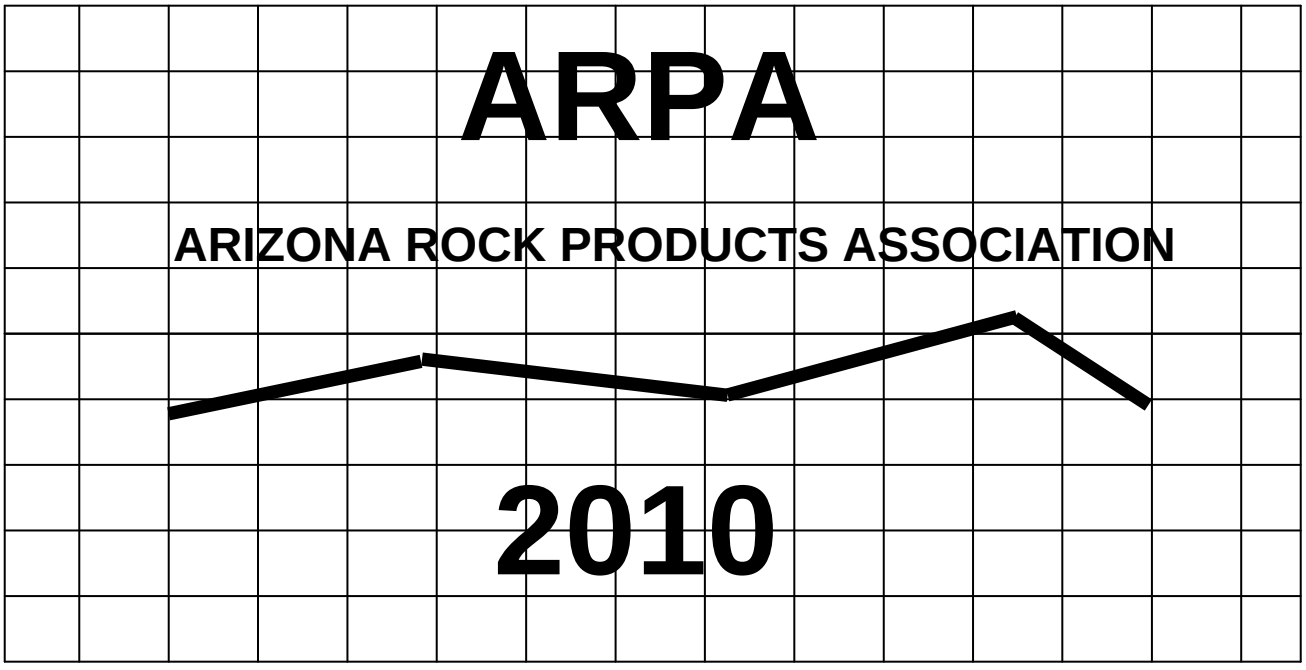
Impact
Of the
Rock Products Industry
On the
Arizona Economy



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Contents

HIGHLIGHTS: Economic Impact 2010

- ***The Arizona Rock Products industry includes sand and gravel mining firms, crushed stone producers, ready-mix concrete suppliers, concrete product and asphalt manufacturers, and cement producers. Combined, these firms employ 6,124 Arizona workers who provide essential materials for an additional 112,361 workers in the construction industry of the Grand Canyon State.***

- ***The value of direct output, production and deliveries of the Arizona Rock Products industry was $1.6 billion in 2010. These revenues went back into the Arizona economy as personal income of $353 million for workers and self-employed proprietors and $1.2 billion income to Rock Products firms and their suppliers.***

- ***Arizona Rock Products industry purchases of goods, services, materials, and supplies from other Arizona businesses were $956.2 million in 2010. Taxes and fees paid to state, local, and federal governments by Rock Products firms totaled $98.8 million.***

- ***When direct expenditures by the Rock Products industry enter the general economy, each dollar is available for additional spending, creating a "multiplier effect" that increases employment, income, and total economic activity in Arizona. The total economic impact of the Rock Products industry, incorporating multiplier effects estimated from an input-output model, was $2.9 billion in 2010.***

