



## STAFF REPORT ACTION REQUIRED

### Applying Acceleration and Delay Costs in Construction Contracts

<b>Date:</b>	May 29, 2015
<b>To:</b>	Public Works & Infrastructure Committee
<b>From:</b>	Executive Director, Engineering & Construction Services Director, Purchasing & Materials Management
<b>Wards:</b>	ALL
<b>Reference Number:</b>	P:\2015\Cluster B\TEC\PW15017 (AFS # 20863)

#### SUMMARY

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The construction of sewers, watermains and roads is disruptive to traffic operations because it typically occupies road lanes. When this work is undertaken on major roads with high volumes of vehicular traffic, the disruption can be quite significant.

This report proposes to pilot, in 2015 and 2016, the potential benefits of (1) the application of acceleration and delay costs in construction contracts; and (2) a cost plus time tendering approach. Based on experience in other jurisdictions, these contracting methods may help expedite the completion of construction projects within the City's rights-of-way, and thereby reduce traffic impacts.

#### RECOMMENDATIONS

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**The Executive Director, Engineering & Construction Services and the Director, Purchasing & Materials Management Division recommend that:**

1. City Council authorize the Executive Director, Engineering & Construction Services and the Director, Purchasing & Materials Management Division to pilot the application of acceleration and delay costs in construction contracts for work within the municipal right-of-way, where the traffic disruption is expected to be significant.

2. City Council authorize the Executive Director Engineering & Construction Services and the Director of Purchasing & Material Management Division to pilot the application of a cost plus time tender process, for construction projects within the municipal right of way, where traffic disruption is expected to be significant.
3. City Council authorize the Executive Director Engineering & Construction Services and the Director of Purchasing & Material Management Division to report back to Public Works & Infrastructure Committee in 2017 on the outcomes of Recommendations No. 1 and No. 2 including:
  - i) capital cost impact;
  - ii) reduction in duration of construction schedule;
  - iii) operational issues which may have arisen;
  - iv) competitiveness of the bidding process; and,
  - v) response from the construction industry.

The report to include recommendations for changes, if any, to the City's construction contract procurement process.

## **Financial Impact**

The recommended measures outlined in this report, which provide contractors working within the municipal right-of-way with monetary acceleration payments to complete projects early, are anticipated to result in an increase in the capital cost of construction projects, with a cost premium estimated to be in the range of 20% to 40%.

In consultation with the client divisions, Toronto Water and Transportation Services, an analysis will be conducted on a project-by-project basis to determine whether the benefits of the approach being considered, specifically the road user impacts, outweigh the capital cost premium that may be encountered in the delivery of the project.

The cost premium for 2015 contract awards will be funded through existing approved capital budgets, and subject to overall capital program spending. This could result in a deferral of other planned capital work to the following year. The cost premium for 2016 contract awards will be subject to approval of Toronto Water and Transportation Services 2016 capital budgets.

The Deputy City Manager & Chief Financial Officer has reviewed this report and agrees with the financial impact information.

## **DECISION HISTORY**

At its meeting on February 10 and 11, 2015, City Council adopted a report from the Executive Director of Engineering & Construction Services titled Managing Traffic Disruption on City-Led Construction Projects and directed the Executive Director, Engineering & Construction Services, in consultation with the General Manager, Transportation Services, the Director, Purchasing & Materials Management, and the City Solicitor, to report to the Public Works and Infrastructure Committee in the second quarter of 2015 on construction terms and conditions that could provide

contractors working in the municipal right-of-way with incentives to complete projects early and/or additional financial penalties for causing delays in the completion of construction projects. The Council Decision can be found at:

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.PW1.3>

## **ISSUE BACKGROUND**

Traffic congestion in the City of Toronto is a major concern for road users and public officials charged with managing the City's transportation road network.

