

Planning After PLANYC:

A Framework for Developing
New York City's Next
Ten-Year Capital Strategy



TABLE OF CONTENTS

INTRODUCTION AND SUMMARY.....	4
CAPITAL PLANNING AND BUDGETING IN NEW YORK CITY.....	5
Strategic Planning.....	5
Needs Assessment.....	5
Resource Identification.....	4
Capital Plan.....	7
Implementation and Asset Management.....	7
CAPITAL SPENDING DURING THE BLOOMBERG ADMINISTRATION.....	9
Reasons for Expanded Capital Spending.....	10
Outcomes of Investment.....	11
Impact on the City's Finances.....	15
Mayor Bloomberg's Final Ten-Year Capital Strategy.....	17
SHORTCOMINGS OF THE BLOOMBERG ERA.....	18
No Citywide Policies for Routine Asset Maintenance and Replacement.....	18
Insufficient Investment in and Planning for State of Good Repair Work.....	20
Increased Spending Paid For Almost Entirely By Debt.....	21
Increased Capital Spending During a Period of High Construction Costs.....	22
Contracting and Management Challenges Contributed to Delays and Overruns.....	22
Funding Gap for Resiliency and Mitigation Efforts.....	24
FRAMEWORK FOR DEVELOPING THE NEXT TEN-YEAR CAPITAL STRATEGY.....	26
Improve Asset Management and the Capital Planning Process.....	26
Develop an Investment Standard that Includes Policies for Debt and Pay-Go Capital.....	27
Use Clear Guidelines to Establish Priorities in the Capital Strategy.....	27
Adopt More Cost-Effective Approaches to Contract and Construction Management.....	28
ENDNOTES.....	30

INTRODUCTION AND SUMMARY

New York City is the center of the largest metropolitan area in the nation. More than eight million people live in the five boroughs, and they are joined by millions of commuters and tourists who visit the city for work, school, shopping, cultural events and other recreational activities. Facilitating these activities is a vast system of infrastructure and capital assets that is necessary to provide government services, engage in economic activity and support a good quality of life.

Maintaining and improving these capital assets is crucial to the city's continued competitiveness, and the importance of capital investment was recognized by Mayor Michael Bloomberg and his administration. Mayor Bloomberg's infrastructure and sustainability plan, PLANYC, included ambitious goals to improve the transportation system, expand the water and sewer system, increase the supply of parks and housing, and make the city's buildings greener and its waterfront more resilient against climate change.

In pursuit of these goals, more money was committed to capital projects than under any mayor since the fiscal crisis of the 1970s. The City has more than \$100 billion in debt outstanding and its debt burden is high when evaluated under the benchmarks used by rating agencies to assess affordability. The outcomes of investment have been mixed: the condition of schools and bridges improved, carbon dioxide emissions were reduced dramatically, park space expanded and tree planting accelerated, but citizens express dissatisfaction with street maintenance, water main breaks remain a costly problem, and sewer backups continue to plague many neighborhoods.

The new mayor will face a difficult challenge: how to responsibly fund competing capital priorities without increasing capital spending and debt extensively. This report reviews capital planning and spending during Mayor Bloomberg's tenure in order to suggest principles that can guide the development of a new long-term capital plan and financing strategy. The start of a new administration provides a valuable opportunity to articulate a vision for a modern city and establish broad priorities, as well as to improve the city's operations and establish a new tenor of doing business. By improving the city's asset management practices, developing an appropriate investment standard, using clear guidelines to establish priorities and adopting more cost-effective approaches to managing contracts and construction, the next mayor can have a long-term impact on the city's infrastructure, government, economy and quality of life.

CAPITAL PLANNING AND BUDGETING IN NEW YORK CITY

The city's capital planning and budgeting processes are set forth in the New York City Charter. The Charter provides for a dynamic process that is shaped by elected officials, city agencies, the City Planning Commission, and community representatives, including community boards and borough presidents. In different ways, these actors evaluate what the city has, decide what it will need and plan for how goals can be best accomplished.

This section describes capital planning and budgeting during the administration of Mayor Michael Bloomberg, and explains how city agencies implemented each of these basic steps:

1. Establishing priorities and goals as part of a strategic planning process;
2. Conducting a thorough needs assessment;
3. Identifying resources available for a capital improvement plan;
4. Devising a capital improvement plan based on goals, needs and available resources; and
5. Implementing the plan, including authorizing funding, developing project schedules, managing projects and maintaining assets.

Strategic Planning

The City Charter requires the mayor to devise a strategic policy statement that summarizes the long-term challenges facing the city and proposes strategies to address those challenges over a four-year period.¹ The statement allows the mayor to articulate his vision for the city, establish the priorities of his administration, and specify policies and programs that are needed, including those to maintain, expand and operate the city's capital assets. The statement also provides a guidepost by which New Yorkers can judge the administration's successes and the city's progress.

As it managed the city's finances in the wake of the 2001 recession and September 11th attacks, the Bloomberg Administration did not publish a strategic policy statement in 2003 as required by the Charter; in 2007, it satisfied the charter requirement with PLANYC. PLANYC was shaped around the premise that the city's population would increase by one million people by 2030. It had ten broad goals, several of which focused on upgrading infrastructure, to enhance sustainability and quality of life in the city.

PLANYC improved upon prior planning exercises by specifying funding sources and milestones for accomplishing its 127 initiatives. Progress reports were issued annually to provide updates on milestones met. The plan was updated in 2011 to include 11 goals and 132 initiatives, many of which continued from the 2007 plan. Goals directly related to the city's capital assets included stimulating housing development, enhancing park space, ensuring the quality of the water supply, improving the reliability of transportation and increasing resiliency.

Needs Assessment

Once the overarching goals are established, the condition, usefulness and performance of capital assets must be evaluated with respect to the citywide capital agenda.

The Department of City Planning (DCP) is responsible for analyzing competing demands from community districts.² Using "fair share" criteria to ensure an equitable distribution of facilities

throughout the city,³ DCP issues the Citywide Statement of Needs, which contains proposals to cite, replace, consolidate, expand or reduce city facilities over the course of two fiscal years.⁴

DCP also works jointly with the Office of Management and Budget (OMB) and city agencies to report on the condition of the city's capital assets—specifically, how much spending is required to get to “state of good repair,” meaning assets are fully functional and safe to use. Agencies report needed spending in the Asset Information Management System (AIMS), published annually. But AIMS does not provide a full picture: it excludes some of the City's most valuable assets— for example, the water and sewer system, public housing and the East River Bridges— as well as less valuable assets like equipment and vehicles.

Three agencies that manage large capital assets— bridges and tunnels, schools and the water and sewer system— conduct detailed inspections and issue yearly reports on the conditions of these assets. The Department of Transportation uses the State rating scale to assess bridges and tunnels. The School Construction Authority performs thorough architectural, mechanical and electrical inspections of school buildings and reports on deficiencies, safety violations, and overall condition. The Water Authority contracts with an independent engineering firm to evaluate the water and sewer system.

There is no single, comprehensive source on capital needs; agencies use different criteria and metrics to assess and report on the condition of their assets.

Resource Identification

The speed with which goals can be achieved and the scope of needs that can be met are constrained by the resources available to undertake capital investment.

Funding for capital improvements typically comes from three sources. The first is intergovernmental aid, which commonly takes the form of grants, and, increasingly, loans or bond support. The second is funding from annual budget resources; this “pay-as-you-go” funding can be appropriated from the general fund or from enterprise funds that rely on user fees or excise taxes, such as gas taxes, tolls or water bills. Third, governments issue bonds; the length of the bond is typically tied to the useful life of the capital asset, and the rationale for borrowing is to “pay-as-you-use,” allowing future taxpayers to share the cost of an asset as they, too, benefit from its use.

Governments vary in their funding approaches, although most use a mix of sources. Data on local governments are not available, but annual capital spending by New York City exceeds that of most states. Between fiscal years 2010 and 2012 approximately 30 percent of state capital spending was from federal funds, 33 percent was from debt and the remainder came from state budget funds.⁵

The City receives about 20 to 25 percent of its capital funding from the state and federal sources. The remaining city-funded portion is financed fully with debt.⁶ The City relies on three types of bonds: general obligation bonds, backed by the full faith and credit of the City; bonds issued by the Transitional Finance Authority (TFA), which are backed by the personal income tax; and bonds, repaid with user fees, issued by the Municipal Water Finance Authority, a component unit of city government, to improve the water and sewer system.

What stops the city from borrowing for all its capital needs? The State constitution limits general obligation debt to 10 percent of the average of the full value of taxable real property in the previous

five years. The City was close to this limit in 1997;⁷ at the behest of the city leaders, the New York State Legislature created the TFA to increase the city's bonding capacity. TFA is a separate bankruptcy-remote legal entity, initially authorized to offer \$7.5 billion in bonds. Over time, TFA's borrowing capacity has been increased, and is now limited to \$13.5 billion in outstanding bonds. Under state law, the City has authority to issue bonds over this threshold provided that the excess, together with the amount of general obligation debt outstanding, does not exceed the constitutional debt limit. There is no formal limit on Water Authority debt since it is repaid from user fees.

The city is also limited by its ability to repay the principal and interest on the bonds, known as debt service, from the operating budget. If the city borrows too much, the resulting debt service will reduce resources available for other priorities and programs. How much is too much? Each year, the Mayor must issue a Statement of Debt Affordability that demonstrates the level of capital spending proposed is within constitutional limits, and provides metrics on future debt and debt service as a share of the tax base and budget resources. The Bloomberg Administration did not articulate a formal policy for issuing debt,⁸ but consistently kept capital spending at a level such that debt service remained near 15 percent of total city tax revenues.

Capital Plan

Once the resources available for investment are identified, the parameters of the capital program are established. The capital improvement plan is then developed based on strategic objectives, agency needs and requests, policy constraints and feedback from the public. Some state and local governments have clearly defined criteria for prioritizing projects to determine which are included in the plan and which are not.

New York City has a long-term capital planning process. Every two years,⁹ DCP and OMB prepare a rolling Ten-Year Capital Strategy that provides a blueprint for capital spending and describes goals, priorities and major projects for each agency. The city does not have transparent criteria for prioritizing or selecting projects, but much of the spending undertaken since 2007 relates to PLANYC goals and initiatives. A financing plan and ten-year debt projections are also included in the Strategy.

Implementation and Asset Management

The Ten-Year Capital Strategy is implemented through the capital budget and the capital commitment plan.

Funding for New York City capital projects is appropriated in a separate capital budget, which follows the same procedural track as the operating budget: the Mayor releases a preliminary budget

Two Budgets

There are two intersections between the capital and operating budgets, and they are best explained with an example. Suppose the capital budget provides for the construction of a firehouse in Flushing, Queens. The firehouse, which will cost \$10 million to build and is expected to last 50 years, is eligible for capital funding because it is a physical asset with a value greater than \$35,000 and a useful life greater than 5 years.

The City will issue a bond to pay for the cost of constructing the firehouse, and the debt service will be paid from the operating budget. In addition, maintenance of the building will be paid from the fire department's operating budget. The bond does not cover operations and maintenance, and these "lifecycle" costs are not necessarily made clear or taken into consideration when a capital project is approved.

in January and an executive budget in April. The City Council can alter and add to the capital budget before it is adopted, but its size cannot exceed the financing boundaries established in the Statement of Debt Affordability. Just as with the operating budget, the City Council adds hundreds of millions of dollars in spending each year for projects supported by its members before adopting the capital budget.

After it is adopted, an implementation schedule, known as the capital commitment plan, is developed. The commitment plan gives an agency the authority to register contracts to procure assets or to work on projects, and provides schedules for project management. Due to the size of the capital program, the City does not issue separate bonds for individual projects; instead, it borrows hundreds of millions of dollars at once, linking its financing needs to anticipated cash outlays as the contracted work is performed.

Before work can begin, the agency completes a project scope, detailing the project's purpose, the type of construction (e.g. new construction, partial renovation, etc.), needed features, performance standards, important milestones, potential challenges, estimated cost and any other important information. The project is then designed; sometimes this is contracted out, but usually it is completed by city personnel.

Once the design is completed, a request for proposals (RFP) is issued to solicit bids from private contractors. State law requires the City to award the contract to the business that submits the lowest bid. To ensure low-bidding companies do not undercut wages and compromise safe labor practices, a private contractor awarded a public construction or maintenance contract in New York State is required to pay employees on the project a "prevailing wage." Prevailing wage rates, which include supplemental pay for fringe benefits, are determined in New York City by the Comptroller for each occupation and title annually.¹⁰

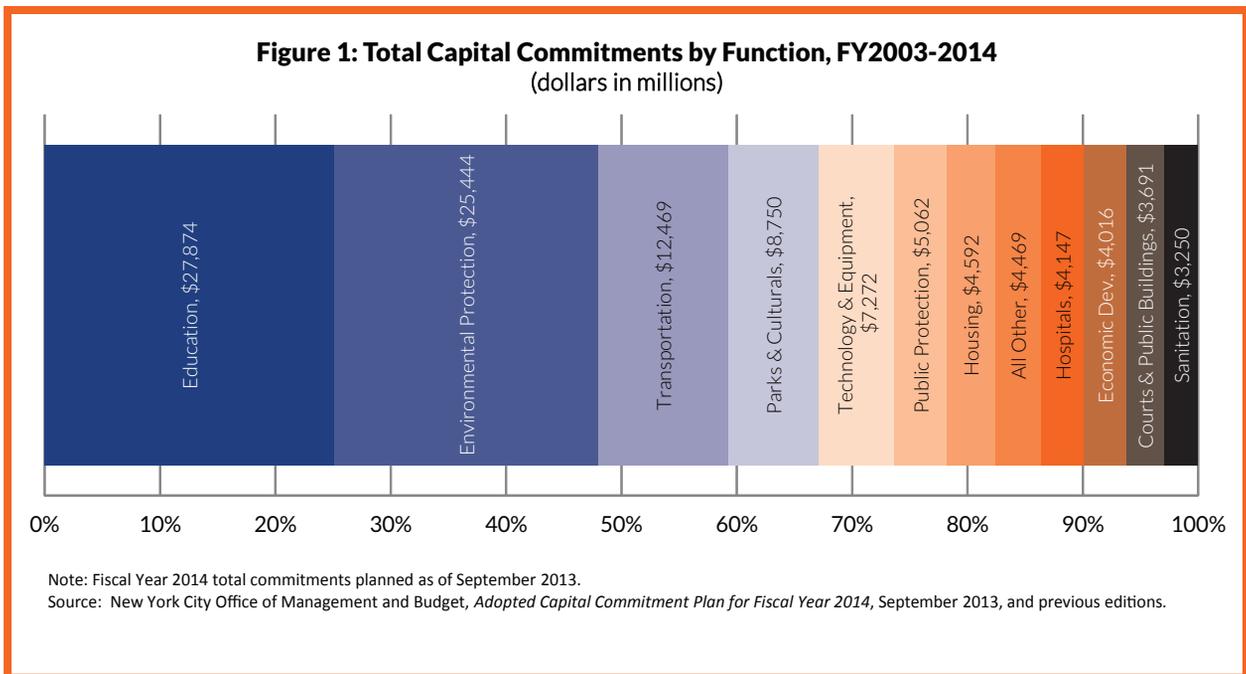
If the project is a building or facility worth more than \$3 million, the city must issue several RFPs— a State law, known as Wicks Law, requires that different contracts be awarded for work on plumbing, electric and heating/cooling systems. Division of construction responsibility, as well as the separation of design from construction, often leads to problems managing the project: for example, the design may prove unworkable or too costly, or the individual contractors may not work well together or organize themselves efficiently, leading to delays or cost overruns.

Once the capital project is completed, regular maintenance should be performed to ensure the asset remains in good working condition for as long as it was built to last. Funding for operations and maintenance of an asset cannot be included as part of the capital budget; these costs should be funded from the operating budget. Nevertheless, capital budgets in the past specified projected maintenance and operations and debt service costs for each capital project; however, these are no longer provided, so "lifecycle" costs and their impact on the operating budget are not taken into consideration when a capital project is approved.

CAPITAL SPENDING DURING THE BLOOMBERG ADMINISTRATION

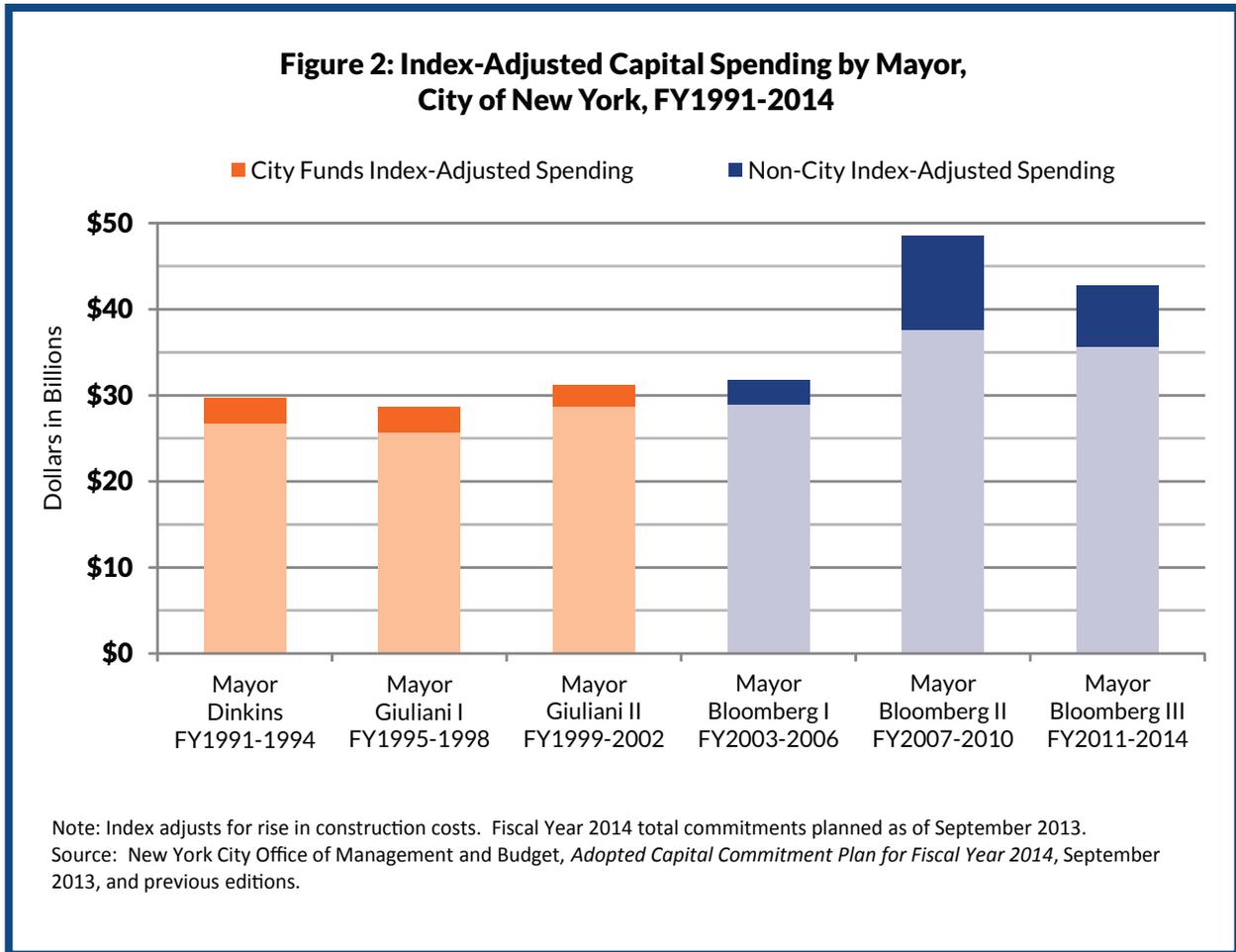
Capital investment has been a hallmark of the Bloomberg Administration: \$90.2 billion worth of capital commitments were registered since fiscal year 2003, with an additional \$20.9 billion authorized in the current fiscal year, for a total of \$111 billion.¹¹

Figure 1 shows how this spending has been allocated across government functions. The bulk of capital work and purchases— almost 70 percent— has been undertaken by just a handful of agencies. Capital spending by the Departments of Education (DOE) and Environmental Protection (DEP) has surpassed all other agencies, totaling \$53.3 billion and 48 percent of all commitments. The Departments of Transportation (\$12.5 billion), Parks and Recreation and Cultural Affairs (\$8.8 billion) have been big spenders, as well.



While other agencies received smaller slices of the pie, the dollars invested across all government functions have been substantial. More than \$7 billion were spent to upgrade technology and purchase new equipment, and \$5.1 billion were used to construct a new police academy, renovate correctional facilities and firehouses, and purchase new vehicles for the uniformed services. More than \$4 billion were devoted to stimulating economic development, renovating and modernizing public hospitals and preserving and developing housing. Sizeable improvements were also made to courts and other public buildings.

The level of capital spending has been unprecedented since the fiscal crisis of the 1970s. After adjusting for changes to construction costs, the City spent \$123 billion under Mayor Bloomberg—\$33.5 billion more than under Mayors Giuliani and Dinkins combined and \$53.5 billion more than under Mayor Koch. As Figure 2 shows, capital commitments during Mayor Bloomberg’s first term were only slightly higher than his immediate predecessors; commitments expanded dramatically during the second term and remained high in the third term.



Reasons for Expanded Capital Spending

Several factors explain the expansion in capital spending. First, the Administration's strategic plan for the city, PLANYC, released in 2007, focused on improving quality of life through repairs, upgrades and enhancements to the city's capital assets. PLANYC included specific goals to reach state of good repair on transportation, to invest in the construction of the third water tunnel and to replace water and sewer infrastructure that is more than a century old. PLANYC also outlined investments to "green" schools and city buildings, expand park space and playgrounds, preserve and upgrade affordable housing, and improve solid waste disposal.

Second, the City was able to pursue PLANYC objectives because the economy prospered. With tax revenues growing rapidly year over year, the Administration could undertake more debt to support greater capital expenditure— with debt service remaining at or below 15 percent of taxes, the metric of affordability relied upon by the Bloomberg Administration.

Third, the City benefited from a new source of intergovernmental aid (see Figure 2). Traditionally, the City's capital program for education was funded almost exclusively by city dollars. Beginning in 2007, the State agreed to pay for half of the DOE's capital program;¹² rather than supplant its own commitment with State dollars, the City expanded the size of the DOE capital plan.

Finally, spending by the DEP was driven by unfunded mandates and paid for by user-fee backed debt. New York City has been granted a rare exemption from filtering its drinking water; but in order to protect the quality of water source, it had to spend \$400 million to acquire land around its reservoirs in the Catskill Mountains to deter development that produces pollution. In addition, the City undertook costly and over-budget projects, such as the \$5 billion Newton Creek Treatment Plant Upgrade and \$3.2 billion Croton Filtration Plant, to comply with federal and state mandates for water quality standards.¹³ DEP is also required to stop combined sewer overflows, the spill of untreated wastewater into the city’s waterways during heavy rainfall. Increased debt by the Water Authority to take on these projects was enabled by steep increases in water and sewer fees— 135 percent since fiscal year 2003— paid by homeowners, landlords and businesses.

Outcomes of Investment

This capital investment increased the value of the assets owned by New York City and its related public authorities by 79 percent since fiscal year 2002 to \$87.7 billion. The value of capital assets owned directly by the City grew from \$26.7 billion to \$50.5 billion – almost \$24 billion. Public authorities under the City’s control, which are also part of the City’s capital portfolio, own \$37.2 billion in assets, \$14.9 billion more than at the outset of the administration.

**Table 1: New York City & Its Public Authorities,
Capital Assets, Net of Depreciation**
(dollars in millions)

	FY2002	FY2013	Change	
			Dollars	Percent
NEW YORK CITY	\$26,659	\$50,510	\$23,851	89%
Education	4,224	19,848	15,625	370%
Transportation services	4,989	9,454	4,465	90%
Land and undepreciated assets	7,934	6,405	(1,529)	-19%
General government	2,643	4,899	2,255	85%
Parks, recreation and cultural	1,666	4,118	2,452	147%
Public safety and judicial	2,821	2,702	(118)	-4%
Health	455	1,019	564	124%
Environmental protection	833	983	150	18%
Social services	815	646	(169)	-21%
Libraries	150	327	177	118%
Housing	0	71	71	-
City University	130	38	(92)	-71%
NYC PUBLIC AUTHORITIES	\$22,318	\$37,183	\$14,865	67%
Water and Sewer System	16,067	27,460	11,393	71%
Housing Authority	4,559	5,662	1,103	24%
Health and Hospitals Corporation	1,594	3,374	1,780	112%
All Others	98	686	588	600%
TOTAL, NYC & PUBLIC AUTHORITIES	\$48,977	\$87,693	\$38,716	79%

Source: New York City Office of the Comptroller, *Comprehensive Annual Financial Report*, Fiscal Years 2002, 2013.

The value of educational facilities has quadrupled since fiscal year 2002 as a result of rehabilitation and expansion of capacity.

As would be expected, the largest gains have been in the areas where the greatest investments were made. In education, the greatly-expanded capital program—which included upgrades to old structures but also the creation of 167 new schools and additions since fiscal year 2003— quadrupled the value of school facilities since fiscal year 2002, bringing the total value to \$19.8 billion, or 40 percent of the City's total capital stock.

Assets of the water and sewer system increased by more than \$11 billion as the City built or reconstructed sewers and water mains, made progress on the Third Water Tunnel, added land and built new water and wastewater treatment plans.

Transportation assets also grew by \$4.5 billion and general government assets increased by \$2.3 billion. In addition, the value of health facilities, parks, cultural institutions and libraries doubled during this period.

It is worth noting the value of the City's assets did not increase by the full amount of capital spending. The value of an asset, once purchased or constructed, decreases as it is used over time; to account for this depreciation, the city reduces the value of a capital asset evenly over the course of its useful life: 25 to 50 years for new construction, 15 to 40 years for infrastructure, 10 to 25 years for reconstruction and 5 to 15 years for equipment. Annual depreciation was \$3 billion in fiscal year 2013 and totaled \$25 billion since fiscal year 2003. Depreciation also explains why values for public safety, social service and city university assets decreased.

Depreciation provides limited insight into whether the condition of the city's assets is improving or declining. Typically, if an asset is fully depreciated, it has reached the end of its useful life and should be replaced. But, it is possible that an asset near the end of its useful life may still be in good working condition because it has been properly maintained or has been rehabilitated. Conversely, a relatively new asset may be in poor condition because routine maintenance or upkeep has not been performed.

While the city reports depreciation for all its capital assets, only the agencies that manage infrastructure and large capital assets provide specific metrics on their condition. The following section culls information from different sources to report on how capital spending expanded and improved the city's assets since fiscal year 2002. The effectiveness has been mixed.

■ **There has been progress in improving the condition of schools and bridges, and green space and the third water tunnel have expanded significantly.**

Schools – The City has greatly expanded capacity and improved the condition of its school buildings. More than 126,000 new seats were added, reducing crowding significantly. Schools that exceed capacity were reduced from 44 percent to 33 percent of elementary schools, from 38 percent to 12 percent of middle schools, and from 64 percent to 32 percent of high schools between fiscal year 2002 and 2012.

Condition assessments also demonstrate improvements in facilities. In fiscal year 2002, more than three-quarters of schools were in “fair” condition, meaning substantial structural, mechanical or electrical repairs were needed. That share decreased to 49 percent in fiscal year 2012. The backlog of hazardous building violations has been virtually eliminated, decreasing to 123 in fiscal year 2013 from 2,200 in fiscal year 2002.

Table 2: Selected Indicators for Major Capital Assets

	FY2002	FY2006	FY2010	FY2013
SCHOOLS				
New schools and additions created since 2003	16	45	124	167
New seats created, cumulative since 2003	14,160	20,007	71,349	126,726
Schools that exceed capacity*				
Elementary	44%	24%	31%	33%
Middle school	38%	15%	9%	12%
High school	64%	48%	37%	32%
Conditions of schools rated as:*				
"Fair to good"	21%	28%	47%	49%
"Fair"	77%	69%	51%	49%
BRIDGES				
Rated "good" or "very good"	296	328	320	326
Rated "fair"	451	456	462	460
Rated "poor" or closed	8	3	5	1
PARKS				
Parks	1,697	1,951	1,896	1,923
Acreage	28,843	28,860	29,043	29,284
Trees planted, cumulative	NA	NA	401,187	770,548
Parks rated as acceptable for:				
Overall condition	88%	88%	83%	85%
Overall cleanliness	93%	93%	88%	90%
Playgrounds rated "acceptable" for:				
Safety surfaces	94%	92%	94%	93%
Play equipment	85%	88%	91%	93%
Monuments receiving annual maintenance	15%	36%	69%	63%
ROADS				
Signalized intersections	11,192	11,946	12,362	12,697
Street lights	329,025	340,000	341,298	343,007
Lane miles reconstructed yearly	48.8	60.2	42.7	51.8
Streets maintained with a rating of "good"	82%	70%	71%	70%
Highways with a cleanliness rating of "good"	NA	NA	98%	100%
On-street parking meters that are operable	90%	91%	83%	99%
Metered spaces with muni-meters	NA	21%	41%	100%
WATER MAINS AND SEWERS				
Water main breaks	494	450	421	403
Water main miles, new or replaced	107.6	47.9	19.1	38.2
Sewers miles constructed or reconstructed	72.1	28.6	14.8	18.7

*For these indicators, fiscal year 2013 values are not yet available; fiscal year 2012 values are shown instead.

Source: New York City Mayor's Office of Operations, *Mayor's Management Report*; New York City Office of the Comptroller, *Comprehensive Annual Financial Report for the City of New York*; selected years.

Bridges – The City uses the State rating scale to assess the condition of bridges. A bridge in “good” condition is one on which maintenance and repairs are performed regularly, while a “poor” bridge is not in a state of good repair and may pose a safety threat that would require it to be closed. Even as it has assumed responsibility for 40 bridges previously owned by other agencies, the Department of Transportation has increased the number of bridges in good condition, while reducing the number of poorly-rated bridges to one: the Brooklyn Bridge. A small pedestrian bridge in Flushing Meadow Park has been closed.

Parks – Increasing green and recreational space was a key initiative of PLANYC: park space grew by 440 acres and 770,550 trees were planted. Even with this expansion, the share of parks rated as “acceptable” by inspectors averaged of 85 percent for overall condition and 90 percent for cleanliness (although the trend has been slightly downward since 2002). Ninety-three percent of playgrounds are rated “acceptable” for safety surfaces and play equipment. In addition, the share of monuments receiving annual maintenance increased to 63 percent from 15 percent in fiscal year 2002.

Third water tunnel – Construction on the third water tunnel began in 1970, in order to allow the first and second water tunnels to be shut down for inspection and repair. The Administration committed more money—almost \$5 billion—to the project than all prior administrations combined. The Manhattan section of the third tunnel was completed and became operational in October, and the remaining sections, which will bring water to the remaining boroughs, are scheduled to be operational by 2026.¹⁴

■ **Investment in some infrastructure, including roads, water mains and sewers, has not been sufficient to prevent further deterioration.**

Streets – In contrast to bridges, the percentage of streets maintained with a rating of “good” decreased from 82 in fiscal year 2002 to 70 in fiscal year 2013. Part of the decline can be explained by a slower pace of repairs: lane miles reconstructed yearly increased after 2002, but fell to a low of 28 in fiscal year 2012 before rebounding to 51.8 in fiscal year 2013.¹⁵ A recent TRIP report rated the New York City-Newark area as 6th among large urban areas in the share (51 percent) of major roads and highways with pavements in poor condition, almost double the national average (27 percent). They estimate the tough terrain causes motorists to pay an additional \$673 a year in additional vehicle maintenance.¹⁶ New Yorkers are highly dissatisfied with the condition of roads: in a 2008 citywide survey, only 39 percent of respondents considered the maintenance of streets and roads in their neighborhoods good or better.¹⁷

Water mains and sewers – Despite record levels of investment in environmental protection, improvements to some of the system’s oldest infrastructure continue to lag. Most water mains are at least 50 years old, and about 20 percent of all water main miles are at least 100 years old.¹⁸ Water main breaks have become less frequent, but the pace of construction and replacement of water mains dropped from more than 100 miles a year to less than 20 in fiscal year 2010 before increasing modestly in recent years. Similarly, only 18.7 miles of sewers were constructed or reconstructed in fiscal year 2013, while sewer backup complaints still number in the tens of thousands each year. More than 40 percent of sewer backups recur locally within two years.

■ **The impact of other investments is unclear.**

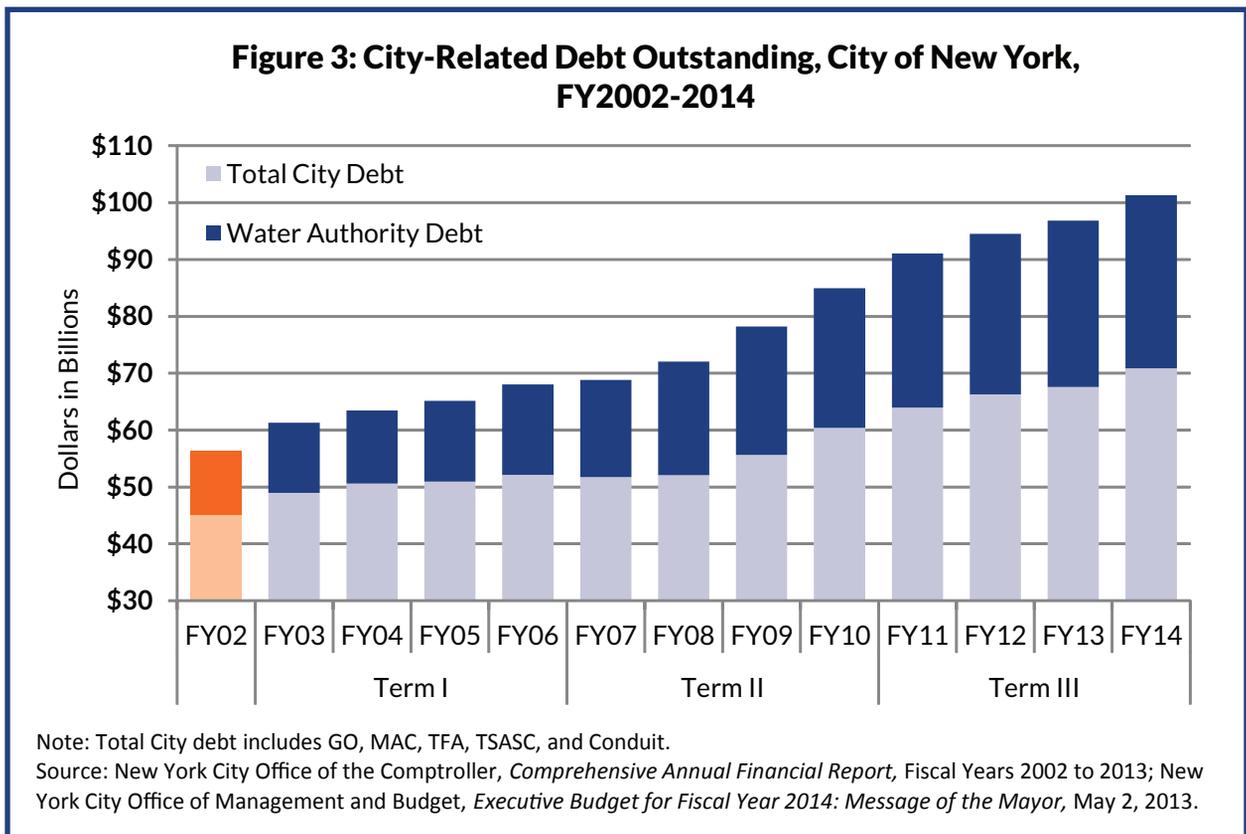
Economic development – Economic development investments ranged from transformational projects like the redevelopment of Willets Point and Coney Island to less ambitious efforts to upgrade infrastructure in industrial areas, improve neighborhood amenities and support projects undertaken by Business Improvement Districts (BIDs). Most of this spending is undertaken by the Economic Development Corporation (EDC) under the rationale that these investments will generate new economic activity; however, little or no analytic evidence is available on the expected or actual return

on these investments. In fact, capital spending is not captured in the cost-benefit analyses published in the EDC’s annual report.¹⁹ This is especially problematic with respect to smaller projects, which generally receive less scrutiny, are sometimes undertaken at the behest of local officials, and are often lumped together under a large appropriation, making it difficult to isolate specific costs and benefits.