- ***Revenues and employment in the Rock Products Industry began to slow as residential housing weakened in Arizona. Overall Arizona employment fell by 11 percent between 2007 and 2010, but Rock Products jobs decreased by 46 percent. Output of construction aggregates in Arizona in 2010 was down by 61 percent from the peak in 2006, according to the U. S. Geological Survey.***

ECONOMIC IMPACT OF ARIZONA ROCK PRODUCTS

Arizona's economy was affected more than almost any other state by the national recession that began in December of 2007. While the United States lost six percent of jobs between 2007 and 2010, the Arizona economy experienced an employment decrease of 11 percent. The Arizona construction downturn was some five times worse, as measured by a collapse in employment of 50 percent over this same period, when more than 114,000 jobs were lost. The Arizona Rock Products industry followed a similar path of contraction, as employment fell by 46 percent. The 2010 economic impact of the Arizona Rock Products industry (including all multiplier effects) fell to $2.9 billion, one half the $5.8 billion all time high value recorded in 2007.

The Arizona Rock Products Industry includes:

- **Sand and gravel mining firms**
- **Crushed stone operations**
- **Ready-mix concrete suppliers**
- **Asphaltic and concrete product manufacturers**
- **Cement producers**

The *direct economic impact* of an industry equals the value of its total output, measured as the dollar value of production, shipments and deliveries. These revenues are distributed back into the economy as investment and retained earnings, payments to personnel, purchases of supplies, materials and services, rent and leases, and payments to government. The Arizona Rock Products industry created direct output valued at $1.6 billion in 2010.

DIRECT ECONOMIC IMPACT OF THE ARIZONA ROCK PRODUCTS INDUSTRY BY SOURCE: 2010

SOURCE	VALUE OF OUTPUT	EMPLOYEE PAYROLL	JOBS
Stone, Sand & Gravel	$368,400,000	$110,218,000	2,303
Ready-mix Concrete	$576,102,000	$108,225,000	2,136
Asphaltic/Concrete Products	$452,340,000	$62,806,000	1,359
Cement	$183,690,000	$16,426,000	326
DIRECT IMPACTS	**$1,580,532,000**	**$297,675,000**	**6,124**

The $1.6 billion annual direct output of Arizona Rock Products firms created 6,124 jobs with an annual payroll of $297.7 million. Payroll figures for each type of firm in the table above are wages and salaries paid to employees, as reported by the Arizona Department of Commerce, and do not include benefits. Stone, sand and gravel output is from the U. S. Geological Survey. Output estimates for other types of firms are based on the U. S. Census of Manufactures for 2009.

The direct output of the Rock Products industry of $1.6 billion circulated through the Arizona economy in three ways: contributions to personal income in the form of payments to workers and proprietors; additions to business income from purchases of materials, supplies and services from businesses; and taxes and fees paid to governments. Each of these creates new income and revenue for the citizens, businesses, and governments of Arizona.

DIRECT IMPACTS OF THE ROCK PRODUCTS INDUSTRY: 2010

As Personal Income (Includes compensation of employees and proprietor's income, before taxes)	**$353,248,000**
As Business Income (Includes income to Rock Products firms before taxes plus payments to suppliers)	**$1,227,284,000**
DIRECT ECONOMIC IMPACT	**$1,580,532,000**

TAXES AND FEES TO GOVERNMENTS: $98.8 MILLION

State & Local Taxes and Fees (Includes income, property taxes and fees of workers, proprietors and corporations	**$30,928,000**
Federal Taxes and Fees (Includes social security contributions income taxes and excise taxes of workers, proprietors and corporations)	**$67,912,000**

Arizona Rock Product firms pay salaries and wages to workers. In addition, workers receive benefits which are included in the calculation of personal income as defined by the U. S. Bureau of Economic Analysis. Rock Product producers buy goods and services from self-employed individuals and smaller unincorporated firms. These payments also contribute to personal income in the table above, summing to Arizona personal income created of $353.2 million.