The City is making great strides in addressing its sewer, water and road infrastructure renewal backlog, with a forecasted growth in capital construction in the next 10 years. An increase in construction projects within the municipal right-of-way represents greater construction-related impacts on pedestrians, cyclists, transit riders and motorists.

Minimizing the duration of road occupancy for City-led construction projects on roads with high volumes of vehicular traffic, cyclists, pedestrians and commercial operations will assist in minimizing traffic congestion and travel delays. Achieving timely completion of construction is a key goal for all construction projects but this is especially the case on roads carrying high traffic volumes, where the impact of lane restrictions is greater.

In road-related construction, tenders are awarded through a competitive process, where the successful contractor is selected by first meeting the mandatory requirements and then by being the lowest compliant bid. The successful contractor is expected to complete the project no later than the completion date prescribed in the bid document, which is determined through the engineering design process. Currently, if a contractor fails to complete a construction contract on time, the City applies liquidated damages for each working day completion is delayed.

As prescribed in contract law, liquidated damages are a per-day, project-specific, dollar amount that is set by the City at the time of tendering. The dollar amount represents an estimate of the direct costs (e.g., additional engineering consultant and staff time) that would be incurred by the City if the completion of a construction contract is delayed. Liquidated damages are calculated on a project-by-project basis and have typically ranged from \$500 to \$3,500 per day for contracts within the municipal right-of-way.

The effectiveness of liquidated damages as a sole means of enforcing schedule compliance is limited because the value of liquidated damages is typically much lower than the contractor's cost to take action to meet the schedule. For example, if a contractor's cost for paving work over the weekend is \$10,000 per day (based on labour costs including overtime and additional costs of up to \$5,000 per day to keep an asphalt or concrete plant open during the weekend), and the contract stipulates liquidated damages of \$3,500 per day, the cost for the contractor to increase production far exceeds the liquidated damages charged by the City.

Liquidated damages also provide inadequate incentive to contractors to minimize the amount of time lanes are closed to the public, or to complete projects or portions of projects ahead of

schedule. As well, a contract term setting unreasonably large or disproportionate liquidated damages may be unenforceable if it is found to constitute a penalty or punishment for default.

## **COMMENTS**

Congestion has significant consequences for the City. It reduces quality of life, has environmental costs, and affects the economy in, for example, lost time and when businesses actively avoid areas that are highly congested. There is significant value to the City in reducing the impact of City-led construction projects on road users by reducing the duration of the road occupancy, especially on roads with high traffic volumes construction.

Based on the experiences of other jurisdictions, contract provisions that take into account the monetary worth of early or late completion of a project as a means to expedite construction schedules can support the reduction of traffic congestion related to construction.

### **Jurisdictional Scan of Approaches to Reduce Delays or Accelerate Project Completion**

The City of Ottawa, York Region, the Ontario Ministry of Transportation and Infrastructure Ontario, and jurisdictions in the United States, have used acceleration and delay cost payment strategies to manage projects that are highly time-sensitive. Studies across North America and Europe have shown that significant delays, sometimes resulting from road construction projects, result in negative societal impacts such as economic impacts due to increased congestion and increased pollution. In these cases, payment strategies often rely on assigning a road user cost to the contractor's use or occupancy of the road.

For example, Infrastructure Ontario stipulates a maximum allowable amount of lane use on major transit construction projects where long term road occupancy is required. If the allowable amount of lane use is exceeded, Infrastructure Ontario imposes an occupation charge on the contractor. The charge is generally based on the amount of traffic delay caused by the loss of use of the lane. This approach lends itself to projects where lanes are occupied for significant periods of time.

#### Road User Costs

An approach widely used in the United States in determining the value to the owner of achieving reduced traffic congestion in the performance of road related construction projects is the concept of Road User Cost (RUC).

RUCs are the additional costs incurred by motorists and the community at-large as a result of construction in the right of way, and can include such costs as extra vehicle operating costs and lost time costs. The RUC is calculated by taking the amount of travel delay (due to slower than normal travel through a construction zone or detouring around it) and multiplying that by the number of travellers impacted in a day (to get the total amount of delay), and multiplying that by an estimate of the average monetary value of a travellers time.