Cultural institutions – There are 33 cultural institutions located on city-owned property, but the City also supports approximately 200 non-profit institutions with capital funds. The City does not gain any assets through these investments, but they may make sense if they will generate increased economic activity, such as attracting additional tourists or visitors; however, awards to cultural institutions are not accompanied with analysis demonstrating the expected results of these investments. Many of these investments are made at the request of borough presidents or added by the City Council in the budget adoption process with little scrutiny. This direct capital spending is in addition to triple-tax exempt conduit financing provided by the City to cultural institutions through the Trust for Cultural Resources. At least six institutions have received both conduit financing and capital funds from the city.²⁰

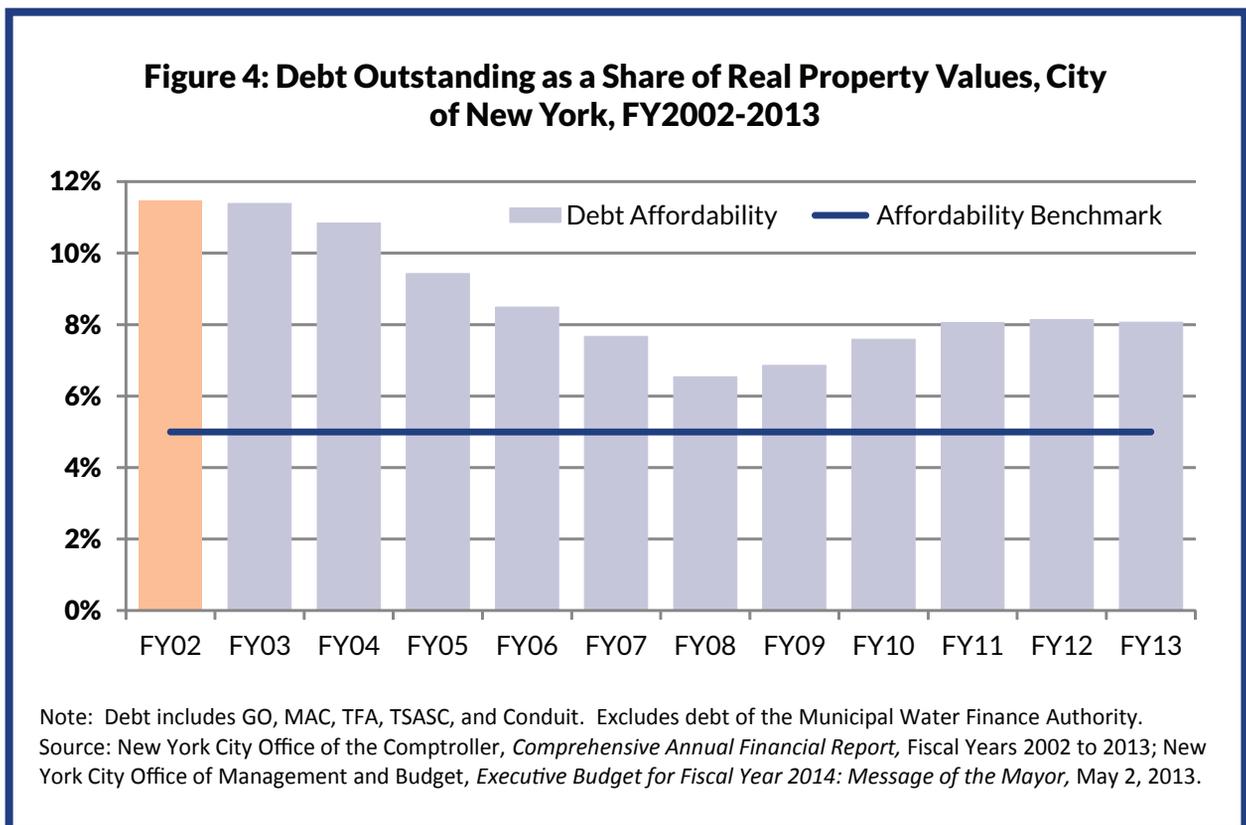
Impact on the City’s Finances

The impact of capital spending is also apparent in the high and growing debt burden. Between fiscal years 2003 and 2014, state and federal dollars funded less than 20 percent of the City’s capital spending; the remaining \$100 billion was financed by debt²¹— issued by the City, the Transitional Finance Authority and the Municipal Water Finance Authority. As a result, the City-related debt outstanding has grown 80 percent since fiscal year 2002, surpassing \$100 billion.



Bond rating agencies typically judge debt affordability in relation to the adequacy of resources available to repay it. Because Water Authority bonds are not legally debt of New York City and are not repaid from the city budget, they are excluded from the affordability analysis; however, other forms of debt—including “conduit debt” from bonds sold on behalf of other entities, now-retired debt of the Municipal Assistance Corporation, and debt from the securitization of revenues from tobacco settlements in the 1990s—are included because they are repaid directly from city revenues.

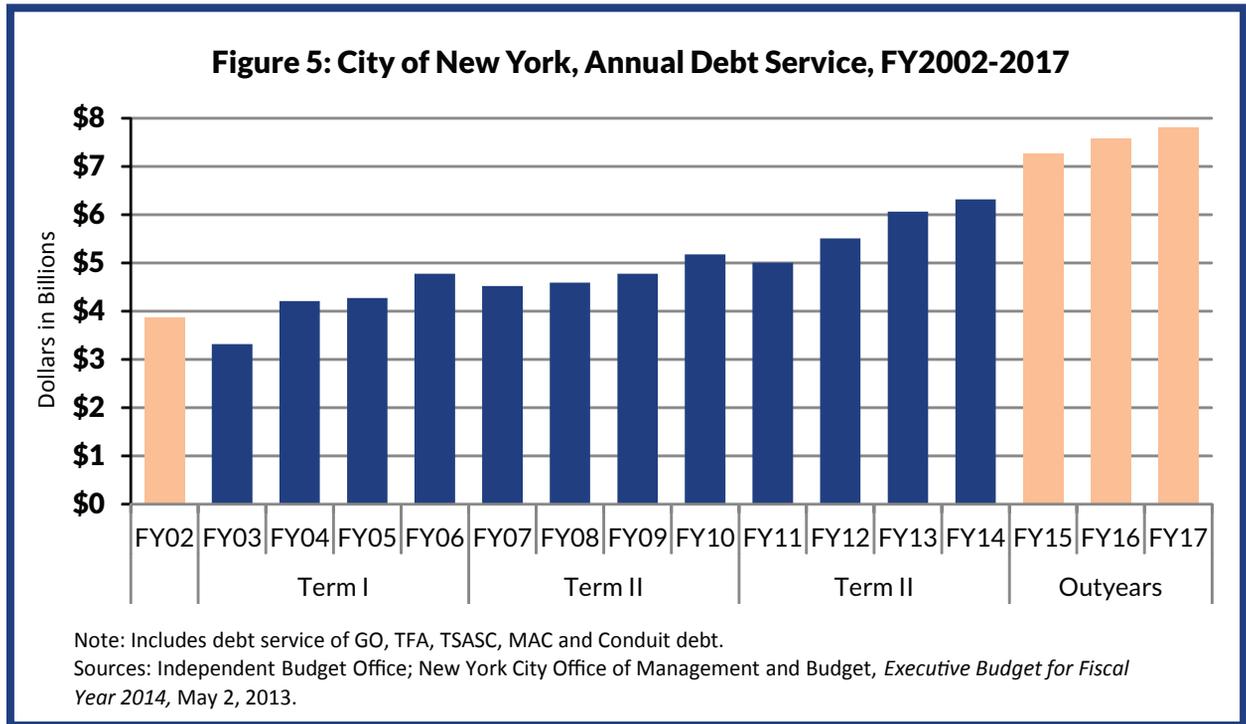
One metric assesses debt outstanding as a share of the full value of real property; a value greater than 5 percent is considered “above average.”²² In fiscal year 2013, the city’s debt totaled \$67.6 billion—more than 8 percent of the full value of property (\$838 billion). Because property values have grown by approximately 7 percent a year, on average, during Mayor Bloomberg’s tenure, the burden is lower than when he assumed office (11.5 percent); however, the ratio has increased since fiscal year 2008, when it reached a low of 6.5 percent – still well above the affordability benchmark.



The results are similar when using an alternative measure: personal income. In fiscal year 2013, the ratio of debt outstanding to personal income was 14.3 percent, more than double the 6 percent benchmark for “high” debt.²³ It is projected to remain at that level until fiscal year 2017, when the city’s debt is projected to reach \$75.5 billion (\$108.4 billion with the Water Authority).

Debt also impacts the city’s operating budget: High and growing debt service costs reduce resources available for other priorities, restrict flexibility to manage operating expenses, and limit the ability to undertake additional capital investments. City debt service has been rising at a rapid rate, growing 65 percent between fiscal years 2002 and 2014. It is projected to grow by an additional 25 percent,

from \$6.3 billion to \$7.8 billion, by fiscal year 2017. The affordability of debt service is examined with respect to the share of spending: more than 12 percent of general fund spending is deemed “above average” and more than 15 percent is “high.” Debt service currently makes up 12 percent of city-funded expenditures and will rise to 13.7 percent by fiscal year 2017.



Mayor Bloomberg’s Final Ten-Year Capital Strategy

The final Ten-Year Capital Strategy devised by the Bloomberg Administration was released in May and approved by the City Council in June 2013. It spans fiscal years 2014 to 2023, and will likely serve as the starting point for the next mayor to develop a long-term capital plan. The Strategy outlines \$53.7 billion in capital commitments, three-quarters of which are for the Departments of Education, Environmental Protection and Transportation.

Half the plan, \$24.5 billion, will be devoted to state of good repair, and a quarter, or \$13.5 billion, will be for replacement. Expansion spending on new assets and large-scale capital improvements will total \$13.6 billion. In addition to the ongoing work to build and renovate schools, repave roads and replace and extend water mains and sewers, notable projects include \$1 billion to replace sanitation trucks, \$900 million for sewer overflow reduction, \$744 million for energy efficiency, including building retrofits, \$550 million for the construction of a new 1,500 bed facility on Rikers Island, and \$200 million for the replacement of the electronic medical record system by the Health and Hospitals Corporation.²⁴

SHORTCOMINGS OF THE BLOOMBERG ERA

Investment in capital assets is important for the city's competitiveness and continued prosperity: at the federal level, the return on investment for infrastructure has been estimated to be as high as \$1.44 for each dollar spent.²⁵ The investments made under the Bloomberg Administration were the underpinnings to increased economic activity, improvements in quality of life and record population and tourism growth; yet the extraordinary level of spending was insufficient to improve the condition of some important capital assets and left the City with a high debt burden. This section describes some practices that limited the impact of investment.

No Citywide Policies for Routine Asset Maintenance and Replacement

The City does not have a formal policy or directive for performing routine maintenance and replacement, and asset management practices at many city agencies are inadequate. As Table 3 shows, agencies vary widely— from 0 to 100 percent— in the share of maintenance needs funded, and in most cases, the amounts spent are insufficient. For example, the Department of Education only funds 65 percent of reported maintenance needs, and comparative research indicates it spends a smaller percentage of its budget on maintenance than other large school districts, including Los Angeles, Houston and Chicago.²⁶

Expenditures for maintenance and upkeep, necessary to keep assets from falling into disrepair, are paid from the operating budget, where they compete with other priorities. While it typically comprises a small share of total agency expenses, maintenance spending is particularly sensitive to reductions during economic downturns: during the most recent recession, attempts to shield classrooms from cuts led the Department of Education to reduce funding for non-capital repairs to school facilities,²⁷ and the share of operational funding for school facilities remains smaller than it was prior to 2010.²⁸ Many elected officials view these maintenance cuts as preferable to layoffs or service reductions because they do not seem to impose a cost to taxpayers or employees; however, deferring maintenance causes assets to fall into disrepair, which proves to be more costly down the road.

Another reason maintenance receives short shrift is capital projects are not undertaken with an eye toward upkeep after the project is constructed or the asset is procured. Operations and maintenance figures are no longer provided for projects in the capital budget, and projects are approved without a clear understanding of the operating resources necessary to properly maintain them. For example, a hallmark initiative of the parks capital program is to plant one million trees; however, the operating budget has not increased to provide for tree pruning. In fact, budget cuts forced staffing reductions that doubled the tree pruning cycle to fifteen years from seven, which is widely accepted as the standard.²⁹ After a series of lawsuits resulting from injuries and deaths due to falling tree limbs in public parks, the City Council added funds for tree pruning before adopting the fiscal year 2013 budget.³⁰

In addition, the City does not adhere to strict replacement cycles for assets that reach the end of their useful lives. While the useful life of some asset classes (buildings, infrastructure, equipment) are identified, assets tend to be replaced on an ad-hoc basis that focuses resources on where they are most urgently needed, e.g. on assets that malfunction unexpectedly. While it may be cost-effective to continue to employ well-functioning assets, extending use well beyond useful life can actually prove to be more costly.

These costs are most vividly illustrated by the disruptions caused periodically by water main breaks. More than 20 percent of water mains are over 100 years old, far past their useful lives and prone to breaks. A break in a 108-year old water main caused a flood on Jerome Avenue in the Bronx in July 2011, submerging cars, ruining personal property and businesses, damaging gas lines and forcing the

evacuation of a homeless shelter.³¹ A water main dating back to 1880 burst in Mott Haven this past August, causing transit, traffic and power disruptions in the area for several hours.³² The costs incurred go beyond emergency repair crews and replacement mains; there are the “hidden” costs to taxpayers of damages, delays, disruptions and lost economic activity that are even greater.

Table 3: Share of Stated Maintenance Needs Funded From Expense Budget, City of New York, FY2014

(Dollars in Thousands)

	Reported Need FY2014	Share Funded	Need as a Share of Agency FY2014 Expense
Small Business Services	\$10,262	100%	9.05%
Correction	5,982	100%	0.56%
Health & Mental Hygiene	3,442	100%	0.25%
Homeless Services	4,935	100%	0.54%
Health & Hospitals Corp.	17,887	97%	9.45%
Transportation	94,878	88%	11.97%
Citywide Administrative	16,180	85%	1.40%
Police	12,299	80%	0.26%
Fire	1,917	67%	0.11%
Education	127,245	65%	0.64%
Children's Services	1,252	50%	0.04%
Libraries	3,969	46%	1.68%
City University	10,279	27%	1.16%
Parks and Recreation	29,029	12%	7.63%
Sanitation	6,456	11%	0.45%
Aging	742	11%	0.29%
Cultural Affairs	17,658	0%	11.26%
Human Resources	1,730	0%	0.02%
ALL TOTAL	\$366,142	66%	1%

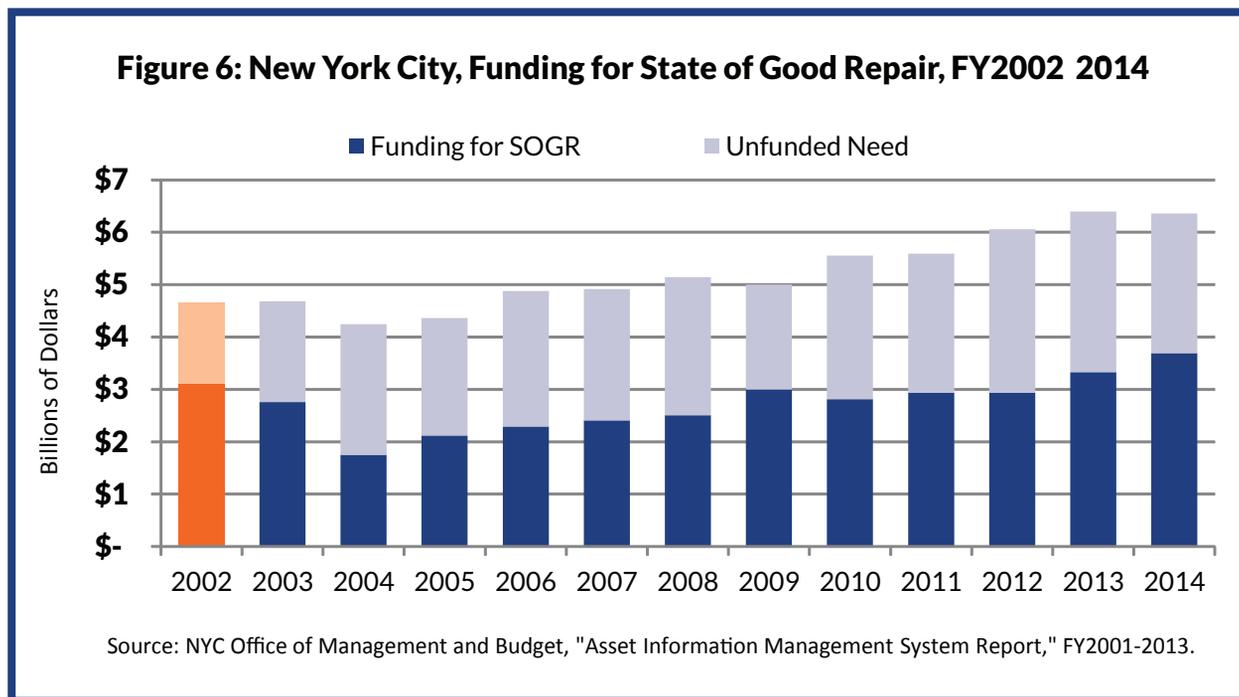
Notes: Maintenance is typically the responsibility of individual cultural institutions, not the Dept. of Cultural Affairs. Small Business Services assumes the Economic Development Corp. will undertake all necessary maintenance. Dept. of Transportation totals do not include flag repairs. The Dept. of Education will undertake additional spending on preventive maintenance, minor repairs and comprehensive surveys.

Source: New York City Office of Management and Budget, "Asset Information Management System Report: Agency Reconciliation," Fiscal Year 2013.

Failure to plan for the replacement of assets also creates disincentives for performing regular maintenance; rather than use scarce operating dollars to perform maintenance, assets that are allowed to deteriorate can be replaced with funds from the capital budget. Of course, once assets fall into disrepair, replacing them is more costly than performing maintenance would have been; for example, repairing or rehabilitating pavement costs six to eight times more than maintaining it in good condition.³³

Insufficient Investment in and Planning for State of Good Repair Work

As a result of its asset management practices, the City is falling further behind on the maintenance backlog: State of good repair requirements, as reported in the Asset Information Management System (AIMS), have grown from \$4.6 billion in fiscal year 2002 to \$6.4 billion in fiscal year 2014. The dollars invested in state of good repair also grew— from \$1.7 to \$3.7 billion— but not sufficiently to keep pace with growing needs. The share of need funded dropped from 64 percent to a low of 41 percent in 2004, and has averaged around 50 percent since.³⁴



The funding shortfall is likely underestimated, as AIMS is limited in scope, excluding less valuable assets like equipment and vehicles, and large assets, such as the water and sewer system and public housing. The maintenance backlog at the New York City Housing Authority (NYCHA) has been well documented in the press; at its peak, there were 423,000 open work orders on 179,000 units.³⁵ NYCHA's most recent Physical Needs Assessments identified more than \$13 billion in unmet needs through 2015, with \$7.5 billion anticipated in the 2011-2015 period.³⁶

Less is known about the magnitude of needs for the water and sewer system. The engineers contracted to independently review the system's condition label it as "adequate" and note increased resources devoted to state of good repair work in the current capital plan, but estimates of total need are not reported.³⁷

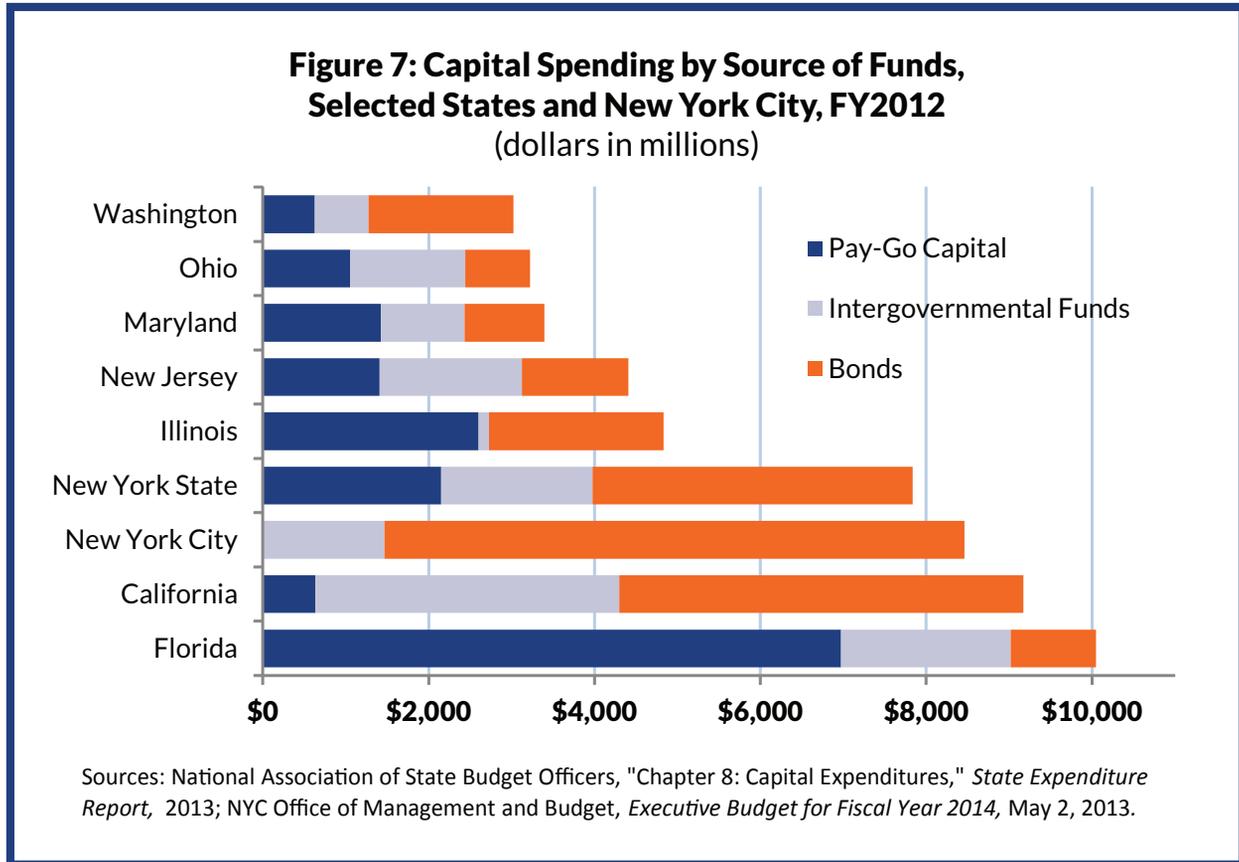
Reaching a state of good repair on the transportation network was a key goal of the first PLANYC report; however, after State legislative leaders failed to approve a congestion pricing scheme that would have provided a new source of revenue for improvements, the goal was dropped from the 2011 update to the plan. Academic research suggests that improvements to highway conditions yield the greatest rate of return;³⁸ nevertheless, the City does not have a plan or schedule for achieving state of good repair on its transportation infrastructure or other assets.

Increased Spending Paid for Almost Entirely By Debt

The vision behind PLANYC was broad and long-term, and the agenda did not focus solely on state of good repair: it included goals to expand or build water tunnels and mains, sewers, parks and waste transfer stations. In addition to these priorities, the city also allocated substantial capital dollars to non-PLANYC areas: school buildings, neighborhood revitalization projects, a new police academy, public hospitals and non-profit cultural institutions. Spending was spread out across many objectives instead of being focused on a handful of important priorities.

These projects were paid for by proceeds from the sale of bonds; with the economy thriving between 2003 and 2008, growing revenues allowed the City to borrow increasing amounts without debt service exceeding 15 percent of tax revenue, the Administration’s affordability metric. This limited the need to prioritize projects strictly; more projects could be undertaken at once.

As Figure 7 shows, most large states fund public capital projects with a mix of debt and current budget resources. When the economy is doing well, state and local governments flush with revenues typically



increase “pay-go” capital from the operating budget.³⁹ While the City recognized record year-end general fund surpluses ranging from \$3.5 to \$4.7 billion between fiscal years 2005 and 2008, just \$500 million was devoted to pay-go capital in fiscal years 2006 and 2007— less than 3 percent of the capital commitments registered in these two years. Since 2008, surplus funds have been used to plug budget deficits and the capital budget has been financed exclusively with debt, resulting in the City’s high debt burden.

Increased Capital Spending During a Period of High Construction Costs

Capital spending began to ramp up in 2005, in the midst of a construction boom during which costs were escalating rapidly. General contractors reported annual cost increases as high as 10 to 12 percent in 2005 and 2006.⁴⁰ By 2008, construction costs citywide were 30 percent higher than they were in 2002.⁴¹ The construction bid price for school capacity projects increased from \$314 to \$468 per square foot— an increase of almost 50 percent— between fiscal years 2003 and 2008. The average cost per street lane mile resurfaced citywide increased similarly during this period. Driving the increases were high land, labor and material costs, as well as “soft costs” such as those related to design, insurance and financing.⁴²

The City bid many construction projects during this time period, with a record level of commitments in fiscal years 2007 and 2008. Contracts were more pricey— not only because costs were rapidly rising, but because the boom resulted in a shortage of contractors available to undertake the work.⁴³ The share of construction contracts which received at least 3 bids declined from 91 percent to 82 percent between fiscal years 2004 and 2008. As a share of contract value, the decline was steeper, dipping from 85 percent to just 26 percent. This indicates several large contracts—mostly for the water and sewer system—were bid with little competition, and hence limited opportunities for savings.

The city has continued to maintain a robust capital program since 2008, and the number of contracts soliciting at least 3 bids has grown steadily to encompass almost all contracts— 93 percent by number and 96 percent by value— in fiscal year 2013.

Contracting and Management Challenges Contributed to Delays and Overruns

State laws complicate contracting and management of public projects in three important ways: the method of procurement; the pay and scheduling of workers; and organization of the work.

State law restricts the procurement methods available to the City. Construction contracts must be awarded to the lowest bidder. This does not allow the City to bid contracts under the “best value” method, which permits consideration of the expertise and prior performance of a contractor, the quality of materials and approach, and other relevant factors in addition to price.

The State’s prevailing wage laws govern the compensation and scheduling of construction and building service workers on public projects. In New York City, the Comptroller is responsible for the annual determination of wages and supplemental pay for fringe benefits that public contractors doing business with the city must provide their employees. A 2012 CBC report found these wages were not determined in a simple or transparent manner, and were almost always higher than mean hourly wages in the New York City metropolitan area— in some cases, by as much as 200 percent. Mandated supplemental rates of pay were also quite costly, doubling the wages of some titles and trades.⁴⁴

The prevailing wage statute also imposes strict work rules. Employees in building and construction trades are not permitted to work more than 8 hours a day or five days a week, except in cases of “extraordinary emergency.” In addition, rest periods of 20 minutes or less are considered time worked.

Any hours worked in excess of eight hours in a single day are subject to overtime pay, which must be paid even if employees are called to work fewer than five days in a given week or do not reach a maximum of 40 hours that week. Employers must apply and be authorized by the State Department of Labor to allow a 10-hour/ 4-day work schedule, and there are few such exceptions. These restrictions add to the cost of labor on public projects; a report by the Citizens Housing and Planning Council found prevailing wage mandates increase the cost of housing construction by 25 percent.⁴⁵

Another state regulation, Wicks Law, requires several subcontractors to work on building construction or renovation. The Office of Management and Budget estimates it increases costs by 14 percent on average,⁴⁶ although by some accounts, subcontractors add 20 percent to their bids to general contractors for public projects.⁴⁷ Bidding the work out to one contractor and letting her delegate the work would be more efficient and cost-effective.

Wicks Law is one reason some construction projects are not completed on schedule. Thirty-one percent of school capital improvement projects are completed late and 29 percent are over-budget. Almost 30 percent of structural work on bridges is completed late. The Department of Design and Construction, which manages the capital portfolios of most city agencies, reports that 10 to 15 percent of design projects and 12 to 17 percent of construction projects are late.

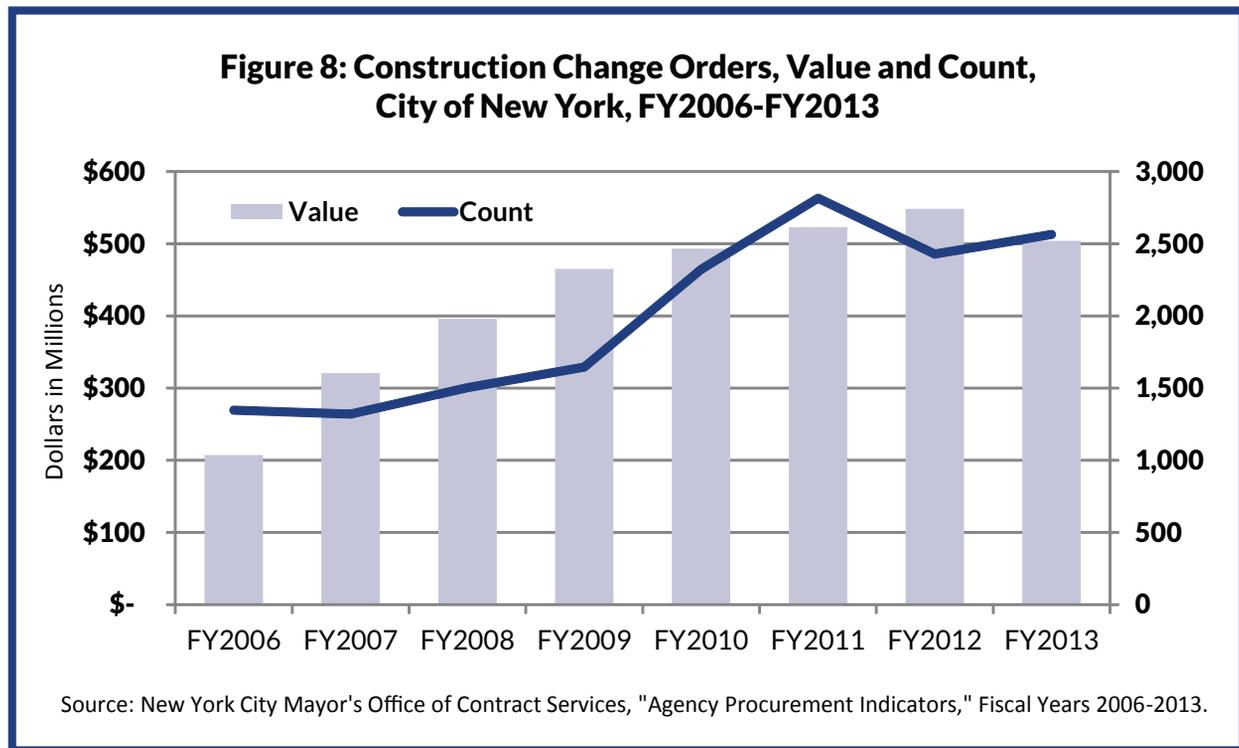
Contributing to delays is the lengthy time to process change orders. Change orders authorize additional work on a project that is outside the original scope, but not a material change to the project; common reasons for change orders include uncertain field conditions, design omissions or errors or changes necessitated by administrative or political input. Reforms enacted in 2008 focused on halving the time needed by agencies to process changes orders caused by unforeseen field conditions from 300 days to 150 days,⁴⁸ but the average time to process change orders remains high: 71 days for design work and 98 days for construction work, on average.

Design change orders tend to be more costly than construction change orders. The average design change order was approximately \$750,000, and the total value of design change orders in fiscal year 2013, \$130 million, constituted almost 20 percent of the original contract values. While some of these changes are intended to reduce construction costs later in the process, they are also indicative of insufficient scoping and a lack of capacity to manage the design process. Fortunately, both the volume and the value of design change orders have declined since fiscal year 2008, the first year for which data was reported. A pilot project in which \$20 million in operating budget resources were appropriated for preliminary project scoping has contributed to this decline.⁴⁹

On the other hand, the number of construction change orders doubled since fiscal year 2006 and the value grew from \$210 million to \$500 million in fiscal year 2013. Change orders increased the value of contracts by 3.5 percent on average, but by as much as 11 percent for agencies such as the Department of Parks and Recreation.

Almost 40 percent of all construction change orders originate from a single agency: the Department of Environmental Protection (DEP). In the last decade, DEP has undertaken large capital projects that have suffered from delays and cost overruns. The most prominent example is the Croton Water Filtration Plant, originally projected in 2004 to be completed in 2012 at a cost of \$1.2 billion.⁵⁰ According to the Independent Budget Office, the project was poorly scoped, resulting in cost underestimations, including parts of the project being completely left out of the original estimates.⁵¹ Amidst delays, the cost ballooned to \$2.1 billion, and the federal government began fining the City \$30,000 per day for failing to have a primary contractor in place to start work.⁵² The cost of completing the plant is now projected to be \$3.2 billion,⁵³ more than double the original cost. Plant commissioning is not expected to occur until the first quarter of 2014.⁵⁴

The Catskill/Delaware Ultra Violet Filtration Plant is another megaproject that has suffered cost overruns. The UV Plant was constructed in response to the federal Surface Water Treatment Rule, which requires filtration of surface water unless a waiver is acquired.⁵⁵ To avoid a \$10 billion full-scale filtration plant, the DEP won approval in 2004 to construct the UV facility at an expected cost of \$600 million. Operations were expected to begin in 2009; the plant began operating in 2012 and was completed, at a cost of \$1.6 billion, in October 2013.⁵⁶



Capital spending by the Department of Environmental Protection is projected to decrease as the City completes large, over-budget, federally-mandated projects like the Croton Water Filtration Project. This spending trajectory assumes that currently planned megaprojects⁵⁷ will not experience the cost overruns of past projects and that the City will successfully fend off any additional mandates. Part of this strategy calls for limiting traditional, or "grey," infrastructure investments and supplementing them with "green" technologies and investments, like swales, green roofs and permeable pavements. These investments are expected to achieve important goals, like limiting combined sewer overflows, in a more cost-effective and eco-friendly manner than building massive new plants.

Funding Gap for Resiliency and Mitigation Efforts

PLANYC included many initiatives to limit the impact of climate change on the city: replicating the Staten Island Bluebelt model, expanding wetlands, changing building codes to improve sustainability, expanding sewers, creating green spaces and improving the reliability of power delivery.⁵⁸ Many efforts were already underway and funded in the capital budget.

After Hurricane Sandy, the Bloomberg Administration issued a report that analyzed the weaknesses in the city's infrastructure and government operations during and immediately after the storm. The report made a broad set of recommendations for repairing infrastructure, hardening utilities and

buildings, improving coastal protection, particularly in the most vulnerable neighborhoods, and generally mitigating the impact of future storms.

The plan's price tag was \$20 billion; however, this was an understatement, as for many of the recommendations, e.g. "Seaport City," the specified cost is for studying the feasibility of the project, rather than completing it. More importantly, even with half the stated cost expected to be covered by federal funds and \$5.5 billion already authorized in the Capital Strategy, the plan still had a stated funding gap of \$4.5 billion.⁵⁹

FRAMEWORK FOR DEVELOPING THE NEXT TEN-YEAR CAPITAL STRATEGY

When the new mayor enters office in January 2014, he will have a year to devise a Preliminary Ten-Year Capital Strategy to start in fiscal year 2016. Capital investment is important to the city's continued competitiveness as a place to live, work and visit. As the city's population grows, infrastructure continues to age, and the threats of climate change become increasingly apparent, the next mayor and his team will have to address these challenges in a fiscally responsible and cost-effective way. CBC proposes this framework to help the next administration develop the Ten-Year Capital Strategy for Fiscal Years 2016-2025:

Improve Asset Management and the Capital Planning Process

Capital strategy priorities should be informed by capital needs. Keeping assets properly maintained and limiting the growth in state of good repair work requires having protocols in place for maintaining and replacing assets regularly.

There is no single, comprehensive source on the condition of the city's assets and infrastructure; agencies use different criteria and metrics for their assessments and reporting. The City Charter intended the Asset Information Management System (AIMS) report to be the citywide asset inventory and condition report, but AIMS is not comprehensive in scope; it excludes the water and sewer system and public housing, both managed by public authorities, as well as less valuable assets like equipment and vehicles.⁶⁰ For agencies that do provide estimates, they do not dovetail with other capital planning documents—neither the objectives specified in the capital strategy nor spending provided in the capital budget. This makes it extremely difficult to understand the trade-offs between and within agencies, to assess progress toward achieving state of good repair, and to understand clearly what capital spending is intended to achieve each fiscal year.

