GONZALEZ-SANEL RESEARCH

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The Concrete Industry

# SELL

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## Concrete Survey: Paving the way to a tepid recovery

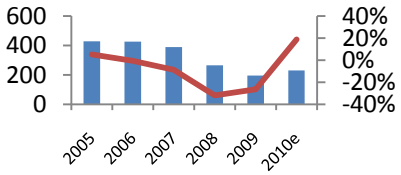
After analyzing industry-wide revenue returns as well as conducting an APV valuation, we feel that the concrete industry is **overvalued**. According to our multiples analysis the concrete industry is worth $51.7B and our APV resulted in $30.7B. We believe the industry is overvalued by around 40.6% according to our analysis.

Recent, tepid macro trends suggest that **concrete producing firms will not see a robust recovery**. If we assume macro trends to remain moderate, our annualized growth (in revenues) for the industry within the next 6 years is 5.79%. For context, the annualized return of the Wilshire 5000 for the last 40 years has been 9.56%.

While infrastructure efforts are underway to stimulate the economy, we believe that this **stimulus is already priced into our valuation of the industry**.

Finally, the industry will continue to be "shaky" and that the additional volatility in the price of raw materials will persist. Given the price increases in the raw materials, the **concrete business will not recover its high margins**.

**Concrete Volume and Growth**
(Million Cubic Yards & %)




Source: USGS, Company Est (2010e).

**Key Stats:**

- $51.7B Multiple Analysis
- $30.7B Industry APV
- 5.79% Volume CAGR Forecast for 6 years
- $45B Federal Spending

**Please read the disclaimer at the end of this report for important information**

**Brief description of Industry**

The US cement, concrete, and construction material industry includes more than 5,000 companies with combined annual revenue of about $60 billion. Major companies include Ash Grove Cement Company, National Cement Company, Texas Industries, US Concrete, and Vulcan Materials, as well as the US operations of foreign companies such as Cemex (Mexico), CRH (Ireland), Holcim (Switzerland), FCC (Spain), and LaFarge (France). The industry includes about 150 cement manufacturing companies, 2,500 ready-mix concrete manufacturing companies, and about 2,700 companies that make concrete block, brick, pipe, and other concrete products.[1]

Concrete itself is a mixture of three basic ingredients: sand, gravel (crushed stone) and cement, as well as chemical compounds known as admixtures. Combining this mixture with water causes the cement to undergo an exothermic chemical reaction called hydration, turning cement into a hard paste that binds the sand and gravel together. Concrete, which is mixed with water at a plant and transported directly to a construction site, is a perishable product that needs to be delivered within an hour and a half before it becomes too stiff to be workable.[2]

Concrete is a geographically segmented industry since the product cannot travel much more than an hour before hardening. Thus the industry is composed of local oligopolies and demand shocks cannot be deflected by reallocating production to other markets. The ready-mix concrete industry witnesses large changes in demand from the construction sector from year to year which are of great concern to ready-mix producers, as the size of the construction industry at the county level changes by 30% per year. Today, around 66% of concrete is used by state and local governments to build streets, highway, and other infrastructure. These government outlays are very volatile due to year to year changes in tax revenues. For this reason, the industry is highly sensitive to changes in the economic landscape, where a stronger economy greatly accelerates growth of construction, and hence the growth of concrete producing firms.[3]

**Competitive Landscape**

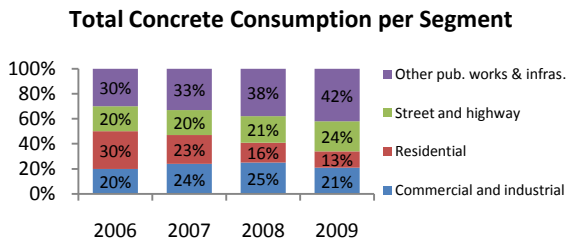
Concrete has to be produced locally and is perishable (it hardens fast), this causes the Ready-mix concrete market to be highly disaggregated. Furthermore, having a highly disaggregated market commoditizes the product, lowering margins in comparison to other consolidated markets. Players within the industry include non-public local and national producers as well as public national and multinational producers. However, most of the larger players are vertically integrated (either both cement and aggregates, or at least with aggregates), where securing the supply of aggregates is key for the business. Environmental changes in the law may limit the amount of permits to exploit aggregates in the future.

[1] http://www.firstresearch.com/Industry-Research/Cement-Concrete-and-Construction-Material.html
[2] http://en.wikipedia.org/wiki/Concrete
[3] Demand Fluctuations in the Ready-Mix Concrete Industry: http://pages.stern.nyu.edu/~acollard/Demand%20Fluctuations%20in%20the%20Ready-Mix%20Concrete%20Industry.pdf

With recent disruption in the economy, there is opportunity to consolidate markets as larger local players have incentives to expand their market footprint and national players want to protect their market against multinational companies. Recent decelerated growth intensifies rivalry between players in the construction materials market. Market players are similar in nature and have little opportunity for diversification, which serves to increase rivalry further.[4]

There are four major segments in the construction industry in the United States: a) Commercial and Industrial construction, b) Residential Construction, c) Street and highway construction and paving, and d) Other public works and infrastructure construction. The recession, directly hit upon construction materials demand. The residential sector which had accounted for nearly 30% of the concrete consumption in 2006, suffered a huge hit during the housing crisis reducing its share to 13% in 2009. Infrastructure construction will continue to drive demand for the concrete industry. The consumption in infrastructure (segment c and d) has grown from 50% in 2006 to 66% in 2009.

Exhibit 1
**Infrastructure driving Concrete Consumption**
Consumption of Concrete per Segment (%)




Source: US Concrete financial reports

The main suppliers to this industry are cement and aggregates, local producers that are not vertically integrated are more exposed to price increases from these raw materials.

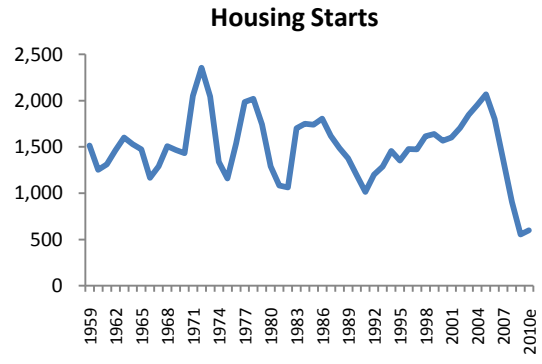
## Macro Trends

No strong consensus exists as to the fate of the U.S. economy within the next year. All sides of the economic spectrum have been more or less argued—including deflation and inflation proponents, as well as market bulls and double-dip doomsayers. Our focus concerns housing starts, unemployment, U.S. GDP and recent stimulus packages.

Housing Starts

Housing starts (the number of privately owned new houses on which construction has been started in a given period) have experienced an unprecedented negative shock in the past 3 years. However, recent data suggest early signs of a recovery.

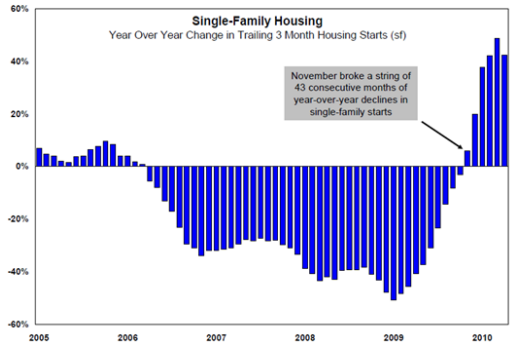
Exhibit 2
**A Housing Bottom?**
Housing Starts (thousand units)




Source: Bureau of the Census; 2010e Market Watch

[4] http://www.articlesnatch.com/Article/Construction-Materials--Global-Industry-Guide---Market-Research-Reports-On-Aarkstore-Enterprise/1387178

Exhibit 3
**Single Family Housing**
YoY % chg in Trailing 3 Month Housing Starts



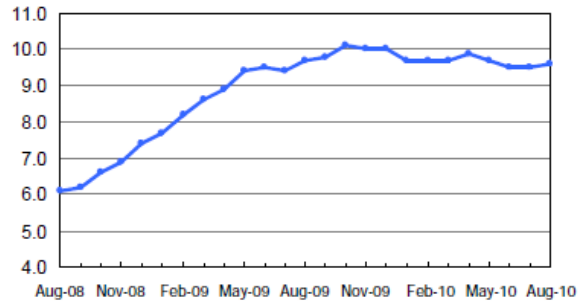

Source: McGraw-Hill, CEMEX

The pace of new home construction in the US made a modest rebound in July 2010 but building still remains weak as the housing market struggles to gain momentum. Builders in the U.S. turned pessimistic in August this year, with the sign that expiration of a government tax credit will keep depressing home construction. The National Association of Home Builders/Wells Fargo confidence index dropped to 13 in August as well, the lowest level since March 2009, from 14 in July. This uncertainty is underscored by a previous July decline in building permits, which fell 3.1 per cent from June to 565,000. Permits signal future construction and are down 3.7 per cent year-on-year.

Unemployment

The concrete industry is strongly correlated with unemployment; later in our analysis we will run a regression of industry revenues to unemployment rates. While the economy is seeing some signs of recovery, the US unemployment rate was at 9.6 percent in August 2010.

Exhibit 4
**Unemployment rate, seasonally adjusted (%)**
August 2008 – August 2010




Source: Bureau of Labor Statistics

In terms of percent losses within a historical context, the recent economic downturn has proven extremely ominous.

More concerning has been several, recent analyst revisions to future unemployment. For example, Goldman Sachs raised its forecast to 10% from 9.8%.[5]

| | 2010 | | 2011 | | | | Ann. Avg. | | Q4/Q4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | '10 | '11 | '10 | '11 |
| **Real GDP (% chg from prev. pd, ann. rate)*** | | | | | | | | | | |
| Current | 1.5 | 1.5 | 1.5 | 2.0 | 2.5 | 3.0 | 2.7 | 1.9 | 2.3 | 2.2 |
| Previous | 1.5 | 1.5 | 2.5 | 3.0 | 3.5 | 3.5 | 2.7 | 2.5 | 2.3 | 3.1 |
| **Unemployment Rate (% of labor force)** | | | | | | | | | | |
| Current | 9.6 | 9.8 | 9.9 | 10.0 | 10.0 | 10.0 | 9.7 | 10.0 | 9.8 | 10.0 |
| Previous | 9.6 | 9.8 | 9.9 | 9.9 | 9.8 | 9.7 | 9.7 | 9.8 | 9.8 | 9.7 |
| **Core PCE Inflation (yr/yr, % chg)** | | | | | | | | | | |
| Current | 1.6 | 1.5 | 1.4 | 1.3 | 0.8 | 0.5 | 1.6 | 1.0 | 1.5 | 0.5 |
| Previous | 1.0 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 1.4 | 0.4 | 0.9 | 0.3 |

* Percent change from previous period, at an annual rate in the case of quarterly figures.
Source: Our calculations.