Table 1 provides an illustrative example of RUCs for a different City streets. The RUCs in Table 1 represent the daily cost if all vehicles on a street experienced a 1-minute delay in a 24-hour period and is based on a rate of \$20 per hour, which is based on Statistics Canada data for average earnings in Toronto. In practice the actual duration of the delay would vary throughout the day but this chart provides a useful order of magnitude comparison.

**Table 1**  
**Sample Road User Costs based on 1 Minute Travel Delay**

Typical Road Segment	Annual Average Daily Traffic (AADT)	Cost of Delay/ Vehicle/hr* (\$/hr)	Average Delay (minutes)	Daily Road User Cost (\$/day)**
Logan - Lakeshore to N of Lake Shore	3,608	20	1	\$ 1,203
Victoria Park - Finch to McNicoll	9,789	20	1	\$ 6,596
O'Connor - Broadview to Greenwood	15,716	20	1	\$ 5,239
Victoria Park - Steeles to McNicoll	20,872	20	1	\$ 6,957
Rexdale Blvd - Kipling to Islington	28,388	20	1	\$ 9,463
Hwy 27 - Humber River to Steeles	28,910	20	1	\$ 9,637
Dufferin - Eglinton to Glencairn	33,856	20	1	\$ 11,285
Bayview - Foxwarren to Finch	37,967	20	1	\$ 12,656
The Queensway - Lady Bank to W of Kipling	38,639	20	1	\$ 12,880
Dundas - Shorncliffe to Aukland	41,720	20	1	\$ 13,907
Warden - Ellesmere to Sheppard	45,999	20	1	\$ 15,333
Bayview - Lawrence to York Mills	47,519	20	1	\$ 15,840
Dundas - The East Mall to Shorncliffe	55,810	20	1	\$ 18,603

\* based on Statistics Canada Data for average earnings in Toronto

\*\* sample calculation for Logan a) cost per minute = \$20/60minutes = \$0.3333 per minute; b) cost for 3,608 vehicles to be delayed 1 minute = \$0.3333 \* 1 \* 3,608 = \$1,202.55

By way of comparison, a consultant's assignment commissioned by Transportation Services (see <http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.PW5.1>) to study the commuter costs of travel delays resulting from lane occupations, estimated that costs between \$2,000-\$4,000 per hour during peak travel demand, and \$1,000-\$2,000 per hour during off-peak times, were indirectly incurred by the public for the closure of a single lane of traffic at Yonge Street and Bloor Street. For Spadina Avenue and Queen Street West, the estimated cost was \$4,000 per peak hour and \$2,000 per off-peak hour. These estimates are comparable to the costs show in Table 1.

Including RUC's in road construction project contracts acknowledges the value of a road user's time when travel delays occur due to construction. The impact of the RUC on a contract payment scheme can be a significant dollar value in comparison to liquidated damages, and inclusion of RUC's may be effective in managing projects where prolonged travel delays are expected to have a significant impact to the public. RUC provides a fair and objective measure to reflect the increased or decreased value to the City when paying for work completed ahead of or behind schedule, respectively.

## **Strategies to Reduce Project Delays and/or Accelerated Project Completion**

Reducing delays in the delivery of construction projects or accelerating project completion approaches can be accomplished by:

- (1) including acceleration-delay cost payment terms and conditions in the contract; and/or,
- (2) incorporating the potential acceleration into the procurement process.

The following provides an overview of these approaches:

### 1. Acceleration/Delay Costs

To encourage early contract completion, acceleration payments for early completion and delay costs for late completion can be employed. In this approach, dollar amounts are set out in the contract to compensate the contractor for each day identified critical work, such as delivery of specific milestones, is completed ahead of schedule. On the flip side, the contract would have a provision to deduct a prescribed dollar amount for each day the specified completion time is delayed. With this approach the City sets the completion date.