Purchases from larger suppliers are recorded as business income for those firms. In 2010, the Rock Products industry purchased $956.2 million of goods and services from other Arizona firms. Retained earnings, depreciation allowance, investments and various "indirect business taxes" such as property taxes and license fees are included in the business income component attributed to the Rock Products industry, creating income to Arizona businesses of $1.2 billion. Combined personal and business income before taxes account for the total direct economic impact of $1.6 billion for 2010.

Taxes and fees to government are paid from personal and business income created by Arizona Rock Products economic activity. At the state and local level, taxes paid by households include income taxes and property taxes, along with fees such as for motor vehicles. These payments by households summed to $4.0 million in 2010.

Businesses in Arizona pay numerous state and local taxes and fees such as income taxes, property taxes, workers compensation, and sales taxes. These payments by Arizona Rock Product firms and their suppliers summed to $26.9 million of revenue for state and local governments in 2010. Combined personal and business state and local government payments were $30.9 million.

Federal tax payments related to economic activity of Arizona Rock Products firms were twice as large ($67.9 million) as state and local taxes and fees. Households (workers and self-employed proprietors) paid income and social security taxes of $36.9 million. Businesses made federal payments of $31 million for income taxes, social security, and various excise taxes and fees.

When households, businesses and governments spend the income created by Arizona Rock Products economic activity, these payments create secondary income for other components of the economy, setting “multiplier” effects in motion.

Multiplier Effects and Indirect Impacts

Multiplier effects result when initial income created by the Rock Products industry re-circulates through the economy. For example, when a Ready-mix concrete truck driver spends for food, clothing, and medical services, the wages paid by the Arizona Rock Products industry support additional jobs and spending in the general economy, creating *indirect economic impacts*.

The sum of direct and indirect impacts is the *total economic impact* of the Rock Products industry. Multiplier effects can be calculated by use of an input-output model. For this study, the IMPLAN economic model was used. The model has been used for numerous Arizona studies, including high technology industries and the Super Bowl, based on data from the U. S. Department of Commerce with specific Arizona information from the Arizona Department of Commerce. The IMPLAN model traces the initial $1.6 billion of output by the Rock Products firms as these dollars move through the economy in successive rounds of spending and re-spending.

MULTIPLIER PROCESS FOR THE ARIZONA ROCK PRODUCTS INDUSTRY

DIRECT IMPACT	X	IMPLAN MODEL MULTIPLIERS	=	TOTAL IMPACT
($1.6 Billion)				($2.9 Billion)

DIRECT IMPACT	+	INDIRECT IMPACT	=	TOTAL IMPACT
($1.6 Billion)		($1.3 Billion)		($2.9 Billion)

The indirect impact comes from two sources. One of these is business spending. When Arizona Rock Products firms buy goods and services from suppliers, these firms in turn increase purchases from their own suppliers, creating a multiplied spending effect. A second component of the indirect impact is from household spending. As workers become consumers, they create new revenues for grocery stores, gasoline stations, and all other providers of consumer goods and services. This spending by households is termed the "induced" impact. In this study, business and household secondary spending are combined as the "indirect" impact.

The total impact of the Arizona Rock Products Industry on the state economy consists of the direct impact and successive rounds of indirect activity, which become progressively smaller as spending "leaks" out of the region. The computed sum of direct economic activity of $1.6 billion and indirect activity of $1.3 billion yields a total economic contribution of the Rock Products industry of $2.9 billion in 2010.

In addition to the 6,124 jobs created directly within the industry, 8,799 additional jobs were supported in other parts of the economy by secondary spending multiplier effects, producing a total employment impact of 14,923 jobs. When Rock Products firms buy electricity, for example, indirect jobs are created in Arizona utilities. When Rock Products employees make consumer expenditures, indirect jobs are induced in the retailing and service sectors. The indirect impacts on major Arizona industries are shown in the table below.