While several economists have negative expectations for unemployment, the consensus forecast is that the U.S. unemployment rate will

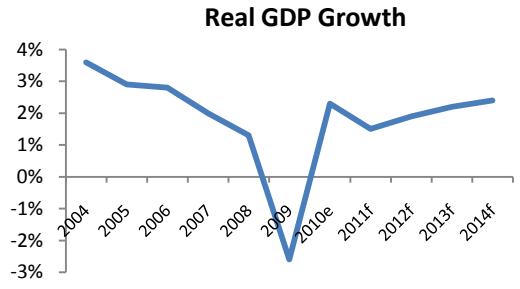
[5] Goldman Capitulates: Lowers GDP Forecast, Increases Unemployment And Inflation Outlook, Sees Imminent QE "Lite": http://www.zerohedge.com/article/goldman-capitulates-lowers-gdp-forecast-increase-unemployment-outlook-sees-imminent-qe-lite

end this year at 9.6 percent and fall only to 9 percent by the end of 2011.[6]

U.S. GDP

The US economy rose at a 1.6 percent pace in 2010's second quarter, a number that's disappointing but still invokes hope that the US will avoid a dip back into recession this year. The number represents a sharp decline in the speed of economic recovery compared to the first quarter, when the gross domestic product (GDP) grew at a 3.7 percent pace.

Exhibit 5
**Real Gross Domestic Product Growth (%)**




Source: Economist Intelligence Unit

Beyond this, according to the September survey of 50 forecasters recently released by Blue Chip Economic Indicators, the consensus outlook for economic growth fell for the third consecutive month. Real GDP growth in the current, July-September quarter is projected to run at an annual rate of 1.8%, little better than the disappointing 1.6% in the previous quarter. With a small pickup expected, to just 2.3% in the fourth quarter, the recent unemployment reading of 9.6% should persist through the end of this year.[7]

Recent Infrastructure Efforts

President Barack Obama has recently proposed spending $50 billion next year on highways, airport and railway construction, the latest attempt to boost the economy. The initiative would be part of a larger effort to fix 150,000 miles of roads, lay or rebuild 4,000 miles of railroad track and refurbish some 150 miles of airport runways. In addition, the plan calls for creating a national "infrastructure bank" to make low-cost loans for transportation projects directly from the federal government to local governments.[8]

If the goal is to indeed repair and build infrastructure, then that requires concrete, aggregates, and cement. The vertically integrated companies will benefit the most from this plan given that they have secured their raw materials. When it comes to aggregates and cement procurement, location matters in a very substantial way. When repairing a road or bridge, the concrete supplier nearest to the construction site usually gets the business due to the reduced logistics costs. Vulcan Materials, Martin Marietta, and CEMEX are among the largest aggregates producers in the US. These companies have more quarries and reserves than anyone in the aggregates business. In this sense, Vulcan Material and CEMEX's ready-mix division has a greater

[6] Economists cut U.S. growth forecast again: http://www.reuters.com/article/idUSN08115282201009 09

[7] Gloom Is Still in Bloom: http://online.barrons.com/article/SB50001424052970204398504575477712439086820.html?mod=googlenews_barrons

[8] Obama in Infrastructure Push: http://online.wsj.com/article_email/SB10001424052748703713504575475400690920676-lMyQjAxMTAwMDAwNjEwNDYyWj.html

competitive advantage than the non-vertically integrated ready-mix producers. Multinationals have started to react to this new business dynamic, and have acquired aggregate companies to increase their competitive advantage in the industry. An example of this is CEMEX's acquisition of Rinker Materials for nearly $15 billion. To a lesser extent, but still likely to benefit, is Texas Industries, a much smaller aggregate provider but sizable enough at $900 million to garner its share of business. In terms of balance sheet, CEMEX has the most leverage with $16.5 billion in debt, followed by Vulcan Materials with nearly $3 billion worth against its market cap of $5 billion market cap.[9]

[9] Who Benefits from Obama's Infrastructure Plan?: http://stocks.investopedia.com/stock-analysis/2010/Who-Benefits-from-Obamas-Infrastructure-Plan-CAT-VMC-MLM-TXI-TPC0909.aspx?partner=YahooSA

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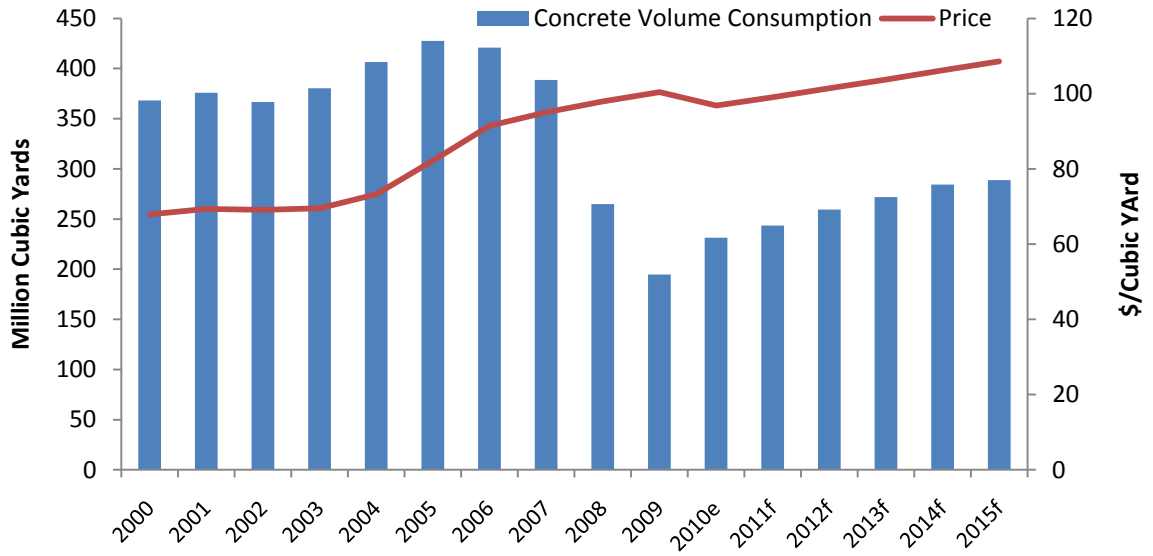
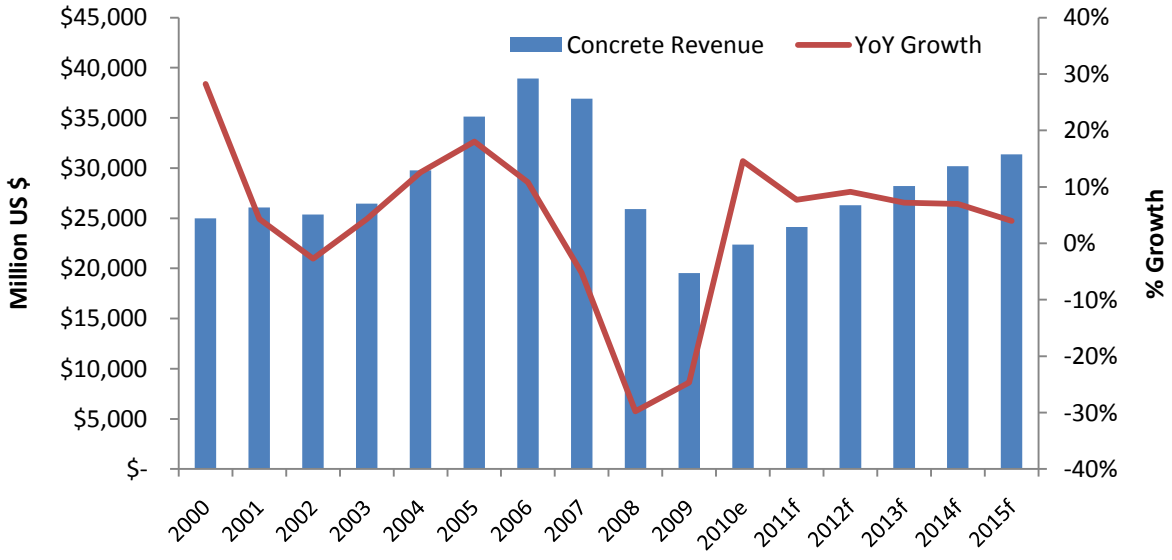
**Industry Data**

Exhibit 6
**Concrete Volume Consumption in the U.S.**
Million Cubic Yards and US $/Cubic Yard




Source: USGS, Company Estimates for 2010 to 2015

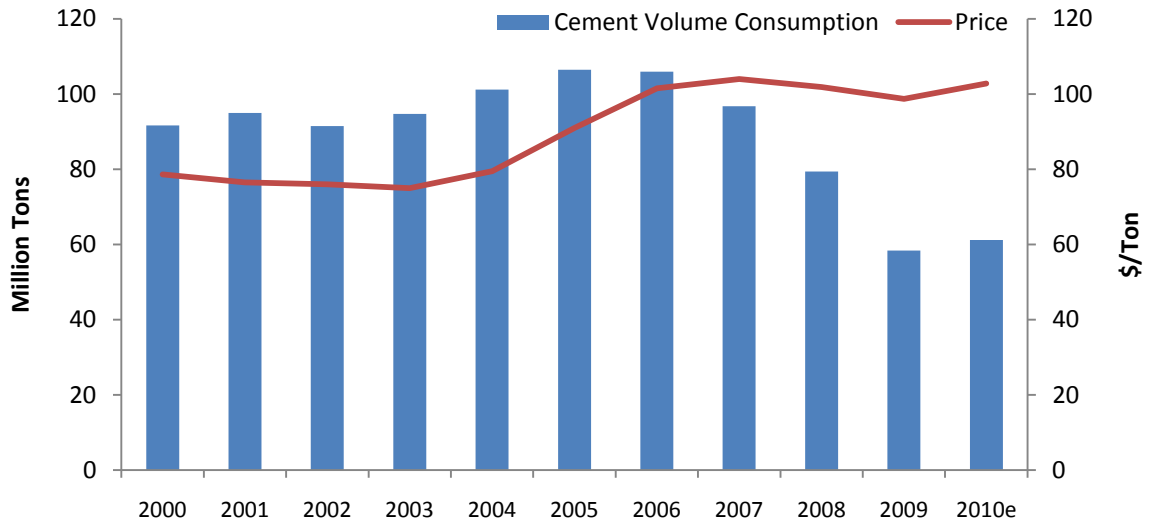
Exhibit 7
**Concrete Revenues in the US and % Revenue Growth**
Million US $ and %