RUCs can be used to establish the daily amounts. In determining the amount, it is important to ensure acceleration and delay adjustments are fair to both the City and its contractors. To be effective, the dollar amount should be high enough to encourage the contractor to meet or exceed the project schedule. If the acceleration payment is not sufficient to cover the contractor's cost for the extra work (e.g., additional project planning, crews, increased project management, overtime, additional labour and/or equipment, etc.), then the contractor would have little incentive to accelerate production, and the provisions would not produce the intended results.

Use of acceleration-delay costs may attract the calibre of bidders who have the capacity to generate better schedule-considered bids and are able to manage and execute projects per plan and schedule targets while deterring contractors who are less certain on their ability to deliver the projects on time. Typically, the cost of delay mirrors the amount of potential acceleration payment and both are capped at a fixed amount based on a certain percentage of the contract value. The City of Ottawa uses 5% of the total project cost as an upper limit of the total acceleration payment and delay cost. This is also the upper limit imposed by the United States Department of Transportation on federally-funded projects. Standard liquidated damages provisions are also applied as well.

When there is little prospect of early completion or limited utility in achieving early completion, this approach provides greater certainty of the projected completion date and sets limits on the financial implications of incurring contract acceleration costs.

## 2. Cost Plus Time Bidding

In Cost plus Time Bidding the contract completion date is not stipulated in the bid document. The bid document includes a monetary value for each working day (the daily rate, or DR) for the purposes of the bidding process. The monetary value is based on a RUC and is pre-calculated by the City prior to preparing the tender document. A contract is awarded based on a combination of the price to complete the work and the number of days to complete the work multiplied by the DR. Under this approach, the contractor submits two components:

- 'A' - dollar amount for contract items
- 'B' - number of working days to complete contract (Bid days)

In the context of the City's Purchasing By-law, the award of the contract, as described above, would be based on the bidder with the lowest total value of  $A + (B \times DR)$ . The value of the contract with the successful bidder would only be A – the dollar amount for contract items – which in this bidding approach may not be the lowest bid. The Purchasing By-law sets out the conditions to allow a call to be awarded by staff, Bid Committee or Standing Committee, of which one of the conditions is that "in the opinion of the Chief Purchasing Official, the award is to the lowest bidder whose bid meets the specifications and requirements set out in the call."

For the purposes of Cost Plus Time Bidding, the Chief Purchasing Official would interpret the lowest bidder based on the lowest total value of  $A + (B \times DR)$  and ensure that this is clearly explained in the tender documents to help avoid confusion in the construction industry. Otherwise the conditions of the Purchasing By-law must be met for the delegated authority to staff, Bid Committee or Standing Committee to apply.

This approach builds in an incentive in the selection of the successful bidder by including time, in the form of the number of working days a contractor bids to complete the contract, as a component of the criteria for contract award. The cost premiums using this approach are difficult to quantify but correlate to the cost for a contractor to expedite the work by provision of additional resources including adding shifts where possible, and/or provisions of equipment and methods that may be more costly.

Cost Plus Time Bidding provides contractors with flexibility to approach bidding projects with a view to being the successful bidder through submitting a total number of bid days that considers best value in terms of both cost and time. The inclusion of bid time in the bidding process supports the calibre of contractors with expertise and capacity to deliver highly time sensitive projects and provides incentive to these contractors to employ construction methods, resources and innovation practices that may not be used in the more traditional low cost bid process to win a bid.

In Cost Plus Time Bidding, the contract terms and conditions will include liquidated damages provisions related to the contract completion date and may also contain acceleration/delay cost provisions if appropriate related to milestone dates in which the release of lane occupancy by the contractor is achieved and where traffic is restored.

