Challenges in Utility Coordination and Implementation of Pavement Degradation Fees

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ABSTRACT

The City of Calgary (The City) has a road network of nearly 16,000 lane-kilometres with an asset value of about $11 Billion. On an extensive roadway network like this which is further growing it can be very expensive and disruptive to carry out maintenance activities on sections affected by utility cuts. A forensic investigation was conducted to determine the level of impact on the serviceability of pavements in Calgary due to the utility cuts and the findings were presented at TAC Conference in 2014 [1]. (Mohammad, 2014) The study estimated 22 percent as the loss of service life. Based on the findings, The City decided to engage the utility companies, developers and other stakeholders in implementing the pavement degradation fees.

In 2015, The City implemented pavement degradation fees to recover costs associated with reduction of service life and any maintenance costs associated with it during its life cycle to bring the road back to the condition prior to the utility cut. While pavement degradation fees is charged on all utility cuts, surface restoration fees has been historically applied to roads with Visual Condition Index (VCI) greater than 7.0 and/or roads less than two years old.

This paper presents the implementation process and associated challenges where stakeholders from various quarters were involved. The paper identifies the steps taken to improve the coordination of right-of-way projects between The City, developers, contractors and Utilities.

- Flat rate fees for pavement degradation and surface restoration – statistics from the past
- Considerations of roadway classification, pavement surface condition (PQI), age etc.
- Exchanging information on planned and on-going construction work in The City's rights-of-way,
- Coordinating the scheduling of right-of-way work.

1. GROWING TREND

Revised land use planning resulted in rezoning of several communities in the inner city. This resulted in redevelopment in several neighbourhoods where new infills started replacing the single family house. Hence the problem is more acute in such neighbourhoods where typically three utility cuts are required per new infill development. This trend which started a few years ago is expected to grow and hence the need to tackle the impact caused by these developments on road infrastructure.

In urban municipal environment, located within the public land dedicated for roadways as well as for other transportation are utilities such as electricity, natural gas, water, sewer, and telecommunication infrastructure. The vast majority of utility work in The City rights-of-way involves water and sewer, followed by gas lines and electricity. Major pavement cutting is less common for telecommunications lines. Utilities often cut through existing pavement to install, repair, or improve underground lines. Invariably utility cuts require lane closure resulting in traffic delays and the most challenging part is the subsequent restoration of the road pavement. The combined effect of growing redevelopment in the inner city and the replacement of aging utility infrastructure put significant pressure on the existing roadway infrastructure by reducing ride quality and service life. As such, utility maintenance work represents a continual challenge for restoring pavements in The City, as with other municipalities.

2. BALANCING THE GROWTH

Redevelopment in The City has a positive impact on various fronts. While it contributes to the growth, this could potentially accelerate the deterioration of the pavement infrastructure. To evaluate the impact of such cuts in pavements, The City conducted a study to analyse the impact of utility cut in terms of riding comfort index (RCI), surface distress index (visual condition index –VCI) and structural adequacy index (SAI). The rezoning was confined to older neighbourhoods in the inner city, hence the perception that the utility cuts may not impact the service life of pavements. While the pavements are designed for 30 years, at the time of life cycle rehabilitation, only a top layer of asphalt is replaced and the underlying structure continues to support the traffic loads. Shallow or deep utility cuts typically extend well below the pavement subgrade which more often than not results in differential settlements, needing intervention earlier than anticipated.

The results from the study indicated that at a 95 percent confidence level the observed F value is smaller than the critical F values for the hypothesis considered for analyzing the significance of utility cut on different roadway classification with the age of pavement. Hence there was very weak to no evidence that the age of the pavement has any impact of the percent change in PQI. Similarly, the analysis further indicated that at a 95 percent confidence level there is limited to no evidence that the classification of the road section (i.e. arterial, collector or local) has any impact of the percent change in PQI. From the PQI analysis it was noted that regardless of the age or road classification of a particular pavement, the introduction of a utility cut resulted in the reduction of the PQI of that section by approximately 22 percent

Based on the results of the study which clearly indicated additional costs to The City to repair and maintain the road in addition to significant reduction to pavement service lives, The City decided to charge a pavement degradation fee for the right to cut pavement in a public right-of-way. The intent of this fee is to recover the cost of repairing the long term damage caused by pavement cutting, even when repaired to specifications. However, any such exercise understandably involves several stakeholders from utilities, contractors to stakeholders within The City to arrive at amicable solution. The process and steps taken to implement this fee is discussed in the next sections.