Source: USGS, Company Estimates for 2010 to 2015

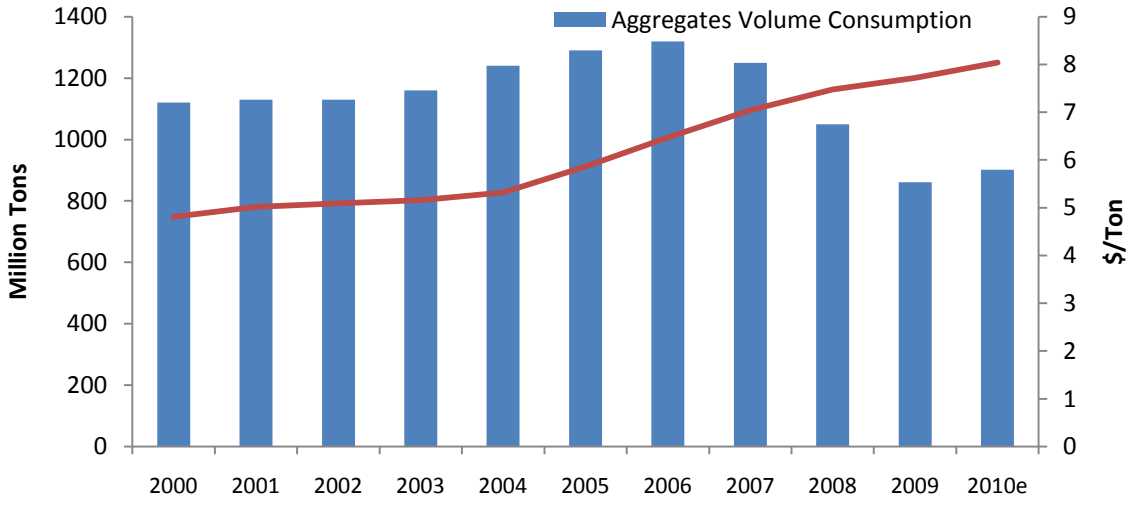
Cement and aggregates are the two main raw materials used to produce Concrete. Historically, the demand and price for these raw materials had been quite stable. From 2007 onwards, the price and volume consumed from these materials has been very unstable affecting Concrete´s gross margins.

Exhibit 8
**Cement consumption in the Concrete Industry**
Million Tons and US $/Ton




Source: USGS, Company Estimates for 2010

Exhibit 9
**Aggregates consumption in the Concrete Industry**
Million Tons and US $/Ton




Source: USGS, Company Estimates for 2010

**Target Company Descriptions**[10]

**Vulcan Materials Company (Public, NYSE:VMC).** Vulcan Materials Company (Vulcan) is a producer of construction aggregates, primarily crushed stone, sand and gravel. The Company is also a producer of asphalt mix and ready-mixed concrete and a producer of cement in Florida. Vulcan operates in three segments: aggregates, asphalt mix and concrete, and cement.

**Eagle Materials, Inc. (Public, NYSE:EXP).** Eagle Materials Inc. (EXP) is engaged in manufacture and distribution of gypsum wallboard, and the manufacture and sale of cement. The Company sells cement in four regional markets, including northern Nevada and California, the greater Chicago area, the Rocky Mountain region and central Texas. Its gypsum wallboard business is supported by its recycled paperboard business, while its cement business is supported by its concrete and aggregates business. As of March 31, 2010, the Company operated four gypsum wallboard plants (five board lines), four cement plants (six kilns, one of which belongs to its joint venture company), one recycled paperboard plant, nine concrete batching plants and two aggregates facilities.

**Texas Industries, Inc. (Public, NYSE:TXI).** Texas Industries, Inc. is a supplier of heavy construction materials in the United States. The Company operates in three segments: cement, aggregates and consumer products. Its cement segment produces gray Portland cement and specialty cements. The Company's cement production and distribution facilities are concentrated primarily in Texas and California. The Company's aggregates segment produces natural aggregates, including sand, gravel and crushed limestone, and specialty lightweight aggregates. Its consumer products segment produces primarily ready-mix concrete and, to a lesser extent, packaged products. It supplies natural aggregates and ready-mix concrete in Texas and northern Louisiana and, to a lesser extent, in Oklahoma and Arkansas. The Company's revenue is derived from multiple end-use markets, including the public works, residential, commercial, retail, industrial and institutional construction sectors, as well as the oil and gas industry.

**Cemex SAB de CV (ADR) (Public, NYSE:CX).** CEMEX, S.A.B. de C.V. (CEMEX) is a global cement manufacturer with operations in North America, Europe, South America, Central America, the Caribbean, Africa, the Middle East and Asia. The Company is a holding company engaged through the operating subsidiaries in the production, distribution, marketing and sale of cement, ready-mix concrete, aggregates and clinker. As of December 31, 2009, the Company's cement production facilities were located in Mexico, the United States, Spain, the United Kingdom, Germany, Poland, Croatia, Latvia, Colombia, Costa Rica, the Dominican Republic, Panama, Nicaragua, Puerto Rico, Egypt, the Philippines and Thailand.

**CRH PLC (UK) (Public, LON:CRH).** CRH plc (CRH) is a diversified building material company, which manufactures and distributes building material products from the fundamentals of heavy materials and elements to construct the frame, through exterior products that complete the building envelope, to distribution channels, which service construction fit-out and renewal. The Company has four divisions: materials, concrete products, exterior products and distribution. Its subsidiaries include Finnsementti

[10] Yahoo Finance: http://finance.yahoo.com/

Oy, Rudus Oy, Irish Cement Limited, Clogrennane Lime Limited, Premier Periclase Limited, Drogomex Sp. z o.o. and O.K.S.M. Sp. z o.o. In January 2009, the Company acquired 26% interest in Yatai Building Materials Company.

**U.S. Concrete, Inc. (Public, PINK:RMIXQ).** U.S. Concrete, Inc. (U.S. Concrete) is a producer of ready-mixed concrete, precast concrete products and concrete-related products in select markets in the United States. The Company operates in two segments: ready-mixed concrete and concrete-related products segment and precast products concrete segment. All of the Company's operations are in the United States. It operates in Texas, California, New Jersey/New York and Michigan. As of March 15, 2010, U.S. Concrete had 125 fixed and 11 portable ready-mixed concrete plants, seven precast concrete plants and seven producing aggregates facilities, (including 27 fixed ready-mixed concrete plants operated by its 60%-owned Michigan subsidiary). It also owns two aggregates facilities that the Company lease to third parties and retains a royalty on production from those facilities. This company filed for bankruptcy in late April 2010 and emerged from bankruptcy on August 2010.[11]

**Target Company Comparables**[12]

| Company | Ticker | Mkt Cap (8 Oct) | EV (8 Oct) | Price/Sales (8 Oct) | EV/Revenue (8 Oct) | EV/EBITDA (8 Oct) | Revenue (LTM) |
|---|---|---|---|---|---|---|---|
| **Vulcan Materials Co** | VMC | 4,710M | 7.58B | 1.83 | 2.92 | 18.78 | 2,451.7M |
| **Eagle Materials Inc** | EXP | 1,020M | 1.32B | 2.18 | 2.80 | 15.98 | 472.4M |
| **Texas Industries Inc** | TXI | 909M | 1.41B | 1.48 | 2.31 | 48.76 | 560.2M |
| **CEMEX SAB** | CX | 8,330M | 24.68B | 0.56 | 1.68 | 9.88 | 14,105.0M |
| **CRH plc** | CRH | 12,280M | 19.16B | 0.53 | 0.87 | 8.33 | 21,210.0M |

[11] Yahoo Finance: http://finance.yahoo.com/
[12] EDGAR Database of Online Corporate Financial Information: http://www.sec.gov/edgar.shtml ; Capital IQ

## Industry Forecast - Regression Analysis[13]

Concrete Volume Analysis

GDP growth and unemployment were used to regress and forecast the concrete volume consumption.

| Year | Nominal GDP (bn) | Unemployment rate (%) | Ready-mix volume (Cubic Yards) |
|---|---|---|---|
| 2000 | 9,825 | 3.90 | 368,233,333 |
| 2001 | 10,128 | 5.70 | 376,033,333 |
| 2002 | 10,469 | 6.00 | 366,733,333 |
| 2003 | 10,971 | 5.70 | 380,300,000 |
| 2004 | 11,686 | 5.40 | 406,500,000 |
| 2005 | 12,638 | 4.90 | 427,500,000 |
| 2006 | 13,399 | 4.40 | 425,533,333 |
| 2007 | 14,062 | 5.00 | 388,500,000 |
| 2008 | 14,369 | 7.40 | 264,763,432 |
| 2009 | 14,119 | 10.00 | 194,654,878 |
| 2010e | 14,444 | 9.70 | 231,267,957 |
| 2011f | 14,660 | 9.40 | 243,381,537 |
| 2012f | 14,939 | 9.00 | 259,507,972 |
| 2013f | 15,268 | 8.70 | 271,847,041 |
| 2014f | 15,634 | 8.40 | 284,262,526 |
| 2015f | 16,009 | 8.30 | 288,919,610 |

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.913148667 |
| R Square | 0.833840488 |
| Adjusted R Square | 0.786366341 |
| Standard Error | 34110239.7 |
| Observations | 10 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 2 | 4.08719E+16 | 2.04E+16 | 17.5641 | 0.001869985 |
| Residual | 7 | 8.14456E+15 | 1.16E+15 | | |
| Total | 9 | 4.90165E+16 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 579,525,549.33 | 78,963,152.36 | 7.34 | 0.00 | 392,807,364.32 | 766,243,734.34 | 392,807,364.32 | 766,243,734.34 |
| Nominal GDP (bn) | 610.83 | 7,221.07 | 0.08 | 0.93 | (16,464.28) | 17,685.94 | (16,464.28) | 17,685.94 |
| Unemployment | (38,883,912.72) | 7,319,905.61 | (5.31) | 0.00 | (56,192,739.04) | (21,575,086.40) | (56,192,739.04) | (21,575,086.40) |

Concrete Price Analysis

Cement prices were used to regress and forecast the concrete price.