ARIZONA ROCK PRODUCTS ECONOMIC IMPACT BY INDUSTRY: 2010

INDUSTRY	VALUE OF OUTPUT	PERSONAL INCOME	JOBS
Rock Products (Direct Impact)	$1,580,532,000	$353,248,000	6,124
Agriculture	$13,939,000	$5,025,000	79
Mining	81,496,000	28,493,000	315
Construction	49,493,000	29,275,000	490
Manufacturing	361,062,000	32,590,000	433
Transportation	86,237,000	51,785,000	825
Communications	23,033,000	7,429,000	67
Utilities	86,632,000	11,591,000	127
Wholesale Trade	72,975,000	36,893,000	564
Retail Trade	92,094,000	59,069,000	1,557
Finance	30,926,000	12,847,000	158
Insurance	26,632,000	12,392,000	196
Real Estate	127,806,000	5,550,000	351
Business Services	68,586,000	43,930,000	936
Other Services	167,899,000	92,880,000	2,700
Subtotal: Indirect Impact	$1,288,811,000	$429,750,000	8,799
TOTAL ECONOMIC IMPACT	$2,869,343,000	$782,998,000	14,923

Source: Arizona Rock Products Association and Implan Input-Output Model for Arizona

Note: The first line of the table is the direct impact of the Rock Products industry. The remaining entries in the table show the secondary or indirect activity and employment created in other industries of the Arizona economy by the direct impact of the Rock Products industry. The sum of this economic activity, payroll and employment by industry is the indirect economic impact. The combined direct impact of the Rock Products industry and the indirect impact by sector yield a total economic impact of $2.9 billion.

The table below sets out a summary of the direct, indirect, and total economic impacts of the Arizona Rock Products industry for 2010. The "total" entries refer to the sum of direct and indirect impacts and include all multiplier effects as the direct impacts recirculate in the Arizona economy.

2010 TOTAL ECONOMIC IMPACT OF THE ARIZONA ROCK PRODUCTS INDUSTRY

14,924 TOTAL ARIZONA JOBS

6,124 Direct Rock Products Jobs
8,800 Indirect Arizona Jobs

TOTAL ARIZONA ECONOMIC IMPACT: $2,869.3 MILLION

Direct Economic Impact: $1,580,532,000
Indirect Economic Impact: $1,288,811,000

Total Arizona Personal Income: $783.0 Million

Direct Personal Income: $353,248,000
Indirect Personal Income: $429,750,000

Total Arizona Business Income: $2,086.3 Million

Direct Business Income: $1,227,284,000
Indirect Business Income: $859,061,000

Total State & Local Taxes and Fees: $103.5 Million

Direct State & Local: $30,928,000
Indirect State & Local: $72,611,000

Total Federal Taxes and Fees: $154.4 Million

Direct Federal: $67,912,000
Indirect Federal: $86,455,000

ARIZONA CONSTRUCTION AND ROCK PRODUCTS

In addition to impacts on the general economy created through injections of direct spending from Arizona Rock Products firms, there are also substantial effects on construction, an Arizona industry that depends on Rock Products as critical inputs.

Sand, gravel, and concrete products are locally based. Along the river beds and flood plains of Arizona, located close to growing metropolitan areas, are some of the finest sources of sand and gravel in the world. These deposits must be counted among the most important minerals in the Arizona economy. They are the basis for Arizona concrete and asphalt products which are essential for construction not only of residential and office structures, but schools, roadways, hospitals, airports, and other private and public facilities.

Sand, gravel, concrete, asphaltic and concrete products, and cement are used by workers in all types of construction, including heavy construction, street and highway construction, commercial, and residential construction. For example, a typical 1,600 square foot house requires 300 tons of sand and gravel. The first 45 miles of metropolitan Phoenix freeway constructed during the on-going expansion program required 450 tons of cement, 1.8 million cubic yards of concrete and 2.9 million tons of sand and gravel for pavement alone. The combined inner and outer loops of the fully completed freeway system will consume 92 million tons and sand and gravel and 20 million cubic yards of concrete.