The next administration should take four steps to improve the city's asset management and capital planning processes. First, it should enact clear guidelines or directives for performing routine maintenance and regular replacement of assets. This will prevent the state of good repair backlog from growing and will limit the costly damages and emergency repairs that occur when assets long past their useful lives break or malfunction.

Second, all city agencies and component units should undertake a comprehensive needs assessment that details the condition of major asset classes and the cost to fix those in disrepair. The City of Portland provides a model for a citywide asset report that is clear and easy to understand. It details the replacement value of assets, summarizes asset management practices and accepted industry best practices, describes approaches for inspecting assets and the confidence level of the assessment, analyzes asset condition, and reports a funding gap based on standards for asset upkeep and service delivery.⁶¹

Third, the needs assessment should be used to develop a plan to achieve state of good repair. The plan should include a detailed timeline with four-year and ten-year goals that are used to develop the capital budget, commitment plan and the ten-year strategy.

Finally, this timeline should be used to publish easy-to-read progress reports, similar to those issued for PLANYC, that describe what the capital program accomplished in that year relative to state of good repair goals. The progress report should not be limited to state of good repair objectives, of course; it should also show expansions in the city's asset base and report on how major capital projects are proceeding, including whether they are on time and on budget.

Develop an Investment Standard that Includes Policies for Debt and Pay-Go Capital

The next mayor must focus on reducing the city's high debt burden. The scale of capital spending should be defined by an investment policy that includes two standards: one for maintaining a responsible level of debt and one for the regular use of pay-as-you-go capital.

Debt outstanding is high under either benchmark used by the rating agencies, and debt service currently makes up 12 percent of city-funded expenditures, which is above average. The most recent financial plan indicates the share will rise to 13.7 percent by fiscal year 2017. The next administration should articulate a standard for keeping debt from becoming unaffordable.

The administration should also develop criteria for paying for some capital expenses from the operating budget. Almost all states rely on a mix of debt and pay-go capital to fund their capital programs, and the use of pay-go funds helps keep the long-run debt burden manageable. A reasonable policy would be to fund the regular replacement of vehicles and equipment using pay-go capital; based on the most recent ten-year capital plan, this would result in \$300 million in annual expenditures from the operating budget— less than one percent of the total. The administration may choose to seed a fund for pay-go capital with a new revenue source, such as tolls on the East River Bridges or taxi medallion sales to fund the regular reconstruction of roads or other transportation improvements. Another approach would be to have a standard for dedicating a share of yearly surplus revenues or annual budget growth toward capital projects.

Decreasing the debt level and using operating funds for capital expenses would also give the City some leeway to switch off between the methods of funding in a counter-cyclical way to maintain a level capital program, not one that spikes during good times and declines during recessionary periods.

Use Clear Guidelines to Establish Priorities in the Capital Strategy

Restraining the level of debt incurred by the City will require greater prioritization of projects in the capital plan. Rather than pursuing a diffuse set of priorities, investment should be focused with the purpose of achieving transformative results toward the improvement of the city's assets and reaching state of good repair.

The mayor will have very little flexibility with a portion of the capital plan. Some projects, such as those mandated by the federal or state governments and those related to hazard, will have to be included in the plan. Large, ongoing projects, such as the third water tunnel, in which the City has already invested substantial resources, should also continue. And it makes sense to include projects that are backed or tied to federal or state funds, like post-storm recovery and some resiliency initiatives. In some cases, the mayor may exercise discretion to slow down the pace of expenditures; for example, he may dedicate less per year toward constructing the third water tunnel in Queens or rehabilitating the school system while still maintaining a level of investment that allows for progress toward those goals.

To devise the remainder of the plan, the City should adopt a "fix it first" strategy, in which state of good repair projects receive priority at each agency. After serious disinvestment in infrastructure in the 1970s and 1980s, the City made progress in improving the condition of its capital stock. But capital needs remain large for some agencies; a concerted focusing of resources toward state of good repair is needed to finally put a real dent in the maintenance backlog. Seventy percent of the next Ten-Year Capital Strategy should be dedicated to state of good repair work until 70 percent of the state of good repair backlog is eradicated. The share of spending dedicated to state of good repair can then be reduced to give greater priority to other investments.

The next set of priorities should be for the regular replacement of those assets needed to ensure that service levels are maintained or improved. Replacement offers an opportunity to use technological advances to recognize efficiencies, such as swapping single-spot parking meters prone to failure with the multi-area muni-meters that accept credit cards.

Any funds that remain should be dedicated to new or expansionary projects. Proposed expansion projects should be accompanied with rigorous cost-benefit analysis demonstrating service improvements or economic enhancements, and only projects with the greatest potential return on investment should be included in the capital plan. Some examples of worthy investments in the current capital plan include \$400 million to construct or extend sewers in Queens and Staten Island, with priority given to areas that experience frequent flooding and are served only by septic systems or sanitary drains; a \$46 million “re-engineering” initiative to modernize the computer systems and databases of the Human Resource Administration, allowing it to improve customer service while reducing its staff by 385 positions;⁶² and \$20 million for street upgrades, including lane markings, signals and a photo enforcement system, to expand or improve Select Bus Service.⁶³

Adopt More Cost-Effective Approaches to Contract and Construction Management

Changes to contracting rules and practices are necessary. Increased funding in the operating budget for project scoping can improve the design process and reduce the need later for change orders. The City should also renew its Project Labor Agreements to reduce labor costs and improve managerial flexibility. First negotiated in 2009, these agreements saved between 3 to 15 percent on 213 project contracts worth a total of \$3 billion, with \$300 million in estimated capital budget savings over four years.⁶⁴ The savings are derived from exemptions to Wicks Law requirements and changes to work rules, most notably caps to overtime and flexibility in scheduling times and across job sites. The Project Labor Agreements expire on June 30, 2014 and should be renewed.

City leaders should also advocate for changes to contracting rules that increase costs and impede efficient construction management. This State agenda should consist of a repeal of Wicks Law and an expansion of the city's toolbox for effective contracting, including the latitude to award construction contracts on a “best value” basis and the authority to pursue public-private partnerships. “Best value” contracts would allow city agencies to choose contractors with a demonstrated record of timely and on-budget performance, limiting the need for change orders, or to select a bid that promises higher

A “Fix it First” Strategy

In 2003, the Michigan Department of Transportation released a capital plan called “Preserve First,” in which capital investments designed to bring the transportation network to state of good repair were prioritized over expansions. New projects were deferred until 90 percent of existing roads and bridges were restored to good condition. This prioritization led to a significant increase in the condition of the state's surface transportation assets: the share in fair or good condition increased from 84 to 94 percent for non-freeway bridges and from 70 percent to 87 percent for pavement between 2002 and 2012. The National Cooperative Highway Research Program praised the use of a variety of fixes at critical points in asset lifecycles to maximize infrastructure investments.

quality materials that can reduce maintenance costs down the road. Public-private partnerships build on best value contracting, as CBC explained in its 2008 report, by focusing on objectives, costs and asset performance across the entire lifecycle of a capital asset, allowing the city to achieve savings across both capital and operating budgets.⁶⁵

ENDNOTES

¹ See New York City Charter, Chapter 1, Section 17. The Mayor's strategic policy statement should also draw upon the strategic policy statements issued by borough presidents.

² Community boards submit Statements of Community District Needs that detail their operating and capital budget priorities.

³ New York City Charter, Chapter 8, Section 203; see also New York City Department of City Planning, "Fair Share Criteria: A Guide for City Agencies," 1998.

⁴ See New York City Charter, Chapter 8, Section 204. Significant expansions and reductions are those that would expand or reduce the size or capacity of a facility by 25 percent or more.

⁵ National Association of State Budget Officers, "Capital Expenditures," *State Expenditure Report: Examining Fiscal 2010-2012 State Spending*, 2013.

⁶ In fiscal years 2006 and 2007, \$500 million in pay-go capital was allocated from the budget.

⁷ To see a calculation of the City's legal debt margin under the constitution dating back to 1997, visit New York City Office of the Comptroller, "Legal Debt Margin Information," *CheckbookNYC*, accessed October 15, 2013, <http://www.checkbooknyc.com/trends/node/407>.

⁸ In 2001, the Giuliani Administration issued a statement of debt policy that defined an affordable debt burden as one for which debt service does not exceed 20 percent of city tax revenues.

⁹ The New York City Charter states the preliminary version of the Ten-Year Capital Strategy should be released in November of even-numbered years, although the last few editions have been released in January of odd-numbered years with the Preliminary Financial Plan. The City Planning Commission and City Council hold hearings on the plan, solicit input from borough presidents, community boards and the public, and issue responses that are taken into account before a final version is released in April.

¹⁰ For more information on prevailing wage, see Citizens Budget Commission, "6 Things New Yorkers Should Know About Prevailing Wage," February 2012, http://www.cbcny.org/sites/default/files/REPORT_PrevailingWage_02142012.pdf.

¹¹ Includes \$4.9 billion reserve for unattained commitments; net of this reserve, the commitment plan for fiscal year 2014 is \$16 billion. Total commitments in fiscal years 2014 reflect an agreement by the Mayor, Comptroller and City Council to accelerate work originally planned in fiscal years 2015 and 2016.

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Primer on
**PROJECT
DELIVERY**

Second Edition

**Developed by the Joint Committee of
The American Institute of Architects
The Associated General Contractors of America**

Primer on Project Delivery Second Edition



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Contents

Introduction	1
Key Considerations	2
Delivery Method Definitions	4
Resources	9
List of Industry Contracts	11

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Introduction

To help architects and contractors achieve quality projects that fulfill owner expectations and are delivered on time and on budget, The American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) formed a task force to produce this second edition of the *Primer on Project Delivery*. Intended to improve understanding for the mutual benefit of owners and the design and construction community, it is primarily addressed to owners who are unfamiliar with the various ways of procuring design and construction services. The AIA and AGC recognize that many viable project delivery methods are available, so the primer is not meant to endorse any one delivery method over another.

At present, there are no industry-wide accepted definitions of project delivery methods and many groups, organizations, and individuals have developed their own. In so doing, they have often used different characteristics to define the delivery methods. The result has been a multiplicity of definitions, none of which is entirely right or entirely wrong. This primer offers basic definitions to help owners better understand their options.

The main criteria for measuring the success of any project delivery method are cost, quality, time, safety and how the project ultimately meets its intended purpose. However, responsibilities for meeting these criteria vary by method. Each delivery method offers a different level of risk to the owner.

The goals of this publication are:

1. *To develop a set of definitions for the four primary delivery methods—Design-Bid-Build, Design-Build, Construction Management at-Risk, and Integrated Project Delivery.*
2. *To create definitions broad enough that all hybrids fall within the four primary delivery methods mentioned above.*
3. *To encourage consensus on a set of defining characteristics for each delivery method. Defining characteristics define a delivery method. Typical characteristics may be common to a delivery method, but are not required to define it.*
4. *To provide the industry with a set of definitions that others can use as a baseline. The design and construction industry has lacked standard definitions for so long that industry-wide consensus will not be reached quickly. Therefore, the goal of this primer is to provide a baseline against which people can reconcile their own set of definitions.*

Note: Some states have laws that establish delivery methods and associated responsibilities. Check with your architect or contractor for assistance in reconciling differences within your state. AGC's Construction State Law Matrix™ (www.agc.org/slm) and AIA's Project Delivery Statute Matrix (<http://www.aia.org/aiacmp/groups/aia/documents/pdf/aias078880.pdf>) are also useful resources for locating information on state laws affecting public or private construction projects.

Risk Tolerance and the Project Delivery Decision

Risk Tolerance regarding the choice of project delivery methods can be defined as the extent to which an organization chooses to risk experiencing a less favorable outcome in the pursuit of a more favorable outcome (*adapted from the International Standards Organization (ISO)*).

All things being equal, most organizations prefer paths where risk is consistent with their tolerance. This idea of risk is completely applicable to the decision regarding project delivery methods and can be seen as one of the factors why there is reluctance to implement certain project delivery models.

New project delivery methods have a structure focused on collaboration, while at the same time eliminating the adversarial nature of traditional models. This is appealing to some owners. There are several ways these collaborative models can be structured from mergers, to hires, to partnerships on a project by project basis.

Whether the various disciplines of design and construction management are provided in-house or whether there is some sort of partnering relationship established; collaborative project teams must provide the necessary leadership to deliver on an owner's expectations of cost and quality, while taking on the risk inherent in all design and construction projects.

This task force worked to reach consensus on how projects are delivered and to ensure that the language used is method-neutral. There was considerable discussion of the terms used to describe the four primary delivery methods discussed in this primer. The task force recognized that delivery and management terms such as "CM-adviser," "CM-agent," "program management" and "turnkey" are appropriate in some situations, as are terms that describe variations of some delivery methods, such as "bridging" as a variation of Design-Build. However, use of these terms is not in keeping with the goal of creating definitions broad enough to include all hybrids of the four primary project delivery methods.

The task force participants learned from this experience, and hope that others will also benefit from the information contained in this document.

Key Considerations

Delivery vs. Management

Before defining the project delivery methods, it is important to distinguish between the delivery and management aspects of project delivery. "Delivery" refers to the method for assigning responsibility to an organization or an individual for providing design and construction services. "Management" refers to the means for coordinating the process of design and construction (planning, staffing, organizing, budgeting, scheduling, and monitoring).

For example, CM at-Risk is a project delivery method and CM-adviser is a form of project management. While this difference in leadership may appear subtle, it is nonetheless important to the understanding of the different delivery methods. Assignment of contractual responsibility is a key concept for differentiating project delivery methods. Considering outsourcing of such responsibility and administration is an option that owners may want to address in any project.

Technology

Building Information Modeling (BIM) is a software tool that can be used with any of the project delivery methods discussed in this document. Because it is relatively new in the marketplace, there has been confusion that BIM is reserved exclusively for use with IPD projects. This is not the case. BIM is a technological choice that allows the IPD process to work most effectively, but is not a defining characteristic of that delivery method. BIM is a technology tool that is well suited for IPD projects because a collaborative delivery process paired with a technological catalyst creates a shared database of information available to all members of the team at the same time. This early access to information is the fuel that drives the successful outcome of a project. All team members utilize their specific area of expertise to inform the project design, make value-added decisions, and thereby advance the outcome. Still, BIM can be used with any of the delivery methods described in this primer.

Selection Procedures

How the owner selects the primary service providers has a significant effect on the project delivery method and resulting contractual relationships.

The selection is usually based on price, qualifications, or a combination of the two. When qualifications or qualifications *and* price serve as the basis for selection, it is common to use a Request for Qualifications (RFQ), a Request for Proposals (RFP), and interviews to review bidders. Each of these methods of gathering information reveals important aspects of the bidders' qualifications. Typically, more than one provider is contacted to supply information to encourage the opportunity for comparison and optimum selection.

The following are commonly used approaches for selecting a design and construction team:

Contractor Procurement Options:

Direct Negotiation – The contractor is selected based on reputation, experience and/or past performance. The fee and/or total cost is negotiated between the contractor and the owner.

Qualifications Based Selection (QBS) – The contractor is selected on the basis of demonstrated competence and qualifications only. The owner shall not request or consider fees, price, man-hours or any other cost information as part of the selection process.

Best Value: Fees – The contractor's final selection is based on some weighting of a combination of qualifications and fees (possibly including general conditions).

Best Value: Total Cost – The contractor's final selection is based on some weighting of the total cost and other criteria such as qualifications.

Low Bid – The contractor's final selection is based solely on lowest total cost.

Architect Procurement Options:

Direct Negotiation – The architect is selected based on reputation, experience, and/or past performance. The fee is negotiated between the architect and the owner.

Qualifications Based Selection (QBS) – The architect is selected on the basis of demonstrated competence and qualifications only. The owner shall not request or consider fees, price, man-hours or any other cost information as part of the selection process.

Best Value: Fees – The architect final selection is based on some weighting of a combination of qualifications and fees.

Low Fee – The architect final selection is based solely on lowest fee.

Accelerated Delivery

In some projects, owners may have an additional requirement to occupy the building or space as soon as possible. In these instances, architects and contractors will agree to terms which require an accelerated project delivery process or “fast-track”. Fast-track projects can appear in any of the delivery methods discussed in this document but are most likely to be seen in CM at-Risk, Design-Build, and IPD. The schedule will require the architect to issue portions of the drawing set (e.g., foundation plans, structural steel, etc.) to the contractor for bid/pricing and construction before the project’s design is fully complete. The benefit to the owner is a shorter schedule; however, the downside is that some design elements are locked in early making changes in scope later in the design phases difficult and costly.

Delivery Method Definitions

Introduction

In recent years, various delivery methods have been created or gained renewed popularity to address owners’ concerns with finger pointing, cost overruns, and increasing project complexity. These delivery methods include Design-Build, Construction Management at-Risk, and Integrated Project Delivery. The sections below provide an overview of each of these project delivery methods with defining and typical characteristics for each. Owners should be aware that each project delivery method should include the development of carefully crafted contracts defining the roles of the players appropriate to that methodology.

Design-Bid-Build (DBB)

This method involves three roles in the project delivery process—owner, architect, and contractor—in traditionally separate contracts. “Traditional” is frequently used to describe the Design-Bid-Build method, which typically involves competitively bid, lump sum construction contracts that are based on complete and prescriptive contract documents prepared by architects. These documents generally include drawings, specifications, and supporting information. The phases of work are usually conducted in linear sequence. The owner contracts with an architect for design, uses the design documents produced by the architect to secure competitive bids from contractors; and, based on an accepted bid, contracts with a contractor for construction of the building.

For most of the 20th century, public work was routinely built using the Design-Bid-Build delivery method. This has included competitive bidding among general contractors, performance bonds, and employment of various other statutory requirements to protect taxpayer investments. Much private work has also been performed for a lump sum figure, in the belief that the marketplace ensures economic discipline and yields the lowest cost. It should be noted that this may not be the lowest cost for the project, but it represents the lowest cost associated with the design documents prepared for the project before actual construction begins.

In many instances private organizations with large constituencies, such as churches and schools, use project delivery methods with sealed bids and formal procedures similar to procedures for public projects.

The following *defining characteristics* identify Design-Bid-Build:

- Three prime players—owner, designer, contractor
- Two separate contracts—owner-designer, owner-contractor
- Final contractor selection is based on Low Bid or Best Value: Total Cost

Typical characteristics of the Design-Bid-Build approach include the following:

- Three phases—design, bid, build. These phases may be linear or overlapping if a project is fast-tracked or bid-out to multiple prime contractors.
- Well-established and broadly documented roles
- Contract documents that are typically completed in a single package before construction begins, requiring construction-related decisions in advance of actual execution
- Construction planning based on completed documents
- Complete specifications that produce clear quality standards
- Configuration and details of finished product agreed to by all parties before construction begins

Construction Management at-Risk (CM at-Risk)

Construction Management at-Risk (CM at-Risk) approaches involve a construction manager who takes on the risk of building a project. The architect is hired under a separate contract. The construction manager oversees project management and building technology issues, in which they typically have particular background and expertise. Such management services may include preparation of cost models, advice on the time and cost consequences of design and construction decisions, scheduling, cost control, coordination of construction contract negotiations and awards, timely purchasing of critical materials and long-lead-time items, and coordination of construction activities.

In CM at-Risk, the construction entity, after providing preconstruction services during the design phase, takes on the financial obligation for construction under a specified cost agreement. The construction manager frequently provides a Guaranteed Maximum Price (GMP). CM at-Risk is sometimes referred to as CM/GC because the construction entity becomes a general contractor (GC) through the at-risk agreement.

The term “at-risk” is often a source of confusion. Sometimes it refers to the fact that the contractor holds the trade contracts and takes the performance risk for construction. In other contexts, the term is tied to the existence of a cost guarantee or GMP. Because the term “at-risk” has two distinct meanings, it is important to understand how it is being used in a particular situation. The definition used for CM at-Risk in this document is based primarily on the fact that the construction manager holds the trade contracts and takes the performance risk. The eventual establishment of a guaranteed maximum price is typical of CM at-Risk project delivery, but it is not a defining characteristic of the delivery method in this case.

When a GMP is used, the CM at-Risk approach is flexible as to when the construction price becomes fixed. As a result, the timing for agreeing to a GMP varies by project. Considerations of risk should include an evaluation of the amount of design information available, the amount of contingency included, and the owner’s willingness to share in the risk of cost overruns.

The CM at-Risk contracts with trade contractors who perform their portion of the construction. These entities are contractually bound only to the CM at-Risk. It should be noted that there is no contractual relationship between the designer and the CM at-Risk.

The following *defining characteristics* identify CM at-Risk:

- Three prime players—owner, architect, CM at-Risk
- Two separate contracts—owner to architect, owner to CM at-Risk
- Final provider selection based on Qualifications Based Selection or Best Value: Fees

Typical characteristics of the CM at-Risk approach include the following:

- Hiring of the CM at-Risk during the design phase
- Clear quality standards produced by the contract's prescriptive specifications
- Establishment of a guaranteed maximum price

Other characteristics that may be seen in the CM at-Risk approach include the following:

- Overlapping phases—design and build
- Preconstruction services offered by the architect, CM or contractor (such as constructability review, bid climate, and bid management)

Construction Management at-Risk is also known by the designations CM at-Risk, CMAR, CM@R, CMc, CM/GC and GC/CM.

Design-Build (DB)

Design-Build has gained popularity in recent years in both the private and public sectors. The primary reason for this interest in Design-Build as a viable project delivery option is the owner's desire for a single source of responsibility for design and construction. In the Design-Build approach to project delivery, the owner contracts with a single entity, the design-build entity, for both design and construction. The design-build entity can be led by an architect or a contractor and can consist of any number of people. As with CM at-Risk, the timing of agreement on a GMP varies with each project.

The following *defining characteristics* identify Design-Build:

- Two prime players—owner, design-build entity
- One contract—owner to design-build entity

Typical characteristics of the Design-Build approach include the following:

- Final design-builder selection may be based on any of the following: Direct Negotiation, Qualifications Based Selection, Best Value: Fees or Total Project Cost, or Low Bid.
- Project-by-project basis for establishing and documenting roles
- Continuous execution of design and construction
- Overlapping phases—design and build
- Some construction-related decisions after the start of the project
- Overall project planning and scheduling by the design-build entity prior to mobilization (made possible by the single point of responsibility)

Other characteristics that may be seen in the Design-Build approach include the following:

- Preconstruction services offered by the architect, CM or contractor (such as constructability review, bid climate, and bid management)

Integrated Project Delivery (IPD)

In today's project atmosphere one could argue the delivery of traditional design and construction services has devolved into an adversarial process resulting in inefficiency, mistrust, and commoditization of services among owners, architects, contractors, subcontractors, and suppliers, each with their agendas, silos, and preferred outcomes built into the project delivery process. However, today's buildings are complex machines requiring the expertise of many professionals to complete. As a response to this unintentional paradox, the industry has begun to look to more collaborative, non-traditional delivery systems to facilitate better communication, reduce/share risk, increase profits, and provide a positive experience for project owners. Integrated Project Delivery (IPD) is one of these collaborative systems.

IPD is conceptually based on a collaborative arrangement of the major project stakeholders early in the process, implemented in an environment of "best-for-project thinking" and shared risk and reward. This collaboration of stakeholders works to define project issues at the outset, helping to identify conflicts, establish performance criteria, minimize waste, increase efficiency, and maximize the scope achieved for limited project budgets. The ultimate goal is to create a project environment that produces a positive outcome for all stakeholders. Although not exclusive to the IPD delivery method, multi-party agreements can include incentive clauses based on the idea of shared savings among the project team.

Both the AIA and AGC define Integrated Project Delivery as a delivery method based on the idea of collaboration.

Integrated Project Delivery (IPD):

IPD is a method of project delivery distinguished by a contractual arrangement among a minimum of the owner, constructor and design professional that aligns business interests of all parties. IPD motivates collaboration throughout the design and construction process, tying stakeholder success to project success, and embodies the following contractual and behavioral principles:

Contractual Principles

- Key Participants Bound Together as Equals
- Shared Financial Risk and Reward Based on Project Outcome
- Liability Waivers between Key Participants
- Fiscal Transparency between Key Participants
- Early Involvement of Key Participants
- Jointly Developed Project Target Criteria
- Collaborative Decision Making

Behavioral Principles

- Mutual Respect and Trust
- Willingness to Collaborate
- Open Communication

It is important to note that some projects are being delivered in a hybrid approach when integrated practices or philosophies are applied to more traditional delivery approaches such as CM at-Risk, Design-Build or Design-Bid-Build (where the owner is not party to a multi-party contract). In addition to not having a multi-party contract, this IPD hybrid is characterized by "traditional" transactional CM at-Risk or Design-Build contracts, some limited risk-sharing , and some application of IPD principles.

The following *defining characteristic* identifies IPD:

- A contractual arrangement among multiple parties including, at a minimum, the owner, the architect and the contractor

Typical characteristics of the IPD approach include the following:

- Shared risk and reward
- Continuous execution of design and construction
- A minimum of three prime players—owner, architect, contractor
- Some construction-related decisions after the start of the project
- Overall project planning and scheduling collaboratively by the entire team
- Selection of the architect and contractor team is typically accomplished through Direct Negotiation, Qualifications Based Selection or Best Value: Fees.

Other characteristics that may be seen in the IPD approach include the following:

- Overlapping phases—design and build
- Preconstruction services offered by the architect, CM or contractor (such as constructability review, bid climate, and bid management)

Conclusion

There are a myriad of choices for both project delivery methods and professional services selection types. The downside of this myriad of choices is that confusion is inevitable. The good news is these alternatives offer the parties involved more flexibility to select the best process for a particular project. The decision about which delivery method to choose has become increasingly complex as different methods of project delivery have been developed.

This primer attempts to address the lack of standard industry definitions for project delivery by sharing a baseline set of definitions. For example, the rise of IPD in the industry, including the many different ways it is defined, adds to the list of project delivery options without a standard definition. As the industry moves forward, it will be increasingly more important to have common definitions of project delivery options.

The definitions proposed in this primer do not represent any one individual opinion but rather are definitions that appear to be most consistent with those currently being used in the industry and reflect the evolution of the terminology and the slight shifts in industry consensus. Perhaps one day, if everyone is able to reconcile to the same templates, we will be one step closer to having standard industry terminology. For now, being more realistic, we are not expecting to have a common vocabulary in which everyone uses the same words but instead to reach the point at which we all understand one another's vocabulary.

Resources

General

[AGC Project Delivery Website](#). The Associated General Contractors of America.

[Best Practices for Use of Best Value Selections](#). The Associated General Contractors of America and The National Association of State Facilities Administrators. 2008.

[Project Delivery Systems for Construction-3rd Edition](#). Michael E. Kenig. The Associated General Contractors of America. 2011.

[Qualifications Based Selection of Contractors](#). The Associated General Contractors of America. 2009.

[The Architect's Handbook of Professional Practice-14th Edition](#). The American Institute of Architects. Joseph A. Demkin, AIA, ed. New York: John Wiley & Sons Inc. 2008.

Construction Management at-Risk (CM at-Risk)

[CM At-Risk State-by-State Map](#). The Associated General Contractors of America. 2010.

[CM/GC Guidelines for Public Owners-2nd Edition](#). The Associated General Contractors of America and The National Association of State Facilities Administrators. 2007.

Design-Build (DB)

[AIA/AGC Design-Build Teaming Checklist](#). The American Institute of Architects and The Associated General Contractors of America. 1999.

[AIA/AGC Recommended Guidelines for Procurement of Design-Build Projects in the Public Sector](#). The American Institute of Architects and The Associated General Contractors of America. 1995.

[The Architect's Guide to Design-Build Services](#). The American Institute of Architects. G. William Quatman, FAIA, and Ranjit (Randy) Dhar, FRAIC, eds. Hoboken, N.J. John Wiley & Sons Inc. 2003.

Integrated Project Delivery (IPD)

[3xPT - Integrated Project Delivery: First Principles for Owners and Teams](#). The American Institute of Architects, The Associated General Contractors of America and The Construction Users Roundtable. 2008.

[Experiences in Collaboration: On the Path to IPD](#). The American Institute of Architects and The American Institute of Architects California Council. 2009.

[Integrated Project Delivery: 2010 Case Studies](#). The American Institute of Architects and The American Institute of Architects California Council. 2010.

[Integrated Project Delivery: A Guide](#). The American Institute of Architects. 2008.

[Integrated Project Delivery for Public and Private Owners](#). National Association of State Facilities Administrators, Construction Owners Association of America, APPA: The Association of Higher Education Facilities Officers, Associated General Contractors of America and American Institute of Architects (AIA). 2010.

[IPD Case Studies](#). The American Institute of Architects, AIA Minnesota and the University of Minnesota, School of Architecture. 2011

List of Industry Contracts

The following chart lists the key contracts and forms for the delivery models discussed in this document. Please refer to the following websites for a complete list of contracts and related documents as well as current updates: www.consensusdocs.org and www.aia.org/contractdocs. Note that AIA-developed contracts begin with either A, B or C, and AGC-endorsed contracts begin with ConsensusDOCS®.

Design-Bid-Build (DBB)

A101™–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

A102™–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

A103™–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is the Cost of the Work Plus a Fee without a Guaranteed Maximum Price

A105™–2007, Standard Form of Agreement Between Owner and Contractor for a Residential or Small Commercial Project (including general conditions)

A107™–2007, Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope (including general conditions)

A201™–2007, General Conditions of the Contract for Construction

B101™–2007, Standard Form of Agreement Between Owner and Architect

B103™–2007, Standard Form of Agreement Between Owner and Architect for a Large or Complex Project

B104™–2007, Standard Form of Agreement Between Owner and Architect for a Project of Limited Scope

B105™–2007, Standard Form of Agreement Between Owner and Architect for a Residential or Small Commercial Project

ConsensusDOCS 200 Owner-Contractor Agreement & General Conditions—Lump Sum

ConsensusDOCS 205 Short Form Owner-Contractor Agreement & General Conditions—Lump Sum

ConsensusDOCS 235 Short Form Owner-Contractor Agreement & General Conditions—Cost of Work

ConsensusDOCS 240 Owner-Architect/Engineer Agreement

ConsensusDOCS 245 Short Form Owner-Architect/Engineer Agreement

Construction Management at-Risk (CM at-Risk)

A133™–2009, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

A134™–2009, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee without a Guarantee Maximum Price

B103™–2007, Standard Form of Agreement Between Owner and Architect for a Large or Complex Project

A201™–2007, General Conditions of the Contract for Construction

ConsensusDOCS 500 Owner-Construction Manager Agreement & General Conditions—GMP with option for Preconstruction Services

ConsensusDOCS 510 Owner-Construction Manager Agreement & General Conditions—Cost of Work with option for Preconstruction Services

Design-Build (DB)

A141™–2004, Agreement Between Owner and Design-Builder

A142™–2004, Agreement Between Design-Builder and Contractor

B142™–2004, Agreement Between Owner and Consultant where the Owner contemplates using the design-build method of project delivery

B143™–2004, Standard Form of Agreement Between Design-Builder and Architect

ConsensusDOCS 400 Preliminary Owner-Design-Builder Agreement

ConsensusDOCS 410 Owner-Design-Builder Agreement & General Conditions—Cost Plus with GMP

ConsensusDOCS 415 Owner-Design-Builder Agreement & General Conditions—Lump Sum

Integrated Project Delivery (IPD)

C191™–2009, Standard Form Multi-Party Agreement for Integrated Project Delivery

A195™–2008, Standard Form of Agreement Between Owner and Contractor for Integrated Project Delivery

A295™–2008, General Conditions of the Contract for Integrated Project Delivery + B195™–2008, Standard Form of Agreement Between Owner and Architect for Integrated Project Delivery

B195™–2008, Standard Form of Agreement Between Owner and Architect for Integrated Project Delivery

C195™–2008, Standard Form Single Purpose Entity Agreement for Integrated Project Delivery

C196™-2008, Standard Form of Agreement Between Single Purpose Entity and Owner for Integrated Project Delivery

C197™-2008, Standard Form of Agreement Between Single Purpose Entity and Non-Owner Member for Integrated Project Delivery

C198™2010, Standard Form of Agreement Between Single Purpose Entity and Consultant for Integrated Project Delivery

C199™2010, Standard Form of Agreement Between Single Purpose Entity and Contractor for Integrated Project Delivery

ConsensusDOCS 300 Collaborative Agreement (Multi-Party Agreement)

Qualification Forms

A305™-1986, Contractor's Qualification Statement

B305™-1993, Architect's Qualification Statement

ConsensusDOCS 221 Contractor's Statement of Qualifications for a Specific Project

ConsensusDOCS 222 Architect/Engineer's Statement of Qualifications for a Specific Project

ConsensusDOCS 721 Subcontractor's Statement of Qualifications for a Specific Project



Design-Build Reform Toolkit

Table of Contents

I.	Design-Build Reform Overview.....	Page 1
II.	Legislation	
	A. Option #1 – Design-Build – QBS.....	Page 5
	B. Option #2 – Design-Build – Constructor Fees.....	Page 8
	C. Option #3 – Design-Build – Bridging.....	Page 12
	D. Option #4 – Design-Build – Concept Design and Price.....	Page 16
III.	Construction Manager At-Risk Issue Brief.....	Page 20
IV.	Project Delivery Methods Diagram.....	Page 21

OVERVIEW: DESIGN-BUILD REFORM CAMPAIGN 2013

The Project Delivery Task Force of the AIA State Government Network and AIA staff have identified issues associated with design-build laws across the country. This document is intended to help your state tackle identified problems by giving you some negotiation strategies and suggested legislative language to advance reform in your state.

Benefits of design-build:

1. Offers clients a single point of responsibility.
2. Potential for faster project completion.
3. Potential for fewer change orders.
4. Potential for superior control of project costs.
5. DB/QBS and DB/Contractor Fees offer opportunity for implementing philosophy of Integrated Project Delivery (maximum owner collaboration in design from the beginning).
6. May be better suited for complex projects.

Detriments of design-build:

1. Contractual duties owed to design-builder rather than client eliminating or obscuring duties and protections typically provided to the client
2. Higher economic risk for architect under DB/Concept Design & Price with stipend.
3. Higher economic risk for 2nd architect under DB/Bridging.
4. Stipends, if offered at all, provided to unsuccessful proposers under DB/Bridging and DB/Concept Design & Price, rarely cover architect's costs and typically require architect to forfeit ownership of design proposal content.
5. DB/Bridging and DB/Concept Design & Price provide limited opportunity for implementing philosophy of Integrated Project Delivery (owner not a true collaboration partner in design until after Design-Builder is selected).
6. Method in which contract is awarded typically circumvents architecture procurement requirements resulting in these services to be procured like a common commodity, rather than according to the qualifications of the professional.

Legislative Strategies

(1) Coalition Building: There are varying opinions among those involved in vertical infrastructure (buildings) and horizontal infrastructure (roads & bridges) about the advantages and disadvantages of design-build for public projects. This paper specifically intends to address vertical infrastructure legislation. However, an important legislative strategy is to identify the position of horizontal infrastructure interests and either invite them to join in support, or otherwise create an exception for them in proposed legislation.

It is important to form a coalition with other advocates of design-build. These may include the Design-Build Institute of America (DBIA), Associated General Contractors, and the American Council of Engineering Companies (ACEC), among others.

(2) Aim High Knowing that Compromise Will Be Required



OVERVIEW: DESIGN-BUILD REFORM CAMPAIGN 2013

When your state component is faced with design-build legislative proposals, here is a negotiation strategy that could help: Since AIA staff research indicates that Construction Manager At-Risk avoids many of the problems associated with design-build, advancing CM at Risk as a preferred alternative should be your state's response. [See CM At-Risk Issue Brief](#) (page 20) to aid your advocacy efforts in this regard.

Should your state's approach to advance CM at Risk as an alternative to design-build fail, a back-up negotiating plan could be as follows: ***In order of preference***, here are some design-build models that best advance and protect the interests of architects and public clients. Refer to the matrix "Design & Construction Delivery Methods for Public Projects" and the References at the end of this paper for sources of detailed information.