[13] **Ready-mix Concrete Manufacturing Report 2002 – US Census Bureau ; Producer Price Indexes Data – Bureau of Labor Statistics**

| Year | Cement ($ /ton) | Price ($/Cubic Yard) |
|---|---|---|
| 2000 | $ 78.6 | $ 67.9 |
| 2001 | $ 76.5 | $ 69.3 |
| 2002 | $ 76.0 | $ 69.1 |
| 2003 | $ 75.0 | $ 69.6 |
| 2004 | $ 79.5 | $ 73.3 |
| 2005 | $ 91.0 | $ 82.2 |
| 2006 | $ 101.5 | $ 91.5 |
| 2007 | $ 104.0 | $ 95.0 |
| 2008 | $ 101.8 | $ 97.9 |
| 2009 | $ 98.7 | $ 100.4 |
| 2010e | $ 102.7 | $ 96.8 |
| 2011f | $ 104.9 | $ 99.1 |
| 2012f | $ 107.1 | $ 101.4 |
| 2013f | $ 109.4 | $ 103.7 |
| 2014f | $ 111.7 | $ 106.2 |
| 2015f | $ 114.0 | $ 108.6 |

*Regression Results*

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.964154189 |
| R Square | 0.9295933 |
| Adjusted R Square | 0.920792462 |
| Standard Error | 3.76104986 |
| Observations | 10 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 1494.125798 | 1494.126 | 105.6255498 | 6.91714E-06 |
| Residual | 8 | 113.1639684 | 14.1455 | | |
| Total | 9 | 1607.289766 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | (10.95) | 9.09 | (1.21) | 0.26 | (31.91) | 10.00 | (31.91) | 10.00 |
| Cement | 1.05 | 0.10 | 10.28 | 0.00 | 0.81 | 1.28 | 0.81 | 1.28 |

**Assumptions in Regressions**

GDP: From 1947 until 2010 the United States' average quarterly GDP Growth was 3.31 percent reaching an historical high of 17.20 percent in March of 1950 and a record low of -10.40 percent in March of 1958. While the economy is in recovery, we do not expect average growth (3.31%) for the next 5 years—most economists are expecting below average growth for the next 5 years. Consensus appears to

average at 3%[14]. The Congressional Office Budget director Doug Elmendorf explains their projections for future GDP growth:

> **Projected growth from 2015 to 2019 is also below historical average growth rates**, a difference that is more than accounted for by slower growth in the labor force because of the retirement of the baby boom generation.[15]

With these issues in mind, for our analysis, we felt that using the Economist Intelligence Unit GDP estimates would be most prudent for industry projections instead of the consensus. According to the Economist Intelligence Unit:

> The private sector is creating far fewer jobs than would be the case in a typical recovery. Retail sales are sluggish, with three consecutive monthly falls in May-July. The housing market, which had showed signs of revival in late 2009, has weakened again following the expiry of temporary tax credits in April. **In light of the disappointing data, we have further revised down our GDP forecast for 2010 to 2.3% (2.7% previously). We maintain our forecast of a further slowdown to 1.5% in 2011 but believe downside risks dominate.** The slowdown in growth reflects the withdrawal of fiscal stimulus and the end of the boost from restocking. Export growth will slow in 2011, as base effects from extremely low exports in 2009 fall out of the equation. Consumers will still be rebuilding their balance sheets, and a marked improvement in the labor market is unlikely, with companies set to continue to meet higher demand by squeezing higher productivity out of existing staff rather than taking on new hires.[16]

We decided to use the EIU's estimates because their previous projections have been impressively accurate. For full disclosure, the EIU's estimates were within 0.6% accuracy from 2000 to 2005 where the economy was not under stress. However, during the crisis period of 2006-2009, EIU's predictions were more inaccurate, within 1.2% accuracy.

Unemployment: The concrete industry is strongly correlated with unemployment; much of this has to do with infrastructure efforts and fiscal policy—in times of how unemployment the government will typically seek to stimulate the economy by pursuing infrastructure development, thereby creating jobs.

As part of the annual budget, the Obama Administration released underlying economic assumptions earlier in the year. For unemployment, the forecast is for an average of 10% in 2010, with a decline to 9.2% in 2011, 8.2% in 2012 and 7.3% in 2013. However, we have used the EIU values in our regression, these values are much more conservative: with 9.4% in 2011, 9% in 2012, 8.7% 2013 and 8.4% in 2014.

Cement Prices: We found the cement prices by going to the US Geological Survey and found the historical sales for the cement and aggregates to the ready mix industry. The average proportion of these raw materials was used to estimate the historical concrete volume. For the future projections, we used the PPI from the Economist Intelligence unit for 2010 and 2011, keeping the 2011 PPI constant throughout the next 5 years up to 2015.

[14] http://www.project-syndicate.org/commentary/feldstein25/English
[15] http://cboblog.cbo.gov/?p=220
[16] http://www.eiu.com/report_dl.asp?issue_id=1453890945&mode=pdf

**Regression Interpretation**

By forecasting concrete prices and volume, we were able to forecast revenues. If we assume the above GDP, unemployment and cement values in our regression, our annualized growth (in revenues) for the industry within the next 6 years is 5.79%. For context, the annualized return of the Wilshire 5000 for the last 40 years has been 9.56%. Adjusting for inflation, the S&P 500, since 1871, has returned 6.68% (including dividends). Furthermore, as the companies in question fall within investment grade range, a BBB corporate bond maturing in 6 years is currently returning 5%.

**Industry Valuation**

We offer a sensitivity analysis for the target group of companies over the years 2010 to 2016. We believe the new highway and infrastructure plans recently announced will be the principal drivers of earnings power over the next years. We also anticipate Federal spending to be $45B annually from 2011-2015. The valuation analysis considers only the revenues and costs related to the concrete business and in case of multinationals it only accounts for revenues in the United States. The base case scenario which considers a terminal growth of 2.4% results in a net present value of $30.7B in Enterprise Value for this industry. On average pure play local Concrete companies are trading at a 2.3x Enterprise Value/Revenue multiple (average EV/revenue multiple of Eagle Materials and Texas Industries). Considering today´s forecasted revenue is $22.4B the market values the Concrete Industry´s Enterprise Value to be $51.7B (2.3 x $22.4B). In this sense we consider that the market is overvaluing the industry by around 40.6%.

**Valuation Sensitivity Analysis**

Enterprise Value

| Million US | Equity Beta | | | | |
|---|---|---|---|---|---|
| Growth Rate | 1.00 | 1.20 | 1.43 | 1.60 | 1.80 |
| 2.20% | 37,295.66 | 33,389.51 | 30,032.14 | 28,059.72 | 26,158.46 |
| 2.30% | 37,774.16 | 33,768.83 | 30,340.16 | 28,331.82 | 26,400.04 |
| 2.40% | 38,273.00 | 34,164.08 | 30,661.40 | 28,615.92 | 26,652.72 |
| 2.50% | 38,793.67 | 34,576.48 | 30,996.94 | 28,913.07 | 26,917.49 |
| 2.60% | 39,337.85 | 35,007.42 | 31,348.01 | 29,224.44 | 27,195.49 |

## Industry Valuation Model using Adjusted Present Value

| *Industry Valuation Model* | | |
|---|---|---|
| **Tax rate** | 35.00% | http://www.taxrates.cc/html/us-tax-rates.html |
| **Rm - rf** | 7.20% | Source: Koller, Tim, Mark Goedhart and David Wessels, Valuation: Measuring & Managing the Value of Companies, 2005, 4th edition. |
| **rf** | 2.70% | Source: St. Louis Fed, 10 yr risk free rate |
| **Rd** | 5.38% | BBB rating on average for the industry resulting in a 2.64% premium over rf |
| **βd** | 0.37 | Implied debt beta |
| **βE** | 1.43 | from peer group analysis |
| **Re** | 12.99% | Cost of Equity |
| **βa** | 1.09 | Asset Beta (unlevered beta) |
| **Average D/E of comparables** | 72.24% | Current D/E, normally it tends to be between 30 to 40%. |
| **WACC** | 9.01% | |
| **Ra** | 10.56% | unlevered cost of equity |
| **Growth rate** | 2.40% | (Sensitivity analysis 2.30% - 2.70%) |