The construction industry in December of 2010 accounted for 4.5 percent of all Arizona jobs, slightly greater than the national average of 4.3 percent. The 6,124 Arizona Rock Products workers produced vital materials — sand, gravel,stone, concrete and various concrete products, asphalt and cement — that contributed to the support of the current 112,361 jobs in Arizona's construction industry.

Most closely linked to the Rock Products industry are 5,915 concrete contractors and trade workers who rely upon Rock Products for their basic inputs. (It could be argued that these workers should be counted among those whose jobs are directly — rather than indirectly — part of the Rock Products industry. For the purpose of the present study, concrete contractors and trade workers were defined as *users* of Rock Products, rather than *producers*.)

ARIZONA CONSTRUCTION JOBS DEPEND ON THE ROCK PRODUCTS INDUSTRY

6,124 ROCK PRODUCTS WORKERS

PROVIDE MATERIALS FOR

5,915 CONCRETE WORKERS

WHO SUPPORT

106,446 OTHER CONSTRUCTION WORKERS

Residential Construction 10,278 Jobs

Commercial/Industrial Construction 11,676 Jobs

Heavy Construction 16,084 Jobs (Including highway and street construction)

Special Trade Workers 68,408 Jobs

TOTAL CONSTRUCTION (INCLUDING CONCRETE): 112,361

TOTAL ALL ABOVE EMPLOYMENT: 118,485

Source: Arizona Rock Products Association and Arizona Department of Commerce, based on figures reported during second quarter of 2010

Residential construction activity began to decline in Arizona in 2006 and a strong national recession began in December of 2007. Between 2007 and

2010, Arizona lost some 300,000 jobs, and unemployment rates rose to exceed 10 percent. For all of 2010, Arizona ranked 49th among all states in job growth, with only Nevada recording weaker labor market performance.

Construction employment declined by 50.4 percent between 2007 and 2010, as one half of the state's construction jobs disappeared and more than 100,000 workers joined the ranks of the unemployed. Residential construction employment was down 57.8 percent. Through 2010, commercial and industrial construction weathered the storm only slightly better than other construction components, down by 30.6 percent.

Rock Products employment declined by 46.1 percent between 2007 and 2010. Ready-mix concrete jobs fell by 53.7 percent, while stone, sand and gravel jobs decreased by 36.7 percent. The current outlook is for modest growth at best in construction activity in 2011, with improvement in 2012.

ARIZONA ROCK PRODUCTS EMPLOYMENT: 2001 - 2010

	Arizona Employment			Percent Change
Arizona Industry	**2001**	**2007**	**2010**	**2007 - 2010**
Stone, sand and gravel mining	2,777	3,639	2303	-36.7%
Ready-mix concrete	4,017	4,618	2136	-53.7%
Asphaltic and concrete products	2,395	2,463	1359	-44.8%
Cement	566	637	326	-48.8%
ARIZONA ROCK PRODUCTS	**9,755**	**11,357**	**6,124**	-46.1%
Concrete contractors	13,005	12,494	5,915	-52.7%
Residential construction	17,221	24,371	10,278	-57.8%
Commercial/Industrial construction	12,983	16,815	11,676	-30.6%
Heavy & Highway construction	19,139	27,648	16,084	-41.8%
Other building trade workers	104,556	145,249	68,408	-52.9%
CONSTRUCTION	**166,904**	**226,577**	**112,361**	**-50.4%**
TOTAL ARIZONA EMPLOYMENT	**2,265,000**	**2,676,800**	**2,377,200**	**-11.2%**

Source: Arizona Rock Products Association and Arizona Department of Commerce

Arizona's population growth contracted in 2008 as the recession became more severe. In-migration to the state was restricted by limited employment growth and a stagnant housing market that made relocation difficult. Slower population growth brought reduced demand for home building and commercial structures. Meanwhile, persistent budget problems for government have reduced spending on roadways and government facilities to serve the residents of the state.