2.1 CASE STUDY OF REZONED COMMUNITIES

Table 1: Average PQI for each Community

Name	2012	2013	2014
Killarney	5.46	5.53	5.57
Glendale	6.7	6.74	6.54
Glenbrook	6.8	6.58	6.41
Rutland Park	5.06	5.98	6.03
Richmond	5.99	6.21	6.3
Scarboro/Sunalta	5.71	6.02	6.13
Shaganappi	5.45	5.91	6
Rossarock	6.48	6.63	6.56

3. INTENT OF FEES

The paper discusses the process of implementation of pavement degradation fees, a new fee directed toward addressing the loss of pavement service life. Surface restoration fee has historically been in the Roads Construction Standard Specifications, applied to roads in very good condition.

3.1 PAVEMENET DEGRADATION FEE (PDF)

Pavement degradation fee is the charged to all pavement cuts including cuts initiated by water and sewer which are part of The City. This fee is to recover the cost of repairing the long term damage caused by pavement cutting and additional maintenance cost to maintain pavements. The only exceptions are pavement coring and bore holes which are very small in area, where the contractor must backfill the area as per specifications.

The impacted area for this fee is calculated using a 1 m zone of influence on all side of the cut as shown in equation below.

Area for PDF = (Length + 2 m) x (Width + 2 m)

The equation below was used to calculate unit rate for pavement degradation fee [1]:

PDF = (% Serviceability Loss x Reconstruction Cost) + (Additional Maintenance Cost)

3.2 SURFACE RESTORATION FEES

Surface restoration fee has historically existed in the Roads Construction Standard Specification. This fee is charged where roads that are cut have a visual condition index (VCI) rating of 7.0 or higher. A VCI of 7.0 indicates the road is in very good condition where resurfacing the impacted area after one freeze thaw cycle will ensure the ride quality is restored back to pre-cut condition. Where the roads are less than 2 years old, cuts are not permitted unless in case of emergency. On such roads if cuts are essential for the project but not emergency, the application will be forwarded for Director's approval.

The impacted area for this fee is calculated using a 1 m zone of influence on all side of the cut as shown in equation below. However, to ensure smoothness of the road, paver laying of asphalt is mandatory for area larger than 100 m^2. As such, a minimum length of 10 m is used in such scenarios and curb to curb for residential and collector roads to avoid joints in the center of the road.

Area for PDF = (Length + 2m) x (Width + 2m)

4 STAKEHOLDER ENGAGEMENT

Excavation permits is under the purview of Road's Business Unit as they are the pavement asset owners. Maintenance Division within Road's is responsible for rehabilitation of utility cuts and Construction Division maintains the Pavement Management System (PMS). In order to perform work on their utilities buried in rights-of-way, the indemnified contractors representing utilities must obtain excavation permit from The City, which regulates and issues permits for all utility construction, reconstruction, or maintenance activities performed in The City's rights-of-way. Road's evaluated options for stakeholder engagement strategy that would cover most parties involved with excavation permits at some stage or the other.

4.1 CAPITAL WORKS COORDINATION COMMITTEE

Road's constituted the Capital Works Coordination Committee (CWCC) a few years ago to efficiently major projects with utilities. Table 2: Information Sharing with Capital Works Coordination Committee below gives an overview of the process followed by the committee in coordinating projects. While it was recognized that major stakeholders are involved, the committee did not have representatives of indemnified contractors performing utility excavation and backfills and the developers. Hence it was concluded that coordination with those representatives that are not part of the CWCC be engaged separately as they for a core group for excavation permits.