| **Numbers in Million $** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Total Revenue from Concrete** | **36923.00** | **25928.87** | **19538.02** | **22389.98** | **24113.56** | **26310.95** | **28203.32** | **30176.11** | **31381.03** | **34638.38** |
| CRH PLC | 2,387.76 | 2,206.12 | 1,824.46 | 1,678.50 | 1,852.73 | 2,045.05 | 2,257.32 | 2,491.63 | 2,750.26 | 3,035.74 |
| CEMEX SAB | 2,076.46 | 1,748.56 | 1,012.71 | 1,007.30 | 1,111.86 | 1,234.16 | 1,382.26 | 1,561.96 | 1,780.63 | 1,965.46 |
| US Concrete, Inc | 803.80 | 754.30 | 534.49 | 504.39 | 556.74 | 617.98 | 692.14 | 782.12 | 891.61 | 984.16 |
| Vulcan Materials Company | 539.64 | 1,201.11 | 528.62 | 487.23 | 537.80 | 596.96 | 668.60 | 755.51 | 861.29 | 950.69 |
| Eagle Materials | 63.34 | 61.55 | 44.69 | 36.54 | 40.33 | 44.77 | 50.14 | 56.66 | 64.59 | 71.29 |
| Texas Industries | 348.39 | 357.76 | 262.08 | 177.15 | 195.54 | 217.05 | 243.09 | 274.69 | 313.15 | 345.66 |
| Estimate rest of Industy | 30,703.61 | 19,599.47 | 15,330.98 | 18,498.88 | 19,818.55 | 21,554.99 | 22,909.77 | 24,253.54 | 24,719.49 | 27,285.38 |
| **Cost of Goods Sold** | **(27,692.25)** | **(19,187.36)** | **(14,262.75)** | **(16,344.69)** | **(17,361.76)** | **(18,680.78)** | **(20,306.39)** | **(22,028.56)** | **(23,221.96)** | **(25,978.78)** |
| **Gross Profit** | **9,230.75** | **6,741.51** | **5,275.26** | **6,045.30** | **6,751.80** | **7,630.18** | **7,896.93** | **8,147.55** | **8,159.07** | **8,659.59** |
| SG&A | (3,200.27) | (2,247.36) | (1,693.44) | (1,940.63) | (1,929.08) | (2,104.88) | (2,444.50) | (2,615.49) | (2,719.93) | (3,002.25) |
| Depreciation & Amortization | (812.31) | (596.36) | (410.30) | (447.80) | (482.27) | (552.53) | (620.47) | (694.05) | (690.38) | (796.68) |
| **Operating Income (EBIT)** | **5,218.17** | **3,897.78** | **3,171.52** | **3,656.86** | **4,340.44** | **4,972.77** | **4,831.96** | **4,838.01** | **4,748.76** | **4,860.66** |
| **Taxes on EBIT** | **(1,826.36)** | **(1,364.22)** | **(1,110.03)** | **(1,279.90)** | **(1,519.15)** | **(1,740.47)** | **(1,691.18)** | **(1,693.30)** | **(1,662.07)** | **(1,701.23)** |
| **NOPLAT** | **3,391.81** | **2,533.56** | **2,061.49** | **2,376.96** | **2,821.29** | **3,232.30** | **3,140.77** | **3,144.70** | **3,086.69** | **3,159.43** |
| Depreciation & Amortization | 812.31 | 596.36 | 410.30 | 447.80 | 482.27 | 552.53 | 620.47 | 694.05 | 690.38 | 796.68 |
| Change in Working Capital | 624.88 | 1,865.99 | 921.80 | (306.85) | (120.65) | (153.82) | (132.47) | (138.09) | (84.34) | (34,866.39) |
| Net CAPEX | (4,430.76) | (3,111.46) | (2,344.56) | (2,686.80) | (2,893.63) | (3,157.31) | (3,384.40) | (3,621.13) | (3,765.72) | (4,156.61) |
| **Free Cash Flow** | **4,446.58** | **4,066.78** | **2,309.54** | **1,398.48** | **1,977.30** | **2,315.54** | **2,218.68** | **2,191.93** | **2,123.75** | **1,997.25** |
| **Terminal Value** | | | | | | | | | | **25,067.84** |
| **Discount Factor** | | | | **1.00** | **0.90** | **0.82** | **0.74** | **0.67** | **0.61** | **0.55** |
| **PV FCF** | | | | **1,398.48** | **1,788.46** | **1,894.38** | **1,641.79** | **1,467.09** | **1,285.70** | **14,820.22** |
| **NPV FCF** | **24,296.12** | | | | | | | | | |
| | | | | | | | | | | |
| **Debt Benefits** | | | | | | | | | | |
| **Debt Balance** | | | 29,853.77 | 29,044.00 | 25,722.12 | 22,786.87 | 20,884.42 | 18,224.25 | 9,864.09 | 9,663.91 |
| **Interest on debt** | | | 1,492.69 | 1,452.20 | 1,286.11 | 1,139.34 | 1,044.22 | 911.21 | 493.20 | 483.20 |
| **Tax Shield** | | | 522.44 | 508.27 | 450.14 | 398.77 | 365.48 | 318.92 | 172.62 | 169.12 |
| **Free Cash Flow** | | | | 508.27 | 450.14 | 398.77 | 365.48 | 318.92 | 172.62 | 169.12 |
| **Terminal Value** | | | | | | | | | | 5811.32 |
| **Discount Factor** | | | | 1.00 | 0.95 | 0.90 | 0.85 | 0.81 | 0.77 | 0.73 |
| **PV Tax Shield** | | | | **508.27** | **427.16** | **359.09** | **312.31** | **258.62** | **132.83** | **4,367.01** |
| **NPV Tax Shield** | 6,365.28 | | | | | | | | | |
| | | | | | | | | | | |
| **Enterprise Value** | 30,661.40 | | | | | | | | | |
| Outstanding Debt | 29,853.77 | (as of Oct 9th 2010) | | | | | | | | |
| **Equity Value** | **807.63** | | | | | | | | | |

Notes to the Model:

- Non pure play companies were adjusted to include only revenues and expenses related to concrete business
- Multinationals were adjusted to account only for revenues and costs in the United States
- Assumes US Concrete Inc will continue operations after emerging from bankruptcy
- Most of the current industry debt comes from CEMEX, Vulcan, and CRH, the debt balance was adjusted according to their amortization schedule

## Estimation of Industry Discount Rate

| *Industry Beta Analysis* | | |
|---|---|---|
| **Risk Free** | 2.70% | Source: St. Louis Fed, 10 yr risk free rate |
| **Risk Premium** | 7.20% | Source: Koller, Tim, Mark Goedhart and David Wessels, Valuation: Measuring & Managing the Value of Companies, 2005, 4th edition. |
| **Marginal Tax Rate** | 35% | http://www.taxrates.cc/html/us-tax-rates.html |

| | Peer Group Analysis | | | | | |
|---|---|---|---|---|---|---|
| | **US Concrete** | **Vulcan Materials** | **Eagle Materials** | **Texas Industries** | **CEMEX** | **CRH** |
| **Beta Equity** | 0.73 | 1.26 | 1.26 | 2.29 | 2.11 | 1.05 |
| **Beta Debt** | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| **D/E** | 7.59% | 58.51% | 30.46% | 60.22% | 211.21% | 65.48% |
| **Beta Asset** | 0.71 | 1.02 | 1.12 | 1.75 | 1.10 | 0.85 |

| | | |
|---|---|---|
| **Avg Beta Asset** | 1.09 | Average of peer group |
| **Target D/E** | 72.24% | Average of peer group |
| **Beta Equity** | 1.43 | Implied from Asset Beta |
| **Beta Debt** | 0.37 | Average of peer group |
| **WACC** | 9.01% | |
| **Unlevered cost Equity (Ra)** | 10.56% | |

## Conclusion

After analyzing industry-wide revenue returns as well as conducting an APV valuation, we feel that the concrete industry is overvalued by around 40.6%. According to our multiples analysis the concrete industry is worth $51.7B and our APV resulted in $30.6B.

Recent, tepid macro trends suggest that concrete producing firms will not see a robust recovery. If we assume macro trends to remain moderate, our annualized growth (in revenues) for the industry within the next 6 years is 5.79%. For context, the annualized return of the Wilshire 5000 for the last 40 years has been 9.56%.

While infrastructure efforts are underway to stimulate the economy, we believe that this stimulus is already priced into our valuation of the industry.

Finally, the industry will continue to be “shaky” and that the additional volatility in the price of raw materials will persist. Given the price increases in the raw materials, the concrete business will not recover its high margins. Therefore, our recommendation is to SELL the industry.

# Back-ups

**Economist Intelligence Unit – United States Annual data and forecast** (http://www.eiu.com/)

# Data and charts

## Annual data and forecast

| | 2005[a] | 2006[a] | 2007[a] | 2008[a] | 2009[a] | 2010[b] | 2011[b] |
|---|---|---|---|---|---|---|---|
| **GDP** | | | | | | | |
| Nominal GDP (US$ bn) | 12,638 | 13,399 | 14,062 | 14,369 | 14,119 | 14,528 | 14,982 |
| Real GDP growth (%) | 3.1 | 2.7 | 1.9 | 0.0 | -2.6 | 2.3 | 1.5 |
| **Expenditure on GDP (% real change)** | | | | | | | |
| Private consumption | 3.4 | 2.9 | 2.4 | -0.3 | -1.2 | 1.4 | 1.2 |
| Government consumption | 0.3 | 1.4 | 1.3 | 2.8 | 1.6 | 0.6 | 0.9 |
| Gross fixed investment | 6.5 | 2.3 | -1.8 | -6.4 | -18.3 | 5.5 | 5.9 |
| Exports of goods & services | 6.7 | 9.0 | 9.3 | 6.0 | -9.5 | 11.3 | 5.5 |
| Imports of goods & services | 6.1 | 6.1 | 2.7 | -2.6 | -13.8 | 14.4 | 5.2 |
| **Origin of GDP (% real change)** | | | | | | | |
| Agriculture | 8.6 | -5.3 | 7.0 | -0.6 | 2.0[c] | 2.0 | 2.0 |
| Industry | -2.2 | 2.6 | -1.4 | -1.1 | -5.5[c] | 3.3 | 1.7 |
| Services | 4.2 | 2.9 | 2.8 | 1.7 | -2.0[c] | 2.1 | 1.4 |
| **Population and income** | | | | | | | |
| Population (m) | 295.7 | 298.4 | 301.3 | 304.1 | 306.8[c] | 309.6 | 312.3 |
| GDP per head (US$ at PPP) | 42,736 | 44,896 | 46,670 | 47,258 | 46,021[c] | 46,931 | 47,965 |
| Recorded unemployment (av; %) | 5.1 | 4.6 | 4.6 | 5.8 | 9.3 | 9.7 | 9.4 |
| **Fiscal indicators (% of GDP)** | | | | | | | |
| Public-sector balance[d] | -2.6 | -1.9 | -1.2 | -3.2 | -10.0 | -9.0 | -7.1 |
| Public-sector debt interest payments | 1.5 | 1.7 | 1.7 | 1.8 | 1.3 | 1.4 | 1.4 |
| Public-sector primary balance | -1.1 | -0.2 | 0.5 | -1.4 | -8.7 | -7.6 | -5.6 |
| Net public debt | 36.9 | 36.5 | 36.2 | 37.7 | 53.5 | 59.0 | 64.9 |
| **Prices and financial indicators** | | | | | | | |
| Exchange rate ¥:US$ (end-period) | 117.9 | 119.0 | 111.7 | 90.8 | 93.1 | 88.5 | 90.0 |
| Consumer prices (end-period; %) | 3.3 | 2.5 | 4.1 | 0.0 | 2.8 | 0.5 | 1.4 |
| Producer prices (av; %) | 4.9 | 2.9 | 3.9 | 6.4 | -2.5 | 4.1 | 2.1 |
| Stock of money M1 (% change) | -0.3 | -0.7 | 0.5 | 16.1 | 6.4[c] | -8.5 | 0.5 |
| Stock of money M2 (% change) | 4.0 | 6.0 | 6.0 | 9.7 | 3.6[c] | 2.9 | 4.7 |
| Lending interest rate (av; %) | 6.2 | 8.0 | 8.1 | 5.1 | 3.3 | 3.3 | 3.4 |
| **Current account (US$ m)** | | | | | | | |
| Trade balance | -784 | -839 | -823 | -835 | -507 | -634 | -680 |
| Goods: exports fob | 909 | 1,036 | 1,160 | 1,305 | 1,068 | 1,267 | 1,375 |
| Goods: imports fob | -1,693 | -1,875 | -1,984 | -2,140 | -1,575 | -1,901 | -2,055 |
| Services balance | 70 | 80 | 121 | 136 | 132 | 111 | 108 |
| Income balance | 72 | 48 | 100 | 152 | 121 | 79 | 111 |
| Current transfers balance | -106 | -91 | -116 | -122 | -125 | -129 | -133 |
| Current-account balance | -748 | -803 | -718 | -669 | -378 | -572 | -594 |
| **International reserves (US$ m)** | | | | | | | |
| Total international reserves | 65 | 66 | 71 | 78 | 131 | - | - |

[a] Actual. [b] Economist Intelligence Unit forecasts. [c] Economist Intelligence Unit estimates. [d] Federal government, financial year (October - September).

Source: IMF, *International Financial Statistics*.