As construction employment has declined, payrolls paid to Rock Products and construction workers have decreased at a similar pace. Construction payrolls (in constant 2010 dollars) fell by 51.1 percent between 2007 and 2010. This decrease in pay removed $5.5 billion from the Arizona economy, contributing to the first decrease in Arizona personal income on record. Rock Product payrolls were down by 48.7 percent. Within the industry, Ready-mix payrolls had the sharpest drop.

ARIZONA ROCK PRODUCTS PAYROLL: 2001 – 2010

	Payroll in Millions of 2010 Dollars			Change
Arizona Industry	**2001**	**2007**	**2010**	**2007 - 2010**
Stone, sand and gravel mining	$102.4	$185.7	$110.2	-40.6%
Ready-mix concrete	214.4	236.2	108.2	-54.2%
Asphaltic and concrete products	102.0	126.2	62.8	-50.2%
Cement	25.1	32.6	16.4	-49.6%
ARIZONA ROCK PRODUCTS	**$443.9**	**$580.6**	**$297.7**	**-48.7%**
Concrete contractors	$497.0	$593.3	$225.3	-62.0%
Residential construction	753.3	1,374.6	458.6	-66.6%
Commercial/Industrial construction	726.7	1,171.4	665.3	-43.2%
Heavy & highway construction	868.6	1,735.3	801.8	-53.8%
Other building trade workers	3,981.9	5,628.6	2984.9	-47.0%
CONSTRUCTION	**$6,827.4**	**$10,503.3**	**$5,135.9**	**-51.1%**
ARIZONA PERSONAL INCOME (In millions of 2010 dollars)	**$175,908**	**$229,870**	**$223,716**	**-2.6%**

Source: Arizona Rock Products Association, Arizona Department of Commerce, and U. S. Bureau of Labor Statistics

ESTIMATED IMPACT BY ARIZONA COUNTY

Every Arizona County has facilities for production of Rock Products that support growth, development, and building of infrastructure. Larger counties with greater construction activity account for greater economic activity and employment. “Direct” activity and employment below measure production and jobs within Rock Product firms. “Total” activity and employment include all multiplier effects of indirect or secondary spending and employment supported by the presence of Rock Product output and sales in each county.

ARIZONA ROCK PRODUCTS ECONOMIC IMPACT BY COUNTY: 2010

	Direct Impact		Total Impact	
County	**Output**	**Employment**	**Output**	**Employment**
Apache	$14,102,000	55	$25,599,000	133
Cochise	37,655,000	146	68,360,000	356
Coconino	54,428,000	211	98,810,000	514
Gila	16,841,000	65	30,574,000	159
Graham	7,977,000	31	14,482,000	75
Greenlee	4,424,000	17	8,032,000	42
La Paz	5,924,000	23	10,755,000	56
Maricopa	860,943,000	3,336	1,562,981,000	8,129
Mohave	55,999,000	217	101,662,000	528
Navajo	36,186,000	140	65,693,000	342
Pima	215,462,000	835	391,156,000	2,034
Pinal	75,615,000	293	137,273,000	714
Santa Cruz	8,265,000	32	15,004,000	78
Yavapai	147,992,000	573	268,670,000	1,397
Yuma	38,719,000	150	70,292,000	366
TOTAL	$1,580,532,000	6,124	$2,869,343,000	14,923

ARIZONA ROCK PRODUCTS FACTS AND FIGURES

This information on the Arizona Rock Products industry and related sectors of the Arizona economy is based on data obtained from the Arizona Rock Products Association, the Arizona Department of Commerce, the United States Geological Survey, the Mine Safety and Health Administration of the Department of Labor, the W. P. Carey School of Business at Arizona State University, Ross Consulting, and the National Stone, Sand and Gravel Association.

- The direct economic impact of production, shipments and deliveries by the Arizona Rock Products Industry in 2010 was $1.6 billion. These revenues were distributed back into the Arizona economy as $353.2 million of personal income to Rock Products workers; $1.2 billion in payments to businesses for investment and purchase of supplies, services and materials; and government payments of $98.8 million.