Design-Build Models:

- (1) DB/QBS Model (See "AIA DB Legislation – QBS")
- (2) DB/Contractor Fees– QBS for single D-B team, with submittal of limited contractor general conditions and other fee-type costs, no design proposal until after D-B selection. (See "AIA DB Legislation –Constructor Fees")
- (3) DB/Bridging with Stipend - QBS for owner's architect to prepare preliminary design documents; concurrent first-phase QBS selection of 3 D-B teams; second-phase RFP process with selected D-B teams competing on basis of total cost proposals to complete the design documents and construct the building.
- (4) DB/Concept Design & Price with Stipend– first phase QBS selection of 3 D-B teams, second phase RFP process with selected D-B teams competing on basis of conceptual design and total cost proposals to complete design documents and construct the building, with statutorily required stipends for unsuccessful proposals; reasonably limit the scope of conceptual design submittals. (See "AIA DB Legislation – Concept Design & Price with Stipend")

(3) The Process

Initial Drafting Process

Depending on whether your state component is attempting to modify existing law or whether your state component is responding to a new design-build legislative proposal, your first goal should be advancing a design-build procurement process that is purely qualifications-based selection. Use the AIA suggested legislation (above in #1) as a starting point. You will, of course, need to modify the AIA suggested legislation to fit with your state's existing statutory framework. Usually, the fewer modifications you can make to existing law, the better so select the provisions that work for your existing statutory framework and draft a proposal to share with other interested stakeholders. Start with AGC.

If you do not have DB legislation in place, use the AIA suggested legislation as your initial proposal to other interested stakeholders. Be prepared to offer language from AIA suggested legislation for the other design-build models described in #2, #3, and #4. However, do not offer



OVERVIEW: DESIGN-BUILD REFORM CAMPAIGN 2013

them all at once; these are “back pocket” alternatives to use depending on your negotiations and the issues being raised.

Coalition Building

Several meetings may be needed to gain momentum. Sending your proposed legislation to other interested stakeholders for review is a critical part of the process. You are in an advantageous position because you’re calling a meeting and giving the attendees something to review and edit. The starting dialogue is yours to frame.

Tip: focus on one stakeholder group at a time. Start small and easy. Create a list of any interest group that could even peripherally care – both for and against. Then in each subsequent meeting, you can claim coalition support with stakeholder groups’ names listed in your correspondences.

Once you’ve gained support from 1-3 groups, identify the groups that may involve longer negotiations. Continue negotiations with scheduled tight deadlines. Never leave a meeting without a future meeting scheduled. Try to keep the meetings paced between 1-2 weeks. Once a consensus is reached among the growing coalition, focus on the legislature.

Approaching Lawmakers

Identify your friends in the legislature. Schedule visits well in advance of their legislative session. If possible, make these visits happen back home in the District with local architects. Coaching is essential. Keep the visit friendly and succinct: this doesn’t have to be a “data dump.” Make your case, tell your story and always leave the meeting with an offer to help on any of your legislator’s issues or participate in local events that might be of interest. During these visits, identify your legislative champions. Who expressed the most interest, and who might be the most forthright and articulate to make your case? Ask if the lawmaker would have interest in sponsoring the legislation. Always convey to the lawmaker the ground work that you’ve already laid: Who will support it? Who will oppose? Which groups are still meeting? What is a sticking point, if any? Keep the lawmaker posted in writing on the status of negotiations.

Once your legislative session begins, keep in touch with your “champions”. When do they plan to file? Are there special strategies for timing or committees? If you have a contract lobbyist, some of these issues will be handled by him/her, but stay involved, don’t delegate. Contract lobbyists have other clients and interests that may take a priority. Despite what they may tell you, your contract lobbyist gives you access, not success. This is your issue and you must be involved.

The “Ask”

Develop talking points (e.g. a one pager with bulleted points that asks for a “yes” vote on HB ____). Your most compelling points are those related to small businesses, and the importance of qualifications-based selection – [see AIA Issue Brief](#)). Work with your lobbyist on meeting with committee members who will ultimately consider the issue. If you haven’t met with committee members prior to the legislative hearing, you have lost ground. By the time the hearing is conducted, the votes have likely been decided behind the scenes. The committee members will have met with the opposition, and strategies for delay or defeat will have been discussed.



OVERVIEW: DESIGN-BUILD REFORM CAMPAIGN 2013

Grassroots

Issue grassroots alerts focused strictly on committee members (not the entire legislative body) 1-2 days prior to your hearing. Ask for emails, letters and phone calls from constituent architects. Additional bodies in the room are also a good thing.

Testimony

Check with the clerk to find out how many copies you will need to submit in advance. Alternatively, distribute copies of your testimony to committee members at the meeting. Attend the hearing and present oral testimony from your Chapter President or another member who is knowledgeable in design-build practices. Prepare for 5 minutes. Do not read. Call AIA if you need assistance in drafting your testimony.

It's not over until the Governor signs...keep the bill moving

Follow up with your "champions" after the hearing to get their thoughts and offer assistance to keep the legislation moving. Did they hear any concerns behind the scenes? Which legislators may need a visit?

Once the bill has been favorably voted out of committee, move to the next voting groups, one or both chambers of the Legislature. Confer with Floor Leaders who will shepherd the bill through floor debate. These lawmakers need clear direction on the bill. Who supports it? Who doesn't? What does it do...in one or two sentences? Keep it simple. Boil down the issue into its simplest form. Remember, on any given day, law makers face hundreds of issues which they cannot possibly keep up with without your talking points and clear direction. Give them your cell phone number and remain close to the chamber during the debate in case they need an answer quickly.

You've made it this far, don't give up! Now, go back several steps and start the whole process over in the opposite chamber.

Selected References:

[AIA Issue Brief: Design-Build](#), July, 2012

[AIA Best Practices](#)

[Qualifications Based Selection of Contractors](#), AGC of America, August, 2009

DBIA Position Statement, Design-Build Institute of America,

Use of [Stipends](#), 2010

[Best Value](#) Selection, 2010

The Role of [Qualifications in Selection](#) of a Design-Builder, 2010

ACEC Model State Design/Build Legislation, American Council of Engineering Companies, July, 2012



OPTION #1 - DESIGN-BUILD w/ QBS PROCESS

The following is an example of language in legislative format for Design-Build/QBS, wherein a design-build team is procured by qualifications-based selection (QBS). This particular design-build model offers the best project value to designers, builders, and owners, and best allows the intended integration and collaboration of the Design-Build project. There is no conceptual design prior to selection of the design-builder, and there is no discussion of fees or work hours until a QBS negotiation is in process.

I. LEGISLATIVE PURPOSE AND INTENT.

The legislature recognizes that there is a public need for the design, construction, improvement, renovation, and expansion of high performing public facilities within the state of [insert state];

Such public need may not be wholly satisfied by existing procurement methods in which public facilities are designed, constructed, improved, renovated or expanded;

Efficient delivery of quality design and construction can be realized when a governmental entity is authorized to utilize an integrated approach for the design and construction of a project under one contract with a single point of responsibility;

The Design-Build integrated approach to project delivery, when the selection process is based solely on qualifications and experience, can result in a project that involves consistent collaboration among design professionals, builders, and owners throughout the process, from beginning to end, and delivers a high quality building.

II. DEFINITIONS.

- (1) "Design-builder" means a partnership, corporation, joint venture, or other legal entity that offers to provide or provides design and construction services under a single contract. The design-builder shall be comprised of both design professionals and construction contractors qualified to engage in design and construction in [cite state].
- (2) "Governmental entity," for the purpose of this law, means the state, political subdivisions of the state, public school corporations, and all officers, boards, or commissions empowered by law to enter into contracts for the construction of public improvements.

III. APPLICABILITY. This law [cite section/subsection of the law] applies to all governmental entities in this [cite state]. [Insert any exceptions, such as limiting DB to specific governmental entities, building types, etc.]

IV. CONTRACTS FOR PROJECTS: DESIGN-BUILD.

- (a) A governmental entity may use the design-build method for the construction, rehabilitation, alteration, or repair of a project. In using this method and in entering into a contract for the services of a design-builder, the contracting governmental entity and the design-builder shall follow the procedures provided below.
- (b) A governmental entity shall use the following criteria as a minimum basis for determining the circumstances under which the design-build method is appropriate for a project:
 - (1) the extent to which the governmental entity can adequately and thoroughly define the project requirements prior to the issuance of the request for qualifications for a design-builder;
 - (2) the time constraints for the delivery of the project;
 - (3) the ability to ensure that a quality project can be delivered; and



- (4) the capability of the governmental entity to manage and oversee the project, including the availability of experienced architectural staff or outside architectural consultants who are experienced with the design-build method of project delivery.
- (c) A governmental entity shall make a formal finding on the criteria described by Subsection (b) before preparing a request for qualifications.
- (d) A governmental entity shall issue, for the purpose of fair and open competition, a public notice of the request for qualifications.

V. USE OF ARCHITECT.

- (a) On or before entering into a contract for design-build services, the governmental entity shall select or designate a staff architect, or an architect who is independent of the design-builder, to act as its representative for the procurement process and for the duration of the design and construction.
- (b) The selected or designated architect has full responsibility for complying with [cite enabling Architects Practice statute].
- (c) If the architect is not a full-time employee of the governmental entity, the governmental entity shall select the architect on the basis of demonstrated competence and qualifications as provided by [cite QBS law or Brooks Act].
- (d) The selected or designated architect shall not be eligible to provide design input or submit a response to the request for qualifications.

VI. REQUEST FOR QUALIFICATIONS.

- (a) The governmental entity, assisted by its architect representative, shall prepare a request for qualifications that includes, but is not limited to, general information on:
 - (1) project site;
 - (2) project scope;
 - (3) project budget;
 - (4) project schedule;
 - (5) criteria for selection and the weighting of the qualifications criteria;
 - (6) notice of any rules, ordinances or goals established by the governmental entity, including goals for minority and women-owned business participation; and
 - (7) other information that may assist potential design-builders in submitting qualifications for the project.

VII. EVALUATION OF RESPONSES TO REQUESTS FOR QUALIFICATIONS.

- (a) The governmental entity shall evaluate each responsive design-builder based on the following criteria:
 - (1) specialized experience and technical competence with respect to the type of services required;
 - (2) capacity and capability to perform services within the time limitations fixed for the project;
 - (3) the past record of performance of the design-builder or of the members of the design-build team with respect to such factors as control of construction budgets, quality of work, and ability to meet schedules;
 - (4) the design-builder's proximity to and familiarity with the area in which the project is located; and
 - (5) other appropriate information submitted in response to the request for qualifications.
- (b) The governmental entity may request design-builders to submit additional information and, if the governmental entity chooses, invite some or all responders to an interview with the governmental entity.
- (c) Consideration shall not be given, or information requested, concerning fees, prices, work hours, or any other cost information prior to entering into negotiations as described in Section VIII.



- (d) Each design-builder shall certify to the governmental entity that each architect or engineer that is a member of the design-build team, including sub-consultants, was selected based on demonstrated competence and qualifications, in the manner provided by [cite QBS statute or Brooks Act]; and,
- (e) Following evaluation of the qualifications of the design-builders, the governmental entity shall rank, based on the published criteria, the three most highly qualified design-builders in the order of best-qualified first.

VIII. NEGOTIATIONS.

- (a) The governmental entity shall first attempt to negotiate a contract with the highest ranked design-builder. The governmental entity shall seek to reach agreement on scope; contract terms; fair and reasonable fees, markups and other cost factors; and any other necessary matters.
- (b) If the governmental entity is unable to negotiate a satisfactory contract with the highest ranked design-builder, the governmental entity shall, formally and in writing, terminate all negotiations with that design-builder and proceed to negotiate with the next highest ranked design-builder.
- (c) This process shall be repeated until either a satisfactory contract is reached or negotiations with all ranked entities end.
- (d) If a satisfactory contract cannot be achieved by any of the top ranked design-builders, the governmental entity may reevaluate the necessary services, including the scope, budget, and complexity. The governmental entity may then either reevaluate qualifications already submitted, choose to advertise and accept new qualifications, or abandon the design-build method of project delivery.

IX. CHANGES TO KEY PERSONNEL.

The design-builder shall obtain written approval prior to changing key personnel after the contract has been awarded.



OPTION #2 – DESIGN-BUILD w/ CONSTRUCTOR FEE ONLY

The following is an example of language in legislative format for Design-Build/Constructor Fees wherein, a design-build team is procured by qualifications-based selection (QBS) with consideration of percentage markups for the contractor member of the design-build team, such as contractor fee, overhead and subcontractor markups. There is no conceptual design prior to selection of the design-builder, and there is no other discussion of fees or work hours until a QBS negotiation is in process.

IX. LEGISLATIVE PURPOSE AND INTENT.

The legislature recognizes that there is a public need for the design, construction, improvement, renovation, and expansion of high performing public facilities within the state of [insert state];

Such public need may not be wholly satisfied by existing methods of procurement in which public facilities are designed, constructed, improved, renovated or expanded;

Efficient delivery of quality design and construction can be realized when a governmental entity is authorized to utilize an integrated approach for the design and construction of a project under one contract with a single point of responsibility;

The Design-Build integrated approach to project delivery, when the selection process is based on qualifications and experience, can result in a project that involves consistent collaboration among design professionals, builders, and owners throughout the process, from beginning to end, and delivers a high quality building.

X. DEFINITIONS.

- (3) "Design-builder" means a partnership, corporation, joint venture, or other legal entity that offers to provide or provides design and construction services under a single contract. The design-build team shall be comprised of both design professionals and construction contractors qualified to engage in design and construction, respectively, in [cite state].
- (4) "Governmental entity," for the purpose of this law, means the state, political subdivisions of the state, public school corporations, and all officers, boards, or commissions empowered by law to enter into contracts for the construction of public improvements.

XI. APPLICABILITY. This law [cite section/subsection of the law] applies to all governmental entities in this [cite state]. [Insert any exceptions, such as limiting DB to specific governmental entities, building types, etc.]

XII. CONTRACTS FOR PROJECTS: DESIGN-BUILD.

- (e) A governmental entity may use the design-build method for the construction, rehabilitation, alteration, or repair of a project. In using this method and in entering into a contract for the services of a design-builder, the contracting governmental entity and the design-builder shall follow the procedures provided below.
- (f) A governmental entity shall use the following criteria as a minimum basis for determining the circumstances under which the design-build method is appropriate for a project:
 - (1) the extent to which the governmental entity can adequately and thoroughly define the project requirements prior to the issuance of the request for qualifications for a design-builder;
 - (2) the time constraints for the delivery of the project;
 - (3) the ability to ensure that a quality project can be delivered; and



- (4) the capability of the governmental entity to manage and oversee the project, including the availability of experienced architectural staff or outside architectural consultants who are experienced with the design-build method of project delivery.
- (g) A governmental entity shall make a formal finding on the criteria described by Subsection (b) before preparing a request for qualifications.
- (h) A governmental entity shall issue, for the purpose of fair and open competition, a public notice of the request for qualifications.

XIII. USE OF ARCHITECT.

- (e) On or before entering into a contract for design-build services, the governmental entity shall select or designate a staff architect, or an architect who is independent of the design-builder, to act as its representative for the procurement process and for the duration of the design and construction.
- (f) The selected or designated architect has full responsibility for complying with [cite enabling Architects Practice statute].
- (g) If the architect is not a full-time employee of the governmental entity, the governmental entity shall select the architect on the basis of demonstrated competence and qualifications as provided by [cite QBS law or Brooks Act].
- (h) The selected or designated architect shall not be eligible to submit a response to the request for proposals nor provide design input to a design-bid response to the request for proposals.

XIV. REQUEST FOR QUALIFICATIONS.

- (b) The governmental entity, assisted by its architect representative, shall prepare a request for qualifications that includes, but is not limited to, general information on:
 - (1) project site;
 - (2) project scope;
 - (3) project budget;
 - (4) project schedule;
 - (5) criteria for selection and the weighting of the qualifications criteria;
 - (6) notice of any rules, ordinances or goals established by the governmental entity, including goals for minority and women-owned business participation; and
 - (7) other information that may assist potential design-builders in submitting qualifications for the project.

XV. EVALUATION OF RESPONSES TO REQUESTS FOR QUALIFICATIONS.

- (f) The governmental entity shall evaluate each responsive design-builder based on the following criteria:
 - (6) specialized experience and technical competence with respect to the type of services required;
 - (7) capacity and capability to perform services within the time limitations fixed for the project;
 - (8) the past record of performance of the design-builder or of the members of the design-build team with respect to such factors as control of costs, quality of work, and ability to meet schedules;
 - (9) the design-builder's proximity to and familiarity with the area in which the project is located; and
 - (10) other appropriate information submitted in response to the request for qualifications.
- (g) The governmental entity may request design-builders to submit additional information and, if the governmental entity chooses, invite some or all responders to an interview with the governmental entity.
- (h) Except for the construction cost-related information described in section VIII(b)(4), no other consideration shall be given, or information requested, concerning fees, prices, work hours, or any other cost information prior to entering into negotiations as described in Section X.



- (i) Each design-builder shall certify to the governmental entity that each architect or engineer that is a member of the design-build team was selected based on demonstrated competence and qualifications, in the manner provided by [cite QBS statute or Brooks Act]; and,
- (j) Following the evaluation of the qualifications of the design-builders, the governmental entity shall select, based on the published criteria, the three most highly qualified design-builders and issue to them a request for proposal.

XVI. REQUEST FOR PROPOSALS.

- (a) The governmental entity shall request proposals from the selected design-builders. The governmental entity shall not require design-builders to submit architectural or engineering designs as part of a proposal.
- (b) The request for proposals shall include, but is not limited to:
 - (1) the procedures to be followed for submitting proposals, including place, date, and time deadlines;
 - (2) the criteria for evaluation of proposals and their relative weight;
 - (3) budget limits for the design-build contract, if any;
 - (4) construction cost-related information deemed necessary by the governmental entity for evaluation of proposals such as:
 - i. formulas for contractor fee, overhead, subcontractor markup, general conditions, etc.
 - ii. discounts for prompt payment, if any.
 - (5) policies of the governmental entity, such as:
 - i. retainage,
 - ii. contingencies,
 - iii. requirements for bid security, performance bonds, payment bonds, and insurance.
- (c) The request for proposals may include more specific information, to the extent available, such as:
 - (1) programmatic needs and other capacity and functional requirements;
 - (2) information on the physical characteristics of the site, such as a topographic survey;
 - (3) material quality standards or performance criteria; and,
 - (4) parking requirements.

XVII. EVALUATION OF PROPOSALS.

- (a) Proposals shall be sealed and shall not be opened until expiration of the deadline for submittals established in the request for proposals. Once the deadline for submittals has expired, the governmental entity shall open and evaluate all responses to the request for proposals.
- (b) The governmental entity may reject as nonresponsive any design-builder that makes a significant change to the composition of its team as initially submitted.
- (c) Each design-builder shall certify to the governmental entity that each architect or engineer that is a member of the design-build team, including sub-consultants, was selected based on demonstrated competence and qualifications, in the manner provided by [cite QBS statute or Brooks Act]; and,
- (d) The governmental entity shall rank the design-builder proposals in the order of best response first based on the published criteria.

X. NEGOTIATIONS.

- (e) The governmental entity shall first attempt to negotiate a contract with the highest ranked design-builder. The governmental entity shall seek to reach agreement on scope; contract terms; fair and reasonable fees, markups and other cost factors; and any other necessary matters.
- (f) If the governmental entity is unable to negotiate a satisfactory contract with the highest ranked design-builder, the governmental entity shall, formally and in writing, terminate all negotiations with that design-builder and proceed to negotiate with the next highest ranked design-builder.



- (g) This process shall be repeated until either a satisfactory contract is reached or negotiations with all ranked entities end.
- (h) If a satisfactory contract cannot be achieved by any of the top ranked design-builders, the governmental entity may reevaluate the necessary services, including the scope, estimated cost, complexity, and reasonable fee and cost requirements. The governmental entity may then either reevaluate qualifications already submitted, choose to advertise and accept new qualifications, or abandon the design-build method of project delivery.

XI. CHANGES TO KEY PERSONNEL.

The design-builder shall obtain written approval prior to changing key personnel after the contract has been awarded.



OPTION #3 – DESIGN-BUILD – BRIDGING

The following is an example of language in legislative format for Design-Build/Bridging. In this variation of design-build, the owner first employs an owner’s architect to assist with development of design criteria, conceptual design, procurement of the design-builder, and administration of the contract for construction. The process of selecting design-build teams is first narrowed by consideration of qualifications. Finalists are then issued a request for proposals that provides a conceptual design and performance and quality requirements. Proposals must provide a price consistent with the RFP requirements. The award of contract is based on a combination of price and qualitative considerations, such as: technical approach, quality of personnel, and management plan. The architect member of the design-builder becomes the architect of record and completes design refinement and construction documentation. A stipend for unsuccessful competitors of the RFQ may or may not be included

XVIII. LEGISLATIVE PURPOSE AND INTENT.

The legislature recognizes that there is a public need for the design, construction, improvement, renovation, and expansion of high performing public facilities within the state of [insert state];

Such public need may not be wholly satisfied by existing methods of procurement in which public facilities are designed, constructed, improved, renovated or expanded;

Efficient delivery of quality design and construction can be realized when a governmental entity is authorized to utilize an integrated approach for the design and construction of a project under one contract with a single point of responsibility;

The Design-Build integrated approach to project delivery, when the selection process is based on qualifications and experience, can result in a project that involves consistent collaboration among design professionals, builders, and owners throughout the process, from beginning to end, and delivers a high quality building.

XIX. DEFINITIONS.

- (5) "Design-builder" means a partnership, corporation, joint venture, or other legal entity that offers to provide or provides design and construction services under a single contract. The design-build team shall be comprised of both design professionals and construction contractors qualified to engage in design and construction, respectively, in [cite state].
- (6) "Governmental entity," for the purpose of this law, means the state, political subdivisions of the state, public school corporations, and all officers, boards, or commissions empowered by law to enter into contracts for the construction of public improvements [insert any exceptions].
- (7) "Design Criteria" means the requirements for a public project, expressed in drawings and specifications sufficient to allow the design-builder to make a responsive proposal. Design criteria may include, as appropriate:
 - a. Capacity;
 - b. Durability;
 - c. Standards; and
 - d. Other criteria for the intended use.



XX. APPLICABILITY. This law [cite section/subsection of the law] applies to all governmental entities in this [cite state]. [Insert any exceptions, such as limiting DB to specific governmental entities, building types, etc.]

XXI. CONTRACTS FOR PROJECTS: DESIGN-BUILD.

- (i) A governmental entity may use the design-build method for the construction, rehabilitation, alteration, or repair of a project. In using this method and in entering into a contract for the services of a design-builder, the contracting governmental entity and the design-builder shall follow the procedures provided below.
- (j) A governmental entity shall use the following considerations as a minimum basis for determining the circumstances under which the design-build method is appropriate for a project:
 - (1) the extent to which the governmental entity can adequately and thoroughly define the project requirements prior to the issuance of the request for qualifications for a design-builder;
 - (2) the time constraints for the delivery of the project;
 - (3) the ability to ensure that a quality project can be delivered; and
 - (4) the capability of the governmental entity to manage and oversee the project, including the availability of experienced architectural staff or outside architectural consultants who are experienced with the design-build method of project delivery.
- (k) A governmental entity shall make a formal finding on the considerations described by Subsection (b) before preparing a request for qualifications.
- (l) A governmental entity shall issue, for the purpose of fair and open competition, a public notice of request for qualifications.

XXII. DESIGN CRITERIA ARCHITECT.

- (i) On or before entering into a contract for design-build services, the governmental entity shall select or designate a staff architect, or an architect who is independent of the design-builder, to act as its design criteria architect as its representative for the procurement process and for the duration of the design and construction.
- (j) The design criteria architect has full responsibility for complying with [cite enabling Architects Practice statute].
- (k) If the architect is not a full-time employee of the governmental entity, the governmental entity shall select the architect on the basis of demonstrated competence and qualifications as provided by [cite QBS law or Brooks Act].
- (l) The design criteria architect shall develop design criteria in consultation with the governmental entity.
- (m) The design criteria architect shall not be eligible to submit a response to the request for proposals nor provide design input to a design-bid response to the request for proposals.

XXIII. REQUEST FOR QUALIFICATIONS.

The governmental entity, assisted by its design criteria architect, shall prepare a request for qualifications that includes, but is not limited to, general information on:

- (8) project site;
- (9) project scope;
- (10) project budget;
- (11) project schedule;
- (12) criteria for selection and the weighting of the qualifications criteria;
- (13) notice of any rules, ordinances or goals established by the governmental entity, including goals for minority and women-owned business participation; and
- (14) other information that may assist potential design-builders in submitting qualifications for the project.



XXIV. EVALUATION OF RESPONSES TO REQUESTS FOR QUALIFICATIONS.

- (k) The governmental entity assisted by its design criteria architect shall evaluate each responsive design-builder based on the following considerations:
 - (11) specialized experience and technical competence with respect to the type of services required;
 - (12) capacity and capability to perform services within the time limitations fixed for the project;
 - (13) the past record of performance of the design-builder or of the members of the design-build team with respect to such factors as control of costs, quality of work, and ability to meet schedules;
 - (14) the design-builder's proximity to and familiarity with the area in which the project is located; and
 - (15) other appropriate information submitted in response to the request for qualifications.
- (l) The governmental entity may request design-builders to submit additional information and, if the governmental entity chooses, invite some or all responders to an interview with the governmental entity;
- (m) Each design-builder shall certify to the governmental entity that each architect or engineer that is a member of the design-build team was selected based on demonstrated competence and qualifications, in the manner provided by [cite QBS statute or Brooks Act]; and
- (n) Following evaluation of the qualifications of the design-builders, the governmental entity shall select, based on the published considerations, the three most highly qualified design-builders and issue to them a request for proposal.

XXV. REQUEST FOR PROPOSALS.

- (d) The governmental entity shall request proposals from the selected design-builders. The request for proposals shall include, but is not limited to:
 - (6) the procedures to be followed for submitting proposals, including place, date, and time deadlines;
 - (7) the considerations for evaluation of proposals and their relative weight;
 - (8) the design criteria as defined in Section IX;
 - (9) budget limits for the design-build contract, if any;
 - (10) a requirement for the submittal of a total project price with identified assumptions, allowances, unit prices, etc., if any; and
 - (11) policies of the governmental entity, such as:
 - i. retainage,
 - ii. contingencies,
 - iii. requirements for bid security, performance bonds, payment bonds, and insurance.

XXVI. DESIGN CRITERIA.

- i. The governmental entity, assisted by its design criteria architect, shall prepare design criteria that includes detailed information on the project, such as:
 - (1) programmatic needs, interior space requirements, intended space utilization, and other capacity requirements
 - (2) information on the physical characteristics of the site, such as a topographic survey.
 - (3) material quality standards or performance criteria;
 - (4) special material requirements;
 - (5) provisions for utilities;
 - (6) parking requirements;
 - (7) the type, size, and location of adjacent structures;
 - (8) preliminary or conceptual drawings and specifications sufficient in detail to allow the design-builder to make a proposal which is responsive to the request for proposals; and
 - (9) notice of any ordinances, rules, or goals adopted by the governmental entity;



XXVII. EVALUATION OF PROPOSALS AND SELECTION OF BEST PROPOSAL.

- (a) Proposals shall be sealed and shall not be opened until expiration of the time established in the request for proposals. Once the deadline for submittals has expired, the governmental entity and its design criteria architect shall evaluate responses to the request for proposals.
- (b) The governmental entity may reject as nonresponsive any design-builder that makes a significant change to the composition of its team as initially submitted.
- (c) The governmental entity and its design criteria architect shall review the proposals for conformance with the requirements of the request for proposals. Clarifications may be required of each design-builder by the governmental entity. The governmental entity shall determine in its opinion the best proposal and recommend to the governmental entity that a contract be awarded to that design-builder.
- (d) The governmental entity shall have the right to reject any and all proposals and may thereafter solicit new proposals using the same process.

XXVIII. NEGOTIATIONS.

- (a) The governmental entity shall enter into negotiations with the selected design-builder to reach final agreement on terms and conditions of the contract for construction.

XII. CHANGES TO KEY PERSONNEL.

The design-builder shall obtain written approval prior to changing key personnel after the contract has been awarded.



OPTION #4 – DESIGN-BUILD – CONCEPT DESIGN & PRICE

The following is an example of language in legislative format for Design-Build/Concept Design & Price with Stipend. In this variation of design-build, the selection of design-build teams is first narrowed by consideration of qualifications. Finalists are then issued a request for proposals that calls for a conceptual design and a price based on the design concept. The award of contract is based on a combination of price and qualitative considerations, such as: design, technical approach, quality of personnel, and management plan. A stipend for unsuccessful competitors of the RFP process is mandatory.

XXIX. LEGISLATIVE PURPOSE AND INTENT.

The legislature recognizes that there is a public need for the design, construction, improvement, renovation, and expansion of high performing public facilities within the state of [insert state];

Such public need may not be wholly satisfied by existing methods of procurement in which public facilities are designed, constructed, improved, renovated or expanded;

Efficient delivery of quality design and construction can be realized when a governmental entity is authorized to utilize an integrated approach for the design and construction of a project under one contract with a single point of responsibility;

The Design-Build integrated approach to project delivery, when the selection process is based on qualifications and experience, can result in a project that involves consistent collaboration among design professionals, builders, and owners throughout the process, from beginning to end, and delivers a high quality building.

XXX. DEFINITIONS.

- (8) "Design-builder" means a partnership, corporation, joint venture, or other legal entity that offers to provide or provides design and construction services under a single contract. The design-build team shall be comprised of both design professionals and construction contractors qualified to engage in design and construction, respectively, in [cite state].
- (9) "Governmental entity," for the purpose of this law, means the state, political subdivisions of the state, public school corporations, and all officers, boards, or commissions empowered by law to enter into contracts for the construction of public improvements [insert any exceptions].

XXXI. APPLICABILITY. This law [cite section/subsection of the law] applies to all governmental entities in this [cite state]. [Insert any exceptions, such as limiting DB to specific governmental entities, building types, etc.]

XXXII. CONTRACTS FOR PROJECTS: DESIGN-BUILD.

- (m) A governmental entity may use the design-build method for the construction, rehabilitation, alteration, or repair of a project. In using this method and in entering into a contract for the services of a design-builder, the contracting governmental entity and the design-builder shall follow the procedures provided below.
- (n) A governmental entity shall use the following criteria as a minimum basis for determining the circumstances under which the design-build method is appropriate for a project:
 - (1) the extent to which the governmental entity can adequately and thoroughly define the project requirements prior to issuance of the request for qualifications for a design-builder;



- (2) the time constraints for the delivery of the project;
 - (3) the ability to ensure that a quality project can be delivered; and
 - (4) the capability of the governmental entity to manage and oversee the project, including the availability of experienced architectural staff or outside architectural consultants who are experienced with the design-build method of project delivery.
- (o) A governmental entity shall make a formal finding on the criteria described by Subsection (b) before preparing a request for qualifications.
- (p) A governmental entity shall issue, for the purpose of fair and open competition, a public notice of request for qualifications.

XXXIII. USE OF ARCHITECT.

- (n) On or before entering into a contract for design-build services, the governmental entity shall select or designate a staff architect, or an architect who is independent of the design-builder, to act as its representative for the procurement process and for the duration of the design and construction.
- (o) The selected or designated architect has full responsibility for complying with [cite enabling Architects Practice statute].
- (p) If the architect is not a full-time employee of the governmental entity, the governmental entity shall select the architect on the basis of demonstrated competence and qualifications as provided by [cite QBS law or Brooks Act].
- (q) The selected or designated architect shall not be eligible to submit a response to the request for proposals nor provide design input to a design-bid response to the request for proposals.

XXXIV. REQUEST FOR QUALIFICATIONS.

- (c) The governmental entity, assisted by its architect representative, shall prepare a request for qualifications that includes, but is not limited to, general information on:
- (1) project site;
 - (2) project scope;
 - (3) project budget;
 - (4) project schedule;
 - (5) criteria for selection and the weighting of the qualifications criteria;
 - (6) notice of any rules, ordinances or goals established by the governmental entity, including goals for minority and women-owned business participation; and
 - (7) other information that may assist potential design-builders in submitting qualifications for the project.

XXXV. EVALUATION OF RESPONSES TO REQUESTS FOR QUALIFICATIONS.

- (o) The governmental entity shall evaluate each responsive design-builder for the following criteria:
- (16) specialized experience and technical competence with respect to the type of services required;
 - (17) capacity and capability to perform services within the time limitations fixed for the project;
 - (18) the past record of performance of the design-builder or of the members of the design-build team with respect to such factors as control of costs, quality of work, and ability to meet schedules;
 - (19) the design-builder's proximity to and familiarity with the area in which the project is located; and
 - (20) other appropriate information submitted in response to the request for qualifications.
- (p) The governmental entity may request design-builders to submit additional information and, if the governmental entity chooses, invite some or all responders to an interview with the governmental entity.
- (q) Each design-builder shall certify to the governmental entity that each architect or engineer that is a member of the design-build team was selected based on demonstrated competence and qualifications, in the manner provided by [cite QBS statute or Brooks Act]; and



- (r) Following evaluation of the qualifications of the design-builders, the governmental entity shall select, based on the published criteria, the three most highly qualified design-builders and issue to them a request for proposal.

XXXVI. REQUEST FOR PROPOSALS.

- (e) The governmental entity shall request proposals from the selected design-builders. The request for proposals shall include, but is not limited to:
 - (12)the procedures to be followed for submitting proposals, including place, date, and time deadlines;
 - (13)the criteria for evaluation of proposals and their relative weight;
 - (14)the design criteria as defined in Section IX;
 - (15)budget limits for the design-build contract, if any;
 - (16)a description of the minimum conceptual design documents required, such as floor plans, elevations, building sections, site plan and specifications, with guidance as to the form and level of completeness;
 - (17)a requirement for the submittal of a total project price with identified assumptions, allowances, unit prices, etc., if any;
 - (18)policies of the governmental entity, such as:
 - i. retainage,
 - ii. contingencies,
 - iii. requirements for bid security, performance bonds, payment bonds, and insurance.

XXXVII. DESIGN CRITERIA.

- i. The governmental entity, assisted by its architect representative, shall prepare design criteria that includes detailed information on the project, such as:
 - (10)programmatic needs, interior space requirements, intended space utilization, and other capacity requirements;
 - (11)information on the physical characteristics of the site, such as a topographic survey;
 - (12)material quality standards or performance criteria;
 - (13)special material requirements;
 - (14)provisions for utilities;
 - (15)parking requirements;
 - (16)the type, size, and location of adjacent structures; and
 - (17)notice of any ordinances, rules, or goals adopted by the governmental entity;

XXXVIII. EVALUATION OF PROPOSALS AND SELECTION OF BEST PROPOSAL.

- (a) Proposals shall be sealed and shall not be opened until expiration of the time established in the request for proposals. Once the deadline for submittals has expired, the governmental entity shall evaluate responses to the request for proposals.
- (b) The governmental entity may reject as nonresponsive any design-builder that makes a significant change to the composition of its team as initially submitted.
- (c) The governmental entity shall review the proposals for conformance with the requirements of the request for proposals. Clarifications may be required of each design-builder by the governmental entity. The governmental entity shall determine in its opinion the best proposal and recommend to the governmental entity that a contract be awarded to that design-builder.
- (d) The governmental entity shall have the right to reject any and all proposals and may thereafter solicit new proposals using the same process.

XXXIX. NEGOTIATIONS.



- (b) The governmental entity shall enter into negotiations with the selected design-builder to reach final agreement on terms and conditions of the contract for construction.

XL. STIPEND AMOUNT FOR UNSUCCESSFUL DESIGN-BUILDERS.

- (a) Unless a stipend is paid under Subsection (c), the design professional for the design-builder retains all rights to the work product submitted in a proposal. The governmental entity shall not release or disclose to any person, including the successful design-builder, the work product contained in an unsuccessful proposal. The governmental entity shall return all copies of the proposal and other information submitted to an unsuccessful design-builder. The governmental entity or its agents shall not make use of any unique or non-ordinary design element, technique, method, or process contained in the unsuccessful proposal that was not also contained in the successful proposal at the time of the original submittal, unless the governmental entity acquires a license from the unsuccessful design-builder.
- (b) A violation of this section voids the contract for the project entered into by the governmental entity. Any interested party may bring an action for an injunction, declaratory relief, or damages for a violation of this section. A party who prevails in an action under this subsection is entitled to reasonable attorney's fees as approved by the court.
- (c) The governmental entity shall offer a fair and reasonable stipend to unsuccessful design-builders that submit responsive proposals in response to the request for proposals. The stipend amount shall be specified in the request for proposals. If the offer is accepted and paid, the governmental entity may make use of any work product contained in the proposal, including the design, form, materials, techniques, methods, processes, and information contained in the proposal. The use by the governmental entity of any design element contained in an unsuccessful proposal is at the sole risk and discretion of the governmental entity and does not confer liability on the recipient of the stipend under this subsection.
- (d) Notwithstanding other law, work product contained in an unsuccessful proposal submitted and rejected under this subchapter is confidential and may not be released unless a stipend offer has been accepted and paid as provided by Subsection (c).