## Economic growth

| % | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|
| GDP | -2.6 | 2.3 | 1.5 | 1.9 | 2.2 | 2.4 |
| Private consumption | -1.2 | 1.4 | 1.2 | 1.5 | 1.8 | 1.9 |
| Government consumption | 1.6 | 0.6 | 0.9 | 1.5 | 1.5 | 1.5 |
| Gross fixed investment | -18.3 | 5.5 | 5.8 | 4.6 | 5.8 | 6.4 |
| Exports of goods & services | -9.5 | 11.3 | 5.5 | 6.2 | 6.0 | 6.1 |
| Imports of goods & services | -13.8 | 14.4 | 5.2 | 5.2 | 5.5 | 5.6 |
| Domestic demand | -3.7 | 3.0 | 1.6 | 1.9 | 2.3 | 2.4 |
| Agriculture | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Industry | -5.5 | 3.3 | 1.7 | 2.5 | 2.5 | 2.5 |
| Services | -2.0 | 2.1 | 1.4 | 1.8 | 2.2 | 2.4 |

## Ready-mix Concrete Manufacturing Report 2002 – US Census Bureau

### Table 1. Historical Statistics for the Industry: 2002 and Earlier Years

[Data based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). For information on confidentiality protection, sampling error, nonsampling error, and explanation of terms, see note at end of table. For meaning of abbreviations and symbols, see introductory text]

| Industry and year[1] | Companies[2] | All establishments[3] | All employees: Number[4] | All employees: Payroll ($1,000) | Production workers: Number[4] | Production workers: Hours (1,000) | Production workers: Wages ($1,000) | Value added ($1,000) | Total cost of materials ($1,000) | Total value of shipments ($1,000) | Total capital expenditures ($1,000) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 327320, Ready-mix concrete manufacturing 2002 | 2 596 | 5 570 | 98 360 | 3 640 427 | 79 582 | 160 454 | 2 794 396 | 10 286 897 | 11 299 472 | 21 573 773 | '890 731 |
| 2001 | N | N | 102 790 | 3 709 915 | 81 370 | 172 852 | 2 716 372 | 10 017 236 | 11 459 783 | 21 472 894 | 838 234 |
| 2000 | N | N | 101 103 | 3 622 064 | 79 796 | 171 405 | 2 643 683 | 9 518 744 | 11 412 475 | 20 933 332 | 938 092 |
| 1999 | N | N | 102 044 | 3 529 981 | 81 141 | 173 135 | 2 592 088 | 9 475 861 | 11 081 867 | 20 569 578 | 985 361 |
| 1998 | N | N | 94 401 | 3 177 079 | 75 157 | 158 418 | 2 346 495 | 8 832 097 | 10 533 584 | 19 388 319 | 834 318 |
| 1997 | 2 888 | 5 221 | 93 136 | 2 965 346 | 72 464 | 147 770 | 2 153 268 | 7 780 774 | 9 418 330 | 17 219 886 | 798 851 |

[1]Statistics presented for years ending in 2 and 7 are census data. Interim census years are derived in a representative sample of manufacturing establishments canvassed in the Annual Survey of Manufactures (ASM).
[2]For the census, a company is defined as a business organization consisting of one establishment or more under common ownership or control.
[3]Includes establishments with payroll at any time during the year.
[4]Number of employees figures represent average number of production workers for pay period that includes the 12th of March, May, August, and November plus other employees for payroll period that includes the 12th of March.

Note: The data in this table are based on the 2002 Economic Census and the 2002 Annual Survey of Manufactures (ASM). To maintain confidentiality, the Census Bureau suppresses data to protect the identity of any business or individual. The census results in this table contain sampling errors and nonsampling errors. Data users who create their own estimates using data from American FactFinder tables should cite the Census Bureau as the source of the original data only. For explanation of terms, see Appendix A. For full technical documentation, see Appendix C.

## Producer Price Indexes Data – Bureau of Labor Statistics (http://www.bls.gov/ppi/)

*PPI Index Cement*

**Producer Price Index Industry Data**
**Original Data Value**

**Series Id:** PCU32731032731002
**Industry:** Cement manufacturing
**Product:** Portland cement ASTM type II, hydraulic
**Base Date:** 200506
**Years:** 2005 to 2010

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | | | | | | 100.0 | | | | | | | |
| 2007 | 119.5 | 119.9 | 116.6 | 120.5 | 119.5 | 119.4 | 121.8 | 121.1 | 120.8 | 119.5 | 119.1 | 118.6 | 119.7 |
| 2008 | 117.8 | 117.1 | 116.7 | 118.0 | 115.6 | 114.8 | 118.1 | 117.7 | 117.3 | 118.2 | 118.1 | 117.5 | 117.2 |
| 2009 | 121.1 | 117.9 | 115.1 | 116.1 | 114.1 | 113.0 | 110.9 | 111.1 | 111.6 | 111.0 | 110.5 | 110.5 | 113.6 |
| 2010 | 111.0 | 110.3 | 109.7 | 109.2 | 110.2 | 109.0 | 108.9 | | | | | | |

*PPI Index Aggregates*

**Producer Price Index Industry Data**
**Original Data Value**

**Series Id:** PCU212321212321
**Industry:** Construction sand and gravel mining
**Product:** Construction sand and gravel mining
**Base Date:** 198206
**Years:** 2000 to 2010

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 171.0 | 172.5 | 172.6 | 175.2 | 176.1 | 176.2 | 176.7 | 177.3 | 177.1 | 177.3 | 177.2 | 177.0 | 175.5 |
| 2001 | 178.8 | 180.2 | 180.3 | 181.3 | 182.0 | 182.5 | 182.3 | 182.6 | 182.5 | 182.2 | 181.9 | 182.6 | 181.6 |
| 2002 | 184.6 | 185.0 | 184.8 | 185.6 | 186.0 | 186.3 | 186.3 | 186.2 | 186.2 | 186.3 | 186.2 | 186.4 | 185.8 |
| 2003 | 187.0 | 187.3 | 187.2 | 188.2 | 188.9 | 189.6 | 189.9 | 189.9 | 189.9 | 189.8 | 190.1 | 189.0 | 188.9 |
| 2004 | 191.0 | 191.5 | 191.9 | 194.5 | 194.8 | 195.7 | 195.9 | 196.0 | 196.6 | 196.9 | 197.7 | 197.6 | 195.0 |
| 2005 | 202.8 | 203.7 | 204.2 | 206.8 | 208.9 | 209.4 | 211.1 | 211.3 | 213.4 | 214.5 | 215.1 | 217.6 | 209.9 |
| 2006 | 222.4 | 222.4 | 223.2 | 227.5 | 228.8 | 230.1 | 231.2 | 232.1 | 232.3 | 232.3 | 233.5 | 233.7 | 229.1 |
| 2007 | 240.7 | 242.8 | 243.2 | 247.0 | 248.2 | 246.3 | 246.1 | 248.3 | 249.2 | 250.6 | 250.8 | 250.6 | 247.0 |
| 2008 | 255.2 | 256.5 | 258.7 | 261.4 | 261.6 | 262.1 | 263.0 | 265.4 | 265.7 | 266.1 | 267.3 | 268.7 | 262.6 |
| 2009 | 270.1 | 270.8 | 271.8 | 271.7 | 272.0 | 271.7 | 271.4 | 270.7 | 270.4 | 270.4 | 271.1 | 271.5 | 271.1 |
| 2010 | 269.8 | 270.2 | 271.7 | 270.9 | 271.6 | 271.0 | 269.7 | | | | | | |

*PPI Index Ready-mix Concrete*

## Producer Price Index Industry Data
## Original Data Value

http://data.bls.gov

**Series Id:** PCU327320327320
**Industry:** Ready-mix concrete manufacturing
**Product:** Ready-mix concrete manufacturing
**Base Date:** 198106
**Years:** 1981 to 2009

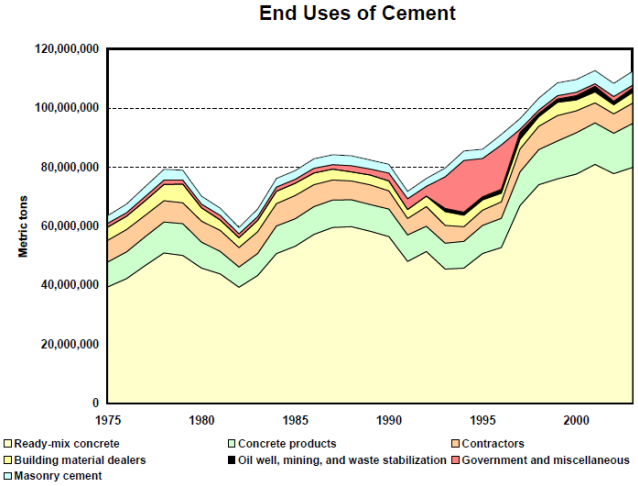
| Year | Annual |
|---|---|
| **1981** | 98.9 |
| **1982** | 100.9 |
| **1983** | 102.3 |
| **1984** | 105.1 |
| **1985** | 108.6 |
| **1986** | 109.5 |
| **1987** | 109.2 |
| **1988** | 109.7 |
| **1989** | 111.5 |
| **1990** | 114.3 |
| **1991** | 116.9 |
| **1992** | 117.4 |
| **1993** | 121.0 |
| **1994** | 125.8 |
| **1995** | 131.3 |
| **1996** | 135.2 |
| **1997** | 138.0 |
| **1998** | 142.3 |
| **1999** | 145.6 |
| **2000** | 150.2 |
| **2001** | 153.4 |
| **2002** | 153.0 |
| **2003** | 153.9 |
| **2004** | 162.1 |
| **2005** | 181.9 |
| **2006** | 202.5 |
| **2007** | 210.3 |
| **2008** | 216.7 |
| **2009** | 222.1 |
| **2010** | 216.9 |