- The total economic impact of the Arizona Rock Products industry — after all multiplier effects were included — was $2.9 billion for 2010, a decrease of 50 percent from the $5.8 billion impact of 2007.

- Sand and gravel is the only mineral produced in all 50 states. The primary uses for sand and gravel include concrete aggregate for buildings, highways, dams, and airports (20%); road base and coverings (17%); asphaltic concrete aggregate (10%); construction fill (9%); concrete products such as blocks, bricks and pipes (2%); plaster and gunnite sands (2%); and numerous other uses such as railroad ballast and roofing materials (40%).

- Because of its heavy weight and high transportation costs, sand and gravel is always produced near the point of use. Therefore, the industry nationally and in Arizona is most active in rapidly expanding urban areas or where other large scale construction projects are underway.

- There are four major steps in sand and gravel mining: (1) site clearing, (2) mining, (3) processing (crushing, washing, blending materials), and (4) reclamation.

- The highest quality sand and gravel is found in river beds, flood plains, and glacial deposits, with nearly equal amounts of gravel and sand and relatively small amounts of unusable materials. As these types of deposits become depleted in future years, more expensive sources will have to be developed with less favorable ratios of gravel to sand and higher costs of transportation to construction sites in developing urban areas.

- A typical 1,600 square foot house requires 300 tons of sand and gravel, including driveways, curbing, concrete slabs, and roadway.

- An average commercial building of 14,700 square feet uses 1,500 tons of sand and gravel. A 24 story office building requires 36,000 tons. A regional retail center requires 100,000 tons. Each mile of urban freeway requires 400,000 tons of sand and gravel for pavement, pipes, drains, bridges, walls, and overpasses.

- The combined inner and outer loops of the metropolitan Phoenix freeway system will consume 92 million tons of sand and gravel and 20 million cubic yards of concrete.

- A typical cubic yard of concrete weighs 3,975 pounds, composed of 470 pounds of cement, 300 pounds (36 gallons) of water, 1,282 pounds of sand and 1,923 pounds of gravel.

- A typical cubic yard of asphalt weighs 3,959 pounds, of which 3,800 pounds is sand and gravel.