XIII. CHANGES TO KEY PERSONNEL.

The design-builder shall obtain written approval prior to changing key personnel after the contract has been awarded.





Construction Manager At-Risk

AIA Position

“The American Institute of Architects believes that project delivery processes must enhance the quality, cost-effectiveness, and sustainability of our built environment. This can best be achieved through industry-wide adoption of approaches to project delivery characterized by early and regular involvement of owners, architects, constructors, fabricators and end use/operators in an environment of effective collaboration, mutually defined goals and open information sharing.”

Action Sought

The AIA urges state legislators to support Construction Manager At-Risk as a highly collaborative and cost-effective project delivery method that meaningfully integrates the design process with essential constructability expertise early in a project.

Explanation and Justification

Construction Manager At-Risk (“CM At-Risk”) for public works is a project delivery method that is authorized by statute to enable a governmental entity to enter into a contract with a constructor early in the design process. This method encourages early collaboration and interactions between design professionals and construction experts which should add efficiencies and value to projects. Efficiencies and added value, *as follows*, are particularly important in the context of publicly-funded projects.

With CM At-Risk,

- construction can begin before design is fully developed which can save time;
- design and construction expertise are integrated early in the life of a project which maximizes communication;
- the contractor can begin purchasing or obtain future commitments for materials and equipment before the design has been completed which could save money; and
- the architect retains a separate contractual relationship with the owner which ensures quality control and protects the owner’s best interests.

Conclusion

State legislatures across the country are looking for innovative project delivery solutions that deliver high quality work and measurable value for taxpayer money. CM At-Risk project delivery can provide this outcome. Indeed, over half of the states in the U.S. have already authorized CM At-Risk for building projects to varying degrees.

For more information contact the State & Local Government Relations team at Yvonnecastillo@aia.org or Zacharyhart@aia.org.

DESIGN & CONSTRUCTION DELIVERY METHODS ¹ FOR PUBLIC PROJECTS							
DESIGN-BID-BUILD	CONSTRUCTION MANAGER/ADVISOR	CONSTRUCTION MANAGER/AT RISK	DESIGN-BUILD				
<p>Design-Bid-Build (D-B-B) is familiar to public owners. It is a sequential process with no overlap in the primary tasks:</p> <ol style="list-style-type: none"> 1) Design culminates in plans and specifications as bidding documents; 2) Bids are received and the project awarded to the low responsive bidder; and 3) Building occurs during the construction phase that follows. Construction contracts are administered by the A/E. <p>PROS</p> <ul style="list-style-type: none"> • Process familiar to public owners • Relatively easy process to manage • Defined scope of construction work • Lowest price for scope • Works well for uncomplicated projects sensitive to budget, but not a critical schedule. • Better for inexperienced public owners due to relative simplicity of process <p>CONS</p> <ul style="list-style-type: none"> • Linear process takes longer than alternative delivery methods • No control over selection of contractor and subcontractors • No budget input from contractor during design 	<p>CM-Advisor is a consultant who offers construction advice to the D-B-B method, but who has no duty to build the project. The Owner contracts with the architect and construction manager as consultants, and with each contractor who will actually perform the work. Construction contracts are administered by the CM and A/E working together.</p> <p>PROS</p> <ul style="list-style-type: none"> • Early CM advice on costs & scheduling • CM responsible for project budget and schedule • Defined scope of construction work • Lowest price for scope • Better for inexperienced public owners due to relative simplicity of process <p>CONS</p> <ul style="list-style-type: none"> • Linear process takes longer than alternative delivery methods • No control over selection of contractors • CM has no contractual responsibility with contractors, thus less leverage • Final price is not established until all packages are bid • Owner must manage multiple contracts 	<p>CM-At Risk is similar to CM-Advisor with the significant exception that the CM-At Risk also takes on general contractor responsibilities to build the project. A guaranteed maximum price (GMP) is often provided by the CM, who later bids and awards contracts to subcontractors. The final construction price is the sum of the CM fee and the subcontractors' bids. The Owner will not pay more than the GMP, and usually retains or shares any savings. Construction contracts are administered by the CM and A/E working together.</p> <p>PROS</p> <ul style="list-style-type: none"> • Early CM involvement in estimating and constructability • All work except CM fee is bid • Single point of accountability: CM at-Risk holds contracts with all subcontractors • Guaranteed maximum price is common • Fast-track delivery (overlap of design and construction) may save time • Good for large, complex projects <p>CONS</p> <ul style="list-style-type: none"> • Not suited for small projects • Not as simple as D-B-B for inexperienced public owners 	<p>Design-Build involves a single contract between owner and a D-B entity that provides both architect and general contractor services. The D-B entity may be an ongoing business organization employing both architects and contractors, or it may consist of a team formed for the purpose of a specific project, led by either an architect or a contractor. In either case, to comply with professional registration laws, it is mandatory that the design portion of the project be led by and under the "responsible control" of a licensed architect. In all 4 versions, it is possible for pricing and construction to begin prior to completion of design. The contractual relationships are the same for all 4 of these D-B variations. The construction contracts are administered by the owner except for bridging, where administration is provided by the owner's independent architect. The major difference in the 4 variations is the timing of selection of the D-B entity and the extent of conceptual or preliminary design work undertaken prior to selection.</p>	<p>D-B/QBS</p> <p>In D-B/QBS, D-B entities compete solely on the basis of qualifications and proven competence. Thus, the D-B team is selected prior to preparation of any design and pricing. Because most public work is subject to a well-defined maximum project budget, the design and construction process after selection of the D-B aims to provide the most quality for the budget available.</p> <p>PROS</p> <ul style="list-style-type: none"> • Single point accountability to owner • Faster completion than D-B-B • Good cost control • Better process for complex projects • Best D-B for owner collaboration during design <p>CONS</p> <ul style="list-style-type: none"> • • • 	<p>D-B/Best Value - Fees</p> <p>In D-B/BV-Fees, D-B entities compete on the basis of qualifications, proven competence, and proposed fees and general conditions costs. Because most public work is subject to a well-defined maximum project budget, the design and construction process after selection of the D-B aims to provide the most quality for the budget available.</p> <p>PROS</p> <ul style="list-style-type: none"> • Single point accountability to owner • Faster completion than D-B-B • Good cost control • Better process for complex projects • Best D-B for owner collaboration during design <p>CONS</p> <ul style="list-style-type: none"> • • • 	<p>D-B/Best Value – Total Cost</p> <p>In D-B/BV-Total Cost, D-B entities typically compete on the basis of qualifications, proven competence, a conceptual design, and proposed total construction cost. Because most public work is subject to a well-defined maximum project budget, the greater selection emphasis tends to be on the quality of the design proposed for the budget available.</p> <p>PROS</p> <ul style="list-style-type: none"> • Single point responsibility for owner • Faster completion than D-B-B • Good cost control • Better process for complex projects • Owner sees multiple design concepts <p>CONS</p> <ul style="list-style-type: none"> • Less owner collaboration during design • Costly for unsuccessful D-B teams • Less owner design control after D-B selected 	<p>D-B/Bridging</p> <p>In D-B/Bridging, the owner's independent architect prepares a preliminary design with performance specifications and detailed preliminary plans and elevations. The D-B entities compete by bidding to complete the preliminary design documents and construct the building.</p> <p>PROS</p> <ul style="list-style-type: none"> • Owner has more design control • • • <p>CONS</p> <ul style="list-style-type: none"> • Requires more time • Discontinuity in design quality and cost responsibility between the 2 phases • More cost to owner for fees •
TYPICAL SELECTION PROCEDURE							
<p>Architect by QBS² General Contractor by Low Bid</p>	<p>Architect by QBS² CM-Advisor by QBS² Contractors by Low Bid</p>	<p>A/E & CM-At Risk by QBS² Subcontractors by Low Bid</p>	<ol style="list-style-type: none"> 1) The owner issues an RFQ (Request for Qualifications) and ranks responses in hierarchical order based on stated criteria. 2) The owner negotiates detailed scope and fair and reasonable fees with the highest ranked entity. 3) If negotiations are not satisfactory to the owner, negotiations are formally terminated. 4) New negotiations are opened with the next ranked entity, continuing until the result is satisfactory to the owner. 	<ol style="list-style-type: none"> 1) The owner invites 3 to 5 D-B entities to compete by submitting an RFP (Request of Proposals) with fees and general conditions costs. 2) The owner selects a D-B on the basis of its judgment of Best Value. 	<ol style="list-style-type: none"> 1) The owner issues an RFQ (Request for Qualifications). 2) The owner invites 3 to 5 D-B entities to compete by submitting an RFP (Request for Proposals) to include a conceptual design, fees, and construction cost. 3) The owner selects a D-B on the basis of its judgment of Best Value. 	<ol style="list-style-type: none"> 1) The owner selects a consulting architect by QBS to prepare a functional and aesthetic preliminary design. 2) The owner invites D-B entities to compete by submitting a bid on the preliminary design documents. 3) The owner selects a D-B on the basis of its bid, and the D-B entity completes the final construction documents as the architect of record. 	
CONTRACTUAL RELATIONSHIP							
SEQUENCE							
OPPORTUNITY FOR INTEGRATED PROJECT DELIVERY (IPD) PHILOSOPHY ³ IN A PUBLIC PROJECT							
<p>Very limited - contractor can provide advice only after design, documentation & bidding are completed.</p>	<p>Somewhat limited – owner has benefit of CM advice, but not advice from the at-risk contractors until after bidding.</p>	<p>Good – CM-At Risk can contribute early in the planning process, but subcontractors can only contribute after bidding.</p>	<p>Excellent – owner has complete participation in the design and construction process.</p>	<p>Excellent – owner has complete participation in the design and construction process.</p>	<p>Somewhat limited – owner does not have benefit of meaningful constructor advice until the D-B entity is selected.</p>	<p>Somewhat limited – owner does not have benefit of meaningful constructor advice until the D-B entity is selected.</p>	

1 There can be many variations to each basic delivery method. The descriptions here represent a typical profile of each method.

2 QBS means Qualifications Based Selection, a procedure in which a provider is selected on the basis of demonstrated competence and qualifications only. After ranking the qualifications, detailed scope and a fair and reasonable fee are negotiated with the top-ranked candidate.

3 A philosophy of Integrated Project Delivery (IPD) for public work means an explicit intent for extensive collaboration among owner, A/E, and constructor(s) for the best interests of the project, throughout the entirety of the process from planning & design through to project completion.



Issue Brief

Public-Private Partnerships: Managing Objections Fiscal Implications Related to an Oversight Body

Because the rising interest in P3s stems mostly from the public sector's inability to deliver infrastructure with public funds, some P3 proponents object to the creation of a new oversight agency out of the belief that such an agency will put a further burden on public finances. However, the opposite is true. An oversight agency is needed to prevent the needless waste of taxpayer dollars by ensuring that potential P3 use is appropriate, bids are competitive and realistic, and bidders are qualified. Furthermore, an expert oversight inspires confidence in the marketplace and encourages competition. The following talking points are meant to help advocates argue in favor of an oversight agency such as the Office of Social Infrastructure Planning and Partnerships (OSIPP).

Not an Ordinary Procurement Process, P3 Requires High-Level Expertise

P3 project delivery is most appropriate for large, complex projects in which the private entity will provide long-term maintenance. Evaluating whether P3 delivers best value to the public requires a high level of expertise in finance, law, procurement, planning, and design. The requisite level of expertise in these disciplines is unlikely to be available in all the various government agencies that will be interested in P3 procurement. An oversight agency ensures that each potential P3 is examined by credible experts in a transparent, predictable process.

The Market Demands a Consistent Administrative Process for P3

The formation of an oversight agency like OSIPP signals seriousness, stability, and expertise to the marketplace. This dispels the perception that P3 projects are ad-hoc endeavors done by unprepared governments out of desperation for capital. This will foster a more stable and attractive P3 market, leading to the participation of more firms which will drive prices down due to increased competition.

Taxpayers Deserve Oversight

Due to their large size and high degree of complexity, P3 projects are high-dollar endeavors. An oversight agency such as OSIPP not only provides the government the expertise it needs to protect taxpayer money, but the money saved from avoiding even one poorly conceived P3 project could more than pay for the expense of operating the agency (see Long Beach Courthouse Case Study).

Exclusive Oversight by One Agency Enables Efficient Capital Asset Planning

An agency like OSIPP can help the government comprehensively evaluate its building portfolio, identifying inefficiencies in the government's management of its capital assets and helping it prioritize its building program to deliver the most efficient use of resources.



September 23, 2013

Re: Six Ways to Successful Public Private Partnership Policies

Issue: Public Private Partnership (PPP) Experiences from Other Countries

Facts: Only five states (Virginia, Texas, Maryland, Florida and North Carolina) have passed *comprehensive* legislation that would authorize governmental entities to contract with private developers to design, build, finance, operate and maintain public facilities. None of these policies address the challenges that have arisen in other countries where PPP has been used for decades for public infrastructure. For example, after almost 20 years of use in the UK, the Private Finance Initiative (as PPP is called there) has been halted to reassess some of the challenges. Midway through Australia's 15-year use of PPP, national guidelines have been implemented to unify the piecemeal approaches of individual jurisdictions and to promote a more measured and objective comparison between PPP and other project delivery methods, thus ensuring the PPP's appropriateness. After about 10 years of PPP use in Canada, the Conference Board of Canada (CBC), a highly regarded and objective organization, released in August of this year a comprehensive study acknowledging that PPP can be a valuable tool for the government to deliver infrastructure. However, the CBC also discusses key "value for money" components such as project size (e.g., minimum \$60 million) and project scope (design-build-finance *with* a long-term maintenance and operations contract) that should be assessed before the decision to use PPP is made. Part of the study considered pervasive concerns with the concept of "bundling" smaller separate projects in order to meet the project size threshold.

Summary Analysis: Public Private Partnerships give governmental entities an additional tool to deliver infrastructure—the ability to finance the design and construction of a building with a private developer. Like any finance tool, there's a price tag which still falls to the taxpayer. That price tag comes in the form of a long-term building lease where the developer can recoup its costs and realize a steady stream of cash through lease payments from a relatively stable tenant—the government. The "hook," or value proposition, on both sides of the contract—for the developer and the governmental entity—lies squarely on the maintenance and operations terms of the contract. If the developer is contractually required to maintain and operate the building over a long-term period, such as 30 years, an incentive is built in to ensure that the developer balances design quality with the life-cycle performance of the building, including efficient operational systems. This long-term incentive benefits the government, which will assume ownership of the property after expiration of the long-term lease. We've discovered, anecdotally from stakeholders with PPP experience in other countries, that one of the most remarkable differences they've noted with PPP government buildings is that "the buildings always look new." This demonstrates a notable advantage to public private partnerships for government property owners, where maintenance and operations are contractually mandated and integrated. The flip side of governmental entities entering into long-term contracts (e.g., 30 years) is being locked into those facility constraints for a long-term, which could limit the ability of the government to adapt to changes in the future. All changes would have to be renegotiated with the lessor (the private developer). Anticipating these issues at the front end, before the contract is signed, is a critical factor in the process.

From our interviewing UK, Australian, and Canadian stakeholders who have extensive experience on the private and government sides of public private partnerships, certain themes and “lessons learned” emerged. These themes can help guide U.S. governmental entities who are considering PPP. We have summarized these themes in the form of six recommendations for state policymakers to consider as they weigh the pros and cons of using public private partnerships to deliver public buildings.

Key provisions that have *not* been included in the state policies enacted to date, but should, involve

- (1) a *requirement* that a public private partnership contract include a long-term maintenance and operations scope,
- (2) provisions that require a centralized governmental entity with expertise in PPP delivery and financial modeling to compare the value of long-term (e.g., 30-year contract) leases to existing project delivery models *before* issuing any requests for qualifications or proposals—a “suitability” test. The suitability test would be triggered *after* meeting some basic threshold requirements (e.g., at least \$60 million per separate project, as well as prohibiting bundling smaller separate projects to meet the threshold),
- (3) provisions that require the government to have an independent consultant or in-house expert in facilities planning, design and construction to assess, in a meaningful manner, the long-term projected needs of the government before considering the use of a public private partnerships. This expert should advise the government before the solicitation of interest from private developers, and should remain as advisor throughout the planning, design and construction,
- (4) comprehensive statutory guidelines, rather than directives to develop guidelines on an individual basis, should apply to all state and local government entities. These statutory guidelines will provide a uniform and fair process that enables private developers to properly assess the risks and rewards for engagement. Such consistency and predictability will be particularly beneficial to local governmental entities who lack experience in the complex financial and intensively legal process of entering into long-term public private partnership contracts,
- (5) provisions that encourage communication between design professionals and the end user during the request for proposals phase so that the government end user (e.g., hospital staff for a hospital project, teachers and administrators for a school project) is encouraged to provide direct, meaningful input to the competitor design teams developing the proposed designs, and
- (6) provisions that enable small businesses to compete by either a) restricting the use of design competitions or b) limiting the number of competitors required to provide designs during the request for proposal phase and by awarding reasonable stipends to unsuccessful bidders.



The HNTB Companies
Engineers Architects Planners

Challenges to successfully implementing a public-private partnership project

Best practices for P3 project delivery

WHITE PAPER | FEBRUARY 2011

Purpose and objective

This white paper identifies some of the key challenges owners face with public-private partnership project delivery and provides best practices to overcome these challenges based upon successful P3 experiences.

Problem statement

For purposes of this paper, P3 delivery is defined as a form of contracting between a public sector owner and private industry to capitalize on the potential for private investment in a project and to take advantage of beneficial risk allocation strategies between the public and private partnership developed. P3 delivery is a relatively new project delivery method in the United States but has a long history in Europe, Australia and other countries where government-sponsored, tax-exempt debt is not available. Owners in the United States are looking at P3 delivery as a way of bridging funding gaps and accelerating project delivery.

However, P3 delivery can place significant stress on an owner's organization that is more familiar with design-bid-build project delivery and when their organizational structure, systems, processes and culture are based upon this traditional delivery method.

This paper addresses four challenges commonly faced by owners new to P3 project delivery that directly affect how they organize for success. Those challenges are:

- Timely decision making and decisions consistent with P3 risk allocation strategies.
- Maintaining transparency through the P3 procurement process.
- Maintaining owner control while getting the most from P3 project delivery.
- Making the right risk allocation decisions that provide the most cost effective project solutions.

Response to the challenges

Challenge: Timely decision making and decisions consistent with P3 risk allocation strategies.

Cause: There are many causes that may result in owner decisions being delayed or made inconsistently with P3 contract document requirements but some of the most common are:

- Non-dedicated core management team – owner key resources responsible for multiple projects.
- Owner's functional groups organized in silos – owner traditional organizational structure used for P3 project delivery.

- No single point responsibility – no project director assigned or lacking decision making authority and authority over project staff.
- Owner management team lacking P3 experience.
- Using design-bid-build processes, systems and structure to manage P3 project delivery.
- Lack of management team continuity from procurement to design and construction through operations and maintenance.

Result: The threats associated with untimely decisions and decisions inconsistent with P3 risk allocation strategies can be significant and include:

- Delaying the procurement process due to response times to proposer's request for information/clarifications.
- Responses to RFI/RFCs that are inconsistent or contradict RFP requirements, increasing likelihood of DBFM claims.
- Contractually required response times missed by owner resulting in delay claims.
- Direction provided to DBFM contractor inconsistent with contract document requirements resulting in added cost and time.
- Delays in delivering owner commitments, such as right-of-way, environmental permits and third-party agreements resulting in claims for more cost and time.

Best practices: Successful P3 project delivery is founded on the owner's emphasis and ability to provide:

- A dedicated management team being single-minded and focused solely on delivering the project successfully.
- A management team that is transparent and experienced in P3 delivery, utilizing a blend of owner and consultant resources when necessary.
- A project director that is responsible and empowered for project decisions, staff direction and executive-level coordination.
- A management organization that is assembled during procurement and remains intact to oversee design and construction through operations and maintenance.
- An owner team (owner and consultant staff) colocated with DBFM contractor for collaboration and timely decision making (for large P3 projects).
- A management team that provides the necessary functional groups to oversee successful project delivery.

Challenge: Maintaining transparency through the P3 procurement success.

Cause: The genesis of this concern is the high stakes that are at risk with large P3 procurements and the heightened level of concern proposers have regarding an owner's ability to manage a fair and equitable procurement selection process. Questions can be raised as a result of:

- A perception that there may be political influence that could affect the selection process.
- A perception that the procurement process may not provide confidential communications.
- A perception that there may be unwritten selection requirements that will influence the outcome of the procurement.

Result: P3 procurement strategies are instrumental to getting the most from this alternative delivery method. If proposers become concerned that the procurement process is not transparent, the effects can be very damaging including:

- The threat of reduced competition because proposers choose not to submit proposals or suggest they may not submit proposals.
- Reduced competition puts increasing pressure on the owner to accommodate proposer risk allocation requests to maintain an adequate number of competitors.
- Reduced competition can increase the pricing and have a negative impact to the financial proposals received.
- A lack of innovation and cost savings as proposers choose to reduce their overall level of effort, including the number of alternative technical concepts they submit.

Best practices: It is vitally important the owner develop a well-defined procurement process, to clearly communicate the process to the proposing teams and to instill confidence in the proposers that the process will be strictly followed and enforced. Procurement process best practices include:

- All levels of management that desire to be included in the procurement process need to have input and buy-in to the selection criteria in the instructions to proposers.
- A thorough selection manual is needed to define the roles and responsibilities of all participants in the selection process and to guide the procurement process. This is a "for owner's eyes only" document.

- All participants in the selection process shall sign a conflict of interest and confidentiality statement.
- The confidential nature of the process is consistently emphasized with the proposers.
- An industry review process is used to ensure all proposers fully understand the instructions to proposers and selection criteria and process.

Challenge: Maintaining owner control while getting the most from P3 project delivery.

Cause: One of the biggest challenges transitioning from design-bid-build project delivery to P3 delivery is the changing owner roles and the way the owner ensures quality. These changes include:

- Cultural changes required as a result of no longer directing the work but defining requirements and overseeing the work.
- The importance of the requirements in the RFP setting the quality standard.
- Ability to develop flexible requirements that deliver quality but encourage innovation.
- Changes in design-bid-build procedures and systems needed to oversee P3 delivery.
- Owner role changing from quality control to oversight of the quality process.
- RFP requirements take the place of owner preferences.
- The owner is no longer the engineer of record.

Result: If the owner struggles with making the change from design-bid-build to P3 delivery, many negative outcomes can occur including:

- The owner will not realize all of the potential P3 innovation and cost and time savings as a result of traditional constraints being placed on the DBFM contractor.
- Owner staff may direct the DBFM contractor's work resulting in change order requests and increased cost.
- The owner may delay the contractor by inserting design-bid-build practices into the P3 project.

Best practices: An owner can maintain control in P3 project delivery and benefit greatly from the new delivery method through well-defined contract requirements and sophisticated oversight processes and systems. Lessons learned include:

- Create a management team comprised of owner staff that embraces the project delivery change.

- The owner develops a thoughtful indoctrination plan to educate the owner team on the differences with P3 delivery vs. design-bid-build and the P3 contract requirements.
- Quality is delivered by developing the right contract requirements and ensuring the DBFM contractor meets all of the requirements.
- The owner team overseeing the DBFM contractor is the same team that developed the RFP requirements.
- Utilize sophisticated auditing and trending processes and procedures to ensure the contractor is meeting all contract requirements.
- Incorporate appropriate performance measures and incentives/disincentives into the contract requirements.

Challenge: Making the right risk allocation decisions that provide the most cost effective solutions.

Cause: Significant impacts occur when risks are shifted to a party that is not well equipped to manage the risks. This can occur when:

- There is a limited understanding of the implications of the risk allocation decisions.
- There is not a collaborative process that includes the necessary experts including financial, legal and technical to weigh in on the decisions.
- There is not a defined process to identify, document and review the risk allocation decisions.
- There is not a process to get management agreement on the risk allocation decisions.

Result: The effects of poor risk allocation decisions can include:

- Significantly increased cost due to unnecessary contingencies.
- The potential for reduced competition due to proposers choosing not to submit proposals.
- Significantly increased delivery schedules due to unnecessary time contingencies.
- Potential for a lower debt credit rating and higher-interest yields from investors.

Best practices: An upfront risk management program has proven to be a key element in ensuring success in P3 project delivery. This process includes:

- A risk management process that first eliminates/mitigates risks before allocating risks.

- Risk allocation decisions are based upon strategic, well-defined project goals and objectives.
- A cross functional group that includes legal, financial and technical experts collaborates on risk allocation decisions.
- A thorough industry review process is utilized to get industry review, feedback and input on risk allocation decisions. This is typically performed using the draft RFP as the basis for input.
- Project delivery risk is shifted to the DBFM as much as practicable.

Summary

There are many challenges to P3 delivery that can affect an owner's ability to take full advantage of this alternative delivery method. The challenges identified in this white paper can have significant negative impacts to P3 delivery. However, based upon past P3 successes, the best practices identified in this paper can greatly increase the likelihood a P3 project will be successfully delivered.

Additional resources

For more information about program life-cycle solutions, consult the following:

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Life Cycle Delivery of Public Infrastructure

Precedents and Opportunities for the Commonwealth

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A Pioneer Institute White Paper

by Dr. John B. Miller



PIONEER INSTITUTE
PUBLIC POLICY RESEARCH

Pioneer's Mission

Founded in 1988, Pioneer Institute is a non-partisan public policy think tank committed to keeping Massachusetts economically competitive and to strengthening the core values of an open society. To inspire market-driven policy reforms, Pioneer promotes individual freedom and responsibility and limited, accountable government. The Institute has changed the intellectual climate in Massachusetts by commissioning timely and rigorous academic studies from leading scholars. Pioneer injects new ideas into the public debate through forums and lectures, transcripts, the media, and outreach to legislators, business groups and the general public.

Pioneer's Centers

■ **This paper is a publication of the Shamie Center for Better Government**, which seeks limited, accountable government by promoting competitive delivery of public services, elimination of unnecessary regulation, and a focus on core government functions. Current initiatives promote *reform of how the state builds, manages, repairs and finances its transportation assets as well as public employee benefit reform*.

The Center for School Reform seeks to increase the education options available to parents and students, drive system-wide reform, and ensure accountability in public education. The Center's work builds on Pioneer's legacy as a recognized leader in the charter public school movement, and as a champion of greater academic rigor in Massachusetts' elementary and secondary schools. Current initiatives promote *choice and competition, school-based management, and enhanced academic performance in public schools*.

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Life Cycle Delivery of Public Infrastructure

Precedents and Opportunities for the Commonwealth

Dr. John B. Miller

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Contents

Executive Summary	1
Introduction	3
A. Delivery and Financing of Infrastructure Projects	4
B. Characterizing Infrastructure Projects	6
I. Two Hundred Years of Public-Private Partnerships in the United States	7
II. Recent Experience with Public-Private Partnerships	11
A. Monetization PPPs: Reaching Deep into the Future for Current Cash	11
B. Successful Greenfield PPPs - Based on Life Cycle Delivery	14
C. Massachusetts' Recent Experiments with Infrastructure Project Delivery	18
III. Framework for Considering and Using Life Cycle Delivery	20
A. Separating Design from Construction	20
B. Shifting the Focus from Initial Design to Initial Delivery	20
C. Shifting the Focus from Initial Delivery to Life Cycle Delivery	21
D. Whether a Project Can Produce a Return on Investment for a Private Entity	24
E. Understanding the Portfolio Approach to Project Delivery	27
F. How the Quadrants in the MIT Framework Differ	29
IV. Recommendations	32
A. A Better Understanding of the Current Condition of Existing Assets	32
B. Developing a Flexible Procurement System for the 21st Century	33
C. Expanding the Use of Life Cycle Delivery	33
V. Conclusion	34
Glossary of Terms	36
About the Author	39
Endnotes	40

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Executive Summary

Life-cycle delivery of infrastructure projects demands our attention. As the Commonwealth faces the interlocking threats of massive funding deficits, creeping levels of deferred maintenance, and unabated demands for expansion, public-private partnerships (PPPs) offer some potential relief. But, unless properly implemented and monitored, PPPs can also be a hindrance to strategic transportation planning and responsible budgeting. This report summarizes the opportunities and challenges PPPs present and recommends a strategy Massachusetts should follow in the future that adds life-cycle approaches to infrastructure delivery, a strategy based on delivering “value for money” and which demands improved levels of service, durable employment, and decreasing costs to users and taxpayers.

While much recent attention on PPPs has focused on high profile cases of the Chicago Skyway and the Indiana Toll Road, the reality is that life-cycle delivery strategies are not new. They have been used since our country’s earliest days and in significant amounts. In fact, PPPs accounted for over 90% of major public infrastructure projects from 1789 to 1933.

America’s most recent experiences have emphasized “monetization PPPs”, or the generation of large upfront payments to the public sector in exchange for long-term leases of specific toll roads. The Chicago Skyway deal consisted of a \$1.8 billion cash payment to Chicago in exchange for a ninety-nine year lease of the roadway. The Indiana Toll Road deal involved a seventy-five year lease of that roadway, resulting in a \$3.8 billion cash payment to the State of Indiana.

The tremendous cash windfall and strategic logic behind each transaction should not obscure more important lessons about life-cycle procurement. Neither the Chicago Skyway nor the Indiana Toll Road procurements were the result of head-to-head competition over lowest prices and highest

service levels, as evidenced by the \$1 billion spread between the two bids for the Skyway (\$800 million versus \$1.8 billion). Rather than competing to provide specified services – including repairs, maintenance, and operations – at the lowest toll rates over the shortest concession period, the procurements were structured such that the contract was awarded to the bidder offering the highest upfront payment.

As the Commonwealth faces the interlocking threats of massive funding deficits, creeping levels of deferred maintenance, and unabated demands for expansion, public-private partnerships (PPPs) offer some potential relief.

As comparative alternatives, the procurements for the Northumberland Bridge in Prince Edward Island and Toronto’s Highway 407 are also examined. Each demonstrates that competitive integration of design and construction with operations and maintenance can, and does, produce dramatic improvements in the cost of initial delivery, life cycle delivery, and the level of infrastructure service.

A companion to this paper, entitled *Lessons Learned: An Assessment of Select Public-Private Partnerships in Massachusetts*, examines infrastructure projects in Massachusetts in order to assess the level of private sector involvement and to draw lessons about appropriate procurement processes for life-cycle delivery.

The Commonwealth has the opportunity to choose when and where it makes sense to either combine or to segment key elements in the infrastructure delivery process. The first decision point is to determine the level of control the public sector wants over design. This is a complex trade-off between control and flexibility versus construction and life-cycle costs. A segmented approach assures public officials that design will

be largely completed before a decision is made on construction, which lowers risk but increases cost and lengthens project schedules.

Once a decision on the appropriate level of control has been made, the Commonwealth should consider, on a project-by-project basis, whether it makes sense to combine design and construction into a single design-build procurement. Again, depending on the circumstances of each project, this approach allows greater control of scheduling, risk, and costs.

To extend further down the construction value chain, the Commonwealth should consider life-cycle delivery, incorporating design, construction, and operations and maintenance into a single competitive procurement. This approach has the virtue of combining highest service levels over a facility's entire life-cycle, thus lowering overall project delivery costs, and fully funding proper maintenance of public assets.

As part of life-cycle delivery, the project's ability to produce a return, be it through user fees, availability payments, rents, or some other means, should be assessed. Based on this determination, the Commonwealth can evaluate the project's potential ability to attract either direct or indirect funding (that is provided directly by the Commonwealth or indirectly through private sector financing).

Finally, the Commonwealth's thinking about project procurement should be broadened to consider our transportation assets as a portfolio. Do we have the resources to build and properly maintain all the projects we want using just design-bid-build and design-build? Clearly not.

Could we build and properly maintain more using a variety of approaches? Clearly yes. The challenge for the Commonwealth is to plan holistically, determine which projects are most appropriate as design-bid-build or design-build and which projects are most appropriate

for life-cycle delivery, which projects are more appropriately funded directly and which are more appropriately funded indirectly.

To succeed, several actions are needed. First, the operations and maintenance costs of current and planned assets must be known and transparent.

Transparency, head-to-head competition, and a menu of well-understood procurement processes are the most important ingredients to successfully attacking and addressing Massachusetts infrastructure needs.

More importantly, the Commonwealth's procurement system should be revised to permit the full range of basic delivery methods, which would require reconfiguring several of the restrictions in the Pacheco law. A flexible system with access to the full range of methods would attract new participants and establish durable markets. Transparency, head-to-head competition, and a menu of well-understood procurement processes are the most important ingredients to successfully attacking and addressing Massachusetts infrastructure needs.

Based on the foundation of good procurement practices, the Commonwealth should engage in a planning and procurement process that incorporates life-cycle delivery alongside other procurement methods.

Much of our future infrastructure construction will continue to be performed through the traditional means of design-bid-build. But with scarce resources, the creeping malaise of deferred maintenance, and a long list of desired projects, the Commonwealth should use life-cycle delivery methods to expand available resources and create value for taxpayers.

Introduction

Early this decade, public-private partnership agreements for the Chicago Skyway and Indiana Toll Road were reached,¹ creating the sense in the market that a series of privatization deals would follow closely behind. Supporters, primarily in the transportation sector, have been widely promoting PPPs as a “solution” to America’s infrastructure problems. Most of these marketing efforts have failed: a cursory review of recent issues of Public Works Financing, a PPP industry newsletter, seems to indicate that only about 1 in 20 PPP proposals for American infrastructure projects, allegedly modeled on prior British or European successes, have reached financial closure. Intense marketing efforts by financial houses have not yet succeeded in “unlocking the trapped value” in existing infrastructure projects

through “monetization”. Recent events in the world’s financial systems are likely to result in an even more careful and calculating evaluation of public infrastructure projects and facilities before far-reaching decisions are made by public officials to “monetize” existing facilities in exchange for very long term liability. The “PPP” world is likely to move decidedly back toward a transparent, competitive determination of “value for money.” Fortunately, throughout the 1980s and 1990s, that is, before the monetization flurry, American academics supported by the National Science Foundation, the Corps of Engineers, and the U.S. Department of Transportation, had already explored the effective use of alternative project delivery and finance methods, including PPPs, that produce infrastructure facilities and services with better initial and long term cost and schedule performance.

Figure 1

How Are Project Costs Paid?

Government pays for projects with public resources.

Direct

This includes monies obtained by:

- (i) collecting taxes, user fees, or other funds;
- (ii) borrowing funds (typically bonds or bond anticipation notes; and
- (iii) receiving grants of money from other governments.

Funds are borrowed based on the credit-worthiness of the government. Grants received are available through taxes or charges by other governments.

Indirect

Government attracts the private sector to pay for projects with private sector resources. This is typically done by ceding specific, limited, control over a public infrastructure asset to create a revenue stream that the private sector will use to earn a return on capital invested and a profit.

“Indirect” includes monies obtained by:

- (i) charging user fees;
- (ii) borrowing funds; and
- (iii) raising equity.

Funds are typically borrowed for design and construction based on the credit-worthiness of the project to produce sufficient revenue to repay the borrowed funds (with interest), to pay for long term O & M, and a profit.

A. Delivery and Financing of Infrastructure Projects

As the options and approaches for infrastructure delivery and financing grew more complex in the 1990's, researchers began to look carefully into the history of infrastructure project delivery and finance in the United States. They sought to develop a simple, yet useful way to compare project delivery and financing methods, and to create ways for public officials and policy makers to think systemically about how the nation might move from its current focus on initial delivery to a more comprehensive focus on both initial delivery and life cycle delivery of public infrastructure.

Two issues recur in the provision of public infrastructure: who pays for infrastructure services and who contracts with government as it arranges to deliver the three key elements of every infrastructure project – design, construction, and long term operations and maintenance. Two different strategies are described below.²

PPPs accounted for over 90% of major public infrastructure projects from 1789 to 1933.