**Cement Statistics – US Geological Survey** (http://minerals.usgs.gov/ds/2005/140/index.html)

CEMENT END-USE STATISTICS[1, 2]
U.S.GEOLOGICAL SURVEY
[Metric tons]
Last modification: September 15, 2005

| Year | Adjusted portland cement shipments by type of final costumer[3] | | | | | | Total portland cement | Masonry cement | Apparent consumption[4] |
|---|---|---|---|---|---|---|---|---|---|
| | Ready-mix concrete | Concrete products | Contractors | Building material dealers | Oil well, mining, and waste | Government and miscellaneous | | | |
| 1975 | 39,471,000 | 8,425,000 | 7,329,000 | 4,503,000 | | 1,274,000 | 61,002,000 | 2,606,000 | 63,608,000 |
| 1976 | 42,244,000 | 9,059,000 | 7,550,000 | 4,530,000 | | 1,164,000 | 64,546,000 | 2,963,000 | 67,509,000 |
| 1977 | 46,710,000 | 9,751,000 | 7,246,000 | 4,951,000 | | 1,413,000 | 70,071,000 | 3,356,000 | 73,427,000 |
| 1978 | 50,932,000 | 10,485,000 | 7,205,000 | 5,524,000 | | 1,450,000 | 75,597,000 | 3,691,000 | 79,288,000 |
| 1979 | 50,103,000 | 10,757,000 | 7,059,000 | 6,313,000 | | 1,388,000 | 75,620,000 | 3,344,000 | 78,964,000 |
| 1980 | 45,818,000 | 8,794,000 | 7,097,000 | 4,509,000 | | 1,230,000 | 67,448,000 | 2,724,000 | 70,173,000 |
| 1981 | 43,840,000 | 7,609,000 | 7,118,000 | 3,530,000 | | 1,549,000 | 63,645,000 | 2,447,000 | 66,092,000 |
| 1982 | 39,335,000 | 6,832,000 | 6,604,000 | 3,312,000 | | 1,332,000 | 57,415,000 | 2,157,000 | 59,572,000 |
| 1983 | 43,325,000 | 7,464,000 | 7,370,000 | 3,824,000 | | 1,247,000 | 63,229,000 | 2,609,000 | 65,838,000 |
| 1984 | 50,732,000 | 9,343,000 | 7,551,000 | 4,181,000 | | 1,438,000 | 73,244,000 | 2,942,000 | 76,186,000 |
| 1985 | 53,210,000 | 9,293,000 | 7,890,000 | 4,149,000 | | 1,333,000 | 75,875,000 | 2,961,000 | 78,836,000 |
| 1986 | 57,233,000 | 9,394,000 | 7,440,000 | 3,945,000 | | 1,599,000 | 79,611,000 | 3,226,000 | 82,837,000 |
| 1987 | 59,575,000 | 9,295,000 | 6,787,000 | 3,657,000 | | 1,510,000 | 80,823,000 | 3,381,000 | 84,204,000 |
| 1988 | 59,844,000 | 9,100,000 | 6,371,000 | 3,064,000 | | 2,106,000 | 80,485,000 | 3,367,000 | 83,851,000 |
| 1989 | 58,302,000 | 9,031,000 | 6,674,000 | 3,326,000 | | 2,021,000 | 79,353,000 | 3,061,000 | 82,414,000 |
| 1990 | 56,490,000 | 9,311,000 | 6,159,000 | 3,356,000 | | 2,655,000 | 77,971,000 | 2,994,000 | 80,964,000 |
| 1991 | 48,079,000 | 8,955,000 | 5,571,000 | 3,037,000 | | 3,663,000 | 69,305,000 | 2,495,000 | 71,800,000 |
| 1992 | 51,419,000 | 8,563,000 | 6,642,000 | 3,565,000 | | 3,282,000 | 73,470,000 | 2,699,000 | 76,169,000 |
| 1993 | 45,481,000 | 8,780,000 | 6,016,000 | 4,657,000 | 1,097,000 | 10,686,000 | 76,717,000 | 2,984,000 | 79,701,000 |
| 1994 | 45,791,000 | 9,070,000 | 4,965,000 | 3,890,000 | 1,027,000 | 17,490,000 | 82,232,000 | 3,250,000 | 85,482,000 |
| 1995 | 50,757,000 | 9,509,000 | 5,163,000 | 3,471,000 | 1,061,000 | 12,964,000 | 82,925,000 | 3,150,000 | 86,075,000 |
| 1996 | 52,773,000 | 9,899,000 | 5,560,000 | 2,937,000 | 1,302,000 | 15,037,000 | 87,509,000 | 3,569,000 | 91,078,000 |
| 1997 | 67,012,000 | 11,390,000 | 7,758,000 | 3,235,000 | 2,317,000 | 1,103,000 | 92,815,000 | 3,627,000 | 96,442,000 |
| 1998 | 74,038,000 | 11,885,000 | 7,912,000 | 3,237,000 | 1,123,000 | 1,080,000 | 99,274,000 | 4,101,000 | 103,380,000 |
| 1999 | 76,018,000 | 12,844,000 | 8,610,000 | 4,468,000 | 1,128,000 | 1,128,000 | 104,200,000 | 4,353,000 | 108,550,000 |
| 2000 | 77,632,000 | 14,002,000 | 7,411,000 | 3,690,000 | 1,462,000 | 1,125,000 | 105,320,000 | 4,333,000 | 109,660,000 |
| 2001 | 80,901,000 | 14,074,000 | 6,777,000 | 3,713,000 | 1,912,000 | 836,000 | 108,210,000 | 4,482,000 | 112,690,000 |
| 2002 | 77,784,000 | 13,680,000 | 6,560,000 | 3,085,000 | 1,178,000 | 1,618,000 | 103,910,000 | 4,435,000 | 108,340,000 |
| 2003 | 79,883,000 | 14,864,000 | 6,866,000 | 3,650,000 | 1,456,000 | 980,000 | 107,700,000 | 4,745,000 | 112,440,000 |

[1]Compiled by G.R. Matos and H.G. van Oss.
[2]Data exclude Puerto Rico.
[3]Data do not match portland cement shipments to customers as shown in Minerals Yearbook. See notes for more detail.
[4]Apparent consumption is the total sales to final customers of portland cement and masonry cement. See notes for more detail.



**CEMENT STATISTICS[1]**
**U.S. GEOLOGICAL SURVEY**
**[All values in metric tons (t) cement unless otherwise noted]**
**Last modification: November 20, 2009**

| Year | Production | Imports | Exports | Stocks | Apparent consumption | Unit value ($/t) | Unit value (98$/t) | World production |
|---|---|---|---|---|---|---|---|---|
| 1900 | 2,680,400 | 411,440 | 17,200 | | 3,074,600 | 4.00 | 78.00 | |
| 1901 | 3,202,400 | 161,850 | 64,500 | | 3,299,800 | 4.50 | 88.00 | |
| 1902 | 4,147,600 | 338,350 | 58,800 | | 4,427,100 | 5.34 | 100 | |
| 1903 | 4,898,000 | 388,170 | 49,100 | | 5,237,100 | 5.88 | 110 | |
| 1904 | 5,282,700 | 166,850 | 134,000 | | 5,315,900 | 4.79 | 87.00 | |
| 1905 | 6,750,300 | 154,610 | 155,000 | | 6,750,100 | 5.26 | 95.00 | |
| 1906 | 8,643,600 | 391,790 | 100,000 | | 8,934,900 | 6.16 | 110 | |
| 1907 | 8,897,800 | 350,420 | 155,000 | | 9,092,900 | 6.14 | 110 | |
| 1908 | 9,059,000 | 145,130 | 146,000 | | 9,058,200 | 4.93 | 89.00 | |
| 1909 | 11,437,000 | 76,530 | 182,000 | | 11,332,000 | 4.76 | 86.00 | |
| 1910 | 13,366,000 | 52,916 | 427,000 | | 12,992,000 | 5.33 | 93.00 | |
| 1911 | 13,678,000 | 28,440 | 540,000 | 1,791,000 | 13,166,000 | 5.32 | 93.00 | |
| 1912 | 14,337,000 | 11,893 | 727,000 | 1,347,000 | 13,623,000 | 4.99 | 84.00 | |
| 1913 | 15,994,000 | 14,651 | 511,000 | 1,935,000 | 15,498,000 | 6.06 | 99.80 | |
| 1914 | 15,322,000 | 20,856 | 369,000 | 2,202,000 | 14,974,000 | 5.54 | 90.30 | |
| 1915 | 14,919,000 | 7,239 | 442,000 | 1,976,000 | 14,484,000 | 5.18 | 83.60 | |
| 1916 | 15,890,000 | 345 | 442,000 | 1,441,000 | 15,448,000 | 6.61 | 98.80 | |
| 1917 | 16,085,000 | 345 | 446,000 | 1,785,000 | 15,639,000 | 8.14 | 104 | |
| 1918 | 12,311,000 | 52 | 388,000 | 1,802,000 | 11,923,000 | 9.65 | 104 | |
| 1919 | 13,995,000 | 1,551 | 425,000 | 906,000 | 13,572,000 | 10.30 | 97.20 | |
| 1920 | 17,163,000 | 90,492 | 509,000 | 1,507,000 | 16,744,000 | 12.10 | 98.80 | |
| 1921 | 16,950,000 | 20,813 | 201,000 | 2,080,000 | 16,769,000 | 11.20 | 102 | |
| 1922 | 19,729,000 | 60,734 | 192,000 | 1,595,000 | 19,597,000 | 10.40 | 101 | |
| 1923 | 23,661,000 | 301,450 | 171,000 | 1,845,000 | 23,791,000 | 11.10 | 106 | |
| 1924 | 25,715,000 | 345,290 | 150,000 | 2,414,000 | 25,910,000 | 10.50 | 100 | |
| 1925 | 27,866,000 | 625,590 | 174,000 | 3,153,000 | 28,318,000 | 10.20 | 95.00 | |
| 1926 | 28,420,000 | 553,430 | 166,000 | 3,569,000 | 28,807,000 | 9.89 | 91.10 | 62,400,000 |
| 1927 | 29,903,000 | 349,730 | 139,000 | 3,856,000 | 29,540,000 | 9.43 | 88.30 | 67,800,000 |
| 1928 | 30,445,000 | 392,720 | 141,000 | 3,906,000 | 30,231,000 | 9.11 | 86.80 | 72,200,000 |
| 1929 | 29,481,000 | 297,700 | 151,000 | 4,076,000 | 29,202,000 | 8.66 | 82.50 | 74,900,000 |
| 1930 | 27,798,000 | 167,990 | 129,000 | 4,437,000 | 27,227,000 | 8.42 | 82.20 | 72,300,000 |
| 1931 | 21,604,000 | 80,159 | 73,300 | 4,191,000 | 21,745,000 | 6.51 | 69.80 | 62,100,000 |
| 1932 | 13,166,000 | 79,818 | 64,000 | 3,453,000 | 13,729,000 | 5.95 | 70.80 | 49,300,000 |
| 1933 | 10,913,000 | 81,353 | 116,000 | 3,334,000 | 10,860,000 | 7.83 | 98.20 | 48,200,000 |
| 1934 | 13,375,000 | 45,367 | 96,500 | 3,658,000 | 12,877,000 | 9.06 | 110 | 58,300,000 |
| 1935 | 13,260,000 | 105,570 | 70,900 | 3,935,000 | 12,745,000 | 8.81 | 105 | 65,400,000 |
| 1936 | 19,523,000 | 282,940 | 57,100 | 3,850,000 | 19,129,000 | 8.61 | 101 | 62,800,000 |
| 1937 | 20,138,000 | 323,020 | 64,600 | 4,250,000 | 19,469,000 | 8.45 | 95.60 | 82,700,000 |
| 1938 | 18,279,000 | 294,540 | 95,200 | 4,093,000 | 18,211,000 | 8.26 | 95.50 | 85,900,000 |
| 1939 | 21,212,000 | 326,430 | 195,000 | 4,034,000 | 21,046,000 | 8.43 | 98.90 | 93,000,000 |
| 1940 | 22,575,000 | 91,756 | 284,000 | 3,986,000 | 21,793,000 | 8.45 | 98.40 | 81,000,000 |
| 1941 | 28,387,000 | 7,334 | 436,000 | 3,406,000 | 28,378,000 | 8.61 | 95.50 | 88,000,000 |
| 1942 | 31,496,000 | 110 | 188,000 | 2,965,000 | 31,045,000 | 8.89 | 88.90 | 80,900,000 |
| 1943 | 22,901,000 | 2,388 | 295,000 | 3,956,000 | 21,226,000 | 9.16 | 86.30 | 71,200,000 |
| 1944 | 15,542,000 | 0 | 689,000 | 3,404,000 | 15,497,000 | 9.60 | 88.90 | 54,900,000 |
| 1945 | 17,537,000 | 55 | 1,100,000 | 2,836,000 | 17,378,000 | 9.56 | 86.50 | 49,500,000 |
| 1946 | 28,102,000 | 682 | 881,000 | 1,891,000 | 19,493,000 | 10.10 | 84.30 | 72,500,000 |
| 1947 | 31,995,000 | 853 | 1,150,000 | 1,733,000 | 32,634,000 | 11.10 | 81.40 | 85,800,000 |
| 1948 | 35,210,000 | 48,266 | 1,010,000 | 1,928,000 | 35,856,000 | 12.80 | 86.50 | 102,000,000 |
| 1949 | 35,939,000 | 18,761 | 778,000 | 2,545,000 | 36,265,000 | 13.50 | 92.40 | 115,000,000 |
| 1950 | 38,724,000 | 237,750 | 412,000 | 2,270,000 | 40,891,000 | 13.80 | 93.20 | 133,000,000 |
| 1951 | 41,825,000 | 151,960 | 500,000 | 3,109,000 | 42,695,000 | 14.90 | 93.40 | 149,000,000 |