Cost Plus Time Bidding allows the bidder significant flexibility in planning a project. Where there is opportunity to apply additional resources, such as extended hours or additional crews, this approach allows the benefits in achieving early completion to be recognized in bid selection. It is an innovative approach that would require the local construction industry to undertake unfamiliar bid preparation methods and so will require significant efforts to work with industry in order for them to become familiar with the approach.

Discussions with other jurisdictions (i.e., the City of Ottawa and York Region) and literature reviews indicate positive project delivery results when acceleration and delay costs have been applied. However, where project schedule delays were beyond the contractor's control, as in the case where there are unanticipated site conditions (e.g., poor subsurface condition of infrastructure) that require a change to the scope of the project, contractors will seek compensation for the extra time required to perform the additional work. In this case, an acceleration payment may still have to be paid based on an adjusted schedule and application of delay costs may become difficult to administer.

In discussions with road, sewer and watermain construction industry representatives, general support was indicated for approaches to achieve on-time or accelerated project completion. Industry representatives have advised that cost premiums may vary between 20% to 40% depending on the project specific opportunities available to accelerate construction. The project specific acceleration opportunities available include items such as: uses of extended hours and weekend work, use of multiple crews, the ability to obtain necessary materials and access to disposal sites outside of normal hours, the premium costs for labour and materials including costs associated with shift premium pay, and additional costs for equipment and materials such as costs for off-hour use of asphalt plants, material handling for disposal.

### **Pilot Candidate Projects**

It is recommended that in select cases where meeting or exceeding the project schedule is vital, and where the premium cost to help better achieve these schedule driven goals is warranted, the use of approaches to achieve on-time or accelerated project completion be assessed. Project selection factors to be considered include whether there are opportunities for a contractor to apply approaches to project execution that can improve upon a traditional contract schedule in a way that will provide value by reducing traffic congestion within overall budgetary constraints.

Engineering & Construction Services, in consultation with Transportation Services, Toronto Water, Legal Services and Purchasing & Materials Management Division, proposes to test the suitability of the approaches outlined above to reduce project delays and/accelerate project completion for select contracts that are planned to be tendered in the Fall of 2015 and in early 2016. Legal Services will provide input into the form that these tools can take to ensure the City's contractual interests are protected. In advance of pilot testing, discussions will be held with the construction industry to explain the new approaches. Mandatory pre-tender meetings will also be held to ensure that bidders are informed of the new approaches and provisions before they submit tenders.



The most likely candidate projects will be those with:

- High traffic volume and high degree of inconvenience to the travelling public where shortening construction duration significantly minimizes traffic congestion;
- Minimum risk of unforeseen circumstances due to such issues as conflicts with utilities, significant underground infrastructure and unknown road base condition. This will tend to result in selection of road reconstruction projects; and/or,
- Where there is a reasonable prospect for work to be completed faster than a traditional schedule based on contractor approaches to implementation.

The outcomes of pilot testing the above-noted approaches, including capital cost impacts, implementation issues if any, and net reduction in schedule, will be used to develop recommendations about the use of these approaches on future construction projects.

Staff will report back to the Public Works & Infrastructure Committee on the outcomes of the pilot testing and provide recommendations regarding ongoing use of the above approaches, as appropriate, in 2017.

## CONTACT

Shirley Wilson, P.Eng.  
Director, Engineering Support Services  
Engineering & Construction Services  
Tel: 416-397-4401  
Fax: 416-392-4426  
E-mail: [swilson2@toronto.ca](mailto:swilson2@toronto.ca)

Joanne Kehoe, CSCMP  
Manager, Purchasing – Construction Services  
Purchasing & Materials Management  
Tel: 416-392-7323  
Fax: 416-397-7779  
E-mail: [jkehoe@toronto.ca](mailto:jkehoe@toronto.ca)

## SIGNATURE

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Michael D'Andrea, M.E.Sc., P.Eng  
Executive Director  
Engineering & Construction Services

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Michael Pacholok  
Director  
Purchasing & Materials Management