mix production.

The production of other cement was estimated as the residual remaining after ready-mix production was taken out of state concrete consumption.

**Value of Shipments:** The data on value of shipments were obtained in a manner similar to those on payroll. Information regarding the value of shipments is first taken directly from the Bureau of Census manufacturing surveys conducted in 1997, 2002, and 2007. These years serve as a benchmark; PCA interpolates for the intervening years and extrapolates for years past 2007. First survey years were adjusted. Again, if the cement manufacturing establishment count provided by the Census matched the plant count in the PCA Plant Information Summary, no cement or ready-mix plants were redistributed so no adjustments were necessary and Census value of shipments was left unaltered; however, if plants had been redistributed to correct the number of establishments, then of course shipments must be redistributed as well, which was accomplished using value per employee ratios. If cement manufacturing establishments were overstated, adjusted value estimates were obtained by multiplying the number of surplus cement employees (ready-mix employees misidentified as cement employees), as calculated above, by the value per ready-mix employee ratio, then subtracting this number from the Census cement value and adding it to the Census ready-mix value. States with understated cement manufacturing plants underwent similar, but reversed, adjustments to their values of shipments.

Additionally, if value of shipments data for a state's industry was not disclosed by the Census, the cement production tonnage was multiplied by the industry specific regional average ratio of value per ton to yield an approximation of value of shipments. Note this is a different ratio than that used above when data were misclassified as opposed to not disclosed. This latter ratio of value per ton provides a more accurate estimate of the actual value of shipments; value per employee was used above since production data is not reported by the Census, so the pre-adjusted ratio of value per ton was indeterminable since values were misstated but production tonnage was reliable.

Finally, after adjustments had been made to Census years, the average value per ton was again computed with the adjusted values of shipments. The average value was interpolated linearly for intervening years, and this average wage was multiplied by tons of cement production to obtain value estimates for non-Census years.

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## Cement & Construction Industries' Contribution to State Employment: Section Four (C)

At the local level a cement plant may be a significant contributor to total area employment. On a national and state basis, however, direct employment by the cement industry accounts for a relatively small portion of overall employment. Keep in mind, however, that very little construction activity can take place without the use of concrete. Indirectly, cement production supports a much larger contribution to national and state labor markets – namely construction employment.

**State Labor Market Profile:** This section provides a base profile of a state's total labor market conditions. It is from this data that cement and related industry's contribution to a state's total employment is measured. Many of the concepts presented in this section, including labor force, labor force participation rate, total employment, and employment growth, are restated from the Economic Profile Section. In addition, this section provides employment information on important sub-markets for labor. This information not only provides a more complete view of a state's labor markets but also provides a basis of comparison to measure the cement industry's employment importance within a state.

**Cement and Related Industry Contribution to State Employment:** This section shows the cement industry's importance to a state's overall employment. PCA provides estimates on direct employment and indirect employment. Combined, these estimates show the overall importance of the cement industry to state employment. These estimates also imply the industry's importance to a state's overall commercial activity.

**Direct Cement Related Employment:** Is the actual number of persons employed by the cement industry and its related industries. The information shown is the same as that provided in the previous section, State Cement & Related Industries Profile.

**Indirect Cement Related Employment:** Indirect employment estimates provide a more comprehensive view regarding an industry's total contribution to state employment. Direct employment includes only persons on payroll at cement related companies. Keep in mind, however, that the process of making cement and concrete generates demand for equipment, plant repairs, and other materials and products that are required as an ongoing part of the production of cement and concrete. These downstream contributions are estimated and included into a state's indirect cement employment contribution. These estimates are separate from direct employment estimates.

In addition, it is important to recognize that for every person employed by the cement and concrete industry additional demand arises as part of normal employee participation in living in the local economy, including housing, food, energy, and transportation, as well as other consumer products. To the extent demand for these products is raised, employment in these upstream industries is increased. These upstream contributions are estimated and also included

into a state's indirect cement employment contribution. These estimates are separate from direct employment estimates.