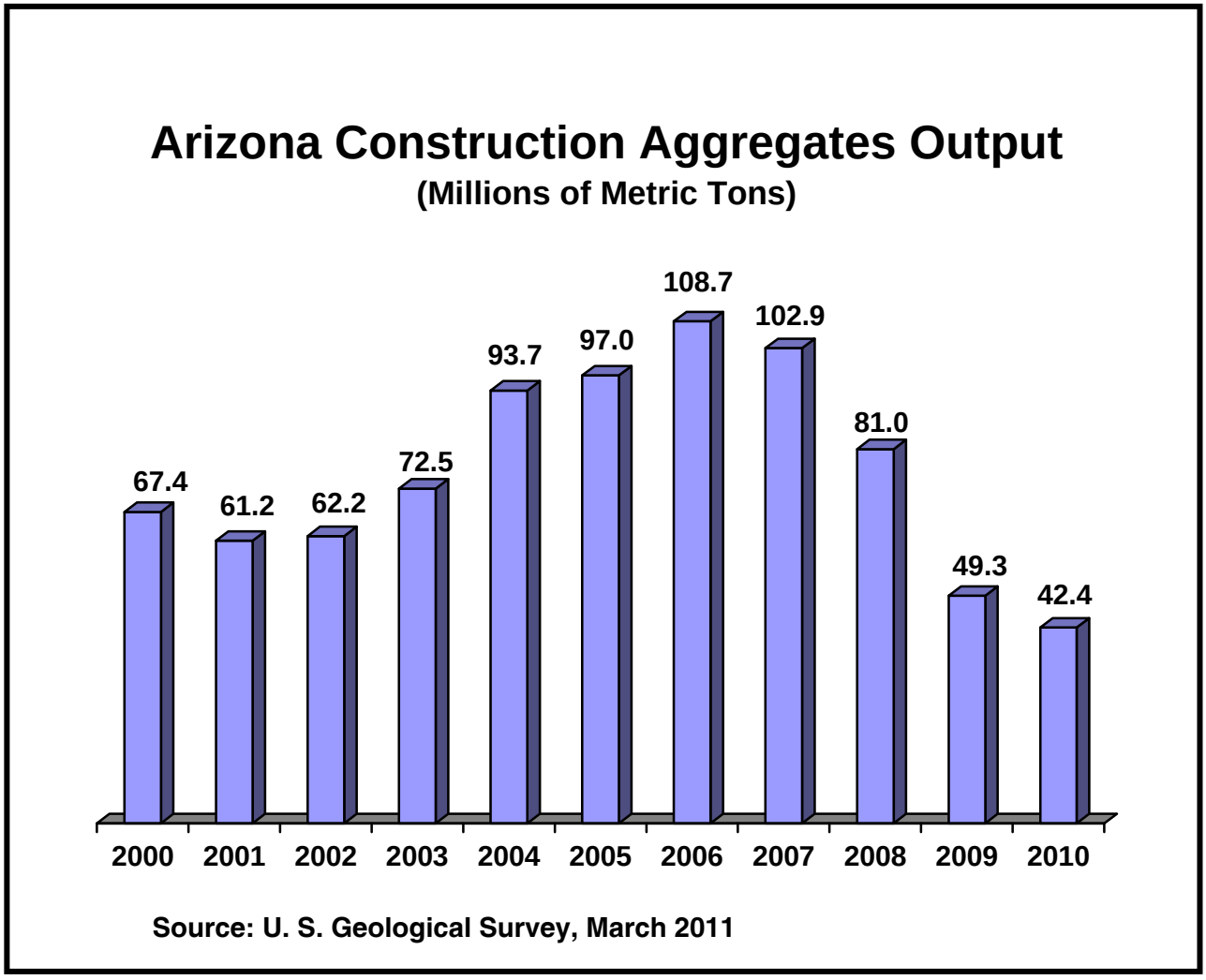
- During 2010, Arizona Rock Products firms employed 6,124 workers who provided essential materials for an additional 112,361 workers in the Arizona construction industry. Construction workers earned a combined income of $5.1 billion that was returned to the economy as consumer purchases for goods and services.

- During 2007, Arizona construction workers made up 7.7 percent of the state labor force, while nationally only 5.5 percent of all jobs were in construction. Construction in Arizona now accounts for a similar share of employment (4.5 percent) as found in the average state.

- In 2006, Arizona production of construction aggregates (crushed stone, sand, and gravel) reached 108.7 million tons, according to figures from the U. S. Geological Survey, a new record for output production for the state.

- The 42.4 million tons produced in 2010 represented a decrease of 61 percent from the record production level in 2006. This was the fourth consecutive year of decrease in production.

- The value of construction aggregates production was $368.4 million, a decrease of 54% from the $809 million peak value of production in 2007.



DATA SOURCES

1. Arizona Department of Commerce. Employment and payroll by industry in Arizona, 2010.

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3. *Construction Sand and Gravel*, U. S. Geological Survey, various years. Historical statistics on quantity and value of output of sand, gravel and crushed stone for Arizona, western region, United States.

4. *Consumer Price Index*, U. S. Bureau of Labor Statistics. Used for adjusting 2001 and 2007 payrolls to 2010 dollars.

5. *Mine Reference Report*, Mine Safety and Health Administration, Denver, Colorado. Sand, gravel and stone operations in Arizona by County for 2010.

6. *Mineral Industry Surveys: Crushed Stone and Sand and Gravel*, U. S. Department of Interior, U. S. Geological Survey, quarterly and annual reports for 2010.

7. *National Non-Farm Employment*, U. S. Bureau of Labor Statistics. Used for establishing ratio between national employment figures and construction employment figures for 2010 and 2007.

8. Additional rock products industry data provided by Arizona Rock Products Association; National Stone, Sand and Gravel Association; and Ross Consulting of Phoenix, Arizona.

9. IMPLAN Input-Output Model, MIG, Inc, Version 3