1. Who pays, at least initially?

Governments can choose one of two basic strategies in answer to “Who pays?” (See Figure 1). The first, described as “direct,” is for government to pay for infrastructure projects with cash that it raises for these purposes. Governments raise their own funds through sales and/or income taxes, user fees, or other charges, and frequently borrow funds in private sector capital markets in order to have sufficient cash on hand to pay for ongoing obligations like health care, education, and public infrastructure. For the purpose of this report, when government assures the private sector that the revenue stream from

tolls, user charges, or government payments will be sufficient to pay for services provided, including a return on investment and profit, this government commitment amounts to “Direct” funding.

Governments may also choose an alternative answer to the financing question. In this approach, described as “Indirect” in Figure 1, a government positions a public infrastructure asset in such a way that the private sector agrees to pay for design, construction, and long term operations and maintenance, in exchange for the opportunity to recover this investment plus a reasonable return through the collection of tolls or user charges. The private sector typically provides these funds through a contribution of equity and by borrowing funds in private sector capital markets. For the purposes of this report, where the timing, amount, and sufficiency of the revenue stream from tolls and/or user charges is at the private sector company's risk, the answer to “Who pays?” is the private sector, and the financing approach is indirect. However, from the consumer's point of view, the consumer is always paying through gasoline, sales, and/or income taxes or tolls paid to government that permit direct financing or through tolls and user fees paid to private sector companies that permit indirect financing. From a practical viewpoint, unless indirect financing from the private sector provides better service and higher value, and/or at lower cost to users, consumers understandably treat indirectly financed projects as an additional tax burden because the government permits the private sector to collect tolls and user fees as the vehicle for substituting private provision for public provision of infrastructure services.

2. Who Contracts With Government to Deliver What?

To a large extent, the structure of the U.S. construction industry determines which professions and firms may contract with the

Figure 2

How Are Project Elements Delivered?

The three (3) key elements of infrastructure projects are delivered separately from each other – “Segmented.”

Distinctions remain between capital budgets for the initial delivery of projects and the operating budgets for long term repair, operations, and maintenance.

Combining Design with Construction (Design-Build) is included here, as is Operations % Maintenance.

Design

Construction

Design-Build

**Operations &
Maintenance**

Segmented

The three (3) key elements of infrastructure projects are delivered together – integrated with each other – “Combined.”

Distinctions are eliminated between capital budgets and operating budgets for these projects.

All “Public Private Partnerships” use combined delivery methods.

Design-Build-Operate-Maintain
(including all combinations of public and private sector funding)

Combined

government to provide public infrastructure. Architects and engineers must be professionally registered under state statutes that require them to play specified roles in the design of public infrastructure facilities. General construction contractors are also licensed under local statutes, and generally provide construction services in accordance with a complex set of local, state, and federal statutes and regulations relating to labor, safety practices, and the environment. Since the Great Depression, government has typically arranged and provided for long term operations and maintenance of infrastructure facilities out of public operating budgets.

Since 1933, the U.S. government and the construction industry have established procurement models to support contracts between the government and separate segments of the industry. Professional designers typically contract directly with governments to provide design through a qualifications-based selection process that balances technical qualifications and cost.

General contractors typically contract directly with governments to build the specified design for a fixed price. Governments then typically maintain and operate the infrastructure facilities at public sector expense.

Governments can choose one of two basic strategies in answer to the “Who contracts with government?” question. In a segmented strategy, government provides for key elements on a piecemeal or segmented basis by separately hiring designers and construction contractors to deliver infrastructure. (For the purposes of this report, the combination of design and construction (design-build) is a segmented process.)

In contrast, governments may also choose a combined approach, whereby a government combines design, construction and long term operations and maintenance in a single contract with a single entity. That single entity performs one or more of these functions itself and sub-contracts with one or more designers, operators,

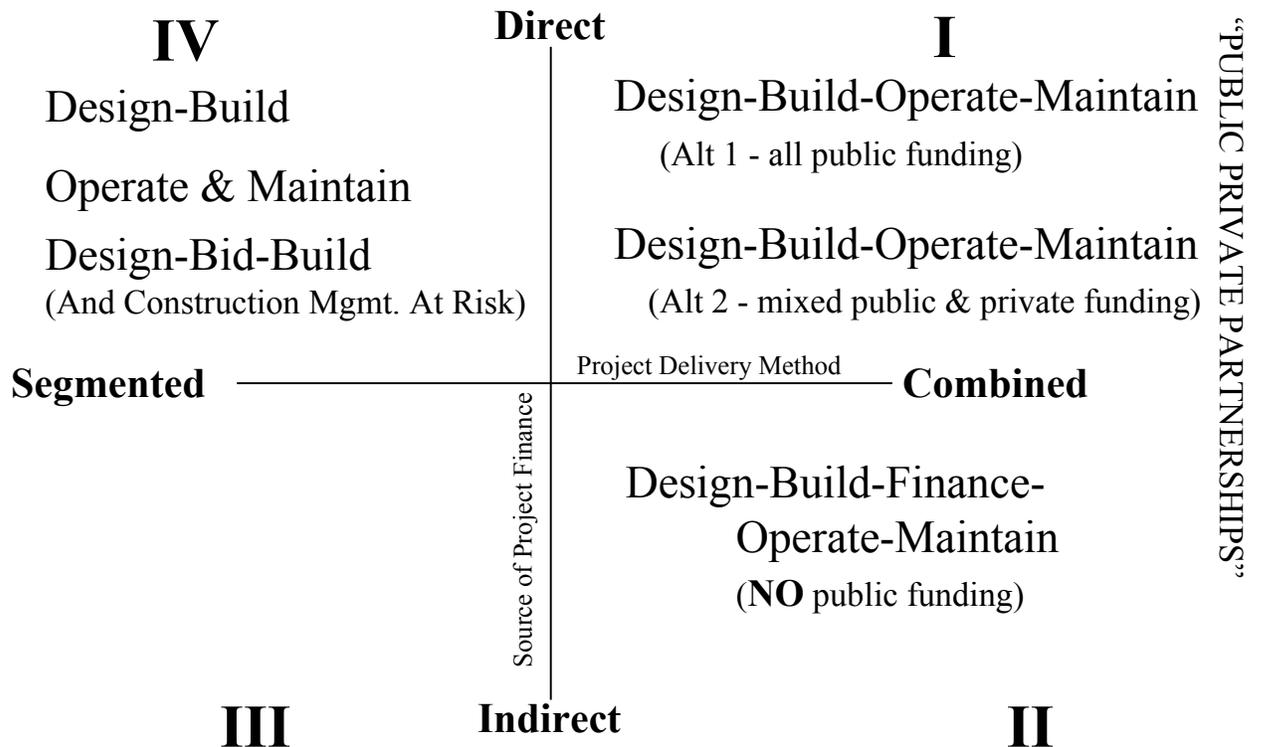
and construction contractors to deliver the completed project over a life-cycle. In this report, projects delivered through a combined or life-cycle strategy may be termed “public-private partnerships” or “PPPs.” Figure 2 illustrates these basic choices.

B. Characterizing Infrastructure Projects

The combination of the concepts in Figures 1 and 2 is shown in Figure 3 – a simple framework of quadrants developed within MIT’s Civil and Environmental Engineering Department in the 1990’s (the MIT Framework). The MIT Framework distinguishes between direct and indirect financing strategies, and segmented and

combined delivery strategies. The horizontal axis represents the degree to which the design, construction, and long term operations and maintenance of an infrastructure facility are segmented into multiple contracts or combined in a single contract. The vertical axis represents the degree to which funds to pay for capital and operating costs are direct or indirect. America’s 225 year experience with infrastructure delivery and finance and the six key methods that ultimately produced America’s infrastructure networks have been incorporated into the MIT Framework, as shown in Figure 3.

Figure 3
Six Key Delivery Methods



I. Two Hundred Years of PPPs in the United States

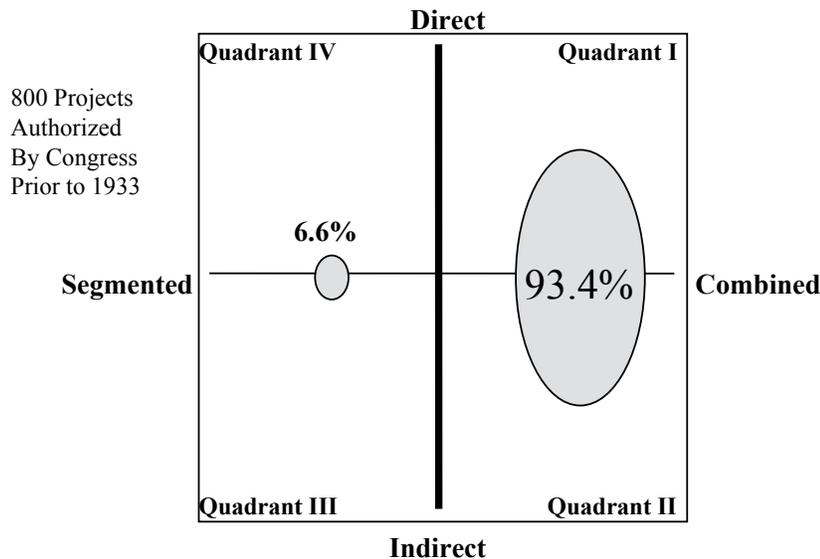
America’s experience with PPPs dates to the period before the adoption of the U.S. Constitution, and confirms that each of the six key delivery methods listed in Figure 3 have been repeatedly and successfully used. Claims by trade associations, marketing firms, investment banks, and interest groups to the effect that one of these methods is inherently new or better are not true. There is no project delivery method that is uniquely and consistently best for the delivery of all of America’s infrastructure projects.

Between 1789 and 1933, federal, state, and local governments faced the same issues currently facing government today – are the costs (both short and long term) of new or refurbished infrastructure projects and facilities justified by the value received? Infrastructure capacity

and level of service were seen then, as now, as fundamental platforms on which local, interstate, and international commerce rely.

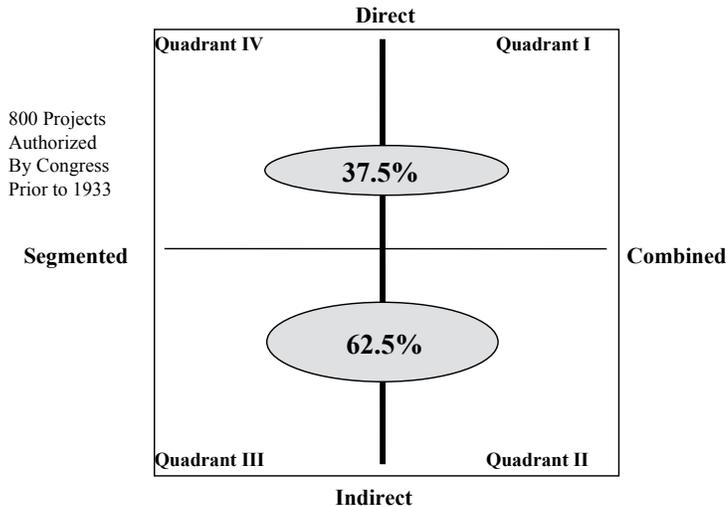
To address pressing infrastructure needs when public budgets were tight and there were competing demands on resources, federal, state and local governments used all of the six key delivery methods listed in Figure 3. Early in this period, most states along the Atlantic seaboard invested public funds in infrastructure development companies in exchange for stock. In general, these investments were failures. The Panic of 1837-39, an economic recession facing the entire country, was caused in part by inappropriate investment of public resources in stock companies promoting infrastructure development. In response, most states amended their constitutions to preclude direct state aid to companies or individuals engaging in infrastructure improvements.³

Figure 4
Early Emphasis by Congress on
Life Cycle Delivery Methods



From *Principles* Text, Miller 2000, Figure 3-3, Kluwer.

Figure 5 Congress' Dual Track Financing Strategy



From *Principles* Text, Miller 2000, Figure 3-2, Kluwer.

Between 1789 and 1933, Congress authorized and promoted many projects, eight hundred of which were incorporated into the MIT Framework, including: canals, roads, railroads, navigation aids, bridges, ferry landings, telegraph networks, cable connections, water supply systems, wastewater treatment facilities, and power generation facilities and distribution networks.⁴ Of these projects, over 90% were delivered using a Combined strategy similar to PPPs. (See Figure 4.) Congress was primarily interested in obtaining infrastructure services over many years and not simply focused on initial delivery of an infrastructure facility, but rather, on life cycle delivery of infrastructure services.

Congress pushed projects directly with its own funds and, at the same time, pulled projects indirectly through concession and lease arrangements which attracted private sector debt and equity financing. During this period, Congress used design-build-finance-operate-maintain as its delivery and finance strategy in five out of every eight (62.5 %) of the projects it promoted through legislation. (See Figure 5.)

Prior to 1933, Congress ran a dual track strategy for infrastructure financing. The logic was practical as well as political. Projects like clearing obstructions and establishing navigation aids such as buoys and lighthouses on navigable rivers were, and still are, a federal obligation under the U.S. Constitution. If Congress didn't push such projects with its own funds, i.e., by direct financing, there was little likelihood that individual states would do so, except on waterways such as the Hudson River where the benefit came solely to the commerce of a single state.

On the other hand, many of the nation's infrastructure needs had to be solved with the assistance of private investment. Federal and state governments simply did not have sufficient resources to pay directly for all projects. In addition, where technology that had been developed in the private sector was unproven or where revenue streams were uncertain, neither Congress nor the States were foolish or impractical in the allocation of scarce public resources. In these situations, Congress and the States put the risk of performance (including design, construction and

Advances in Technology through the Integration of Design with Construction and with O&M.

John A Roebling's Wire Cable technology made the Brooklyn Bridge possible; James B. Eads' diving apparatus and Carnegie's steel made the Eads Railroad Bridge in St. Louis possible; and Eads' system of self scouring mat jetties permanently opened the mouth of the Mississippi River to navigation to the Gulf of Mexico.

■ Life Cycle Delivery of Public Infrastructure

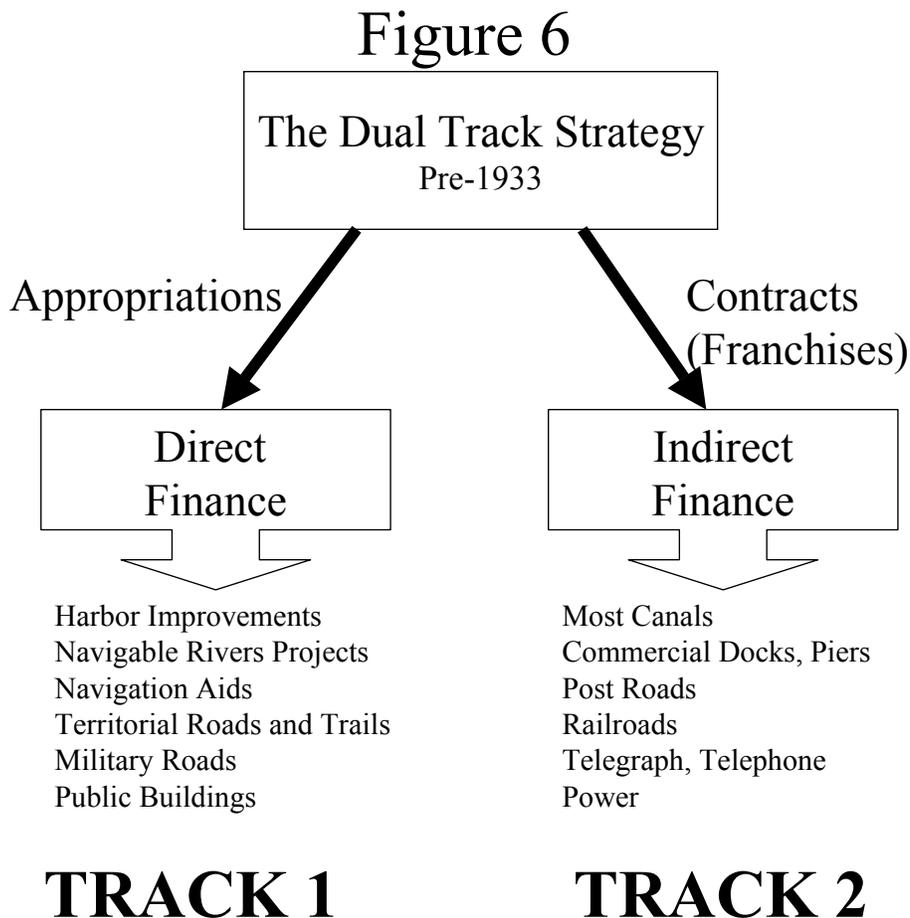
operations), along with the risk of financing, on the private sector, as in Quadrant II. (See inset (p.8) for three well known examples.)

Figure 6 summarizes the basic choices Congress made in this period.

In the twenty-first century, governments are again strapped for cash and the technology needed to improve infrastructure performance is increasingly to be found in the private sector. Governments are again likely to alter their mix of directly and indirectly financed projects toward greater reliance on private sector investment in the infrastructure stock. In January 2008, the National Surface Transportation Policy and Revenue Study Commission reported to Congress on the future transportation service and funding

needs in the U.S.⁵ This report recommends that Congress should provide direct support for the nation's infrastructure networks at about 40% of life cycle costs.

This is a substantial change from the Eisenhower-era strategy of finance one class of infrastructure – the interstate highway network – with 90% federal grant funding and 10% matching state funding. With health care, defense, homeland security, and other funding priorities competing with infrastructure for scarce public dollars, the nation appears to have come almost full circle with respect to its infrastructure strategy, heading back to an equilibrium in which the government pushes infrastructure projects about 40% of the time through direct financing, and pulls infrastructure projects the rest of the time



From *Principles Text*, Miller 2000, Figure 3-1, Kluwer.

through indirect financing and life cycle delivery of services.

With the perspective of history, the provision of public infrastructure facilities and services is best viewed as a dynamic system, in which the infrastructure collection and the population it serves are constantly evolving and changing. What we are now willing to accept as “high quality” transportation, water supply, waste water treatment, telecommunication, and power supply, has constantly changed throughout American history. The very concept of mobility – the movement of people, goods, and information – has undergone dramatic change in even the last decade. Advances in science, modes of communication, engineering, and construction methods not only add to the demand for infrastructure services, but also change the mix of the services in demand. This continues today, in still new and different ways. For example, the emergence of wireless technology is quickly changing how transportation networks work, what governments and users expect in the way of service, and what consumers might be willing to pay for access to internet-based information including email, traffic conditions, weather, news and sports.

There is no project delivery method that is uniquely and consistently best for the delivery of all of America’s infrastructure projects.

Throughout the country’s history, public infrastructure networks have always relied on both government and private sector investment. Advances in science, materials, equipment, engineering methods, and construction practices have generally been the result of private sector investment, in part, to meet changing public demands. It should be expected, rather than be a surprise, that the proportions of direct and indirect government funding have regularly

changed throughout American history, and within particular infrastructure classes. This continues today, and is still evolving. For example, private sector technology advances in computerized control of water and wastewater treatment processes have allowed Combined methods to be effective in improving the quality and cost performance of water and wastewater treatment facilities along with more frequent use of indirect financing methods for the payment of user fees.

Advances in science, materials, equipment, engineering methods, and construction practices have generally been the result of private sector investment, in part, to meet changing public demands.

History confirms that there is no static (or correct) answer in determining whether direct or indirect financing should always be preferred for particular classes of infrastructure projects. Throughout American history, different combinations of available technology, labor, materials, and equipment have mixed with available public and private funds to deliver infrastructure assets in three of the four quadrants of the MIT Framework. Advances in science have combined with improved engineering knowledge, better construction methods, improved O&M techniques, and equally important, skilled labor, to produce and renew America’s infrastructure assets. Recent arguments about who funds, who pays, and what is purchased are not new, and are mostly irrelevant to the re-discovery of workable combinations of technology, equipment, materials, and labor that are focused on delivering better infrastructure value, higher levels of infrastructure service, and a competitive advantage to the American economy in an increasingly international marketplace. As factions push for one or another “public” or “private” result, the incontrovertible fact is that for 200 years, American infrastructure has been “stuck” with both public and private investment.

II. Recent Experience with Public-Private Partnerships

With the historical use of public-private partnerships in mind, the current incarnations of these project delivery methods offer a range of experience. This section will analyze several of the current, high profile monetization PPPs, some alternative strategies, and the Massachusetts experience.

A. Monetization PPPs: Reaching Deep into the Future for Current Cash

1. The Chicago Skyway

In October 2004, the City of Chicago entered into a ninety-nine year lease of the Chicago Skyway with a consortium comprised of Macquarie Bank (Australia) and Cintra Concesiones (now based in Texas, with parent in Spain). The lease began with an up-front \$1.8 billion cash payment to the City of Chicago. The City awarded the lease to Cintra/Macquarie based on the amount of this up-front payment; in fact, its offer was \$1 billion dollars more than the second bidder. The City used the cash infusion to pay down existing debt (improving its credit-worthiness); and to establish an \$800 million rainy day fund for use outside the transportation system.

2. The Indiana Toll Road

In February 2006, the State of Indiana entered into a seventy-five year lease for the Indiana Toll Road with a consortium comprised of Cintra SA, (Spain), and Macquarie Infrastructure Group (Australia). Cintra won the contract because it offered the highest up-front payment, a \$3.8 billion cash payment to the State. Indiana governor Mitch Daniels committed all proceeds from the lease to transportation improvements and extensions across the State of Indiana.

Two billion dollars of the funds received will pay for the completion of Interstate I-35, a tolled interstate highway to be built across the state from southwest to northeast, part of a longer interstate route connecting at its most southern terminus to Texas and Mexico. One billion dollars were committed to retire existing state highway debt, with the remaining \$800 million slated to fund local transportation improvements along the Indiana toll road corridor.

3. Texas SH 121

In the spring of 2007, a team comprised of Cintra and JP Morgan Fund “won” the procurement competition to build and operate a Greenfield toll-road concession in the Dallas Metroplex. Cintra/JP Morgan was originally selected as the winner following a multi-million dollar competition for the fifty-year franchise for Texas SH 121.

The Cintra/JP Morgan Fund proposal was determined to provide the best value among private sector competitors; it offered \$763+ million in new equity investment to meet the region’s transportation needs; contributed \$2.25 billion dollars in debt financing, and isolated risk by tying tolls on Texas SH 121 to tolls on the region’s publicly owned and managed toll roads.

As a prerequisite to submitting the proposal, the Cintra/JP Morgan Fund team had already managed and dealt with design, construction, and operations risks through the development of conceptual design at its own expense. It also obtained firm fixed pricing to provide these services to the consortium if and when the concession was awarded.

However, after Cintra/JP Morgan won, and the details of its proposal, including prices, were made public, North Texas Toll Authority (NTTA) submitted a post-competition proposal to the Dallas Council of Governments and was allowed, with support from the Texas Legislature, to compete with Cintra for the SH 121 concession.

Table 1

NTTA currently operates sixty-four miles of existing toll road in the Dallas Metroplex. NTTA’s proposal to the Dallas Council of Governments was subsequently judged to be superior to that of Cintra/JP Morgan. It offered an up front payment from one government (NTTA) to another government (Texas DOT) that was slightly larger than the payment the Cintra/JP Morgan Fund team had proposed. The project was awarded to NTTA. NTTA has since closed the transaction, and is proceeding forward with the SH 121 project.⁶

In part because of Texas SH 121, there is now substantial uncertainty about the future of monetization toll road projects in the State of Texas and in the U.S. Table 1 summarizes Cintra’s and NTTA’s toll road expertise, and illustrates some of the reasons that the consequences of the re-competition of the SH 121 project are being monitored closely by both private and public participants in US toll road projects. The Texas legislature has adopted a two year moratorium on most such arrangements pending further investigation, study, and legislative action in the next session.

4. Problems with Monetization PPPs

The Chicago Skyway, Indiana Toll Road, and SH 121 procurements have produced a great deal of uncertainty and fluctuation in policy, political resolve, and logic. Millions of dollars have been spent on transaction costs associated with PPP projects in the U.S. and most projects have not closed successfully.

The consortia that operate the Chicago Skyway and the Indiana TR will do what the previous public owners would not: raise tolls. In each case, the right to raise tolls was set forth in the concession agreement, negotiated after the concession award itself. Future tolls will be computed using whichever of three price escalators produces the highest increase from the prior year – 2%, the increase in CPI, or the increase in per capita GDP.

Experience Comparison for Texas State Highway 121		
Characteristic	NTTA	Cintra
Current Total Miles of Toll Roadway in Operation	64 miles	1,243 miles
Toll Roadway Miles Opened Prior to 1999	22 miles	30 miles
Toll Roadway Miles Opened in 1999 or Later	42 miles	1,213 miles
Rate of Toll Roadway Miles Opened per year, since 1999	5.2 miles	151.7 miles
Construction Cost of Toll Roadways Opened in 1999 or later (with partners)	\$1.192B	\$6.755B
Rate of Construction Cost Expended Per Year on Toll Roadways Opened in 1999 or later (with partners)	\$149M	\$807M
Total Miles of Existing Toll Roadway in North America	63.9 miles	231.5 miles

The Chicago Skyway and Indiana Toll Road deals stand out when compared to infrastructure deals struck between public clients and private producers over the last two hundred years! Rather than competing to provide specified services – including repairs, maintenance, and operations – at the lowest toll rates over the concession period, the procurement was structured such that the contract was awarded to the bidder offering the highest upfront payment. The full amount of these upfront payments must be recovered through tolls.

The Skyway transaction made a great deal of political sense, because Chicago did not want or need to be expert in toll road operations, and most toll-paying users of the road were from out of state. Similarly, the Indiana toll road transaction made sufficient political sense to pass both houses of the legislature, although in the succeeding election, control of both houses in the Indiana legislature switched from Republican to Democrat. And it may be that Indiana is best served by spending its

■ **Life Cycle Delivery of Public Infrastructure**

\$3.8 billion on projects that improve its position as a logistical transportation hub.

Nonetheless, the procurement process associated with each transaction raised intractable questions. Rather than confirm transparency, competitive pricing, and fair treatment of competitors and users – the essential purposes of a good procurement system – the process did none of these things.

The ninety-nine and seventy-five year concession terms were not competitively tested.⁷ In each case, the offers received were far higher than expected, indicating that government could have obtained both the payment it sought and lower tolls or shorter terms. The use of per capita GDP increases as an escalation factor was also not competitively tested through the procurement process. The terms and conditions relating to the Skyway and Indiana Toll Road deals were not finalized until after the winner was chosen, raising the concern that proposers did not compete head-to-head, but rather in a rolling competition where service levels, toll rates, and the length of the concession were not high priorities.

Yet, the deals have created a sea change in thinking about PPP transactions in the U.S. Governors in Pennsylvania and New Jersey are exploring similar arrangements for the Pennsylvania and New Jersey Turnpikes. On the other hand, NW Financial Group analyzed the Skyway and Indiana Toll Road deals, applying historical rates of growth in GDP and the CPI to estimate ranges for the growth in tolls. For the Chicago Skyway, NW Financial Group's analysis suggests that passenger car tolls will rise from \$2.00 to between \$28.00 and \$1,800.00. In Indiana, the analysis suggests that passenger car tolls will rise from \$4.65 to between \$34.00 and \$1,200.00, and for five-axle trucks, tolls will rise from \$14.60 to between \$135.00 and \$4,700.00. The width of these ranges strongly suggests that there was insufficient competitive market pressure on

price when these terms were negotiated after the concession winner was determined.

In retrospect, the Chicago Skyway and Indiana Toll Road transactions are likely to be seen as aberrations in the privately funded delivery of infrastructure services and facilities in the U. S. and not the emerging paradigm claimed by their adherents. There may be other similar transactions, but it is more likely that such transactions will be driven by specific factual circumstances and long term rationalization of the infrastructure market, not by the notion that existing infrastructure services can be productively used as plentiful sources of cash in exchange for a century of higher than necessary user fees.

Likewise, the SH 121 “post-competition” competition was a “cold shower” for potential participants in Texas that were otherwise willing to compete on price and quality. The Texas process was not sufficiently stable to produce transparent competition with predictable results. There is a practical limit to how much bid and proposal preparation costs private sector competitors are willing to incur in pursuit of uncertain PPP agreements. In order to attract reputable participants and competitive pricing, free from unreasonable contingencies, governments must substantially improve their treatment of prospective and actual competitors for PPP or life cycle delivery type projects. If they do not, prices (and tolls) will be higher than would be required in a transparent, fair and competitive process. In the long run, the perception of transparency, fairness, and competitive pricing may be more important than any other factor in the public's acceptance of PPP transactions.

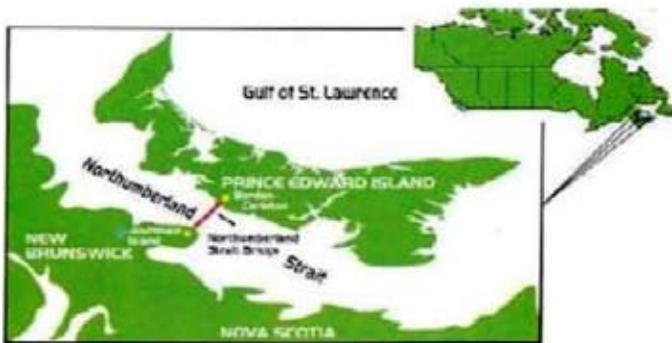
B. Successful Greenfield PPPs – Based on Life Cycle Delivery

Two Canadian projects completed in the 1990s illustrate where many observers thought combined delivery projects were heading in the United States, and where they could still go given sound planning and policy-making. The term PPP caught on, “monetization” followed, and the market has been side-tracked since. These Canadian projects demonstrate that competitive integration of the design and construction with operations and maintenance can and does produce dramatic improvements in the cost of initial delivery, life cycle delivery, and the level of infrastructure service. The projects ought to be used as guideposts for Massachusetts policy-makers as the state considers how to use and apply a Massachusetts version of PPPs based on life cycle delivery of essential infrastructure services.⁸

1. Northumberland Bridge, PEI

The Northumberland Bridge project, subsequently dubbed the “Confederation Bridge,” crosses the Northumberland Strait and connects the Province of Prince Edward Island to the Province of New Brunswick.⁹ The Bridge replaces ferry service previously operated by the federal government.

Figure 7: Location of the Northumberland Strait Bridge



The history of the ferry service and the Canadian federal government’s decision to replace it with a fixed link are inextricably tied to the formation of the Canadian confederation in 1867. A key factor in the development of the Northumberland Bridge project was the constitutional commitment of the federal government of Canada to maintain transportation services across the Strait. When Canada was formed, the federal government agreed to build, open, and maintain the Trans-Canada highway from the east coast to the west coast, including Prince Edward Island. When the Trans-Canada highway crossed the Northumberland Strait between Prince Edward Island and New Brunswick, it used a ferry system operated by the federal government.

These...projects demonstrate that competitive integration of the design and construction with operations and maintenance can and does produce dramatic improvements in the cost of initial delivery, life cycle delivery, and the level of infrastructure service.

From the outset, there were difficulties in maintaining ferry services across the Strait, including interruptions during bad weather and the rising cost of transporting goods and cargo. In winter, the thickness of the ice is measured in meters. For these reasons, keeping the strait open to ferry traffic proved difficult and expensive.

Federal investment in larger ferries capable of transporting large trucks solved some of these problems, but the ongoing cost of ferry operations and the resulting toll charges rose sharply in the 1980s. To understand the problem and its potential solutions, the government prepared a detailed analysis of past capital and operating expenses and revenues, and estimated future capital and operating expenses and revenues (life cycle delivery costs and revenues) over a fifty-year period. The government used this analysis

■ Life Cycle Delivery of Public Infrastructure

to plan and execute a transparent, competitive procurement process. Through this process, the government sought to enable private sector delivery of better infrastructure services across the strait via a new bridge at a substantially lower net cost to the government and toll payers.

With a firm understanding of expected life cycle delivery costs and revenues if it continued the ferry operations (including a needed substantial upgrade in vessels and ferry terminal facilities), the government executed a transparent, competitive procurement strategy that attracted strong proposals from a number of experienced teams. Included in the government's request for proposals to design, build, operate and maintain a fixed crossing over the Strait were minimum design requirements for technical performance, useful life, required condition of road surface, lighting, safety barriers, etc. Proposers had a clear understanding of the size, capacity, and required performance of the crossing (either a bridge or a tunnel) that the government sought, not only initially, but over the thirty-five year concession term.

Having done the homework sufficient to understand its current and future costs for ferry services, the government made two exceptional commitments in the RFP.

First, the federal government committed to pay \$41.9 million dollars annually (in 1992 Canadian dollars)¹⁰ each year over the thirty-five year term of the concession, a cash flow that was substantially less than the anticipated cost of continued ferry services. Second, the federal government committed to begin these payments to the successful bidder in 1997, whether or not the bridge was open to traffic. In exchange for this second commitment, the request for proposals required that the successful bidder would take over and run the ferry service in the event the bridge was not opened to traffic on schedule in 1997. Evaluation factors in the RFP confirmed

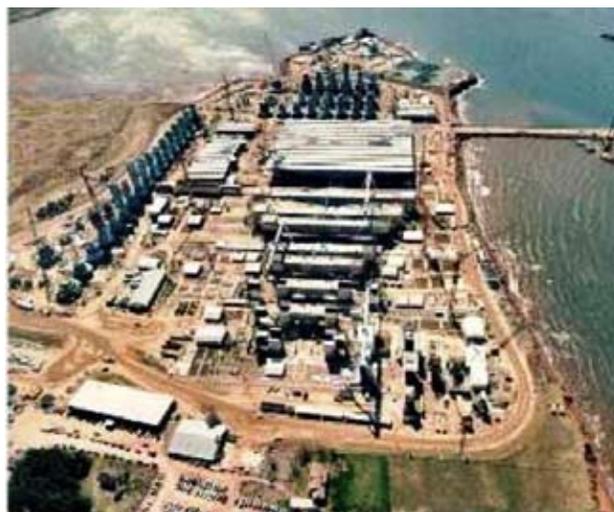
that the winner would meet or exceed the design requirements specified by the government and provide the lowest fare structure (evaluated on a common basis by the government) over the thirty-five-year franchise term.

The effect of a well planned competitive procurement process was extraordinary. Teams with designs that were expensive to build and/or to maintain and operate over the thirty-five year franchise would be forced to recover these higher costs through the fare structure they proposed, a strong incentive for teams to design for ease of construction, operation, maintenance and repair, and for long life.

By committing to pay \$41.9 million dollars per year whether or not the bridge was open, the government eliminated concerns about cash flow among private sector lenders. The winning consortium was able to arrange for private financing at a fraction of a point above the borrowing rate available to the federal government itself. The effect of a sound procurement plan was to minimize financing costs, which translated directly into the lowest possible fare structure over the concession term.

By requiring the winner to operate the ferry system in the event of a delay in completing the bridge, the government sent a clear signal that design

Figure 8: The Winning Consortium's Outdoor Factory



and construction risks would be transferred to the concessionaire. Construction industry firms are accustomed to accepting and managing such risks – unlike the political risks generated in projects like Texas’ SH 121.

The winning consortium proposed a pre-cast concrete structure in four basic parts and a construction process that matched the procurement strategy planned by the government. Each element of the proposed bridge was designed with ease of construction, operations and maintenance in mind. The winning proposer planned to build the four basic parts of the bridge in what amounted to an outdoor factory where the components moved as they were being built along an assembly line toward a temporary pier where the world’s largest barge/crane would lift, transport, and assemble the bridge.

Figure 9: Northumberland Bridge Nearing Completion (1997)



The procurement was structured to give the winning consortium powerful incentives to create an innovative design and employ new construction technologies. To minimize its operations and maintenance costs, the bridge was designed to

permit most maintenance to occur from inside the spans, safe and secure from inclement weather. To extend the short construction season in the Strait, DuPont developed and supplied special adhesives for use in cold temperatures. To protect the bridge from structural damage by heavy ice flow, ice shields were designed that force the ice to break upwards. To properly secure the piers to the sea bed, special techniques were developed for the installation of high-strength underwater grout and the transport barge was equipped with systems to place and hold piers within a fraction of an inch of the design location.

When opened (early) in 1997, the Northumberland Bridge provided a year-round fixed link across the Strait. The government’s estimate of its savings in life cycle costs, between paying the yearly fee to the concessionaire and operating the ferry service, was 30% or \$750 Million Cdn over the thirty-five year concession. The concession agreement requires that the bridge be returned to full ownership and control of the federal government at the end of the concession, with a transfer price of \$1. The bridge’s useful life of one hundred years will put the federal government in the position of either operating the bridge as a toll structure itself or re-competing the bridge’s O&M at the end of the initial thirty-five year term.