Calculating indirect employment is no easy task. In economic terms, the calculation is referred to as an "employment multiplier". The use of employment multipliers is a commonly used method within economics to provide a measure of an industry or of the impact of policy actions on labor markets. Employment multiplier estimates are inevitably subject to scrutiny with an eye toward bias. As a result, PCA performed an extensive search of economic literature and research on employment multipliers. Considered by many to be among the most definitive and comprehensive research on the subject is a report written in 2003 by Josh Bivens from the Economic Policy Institute. PCA has used the employment multiplier conclusions from this report in reference to construction employment. In doing so, PCA believes potential accusations of bias will be neutralized, or at the least minimized. The employment multipliers estimated by the Bivens' report are national estimates and have been applied uniformly across all states.

**Percent of Cement and Related Industries to Total State Employment:** Cement and related industries' contribution to total state employment is calculated by combining direct and indirect employment (total cement and related employment) and dividing by total state employment. Typically, even with the indirect employment estimates included the cement and related industries' contribution to total state and national employment is rather small. Keep in mind, particularly when indirect employment is calculated, that the cement and related industry may play a very substantial role in the local (town) employment profile.

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## Construction Industry Contribution to State Employment

Indirectly, cement production supports a much larger contribution to national and state labor markets – namely construction employment. While the employment contribution by the cement and related industries is typically small at the state level, it must be understood that most construction activity requires the use of concrete at some stage of the construction process. The production of cement and concrete provides critical support to a much larger component of most state's employment picture, namely total construction employment. Without concrete's contribution, construction employment would be a fraction of prevailing levels. As a result, PCA includes an assessment of the construction industry's contribution to total state employment conditions.

**Construction Employment:** This section combines direct and indirect employment estimates for the construction industry. Direct employment is sourced from the Bureau of Labor Statistics, Household Survey. The same methodology used to calculate indirect employment for the cement industry is used to calculate construction industry indirect employment. Direct and indirect construction employment is combined to yield total construction employment. Total construction employment is divided by total state employment to provide estimates of the construction industry's contribution to a state's total labor market.

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## Cement & Construction Industries' Contribution to State Revenues: Section Five

This section provides a brief historical snapshot of the health of state finances. A strong fiscal position of a state typically leads to more robust public spending – including public construction activity. Keep in mind, roughly 90% of all public construction activity is performed at the state and local level.

**State Budget Performance:** There are two key concepts that form a picture of state fiscal health, namely state revenue collections and state expenditures. Both are stated in nominal terms (not adjusted for inflation). The net difference between revenues and expenditures yields either a fiscal surplus or fiscal deficit. The size of the deficit or surplus is the most common concept used to measure the strength or weakness of a state's fiscal position. The concepts and information sources used in this section are identical to those used in the Economic Profile Section.

**Cement and Related Industry Contribution to State Revenues:** Providing estimates for the cement industry's contribution to state revenues is not a simple exercise. This is because the source of state revenues is diverse. State revenues can accumulate from individual income taxes, corporate income taxes, sales taxes, fines, user fees, and other revenue generating fees. To accurately assess the cement industry's impact on revenues on a state-by-state basis, taking into consideration all state tax codes is beyond the scope of this report.

Nevertheless, PCA has provided a relatively simple methodological approach to capture the cement and related industries' contribution to total state revenues in the context of diverse state revenue bases. By dividing total state revenues by total employment, the average revenue contribution per employee is calculated. This calculation provides an easy measure that includes all income tax, sales tax, and user fees per worker. The average state revenues per worker are applied to the total employment contribution by cement and related industries to yield total revenue contribution by the industry. Both direct contributions and indirect contributions are included in the estimates. These values are then compared against total state revenues to give the percentage contribution for cement and related industries. An identical calculation is performed using construction industry employment to yield the construction industry's contribution to state revenues.