**Sand and Gravel Statistics – US Geological Survey** (http://minerals.usgs.gov/ds/2005/140/index.html)

**SAND AND GRAVEL (CONSTRUCTION) STATISTICS[1]**
**U.S. GEOLOGICAL SURVEY**
**[All values in metric tons (t) sand and gravel unless otherwise noted]**
Last modification: December 15, 2009

| Year | Primary production | Imports | Exports | Apparent consumption | Unit value ($/t) | Unit value (98$/t) | World production |
|---|---|---|---|---|---|---|---|
| 1900 | | | | | | | |
| 1901 | | | | | | | |
| 1902 | 452,000 | | | 452,000 | 0.71 | 13.30 | |
| 1903 | 747,000 | | | 747,000 | 0.80 | 14.50 | |
| 1904 | 5,280,000 | | | 5,280,000 | 0.47 | 8.50 | |
| 1905 | 16,400,000 | | | 16,400,000 | 0.45 | 8.14 | |
| 1906 | 24,400,000 | | | 24,400,000 | 0.35 | 6.33 | |
| 1907 | 32,100,000 | | | 32,100,000 | 0.31 | 5.41 | |
| 1908 | 30,000,000 | | | 30,000,000 | 0.34 | 6.15 | |
| 1909 | 49,000,000 | | | 49,000,000 | 0.30 | 5.42 | |
| 1910 | 56,900,000 | | | 56,900,000 | 0.29 | 5.06 | |
| 1911 | 53,700,000 | | | 53,700,000 | 0.30 | 5.24 | |
| 1912 | 53,800,000 | | | 53,800,000 | 0.33 | 5.56 | |
| 1913 | 65,100,000 | | | 65,100,000 | 0.29 | 4.77 | |
| 1914 | 65,500,000 | | | 65,500,000 | 0.29 | 4.71 | |
| 1915 | 61,800,000 | | | 61,800,000 | 0.30 | 4.82 | |
| 1916 | 71,800,000 | | | 71,800,000 | 0.32 | 4.78 | |
| 1917 | 60,400,000 | | | 60,400,000 | 0.42 | 5.34 | |
| 1918 | 47,000,000 | 503,000 | | 47,500,000 | 0.54 | 5.84 | |
| 1919 | 56,300,000 | 542,000 | | 56,900,000 | 0.62 | 5.84 | |
| 1920 | 64,800,000 | 1,110,000 | | 65,900,000 | 0.76 | 6.18 | |
| 1921 | 67,300,000 | 823,000 | | 68,100,000 | 0.73 | 6.65 | |
| 1922 | 78,100,000 | 409,000 | 162,000 | 78,300,000 | 0.68 | 6.61 | |
| 1923 | 117,000,000 | 431,000 | 250,000 | 117,000,000 | 0.65 | 6.21 | |
| 1924 | 132,000,000 | 630,000 | 142,000 | 133,000,000 | 0.64 | 6.10 | |
| 1925 | 145,000,000 | 481,000 | 193,000 | 146,000,000 | 0.65 | 6.05 | |
| 1926 | 155,000,000 | 852,000 | 193,000 | 156,000,000 | 0.63 | 5.81 | |
| 1927 | 169,000,000 | 638,000 | 191,000 | 169,000,000 | 0.61 | 5.73 | |
| 1928 | 179,000,000 | 675,000 | 334,000 | 180,000,000 | 0.58 | 5.52 | |
| 1929 | 190,000,000 | 1,510,000 | 221,000 | 191,000,000 | 0.62 | 5.90 | |
| 1930 | 171,000,000 | 1,640,000 | 147,000 | 173,000,000 | 0.62 | 6.05 | |
| 1931 | 134,000,000 | 350,000 | 98,800 | 134,000,000 | 0.60 | 6.42 | |
| 1932 | 105,000,000 | 169,000 | 43,600 | 105,000,000 | 0.51 | 6.09 | |
| 1933 | 93,000,000 | 85,500 | 37,400 | 93,100,000 | 0.51 | 6.42 | |
| 1934 | 100,000,000 | 100,000 | 15,200 | 100,000,000 | 0.54 | 6.58 | |
| 1935 | 106,000,000 | 114,000 | 17,000 | 106,000,000 | 0.50 | 5.94 | |
| 1936 | 153,000,000 | 295,000 | 22,600 | 154,000,000 | 0.52 | 6.12 | |
| 1937 | 162,000,000 | 438,000 | 30,500 | 163,000,000 | 0.52 | 5.90 | |
| 1938 | 159,000,000 | 605,000 | 16,100 | 159,000,000 | 0.50 | 5.79 | |
| 1939 | 197,000,000 | 229,000 | 12,600 | 197,000,000 | 0.49 | 5.75 | |
| 1940 | 207,000,000 | 399,000 | | 207,000,000 | 0.47 | 5.47 | |
| 1941 | 249,000,000 | 388,000 | | 249,000,000 | 0.52 | 5.76 | |
| 1942 | 262,000,000 | 503,000 | | 262,000,000 | 0.64 | 6.41 | |
| 1943 | 197,000,000 | 348,000 | | 197,000,000 | 0.66 | 6.22 | |
| 1944 | 161,000,000 | 251,000 | | 161,000,000 | 0.63 | 5.84 | |
| 1945 | 163,000,000 | 253,000 | | 163,000,000 | 0.66 | 5.98 | |
| 1946 | 216,000,000 | 314,000 | | 216,000,000 | 0.68 | 5.68 | |
| 1947 | 245,000,000 | 431,000 | | 245,000,000 | 0.77 | 5.62 | |
| 1948 | 274,000,000 | 385,000 | | 275,000,000 | 0.82 | 5.55 | |
| 1949 | 277,000,000 | 383,000 | | 277,000,000 | 0.80 | 5.47 | |
| 1950 | 320,000,000 | 396,000 | | 321,000,000 | 0.82 | 5.55 | |
| 1951 | 346,000,000 | 426,000 | | 347,000,000 | 0.85 | 5.34 | |

1

**United States Construction materials market value – DATAMONITOR**

| Table 15: United States construction materials market value forecast: $ billion, 2009–14 | | | |
|---|---|---|---|
| Year | $ billion | € billion | % Growth |
| 2009 | 39.8 | 28.6 | 0.4% |
| 2010 | 40.6 | 29.2 | 2.0% |
| 2011 | 41.3 | 29.7 | 1.9% |
| 2012 | 42.2 | 30.3 | 2.0% |
| 2013 | 43.2 | 31.0 | 2.4% |
| 2014 | 43.9 | 31.6 | 1.8% |
| CAGR: 2009–14 | | | 2.0% |
| Source: Datamonitor | | | DATAMONITOR |

**Ready-mix Average Composition – Historical Materials from University of Nebraska- Lincoln Extension**

http://digitalcommons.unl.edu/extensionhist/announcements.html

## Ordering

Before ordering concrete, check the weather forecast to decide if hot or cold weather precautions need to be taken. Ideal temperatures for placing concrete are between 50 and 90°F. Setting time shortens as temperatures increase; reduced temperatures lengthen setting time.

Good quality, long-lasting concrete requires the proper amount of cement per cubic yard and careful control of the water-to-cement ratio. Air entrainment is also desirable for most agricultural applications. The appropriate amounts depend on desired strength, consistency, workability, and other properties, such as resistance to abrasion from frequent scraping and to manure acids. For general use in swine housing, using a maximum aggregate size of 3/4 in., the following ranges are recommended:

- *Cement*--5 3/4 to 7 sacks or 540 to 660 lbs per cubic yard of concrete.
- *Water*--4 to 5 3/4 gallons per sack of cement.
- *Water to cement ratio*--0.35 to 0.50 (weight basis).
- *Air entrainment*--5 1/2 to 7 1/2 percent.
- *Minimum compressive strength*--footings and foundations, 3000 psi; walls and floors, 4000 psi.

A high water-to-cement ratio causes a weaker, less durable and less watertight concrete. Both the water and cement can be increased for improved workability as long as the ratio is not changed. Air entrainment increases concrete durability and freeze- thaw resistance.

Give the ready-mix supplier detailed directions to the jobsite. If the driver gets lost, valuable working time is wasted and concrete quality may be reduced. Indicate any special trucking restrictions such as low load limit bridges and underpasses that must be avoided. Describe the jobsite conditions as to any height, weight, or width restrictions, as well as ground conditions and any other important factors. Indicate the desired time interval between loads.

# Important Disclaimer

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