The procurement plan followed by the federal government successfully achieved what current monetization PPPs cannot. In a transparent, competitive process, it confirmed that a new, well-planned infrastructure service will provide additional value at a fair (in this case lower) cost to the government and/or to users.

2. Highway 407 ETR

The Highway 407 ETR project is a congestion relief toll road that connects Quebec, Montreal, and Toronto to the I-75 corridor in Detroit, running parallel to Highway 401, north of Toronto. Originally built by the private sector in the mid 1990s and taken back for public operation

■ Life Cycle Delivery of Public Infrastructure

in 1997 following a change in government in Ontario, the road was offered back for private sector operations and maintenance, along with a substantial (Greenfield) extension to the road at both the eastern and western ends, in the year 2000.¹¹

For decades, the need for congestion relief in the Toronto region north of Highway 401 had been evident. Toronto had emerged as the economic and manufacturing center of Canada, and Highway 401 was repeatedly widened and expanded to accommodate heavy truck and passenger vehicle traffic along the Trans-Canada corridor. Near Toronto, Highway 401 is twelve lanes wide, six lanes in each direction, split into express and local lanes, and congested for long periods of time throughout extended morning and evening rush hours

Figure 10 shows the original center section of Highway 407 ETR, plus the road's eastward and westward expansions. When first built in the mid 1990s, Highway 407 ETR was intended to be a design-build-operate concession, but at the end of a competition in which the government organized only two competing teams, government preferred the design and construction (design-build) portion of the proposal of one of the teams but the electronic toll collection system of the other team. The government accepted the design and construction proposal it liked and converted the project to design-build.

The government subsequently hired Hughes Aircraft to design, construct, operate and maintain the world's first, completely seamless Electronic Toll Collection / Automatic Vehicle Identification (ETC/AVI) system to be installed after the design-build portion of the road project.

Hughes' Slotted Aloha (TDMA) protocol for target acquisition technology, originally developed for the F-14 fighter jet, is incorporated into an entirely electronic toll collection system. It either reads transponders on cars traveling the

road at speed, or identifies vehicles by shape, size, and license plate, also at speed. There are no toll booths, no need for traffic to slow down or stop, and no need for extensive additional paved space where vehicles are stacked to wait to pay tolls. Cars and trucks simply drive through at speed. Upon completion, the province had spent \$1.5 billion building the road and installing the ETC/AVI system. Although there were some technical problems with the toll collection system, toll congestion relief was now available for a portion of the trip on Highway 407.

After an election and a change in control, the Ontario government began to explore private operation of both the road and the ETC/AVI system. It recombined the two separate contracts into a single long term DBFOM concession to build the extensions to the east and west, and to consolidate all design, construction and operations and maintenance into a single contract.

Just as in the case of the Northumberland Bridge project, the government prepared a detailed analysis collecting prior capital and operating expenses and revenues and projecting estimated future capital and operating expenses and revenues (life cycle delivery costs and revenues) for the full build-out of Highway 407. In 2000, the government issued a Request for Proposals to

Figure 10: Highway 407 ETR Across the Northern Tier of Toronto, Ontario



operate and maintain the existing Highway 407, including the ETC/AVI function, and to design, build, finance, operate and maintain the east and west extensions. The proposal sought bids to acquire the project from the province for a ninety-nine year term, and included detailed design and operating requirements for both the existing and future road segments, along with parameters for managing toll increases during the concession.

The government took final offers from the two most highly ranked teams and ultimately selected Cintra's¹² bid of \$3.0 billion dollars. After the closing, the province used half of the up-front payment to retire the 1997 debt incurred while building the initial segment of Highway 407, and applied the remaining \$1.5 billion to other transportation projects in the province.

Figure 11 shows the successive strategies employed by the province to build Highway 407 (Part I) and to complete the road as a Design Build Finance Operate Maintain project (Part II). Since

2000, the extensions have been completed and traffic on the road has steadily increased. Capacity north of Toronto has doubled and congestion on Highway 401 has been significantly relieved. By all accounts, the highway is one of the most successful toll roads in North America.

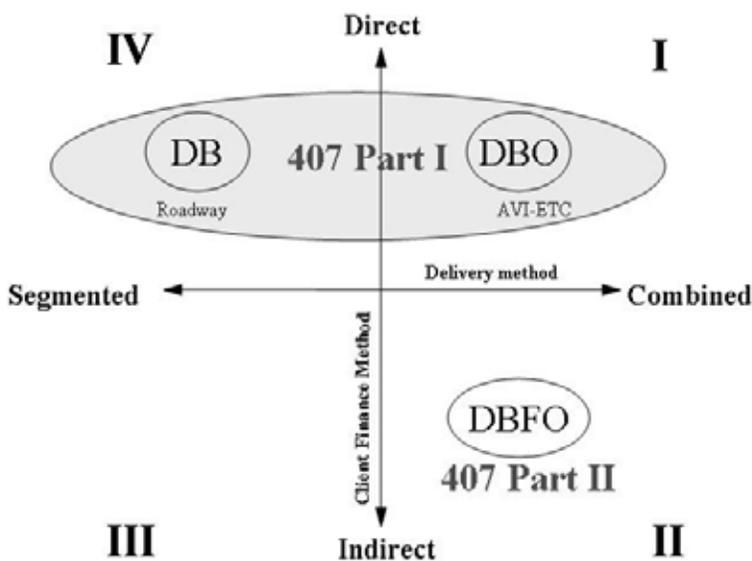
C. Massachusetts' Recent Experiments with Infrastructure Project Delivery

In a separate report, entitled *Lessons Learned: An Assessment of Select Public-Private Partnerships in Massachusetts*, four project case studies reviewed the methods employed for major infrastructure project delivery in Massachusetts. These projects were the Route 3 North reconstruction project from Burlington to the New Hampshire border; the 5 year operations contract between the MBTA and Massachusetts Bay Commuter Rail, Inc. (MBCR), which is to be extended for an additional 3 years; the Big Dig management structure; and the Northeast (MA) Solid Waste Compact (NESWC) for the disposal and recycling of solid waste (a "trash to cash" plant) in North Andover.

Except for the NESWC project, these cases were not based on life cycle delivery and do not meet our definition of a public-private partnership. Only the 20-year NESWC pact involved a contract sufficiently long in duration to permit the private-sector contractor to price and deliver an infrastructure facility on a life cycle delivery basis. Yet, the procurement practices followed on the NESWC facility produced horrific results for its member communities.

The Route 3 North project demonstrates how the combination of design with construction (design-build) in a single procurement, when appropriately used, can produce clear savings in the cost and time of initial delivery.

Figure 11



■ **Life Cycle Delivery of Public Infrastructure**

The agreement between MBTA and MBCR shows how a public entity can contract with the private sector to substantially reduce the amount of deferred maintenance within an infrastructure network, and use a pure operations and maintenance contract approach to position the network for better future technical and life-cycle cost performance.

The Big Dig project, which temporarily added hundreds of private-sector engineers and construction managers to the staff available to manage one of the largest and most complex construction projects in history, is an example of how a public entity can adjust its internal capacity to manage projects over short periods of time.

The effect of a sound procurement plan was to minimize financing costs, which translated directly into the lowest possible fare structure over the concession term.

NESWC provides the clearest lessons for future life cycle delivery (public-private partnerships) in Massachusetts. Because the service agreement contained an unconditional obligation on the part of the member towns to pay all of the contractor's development, financing, operations, repair, and maintenance costs, there was no financial risk transferred to the contractor.

The NESWC project is a classic situation in which the Commonwealth commanded others (the member communities) to take risks with an emerging technology in circumstances where the Commonwealth, rather than the towns, should have done so. The scope of the project had not yet developed to a point that allowed a competitive, transparent competition to take place. Instead, an extremely "soft" competition was conducted to select an entity to build the plant, without obtaining a simultaneous commitment from the bidder as to what precisely would be built and

what precise charges would be paid by member towns. Because the procurement was so poorly planned and executed, the pricing terms were based on recovery of costs, overhead, and profit – essentially a cost-plus arrangement that most public procurement officials would be wary of over a 20-year term. The terms of the service agreement were negotiated by the Commonwealth on behalf of the member towns after the contractor had been selected.

The NESWC project is an example of how poor procurement practices, lack of preparation, and lack of head-to-head competition, can produce unacceptable results with respect to any infrastructure facility.

There are few local success stories in the effective use of life cycle delivery methods, or PPPs, as the Commonwealth considers additional mechanisms to quicken the pace and increase its level of investment in infrastructure renewal. However, legislative models for life-cycle delivery of major infrastructure facilities already exist. These models ensure transparency, head-to-head competition on technical compliance and price, public safety, and fair treatment of competitors,¹³ and policy makers should consider using them to establish a durable market that supports the full range of project delivery and finance mechanisms in the Commonwealth.

III. Framework For Considering and Using Life Cycle Delivery

For a government to properly consider the use of alternative funding and delivery strategies for public infrastructure projects, better, different, and earlier information needs to be collected, assembled, and provided to public decision makers. In addition, appropriate information about upcoming projects should be made public as a first step in attracting the competitive interest of designers, constructors, operators, and financiers. This section of the Report identifies key issues to consider in fashioning the Commonwealth's future infrastructure strategy.

A. Separating Design from Construction

For most public buildings, a primary early focus is design, especially when the building's predominant purpose is occupation by people. For most schools, courts, auditoriums, transportation terminals, office buildings, and other occupied buildings, government officials are likely to conclude that practical control over the initial design is required.

For these projects, DBB (or Construction Manager at Risk) is usually the method chosen to deliver this design. The logic behind this choice usually comes from the conclusion that the most important goal in planning the infrastructure facility is to "get the design right first", before making the decision to move forward with construction. DBB and CM at Risk are viable approaches for nearly all infrastructure facilities, but they frequently lead to higher life cycle costs, which are not commonly part of the evaluation process. Despite this shortcoming, DBB will continue to be the most regularly used delivery method for public infrastructure facilities.

There are several advantages to DBB and CM at Risk. If the public entity is unable to define for itself the features to be included in the design, an architectural firm prepares the program requirements for the public owner. The public entity can review and approve alternative design concepts and details to ensure that it approves all design features. Also, the public entity can stop spending at any time during the design phase, without incurring any liability for construction costs. Also, Construction Manager-at-Risk can facilitate better coordination between the designer and the eventual contractor before the design is finalized and a maximum price is determined.

However, there are some clear disadvantages to the DBB approach. Because the designer typically does not consider the cost of construction, segmenting the design function from the construction function causes the public owner to lose substantial control over the construction price, typically 15-20 times the cost of initial design. And, more importantly, unless it is extraordinarily sophisticated, the public owner has essentially no control over long-term operations and maintenance costs, which are typically 10 times the cost of initial construction, or 150-200 times the cost of initial design.¹⁴

Public owners typically ignore life cycle delivery costs when using design-bid-build. The life cycle obligations a public owner assumes when it approves the design and construction of a public building (O&M, energy, and borrowing costs) are simply passed on to taxpayers or users.

B. Shifting the Focus from Initial Design to Initial Delivery

For some infrastructure facilities, it may be practical and preferable to focus on initial delivery, that is, on both the design and construction functions. Where the combination of design and construction in a single competitive procurement

■ Life Cycle Delivery of Public Infrastructure

makes practical sense, there can be substantial savings in cost and in the time required for initial delivery. In these situations, design-build (DB) is a viable alternative to DBB. In Design-Build (DB), the public entity retains control of both initial design and construction, but through a competition for both in a single contract. Here, the overarching goals of the public entity are to accomplish initial delivery on a fixed price basis, and to transfer the risk of coordinating and managing both the design and construction to a single entity, the design builder.

DB is a viable approach for virtually all engineering projects for which clear design requirements can be established before a competitive procurement process. DB is a possible approach for heavily occupied public spaces, if and only if the public owner can clearly establish design requirements that will remain stable throughout the competitive process and after award.

DB comes with some additional risk. Changes in design requirements initiated after award are much more expensive to the public owner in DB than in DBB. In DB, a late change in design requirements typically delays construction and increases costs. In DBB, most changes in design requirements occur before the construction contractor is hired.

Nevertheless, DB offers significant cost savings advantages over DBB. If a public entity is prepared to establish stable design requirements in a competitive procurement for both design and construction, typical cost savings are 10% over DBB and typical time savings are 12% over DBB. For engineering projects such as pipelines, utility distribution and collection, utility control buildings, stadiums, short span bridges, track, etc., DB is a perfectly viable alternative to DBB.

Disadvantages include lack of control over long-term operations and maintenance costs, unless careful attention has been paid to operations and maintenance characteristics and features in the DB

design requirements. As with DBB, the life cycle obligations (operations and maintenance, energy, and borrowing costs) that a public owner assumes when it approves DB for a public building are simply passed on to taxpayers or users.

An Effective Approach to Design-Build

The ABA 2007 Model Code for Public Infrastructure Procurement establishes a starting gate and a finish gate for delivery methods in which design is integrated with construction. The starting gate is creating design requirements and giving competitors adequate notice of the functional requirements to be met. The finish gate is creating Proposal Development Documents, which must be submitted at the time the proposals are received, and which contain full concept plans, with substantial architectural content, to illustrate how each proposer would aesthetically incorporate design requirements into the facility to be constructed. The 2007 MC PIP requires public owners to do the homework necessary to produce design requirements; in return, it allows substantial competition on aesthetic and architectural bases for evaluation and comparison before a design-builder is selected.

C. Shifting the Focus from Initial Delivery to Life Cycle Delivery

The cost of long-term operations and maintenance on public infrastructure assets is a critical question facing every government in the U.S. We all observe, first hand, the consequences of inadequate maintenance of existing assets each time we ride a bus or subway, or drive a vehicle. Governments need to decide early in a project's development process whether they plan to provide

for initial delivery only, or for life cycle delivery of the proposed infrastructure facility. Figure 12, below lists the six key delivery methods along the bottom, and presents some of the practical consequences of choosing between initial delivery and life cycle delivery.

By choosing initial delivery, as shown on the left side of Figure 12, the options narrow to three of the six possible delivery methods, all in Quadrant IV: DBB, DB and because it is typically available for use only after the first two, Operation and Maintenance (O&M). By choosing life cycle delivery, shown on the right side of Figure 12, government is focusing on the other three possible delivery methods in Quadrants I and II.

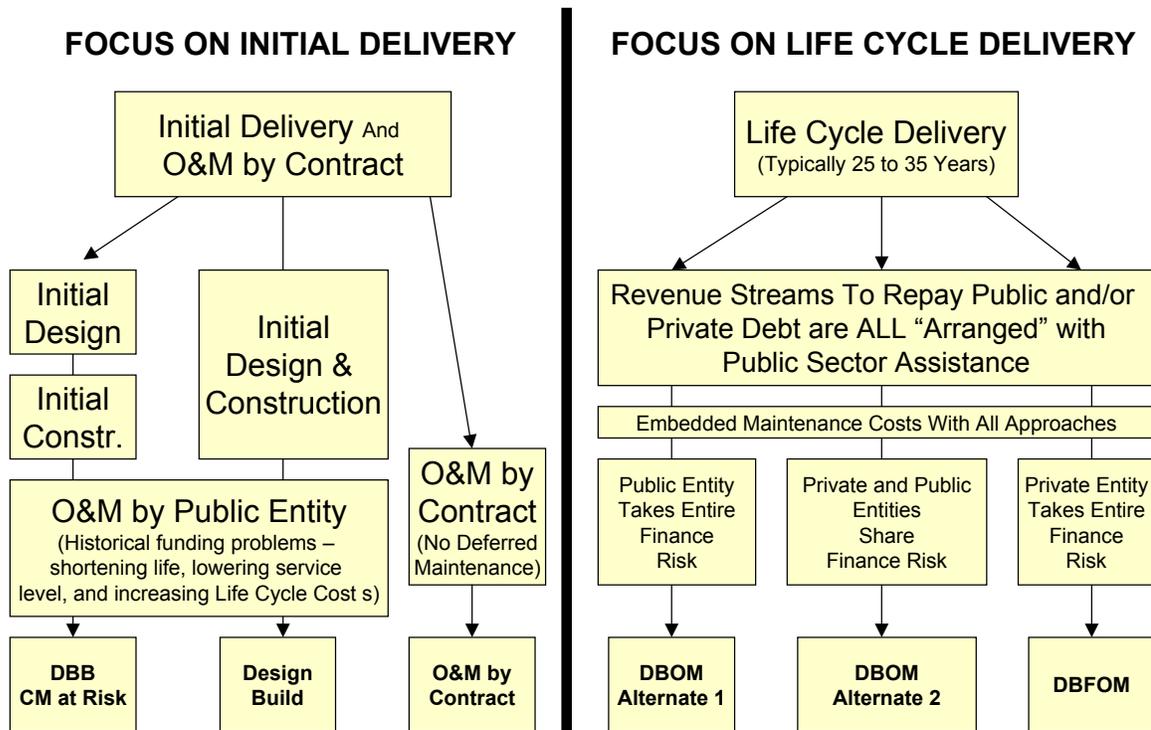
This basic choice has important consequences. If the choice is initial delivery, decision-makers should immediately face the question of how the government will provide and pay for long-term operations and maintenance. Unfortunately,

when choosing initial delivery, governments have historically avoided questions about ongoing expenditures for operation and maintenance.

The vast majority of public buildings are operated with underfunded maintenance budgets. Inadequate operations and maintenance budgeting is largely invisible, encouraging the continuing cycle of deferred maintenance, until much higher than necessary capital replacement costs become necessary. Failure to properly perform operations and maintenance services throughout the life cycle results in substantial additional overall expense, lower levels of service, damage to existing equipment, additional energy consumption and shortened useful life of existing facilities.

Over the past several decades, federal, state, and local governments across the U.S. have seen the effects of failing to properly operate, inspect and maintain important infrastructure facilities. Bridge collapses on the interstate

Figure 12
Basic Project Delivery Choices



■ Life Cycle Delivery of Public Infrastructure

highway network in Connecticut (1983, Mianus River), New York (1987, Schoharie Creek), and Minnesota (2007, Mississippi River) provide potent reminders of the impact of deferred inspection and proper maintenance. Years of research at the US Army Corps of Engineers have confirmed that when proper maintenance is not performed (i.e. regularly deferred), the rate of degradation in the value and the useful life of road structures is significantly higher. Deferral of maintenance essentially guarantees significantly higher capital replacement costs throughout transportation infrastructure networks.

Where an existing facility is being poorly operated and maintained, and where necessary maintenance has been regularly deferred, it may be practical to focus on managing the operations and maintenance responsibility through a fixed-price, competitively bid contract. Such an approach to long-term O&M may also make sense for a new facility that requires separate design and where long-term operations and maintenance is a priority.

Deferral of maintenance essentially guarantees significantly higher capital replacement costs throughout transportation infrastructure networks.

Cleaning, routine maintenance (filter replacement, motor servicing, cleaning of roof and bridge drains, cleanout of storm drains, etc.), and, on occasion, operation of infrastructure stock have been successfully contracted out through competitively awarded contracts. Contract operations and maintenance have been used in public infrastructure facilities for occupied spaces – schools, courthouses, public office buildings, public transit stations, intermodal terminals, and other heavily occupied and used space.

The principal advantage of operation and maintenance by contract is that a mechanism is established by which operations and maintenance services that are not otherwise being performed are listed, measured, and verified on a daily or regular basis. The addition of an operations and maintenance contract typically results in higher O&M expenditures, but lower public expenditures, because maintenance is performed timely and prevents damage to existing equipment, conserves energy, and extends the useful life of existing facilities. Proper maintenance, either through contract or by public owners themselves, usually results in substantial reduction of life cycle costs.

Where an existing facility is being poorly operated and maintained...it may be practical to focus on managing the operations and maintenance responsibility through a fixed-price, competitively bid contract.

Competitive pricing for long term operations and maintenance can typically produce savings of 10 to 20% of life cycle costs. Some years ago, the MBTA moved to contract cleaning operations in downtown subway stations, a change which dramatically improved results, because cleaning standards contained in the competitively bid contracts were checked and enforced on a daily basis as a condition for payment.

Another advantage of long term operation and maintenance contracts is that they establish the actual costs for maintaining an infrastructure facility. With a solid factual understanding of long term O&M costs, governments can properly analyze the technical and financial feasibility of substituting a Quadrant IV (segmented) delivery strategy with either a Quadrant I or II (combined, or life cycle delivery) approach.

A good example of this is the MBCR, Inc. contract with MBTA to operate and maintain the commuter

railroad network. With proper accounting and reporting from the MBCR, the MBTA should be in a better position to estimate ongoing capital and maintenance costs over long periods of time, enabling it to develop better strategies to operate, maintain, replace, and upgrade the entire commuter rail network through a steady program over many years.

D. Whether a Project Can Produce a Return on Investment for a Private Entity

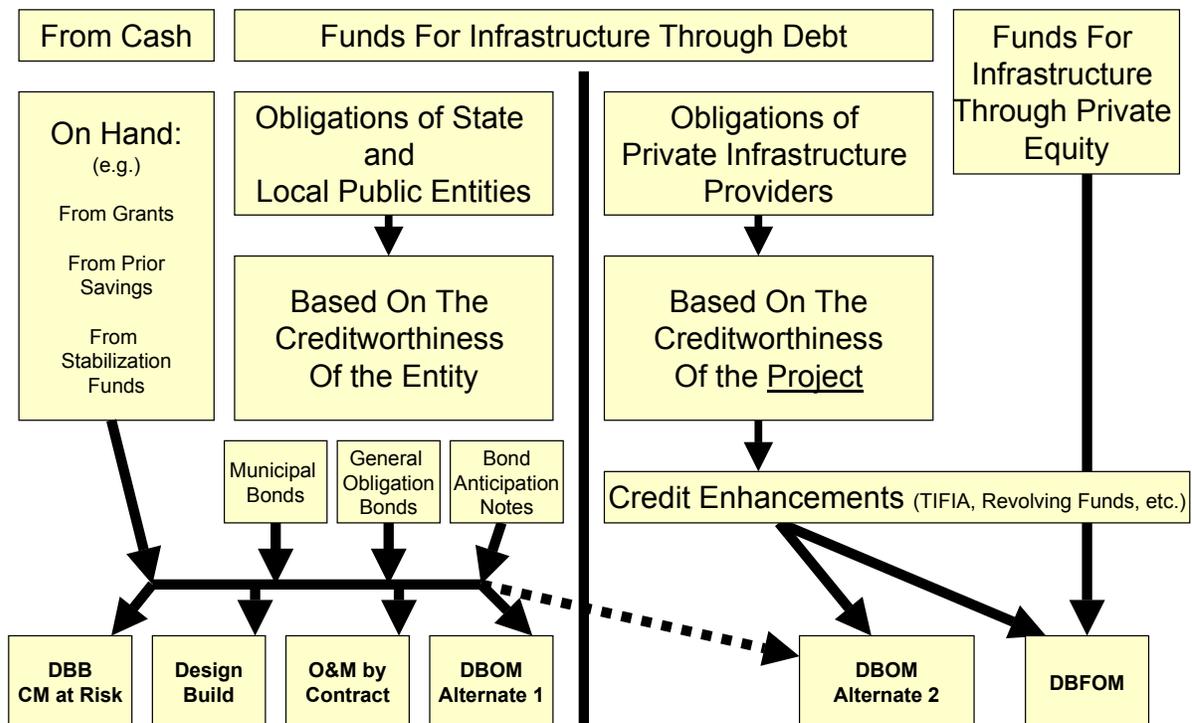
Before considering whether public funds are (or should be made) available to fund one or more projects, government officials should also consider whether an infrastructure project can be positioned for private financing, in whole or in part. Figure 13 shows the three basic sources

of funding for public infrastructure facilities – cash, funds obtained through debt (both public and private) and equity funds contributed by the private sector. Typical obligations of state and local governments in the Commonwealth are municipal bonds, general obligation bonds and bond anticipation notes (BANs), as shown on the left side of Figure 13. Four of the six basic delivery methods rely exclusively on public sector sources of financing. Projects that are funded through these types of public obligations do not include either of the two basic delivery methods on the far right – DBOM Alt. 2 (Mixed Funding) or DBFOM.

Figure 14 presents a summary of characteristics that make infrastructure projects suitable for financing on the right hand side of Figure 13, or, in many more situations, a combination of both public and private sources of debt and equity.

Figure 13

Sources of Funding For Public Infrastructure Facilities



■ Life Cycle Delivery of Public Infrastructure

Figure 14 was developed based on a series of interviews conducted in Hong Kong in the early 1990s, when the colony was fully engaged in using private funding to support an aggressive program of infrastructure improvements.

Investors, unlike governments, can choose to invest elsewhere (geographically or out of the infrastructure sector), so the logic followed by governments in assessing public sector investments simply does not apply in the same way. Before investors agree with producers (developers) to invest significant cash to build an infrastructure project, they need to become comfortable along three basic themes.

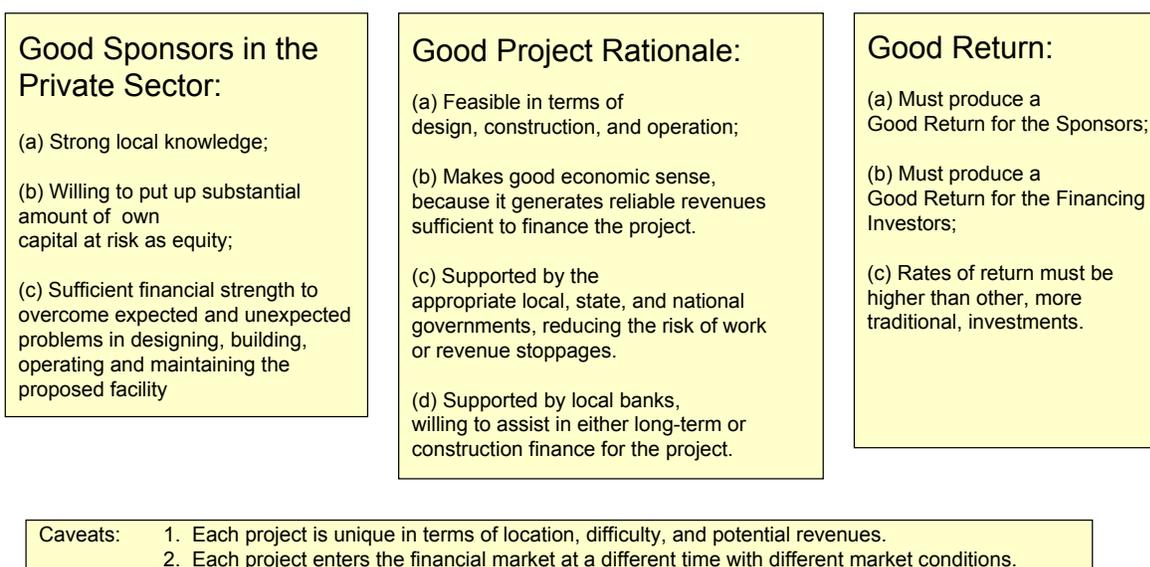
First, investors want good sponsors in the private sector. Therefore, governments have to structure infrastructure competitions transparently, competitively, and in a way that allows strong local producers to participate, and that allows producers to find good investors with whom to team. To a banker, a key indicator of a good

sponsor is its willingness to put up substantial equity that doesn't get repaid until after investors are repaid in full.¹⁵ Investors want to have confidence that sponsors have sufficient strength and local experience to overcome expected and unexpected problems in providing and operating the facility.

Second, investors want to be assured that a project has a strong rationale. Economic and technical feasibility has to be clearly shown.¹⁶ Another key ingredient is strong government support for the project.

Third, investors want a good return on their investment in a public sector infrastructure project. In fact, they seek a higher return than on traditional investments in the private sector. Government officials have the most difficulty with this third theme, which is the source of most of the confusion surrounding the use of life cycle delivery (PPP) approaches around the world.

Figure 14
Characteristics of Infrastructure Projects Suitable for Financing Through Private Debt and Private Equity



Adapted from "Aligning Infrastructure Development Strategy to Meet Current Public Needs", PhD Dissertation, MIT, by John B. Miller, May, 1995, pp. 41-2.

In the Texas SH 121 procurement, NTTA's argument was that it would be folly for the state to allow a "plum" toll-road project to go to the private sector for funding. NTTA argued that it was better for the public entity to incur the debt. Essentially, NTTA argued that if Cintra was willing to put up \$760 million in equity and \$2.25 billion dollars in private debt to fund SH 121, the asset was "too valuable" to put into the private sector.¹⁷

However, history should confirm to public officials that public sector resources have never been and will never be sufficient to provide for all infrastructure needs in the United States.¹⁸ Therefore, judicious, competitive, transparent use of private sector resources to close the gap between the level of resources governments can provide and the level needed to compete in world markets is all to the good. Two hundred years of experience confirms that it is unwise to reject private sector resources in the face of a significant shortfall in public sector funding.

But in the case of Dallas, this logic was in fact backwards. The Metroplex master plan estimated that tens of billions of dollars in private infrastructure investment were required to complete the plan. Dallas Metroplex governments were attempting to accelerate a substantial upgrade in the region's infrastructure portfolio to a pace much faster than public investment alone could ever support. Turning down an equity investment by Cintra of \$763 million in favor of the \$3 billion plus in public sector debt by NTTA widened, rather than narrowed, the gap.

The SH 121 project represents the classic example where governments' long-term interest was to attract private sector investment at the portfolio level in "good" projects. This seems counterintuitive to many in the public sector, and "monetization" deals like SH 121 breed suspicion within stakeholder groups who are never quite sure that the thirst for more and more money up-

Moving the Line between Public and Private: Opportunities Small and Large

Depending on where the line between private and public sector activity is drawn, our view of what should be "public" and what should be "private" should continue to evolve for the benefit of everyone. We are accustomed to the notion, for example, that the road network to and from the Burlington Mall should be in the public sector, and that the road network within the mall itself should be firmly in the private sector. But could a similar distinction be applied to the space not directly connected to transportation at MBTA stations? How far away from the subway platform should the line of private space be drawn? In Toronto and Hong Kong, and in isolated situations in Washington and Atlanta, for example, within a few feet of the subway doors, transit passengers are in privately financed and developed commercial space – dramatically "streamlining" the public sector's responsibility for initial delivery and life cycle delivery costs of a mass-transit system. When the new Boston Garden was built on top of a new North Station, and on top of a private sector parking garage, this "streamlining" was accomplished. Could a series of smaller, mid-course corrections throughout the Commonwealth serve to substantially improve how public and private sector dollars finance, operate, and maintain the collection of public infrastructure assets?

front isn't unnecessarily raising tolls and the rate of toll increases on drivers. But, it is reasonably clear that the public sector's long-term goals to stretch public dollars through competition over the life cycle, and to attract additional private sector dollars to the infrastructure sector can only be achieved if all the features set forth in Figure 14 hold true.

■ Life Cycle Delivery of Public Infrastructure

In a few cases, private sector funds have been attracted to infrastructure projects through very long, very large, concessions based on the amount of upfront money paid. In the long run, this approach is not sustainable. The better practice with respect to such large projects is to allocate to the private sector a typically small percentage of the most expensive, most desirable, infrastructure projects where a strong return on investment appears likely within a period of twenty-five to thirty-five years. By eliminating substantial upfront payments, which tempt government to reap cash today at the expense of future generations, the focus of these projects can and should be efficiency, improved technology, reduced energy use, and low prices to users. Allowing a “good return” on this category of projects has the added benefit of shortening concession periods, and permitting facilities to either be “re-concessioned” at competitive pricing or converted from tolled facilities to non-tolled facilities.

E. Understanding the Portfolio Approach to Project Delivery

Consider thinking about collections of projects when deciding how to deliver and finance multiple projects. In such an approach, one reason to push one of the projects in a collection toward life cycle delivery might be that the resulting savings in cost on that project will allow another project in the collection – one that can’t be delivered in that way – to proceed at all. In this Section, the “portfolio approach” to project delivery is outlined.

First, establish a preliminary infrastructure project list looking several years (the suggested period is ten years) into the future. To be prepared to properly consider the use of different funding and delivery strategies for public infrastructure projects, better, different, and earlier information needs to be collected, assembled, and provided to public decision makers.¹⁹ This includes a

basic description of each project, its features and performance requirements; its technical and economic feasibility; current estimates of the cost of initial delivery (design and construction); expected start, duration, and completion; estimated annual O&M costs; and whether the project might be supported in whole or in part by tolls or user fees.

One reason to push one of the projects in a collection toward life cycle delivery might be that the resulting savings in cost on that project will allow another project in the collection...to proceed.

Second, establish actual constraints on public contributions to these projects through an analysis of “practically available” public funds over the same planning period. By “practically available”, we mean that the willingness of legislators, city councilors, selectmen, town meeting members, and voters to authorize increased public debt for infrastructure has practical limits. “Practically available” resources (that is, cash on hand or cash available through borrowing) are those that governments will vote to make available in support of an infrastructure project.²⁰ If sufficient cash to pay for all the projects on the preliminary infrastructure projects list is on hand,²¹ or if cash is available from state or federal grants, it can be appropriated to fund selected projects.

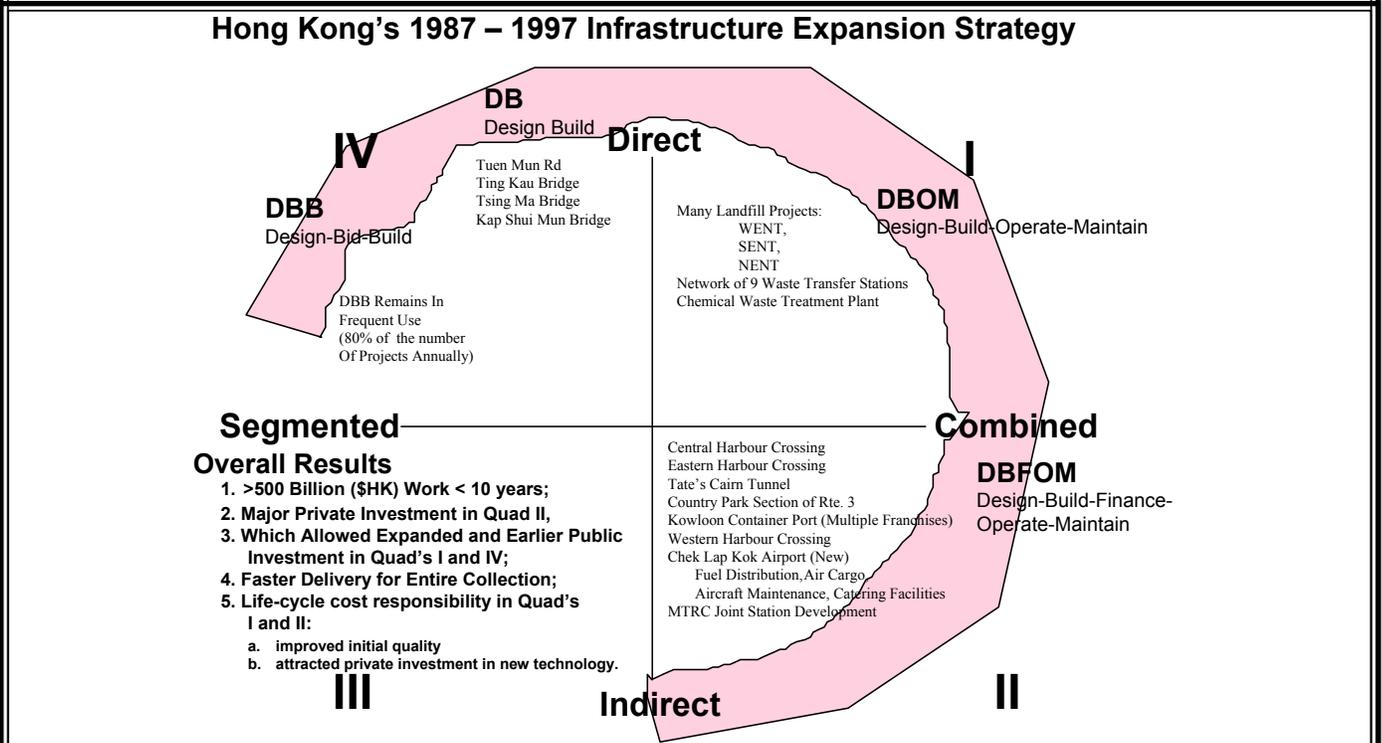
In most situations, however, governments rely on their ability to borrow cash, typically in exchange for a commitment to repay the debt through the issuance of bonds or notes. Most cities and towns in the Commonwealth, as well as the Commonwealth itself, can choose to borrow money for infrastructure expenditures at progressively higher rates of interest, limited only by their ultimate credit-worthiness, as judged by independent rating agencies and the financial markets.

Third, if public resources are insufficient, test different combinations of the six key delivery methods against projects on the preliminary project list. Where available funds are not sufficient to fund all projects, the scope of individual projects must either be revised, additional funds found, or life cycle delivery methods applied to some projects. Life cycle delivery options generally offer two different ways for public officials to approve

projects that are further down the preliminary list of infrastructure projects.²² Economies of scale, efficiency through the integration of design with construction, and the implementation of innovative technologies, designs and construction techniques are typical ways in which a portfolio approach permits public officials to proceed with more infrastructure projects at a faster pace.

Hong Kong: The Portfolio Approach in Practice

Between 1987 and 1997, the Crown Colony of Hong Kong used the portfolio approach to accelerate and complete an aggressive program of infrastructure renewal and expansion, as Hong Kong sought to ensure its economic future in South China in the years following the return of Hong Kong and Kowloon to the PRC. The project delivery and finance strategy employed by the Colony (with the assent of both the British and Chinese governments) is represented in the Figure below.



Approximately 80% of the projects were delivered by DBB using only public funds. A few signature bridge projects were delivered using DB, but they followed design concept competitions. The majority of environmental projects for water, wastewater, and solid waste, were delivered through competitive award of twenty-five to thirty-five year DBOM concession agreements. In these projects, the need for efficiency and quality performance of stable, predictable public infrastructure services made DBOM a logical fit. A few large transportation projects where demand was strong and revenue was predictable were positioned as DBFOM projects in Quadrant II, also through competitively awarded concessions of twenty-five to thirty-five years.

■ Life Cycle Delivery of Public Infrastructure

In situations where there are opportunities to be more efficient either through reduced costs or higher levels of service or both, it is often practical for government to focus on long-term efficiency in the design, construction, and operation of an infrastructure facility.²³ For government to conclude that design-build-operate-maintain (DBOM) is a viable approach, efficiency across a facility's entire life cycle is typically the overarching goal.

DBOM has proven viable for virtually all engineering projects where clear, stable design requirements are included at the start of a competitive procurement. The DBOM approach may also be suitable for heavily occupied public spaces, with the same concerns expressed above with respect to DB.²⁴ In any case, the public owner must have clearly established and stable design requirements as a basis for competition.

The principal advantage of DBOM should be that when government obtains competitive pricing, private sector participants are in head-to-head competition as to which has most efficiently and effectively designed for ease of construction and for ease of operations and maintenance. Provided that the evaluation factors reward proposers that best achieve this integration through the most technically and commercially advantageous proposals, life cycle delivery can be obtained with typical cost savings of 30% to 40% over DBB, and typical time for delivery of 25% over DBB. Life cycle costs incurred by the public entity (including operations and maintenance, energy and borrowing costs) must be competitively tested before being passed on to taxpayers or users.

Sometimes, situations arise in which new technologies and/or innovations²⁵ present opportunities, beyond operational efficiency, for government to realize long term improvement in the design, construction, and operation of an infrastructure facility. Where such technologies or innovations are obtainable from the private

sector at private sector risk, design-build-finance-operate-maintain (DBFOM) can be a practical alternative for government.

As defined in this report, DBFOM is a delivery strategy in which the private sector takes all financing risk.²⁶ While rare, governments have opportunities to incorporate breakthrough technologies, design, and construction techniques into public infrastructure networks, and the use of private sector finance at private sector risk, with higher than usual returns, has attracted technology and innovation to infrastructure networks throughout American history. This strategy invites innovation across the entire life cycle, including design, construction, and operations and maintenance, with competitively determined charges to users, and pre-established cost escalators.

Figure 15 summarizes the essential elements of the process described in this section for identifying which of the six basic delivery methods are viable options for each project under consideration.

F. How the Quadrants in the MIT Framework Differ

Effective use of the MIT Framework will help public officials improve cost and service performance. Research conducted at MIT demonstrated repeatedly that delivery strategies positioned in each of the quadrants produce predictable results. While no single delivery method will be appropriate for all infrastructure needs, public officials and their consultants can quickly learn and take advantage of the attributes of each quadrant (see Figure 16).

1. Quadrant IV: Segmented, deliberately-paced approach; Isolated technology; Least risk.

For many years, public officials have been comfortable with Quadrant IV, in particular

with design-bid-build (DBB). DBB’s segmented approach assures public officials that design will be complete, or nearly so, before a decision is made on construction. DBB is the slowest and most expensive of the options, but has the least associated risk. It is the “isolated technology” quadrant; the only path for innovation in technology is through the designer. Design-build (DB) offers opportunities for better integration of design with construction, fewer disputes along this divide, faster delivery, and savings in initial delivery costs.

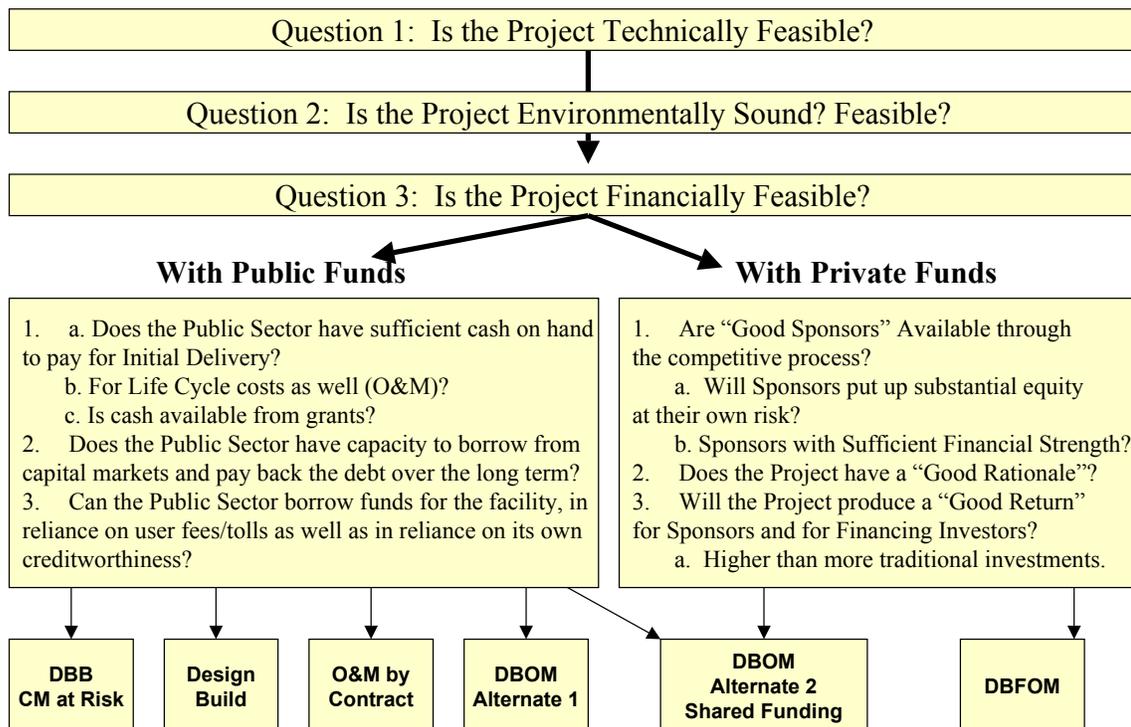
A measured increase in the number of stand alone O&M contracts, in appropriate situations, where current O&M costs are either unknown, or, alternatively, are known to be unacceptably high, is another tool that public officials may find useful in managing a collection of infrastructure facilities. The five-year operations contract

between the MBTA and Massachusetts Bay Commuter Rail, Inc., due to be renewed for three more years, demonstrates that such contracts can be helpful in managing deferred maintenance and in understanding the true level of funding required to maintain and operate a complex network of infrastructure assets.

2. Quadrant I: Efficiency; Innovation in operation

Public officials will increasingly grow comfortable with Quadrant I. When projects are properly structured and competitively bid, and in situations where existing operations and maintenance costs are well known, transparent use of Quadrant I has regularly produced life cycle cost savings between 20% and 40%. Ideal candidates for DBOM Alternates 1 and 2 include water treatment plants, wastewater treatment

**Figure 15
Project Viability Of Basic Delivery Methods**



■ Life Cycle Delivery of Public Infrastructure

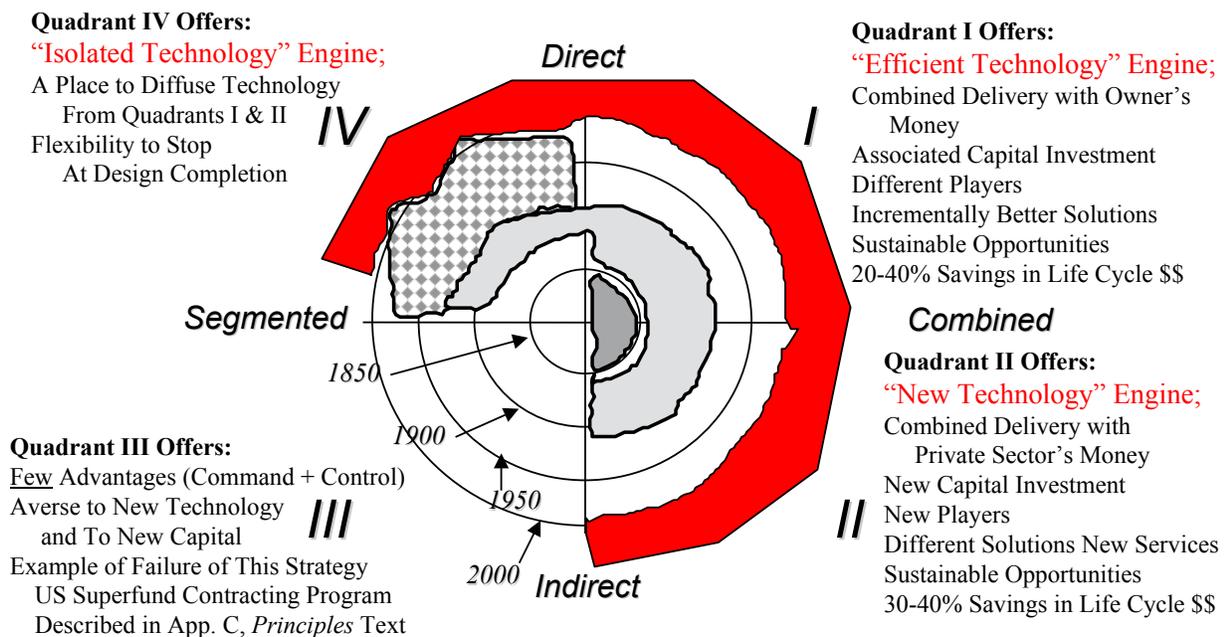
plants, and highway projects involving critical infrastructure services. This approach is also ideal for projects that require private sector economies of scale in purchasing chemicals and equipment, and/or in projects that require private sector innovation in equipment and in operations. Where “availability payments” or “shadow tolls” are being considered by the government in exchange for services, Quadrant I will generally provide the most effective procurement solution.

3. Quadrant II: Innovation, new technology, high capital cost; High risk.

In some situations, a major upgrade in technology or practice can significantly increase infrastructure capacity, materially extend facility life, produce significant cost savings or dramatically lower user charges. This kind of private sector innovation may require high initial capital costs with relatively high risk. A government decision

to take on an expensive project usually has strong adverse consequences elsewhere in the network.²⁷ In these situations, a determined effort to position such large, risky, complex, high technology, infrastructure projects in Quadrant II makes a lot of sense. The question to be asked is whether there is an acceptable way to attract a combination of good producers, good project rationale, and good return to enable government to finance the project entirely in Quadrant II.

Figure 16
The Quadrants Behave Differently



IV. Recommendations

Infrastructure is the platform on which both the American economy and the economy of the Commonwealth run. Skyrocketing costs associated with health care and public education will continue to consume a larger percentage of general public revenues. With a substantial shortfall in practically available public resources, state departments, local governments, and public authorities have few options when faced with expanding infrastructure needs and rising O&M costs due to decaying existing infrastructure. However, the pressure for better infrastructure services and better value for money across entire collections of projects will only intensify. In this climate, the integration of design with construction (Design Build) and the integration of design with both construction and O&M (Life Cycle Delivery or PPP approaches) can play a vital role.

Infrastructure is the platform on which both the American economy and the economy of the Commonwealth run.

Every infrastructure project requires government to plan, maintain and arrange for financing over the project's entire life cycle. To discharge these obligations, governments need accurate information about ongoing facility costs; a flexible procurement system that establishes attractive, durable markets; an openness to "new" modes of designing, building, operating and financing facilities, as illustrated in the MIT Framework; and an understanding of future trends in infrastructure procurement. Massachusetts citizens have the skills, the experience, and the necessary technology to assist the Commonwealth in meeting its infrastructure needs, on a competitive and transparent basis. Three basic recommendations are offered as the Commonwealth moves forward to tackle infrastructure issues.

A. A Better Understanding of the Current Condition of Existing Assets

State and local governments can and must acquire and maintain accurate knowledge of physical condition, rates of degradation, and current and expected O&M costs, and expected replacement costs of existing infrastructure assets. With detailed information of this nature, governments can make effective use of current cost information to establish competitive baselines for confirming that the Commonwealth's investments in infrastructure in fact produce better levels of service and better value for money as the infrastructure stock is rebuilt, replaced, and extended.

Technology is available today to permit government to gather detailed and accurate answers to the questions that support more effective decisions and better performance:

- *What is the current actual cost to operate and maintain individual facilities within infrastructure networks? What is their current estimated replacement cost?*
- *What is a facility's O&M cost over the past five years, and projected O&M cost over the next five years?*
- *What is the current capacity of existing infrastructure facilities? What are the current and projected revenue streams associated with those facilities?*

With a clear understanding of ongoing infrastructure costs, governments throughout the Commonwealth can shift their focus away from specific projects. Procurement strategy can improve to address both individual projects as well as the impact of each on the entire collection of infrastructure projects. Through a "portfolio" approach to entire networks of projects, government's focus can shift upward

■ Life Cycle Delivery of Public Infrastructure

to improving the cost and performance of public infrastructure at both the project and portfolio levels, and to more effectively use competition to confirm that high quality infrastructure services have been obtained at low, competitively verified prices.

B. Developing a Flexible Procurement System for the 21st Century

The Commonwealth's lack of a flexible procurement system constitutes the most serious obstacle to the effective use of the six basic delivery methods to improve public infrastructure assets. The Commonwealth's procurement system should be revised to permit each of the six basic delivery methods. A flexible system with access to each of the basic methods would attract new participants and establish durable markets.

The procurement laws should specifically permit the three basic methods for initial delivery: design-bid-build (DBB) and Construction Manager at Risk; Design-Build (DB); operations and maintenance (by contract); and the three basic methods for life cycle delivery: design-build-operate-maintain alternate 1 (all public funding); design-build-operate-maintain alternate 2 (mixed public and private funding); and design-build-finance-operate-maintain (all private funding).²⁸

The procurement laws should insist on transparency, fair treatment of potential and actual competitors and the competitive award of contracts based on pre-disclosed evaluation criteria and head-to-head competition. A new procurement strategy should incorporate evaluation factors that focus on higher levels of service for better value to governments and to users. Specifically, evaluation criteria should focus on:

· *Better future performance on the cost of both initial delivery and life cycle delivery when compared to known current performance;*

· *Higher levels of service when compared to known current conditions and levels of performance; and*

· *Improved environmental performance when compared to known levels of current performance.*

Adjusting the Pacheco Law

The "Pacheco law", found at MGL Ch. 7 Sections 52 through 55, is often cited as a significant barrier to "privatization" in Massachusetts. The thrust of the statute is generally to discourage the transfer of public sector functions to the private sector solely for savings in the wages of employees – a purpose which makes practical sense. While it may be a barrier to "privatization", it need not be a barrier to competitively awarded, life cycle delivery projects that improve service levels and reduce life cycle costs by 40-45%. With some clarifications for "Life-Cycle" delivery, including that Design-Build-Operate-Maintain contracts could typically extend for the world-wide standard of 25–35 years, the requirements of the law could be readily adapted to establish a pre-procurement process, and a pre-procurement ruling of compliance by the State Auditor. Such an advance ruling would prove to be quite useful in focusing both the private and public sectors on projects, designs, methods, and approaches that improve the life-cycle cost performance of infrastructure networks – goals that produce durable employment in public infrastructure and extend the infrastructure base on which the state's economy rests.

C. Expanding the Use of Life Cycle Delivery

With continuing pressures for better infrastructure and better value for money, governments can make effective use of the three basic life cycle delivery approaches – Design–Build–Operate–Maintain (Alternate 1, all public funding); Design–Build–Operate–Maintain (Alternate 2, Mixed public and private funding); and Design–Build–Finance–Operate–Maintain (all private funding). As MIT’s Hong Kong case study illustrates, a wise use of indirect financing for appropriate projects makes it possible to leverage government and private funds to achieve a program of infrastructure renewal and expansion beyond the capacity of government funds alone.

The Commonwealth’s lack of a flexible procurement system constitutes the most serious obstacle to the effective use of the six basic delivery methods to improve public infrastructure assets.

These contracts hold much promise for governments when they incorporate a number of important elements. The public sector must expand its expertise in identifying infrastructure projects suitable for financing through private debt and private equity. Once a project is determined to be a strong candidate for indirect financing, the government must make use of transparent, competitive procurement methods in the award of life cycle delivery contracts. Finally, the government must identify and create relationships with good private sponsors that work towards ensuring that a given project features both a good project rationale along with a good return to private investors.

V. Conclusion

If our perspective were limited to the last few years, the infrastructure sector seems to be in an incredible state of flux. But, from the perspective of more than two centuries of experience, the U.S. infrastructure industry and the public procurement market it generates are simply going through another cycle. There have been many such cycles since 1789. Throughout these cycles, previous generations have contributed technologies and equipment as infrastructure networks have been entirely replaced and upgraded – the barge, the train, the car, the plane, the radio, the phone, the computer, and the Internet. The Commonwealth and the nation are headed toward the latest reincarnation of the dual track strategy described previously in this report.²⁹

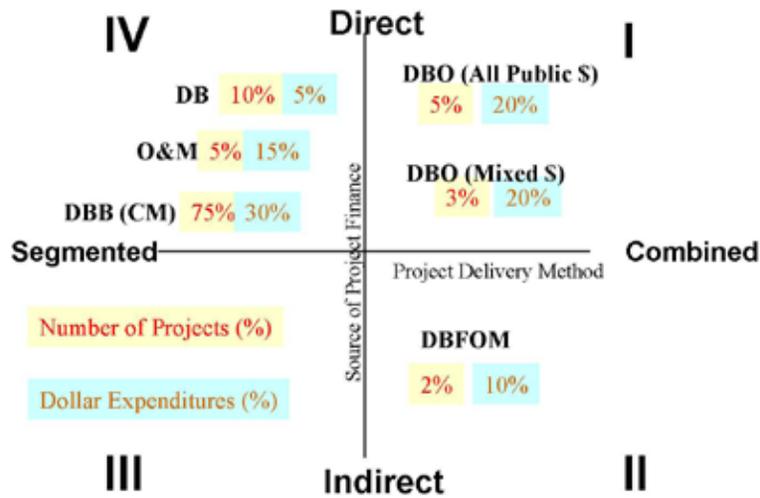
A wise use of indirect financing for appropriate projects makes it possible to leverage government and private funds to achieve a program of infrastructure renewal and expansion beyond the capacity of government funds alone.

Figure 17 (p. 35) represents the author’s prediction of how public infrastructure delivery strategy will evolve over the next thirty years in the Commonwealth and in the United States. The six basic delivery methods are shown in Figure 17, along with the author’s predictions of the number of projects using each method (by percentage) and the percentage of public (direct) dollars expended using each method.

A relatively small percentage (10%) of the total number of infrastructure projects will use the life cycle delivery methods in Quadrants I and II, but the life cycle cash flow through these projects will be quite large (50% of expenditures), creating durable, additional employment. The vast majority of public infrastructure projects

Figure 17

Predicted Steady State



Adapted From *Principles Text*, Miller 2000, Kluwer.

(75%) will continue to use design-bid-build (and Construction Management at Risk) for initial delivery because of the essential need in these projects for extensive review, approval, and control of the initial design. The use of design-build will continue to expand (to 10% of all projects and approximately 5% of all expenditures). Operations and maintenance (by contract) will expand slightly in situations where governments need to better understand ongoing O&M costs.

The current cycle is best compared to the transformation of the U.S. defense industry and its products over the last thirty years. In this time period, the defense industry has evolved from the mass production of relatively “dumb” items of military equipment to the incorporation of highly sophisticated “smart” information technologies such as GPS, GIS, stealth technology, unmanned

drones, and computer guided and controlled machines.

The next incarnation of America’s infrastructure networks is now underway. The relative contributions of technologies, techniques, finance, equipment, labor, and materials are once again being shuffled and dealt in ways unique to our new circumstances.

What has not changed is the need for transparency, the requirement for head-to-head competition in the award of public sector resources and concession rights, and the important organizing role that governments (at all levels) must play in coordinating infrastructure projects at the network level. The capacity of the Commonwealth, its citizens, its educational institutions, and its construction industry firms to address its infrastructure needs is also clear.

While the Commonwealth has yet to substantially participate in the emerging paradigm in which life cycle delivery plays an important new role, the conceptual tools, the legislative frameworks, and the planning capacity to use these methods are effectively available for ready application to infrastructure problems and issues in Massachusetts.

Glossary of Terms

A. General Terms

ARCHITECTURAL PROJECTS. For purposes of this report, projects predominantly involving design by architects, typically buildings, passenger terminals, multi-modal terminals (sometimes called “vertical projects” in the construction industry), where there is significant design focus on inhabited space. The distinction from Engineering Projects is for convenience only.

CLIENT/OWNER. Public or private client procuring facilities or services.

CONTRACTOR/PRODUCER. The successful bidder or proposer that emerges as the winner of the procurement process.

DESIGN REQUIREMENTS. The written description of the infrastructure facility to be procured, including: required features, functions, characteristics, qualities, and properties that are required by the client; the anticipated schedule, including start, duration, and completion; and estimated budgets for design, construction, operation and maintenance. These may include drawings and other documents illustrating the scale and relationship of the features, functions, and characteristics of the project.

ENGINEERING PROJECTS. Projects predominantly involving design by engineers – typically roads, water, sewer, transportation projects (sometimes called “horizontal projects” in the construction industry – where there is less design focus on inhabited space. The distinction from ARCHITECTURAL PROJECTS is for convenience only.

INFRASTRUCTURE. Used in a broad sense to refer to capital facilities such as building, housing factories, and other structures which provide shelter; the transportation of people, goods, and

■ **Life Cycle Delivery of Public Infrastructure**

information; the provision of public services and utilities such as water, power, waste removal, minimization, and control; and environmental restoration.

INFRASTRUCTURE FACILITY. A building; structure; or networks of building, structure, pipes, controls, and equipment that provide transportation, utilities, public education, or public safety services. This includes government office buildings; public schools; courthouses; jails; prisons; water treatment plants, distribution systems, and pumping stations; wastewater treatment plants, collection systems, and pumping stations; solid waste disposal plants, incinerators, landfills, and related facilities; public roads and streets; highways; public parking facilities; public transportation systems, terminals, and rolling stock; rail, air, and water port structures, terminals, and equipment.

PORTFOLIO OF PROJECTS. The collection of infrastructure facilities and services owned, leased, operated, or controlled by a single client.

PROJECT. Discrete tasks performed in connection with part, or all, of an infrastructure facility or service.

PROJECT VIABILITY. A combination of technical, financial, and environmental feasibility measures, the key ingredient for effective use of all the project delivery methods.

B. Terms Relating to Delivery Methods

INITIAL DELIVERY. The design and construction phases of an infrastructure facility, that is, the production of the initial facility itself. Long term operations and maintenance is not included in this phase.

LIFE-CYCLE DELIVERY. All phases of an infrastructure facility, that is, both the initial delivery of the initial facility and its operations

and maintenance of the facility throughout its useful life.

DESIGN-BID-BUILD (DBB). A segmented delivery strategy in which the design of an infrastructure facility is fully separated from construction, both of which are, in turn separated from maintenance and operation of the facility. In the DBB model, the client separately provides project planning and financing. The DBB model focuses on initial delivery only, and does not include long term operations and maintenance. Included in DBB is an important variant known as Construction Management at Risk, CM at Risk, in which the client procures the services of a construction manager before the design is completed. CM at Risk assists the client and the designer during the completion of the design process and commits to a Guaranteed Maximum Price to construct the project before construction commences.

DESIGN-BUILD (DB). A delivery strategy in which the client procures both design and construction of an infrastructure facility from a single producer.

DESIGN-BUILD-OPERATE-MAINTAIN (DBOM). Delivery method in which the client procures design, construction, maintenance, and operation of an infrastructure facility as an integrated whole over a contractually defined period from a single producer. The client provides initial planning and the functional design for the infrastructure facility in sufficient detail to permit private sector producers to compete for the project on pre-established evaluation criteria. The DBOM model, as defined in this report, requires that the client directly provide either

all of the cash flow required by the producer to finance the tasks assigned by the client; or the client shares the obligation with the producer to finance the cash flow required. The client typically provides this cash flow: by direct cash payments to the producer (sometimes referred to as “availability payments” or “shadow tolls”) in exchange for services; by transferring user fees collected from operation of the infrastructure facility; or by combinations of both. In short, all or a portion of the funds required to pay for the services provided by the producer during the contract period are either appropriated by the client prior to award of the contract or secured by the client through commitments of fare, toll, or user charges.

DESIGN-BUILD-FINANCE-OPERATE-MAINTAIN (DBFOM). Also known as build-operate-transfer (BOT): A delivery method in which the client procures, from a single producer, an infrastructure facility’s design, construction, financing, maintenance, and operation as an integrated whole over a contractually defined period. The client provides initial planning and functional design in sufficient detail to permit private sector producers to compete for the project on pre-established evaluation criteria. In the DBFOM model as defined here, the risk that project receipts will be insufficient to cover all project costs, debt service, and a return on equity is placed squarely on the producer. No client funds are appropriated to pay for any part of the services provided by the producer during the contract period.

BUILD-OPERATE-TRANSFER (BOT). The popular name in the 1980’s and 1990’s in the Far East and in the Middle East for DBFOM. Operations and maintenance: A project delivery method in which the client enters into a single contract for the routine operation, repair and maintenance of an infrastructure facility.

C. Terms relating to the MIT Framework

QUADRANT I. The portion of the MIT Framework defined by combined project delivery methods and direct project finance methods. There are two key delivery methods in this quadrant, including two variations of DBOM: DBOM Alternative 1, which includes projects fully financed by the public sector, and DBOM Alternative 2, which involves shared financing by the public and private sectors.

QUADRANT II. The portion of the MIT Framework defined by combined project delivery methods and indirect project finance methods. The key delivery method in this quadrant is DBFOM.

QUADRANT III. The portion of the MIT Framework defined by segmented project delivery methods and indirect project finance methods.

QUADRANT IV. The portion of the MIT Framework defined by segmented project delivery methods and direct project finance methods. There are three key delivery methods in this quadrant, each of which is a segmented delivery strategy: DBB, DB and O&M. DBB and DB are initial delivery methods only, and do not address long term operations and maintenance. All three delivery methods in Quadrant IV are typically fully financed by the public sector.

About The Author

Dr. John B. Miller's career has spanned the legal and academic worlds, focusing on practical business, legislative, and contractual solutions to the world's burgeoning infrastructure needs. He graduated from MIT in 1974 with a bachelor's degree in Civil Engineering and a Master's degree in Soil Mechanics. In 1977, Dr. Miller received his J.D. from the Boston University School of Law and Master's in Law in Taxation from the same school in 1982.

After serving as Associate General Counsel and Patent Counsel to a Cambridge high tech firm for three years, Dr. Miller joined the Boston office of Gadsby & Hannah in 1981, where he built a national practice in construction law and government contracts. Dr. Miller was elected to the American College of Construction Lawyers in the Fall of 2005. In August, 2006, Dr. Miller joined Patton Boggs LLP as Of Counsel in its Construction Projects, Infrastructure, and Finance groups. In over 30 years of practice, Dr. Miller has represented clients with the full range of construction industry interests, including cities, towns, designers, contractors, suppliers, subcontractors, and construction managers. After Dr. Miller resigned his partnership at Gadsby & Hannah, the firm represented the Big Dig.

In 1992, Dr. Miller accepted a three-year fellowship in the Center for Construction Research and Education in MIT's Civil Engineering Department. He received his PhD in Infrastructure Systems in 1995, and joined MIT's Construction Management Faculty. At MIT, Dr. Miller was awarded a four-year NSF CAREERS grant to explore and develop the logic for a new area of engineering practice that applies the array of project delivery methods to American infrastructure networks. The goal of this research was to promote and attract new technology and more effectively deliver complex collections

of infrastructure assets – i.e., buildings, water, wastewater, and transportation.

His research at MIT produced a comprehensive history of America's 200 year experience with public-private partnerships. Miller's work with industry groups produced the 2007 ABA Model Code for Public Infrastructure Procurement, the intent of which is to re-establish a broad, competitive US marketplace for infrastructure and to balance public policy requirements of transparency and fairness. While at MIT, Dr. Miller taught several undergraduate and graduate level courses, including Law and the Construction Industry, Public Infrastructure Development Systems, and The History of American Infrastructure.

Dr. Miller's work at MIT produced theory, evidence, and practical new approaches for addressing long term infrastructure problems. He authored two textbooks on public-private partnerships, *Principles of Public and Private Infrastructure Delivery* and *Case Studies in Infrastructure Delivery*. His contributions to the ABA 2000 Model Procurement Code and the ABA 2002 Model Regulations produced a new project delivery model for state, district, and local governments. A condensed version of this model – the Model Code for Public Infrastructure Procurement (MC PIP) – was issued by the ABA Sections of Public Contract Law and State and Local Government Law in 2007.

About Pioneer

Pioneer Institute is an independent, non-partisan, privately funded research organization that seeks to change the intellectual climate in the Commonwealth by supporting scholarship that challenges the "conventional wisdom" on Massachusetts public policy issues.

Endnotes

¹ These transactions are discussed in more detail below.

² See Engineering Systems Integration for Civil Infrastructure Projects, John B. Miller, *Journal of Management in Engineering*, September/October 1997, pp. 61 to 69 for background on this research.

³ Miller, John B., PhD Dissertation, at page 167.

⁴ The results of this research are presented in *Principles of Public and Private Infrastructure Delivery*, Ibid, Chapter 3, pp. 79 thru 170.

⁵ The National Surface Transportation Policy and Revenue Study Commission was created under Section 1909 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (P.L. 109–59) to investigate and make recommendations to Congress on the future federal role in surface transportation policy. To examine the Finance Commission’s Report, go to www.transportationfortomorrow.org.

⁶ Proposal preparation costs (transaction costs) spent by all proposers are estimated to be in excess of \$30 million.

⁷ The present value of one dollar (\$1.00) ninety-nine (99) years from now is \$0.008 (eight tenths of one penny – assuming an interest rate or discount rate of 5%). The present value of one dollar (\$1.00) 75 years from now is \$0.026 (between 2 and 3 pennies -- at the same discount rate). Put another way, when a public entity includes that ninety-ninth year at the end of a lease – it is worth almost nothing to the private sector. Does it make practical sense for governments to do so?

⁸ Life Cycle Delivery would be a more descriptive term than PPP, which is almost meaningless in today’s environment.

⁹ A complete case study of the Northumberland Bridge Project, with cash flow analysis, and

teaching aids, is contained in *Case Studies in Infrastructure Delivery*, John B. Miller, Kluwer Academic Publisher, 2002.

¹⁰ In other words, escalated by the CPI each year over a thirty five year period of the concession.

¹¹ Two case studies on Highway 407 ETR are included in separate chapters of the Case Studies book, *supra*.

¹² The same firm that subsequently participated in the Chicago Skyway and Indiana Toll Road transactions.

¹³ See, for example, the ABA 2007 Model Code for Public Infrastructure Procurement, and the ABA 2000 Model Procurement Code for State and Local Governments. Both are available from the ABA Web Store.

2007 MC PIP: <http://www.abanet.org/abastore/index.cfm?section=main&fm=Product.AddToCart&pid=5390260>

2000 MC: <http://www.abanet.org/abastore/index.cfm?section=main&fm=Product.AddToCart&pid=5390244>

¹⁴ For example, a facility that cost \$100 million to build will likely cost between 6% and 10% to design separately. After delivery, the public owner will likely spend between \$800 Million and \$1B on operations and maintenance, repair, utilities, and refurbishment over a 50 – 70 year life. A good rule of thumb to estimate annual operations and maintenance costs is to assume 7% to 9% of initial delivery costs (design and construction) per year, with inflation. The better practice is to collect actual data.

¹⁵ The concept is similar to a 10% or 20% down payment on a house, which is an equity contribution by an owner that gives comfort to the bank that the borrower believes it will pay the debt in full. The borrower’s equity is fully at risk, if the bank isn’t repaid. The borrower has strong incentives to make the project work.

■ Life Cycle Delivery of Public Infrastructure

¹⁶ For example, before each one of Hong Kong's three (3) tunnel crossings to Kowloon were authorized, there were extremely strong indicators that the demand from motorists was more than sufficient to pay for design, construction, long-term O&M, and the cost of borrowing.

¹⁷ The very long terms of monetization transactions (407 ETR – 99 years, Chicago Skyway – 99 years, Indiana TR – 75 years, and SH 121 – 50 years) with substantial up-front payments are creating substantial concern in the public sector as to the fairness of these transactions – including the projected rate of returns on private investment.

¹⁸ A proposition fully supported by the research at MIT, as described above.

¹⁹ Public disclosure of appropriate information about upcoming projects, as it is being collected, should be made as a first step in attracting the competitive interest of designers, constructors, operators, and financiers.

²⁰ All levels of governments throughout the Commonwealth have commitments other than infrastructure that also require borrowing. Health care and education are primary examples of needs that compete with public infrastructure.

²¹ This is rare for cities and towns in the Commonwealth, unless “sinking” or “rainy day” funds have been established in prior years.

²² A good, current “rule of thumb” for quickly evaluating whether an annual net revenue stream from an existing or proposed Infrastructure Facility might be sufficient to support both Initial Delivery and Life Cycle Delivery is to divide the projected income stream by discount rates of 8% and 10%. The result provides a preliminary range for the Initial Delivery costs that could be supported by that revenue stream. So, for example, the annual revenue stream of \$42 Million dollars promised as a minimum payment by the Canadian government on the Northumberland Bridge project, when divided by a range of discount rates

of 7% and 10%, provides a preliminary indication that the revenue stream may be sufficient to fully support the bridge IF the bridge can be designed and constructed in the range between \$420 million dollars (\$42 million divided by 10%) and \$525 million dollars (\$42 million divided by 8%). Trial discount rates should only be used for ball-parking purposes. The actual cost of capital is more appropriately used as projects move from first concept to competitive phases.

²³ Both alternatives of Design Build Operate Maintain are considered together in this section.

²⁴ The ABA 2007 Model Code for Public Infrastructure Procurement provides practical solutions for DBOM, and for DBFOM. Competitors must meet all Design Requirements, and compete head-to-head over design concepts, aesthetics, and life cycle costs.

²⁵ An example Bay Staters will recognize is the technology behind the Ted Williams Tunnel, sunken tube technology with self sealing tube to tube connections, which was first introduced on the Western Harbor Crossing in Hong Kong, at private sector risk. Parsons Brinckerhoff's experience with the technology helped move it to Boston.

²⁶ DBFOM has also been successful used where the economics of the proposed concession are so strong that the government need not assume any of the financing risk. The Western Harbor Crossing, the Eastern Harbor Crossing, and the Tate's Cairn Tunnels in Hong Kong are examples of this.

²⁷ The Big Dig was perceived by many in the Commonwealth as “draining the moat dry” with respect to other infrastructure needs across the state.

²⁸ The ABA 2007 Model Code for Public Infrastructure Procurement (MC PIP) published in March, 2008, consists of a legislative blueprint meeting all of these goals. The competitive

processes employed in the 2007 MC PIP are well known in the Commonwealth, having been substantially adopted for procurement of supplies and services in the 1980's.

²⁹ See Figure 6, supra.