Table 2: Information Sharing with Capital Works Coordination Committee

Exchange	Period	Description
Annual Project Schedules	Annually in January	Project information and timelines are entered in a template by all stakeholders (internal and external). Conflicts are coordinated with Project Managers, plans realigned, if necessary
GIS Information	Updated Quarterly	PDF map published on Calgary.ca
Monthly Project Status Meetings	Monthly	Status updates. Potential conflicts are discussed
Multi Year Program List	Annually in January	Paving program, water, sanitary, gas line replacement programs and other similar programs that have 3 - 5 year program lists are shared to assist in project scheduling

Internal Stakeholders	Paving, Water, Sanitary, Local Improvements, Development & Planning, Traffic, Water, Sewer, Transportation Infrastructure, Transportation Planning
External Stakeholders	Electricity, Gas, Telecommunications

4.2 ENGAGEMENT WITH INDEMNIFIED CONTRACTORS AND DEVELOPERS

All stakeholders were indicated of the upcoming changes and an engagement at a larger level was held to show the findings of the study and The City's future plans. Road's who led the pavement degradation study along with excavation permit office and other internal stakeholders invited Developers and indemnified contractors working on Water, Sewer, and gas line projects. This was one of the smaller groups that specifically catered to the needs of the Developers. With significant amount of new developments taking place, coordination with them was vital to create consensus and define a process that is easy to understand and implement.

While they agreed with the findings and the proposed degradation fee, their involvement was vital in identifying their concerns regarding its implementation. The fees initially proposed were based on the unit rate per square meter as in Table 3: Initial Proposed Fees. After a few rounds of engagement, the contractors identified the following concerns regarding unit rates for pavement degradation fees:

- That applying unit rate would lead to inconsistencies in the estimates, hence may not create a level playing field among the contractors
- Preferred a process that would charge flat rate for fees
- One fee that includes all utility cuts for the property for which permit is applied for
- Excavated area varies depending on the location of the utility line which when estimated before getting the Utility Line Assignment (ULA), the estimates can be off significantly

Table 3: Initial Proposed Fees

Road Classification	Road Age at Time of Utility Cut (Years)	Pavement Degradation Fee ($/m^2)
Arterial	0-5	$57
	5-10	$52
	10-20	$47
	20-30	$38
	30-70	$29
Collector	0-5	$51
	5-10	$47
	10-20	$42
	20-30	$34
	30-70	$26
Local	0-5	$46
	5-10	$42
	10-20	$38
	20-30	$30
	30-70	$23

4.3 FEE STRUCTURE –PAVEMENT DEGRADATION AND SURFACE RESTORATION

The City considered the view of stakeholders and analyzed the history of excavation permits to address the concerns. This data was analyzed to get an understanding of the typical length and widths of cuts. It was inferred from the past years data that for a new development typically three to four utility excavation permit were issued and the area of which was around 40 to 50 m^2. Weighted average was used in proposing pavement degradation fee of $1,900 as flat rate fee where cuts are less than 100 m^2.

The next step was to analyse the impact of these cuts to arrive at a flat rate fee for surface restoration. Paving operation and consideration of practicality was important to calculate the area to be restored. Most of these cuts were on local or collector roads which extended to the length of the property (about 10 m) and for the road width (9.2m or 10.2 m for local and collectors respectively). Also to ensure the restoration is done to standards using a paver, a minimum of 10 m length was necessary. The proposed flat rates were arrived at using the methodology mentioned above and as shown in Table 5 : Implemented Fee Structure Based on the Area of Utility Cut

The data for larger utility cuts well exceeded 100 m^2 as the lengths were more than a few blocks traversing through different classification roads, impacting more than one lane of the pavement structure. For the latter case, setting a flat rate fee was deemed impractical and unit rates will be applied.

Table 4 : Implemented Fee Structure Based on the Area of Utility Cut

Fee Type	Roadway Classification	Utility Cut < 100 m2	Utility Cut > 100 m2 [1]
Pavement Degradation	Arterial	$1,900	$49/m^2
	Collector		$44/m^2
	Local		$40/m^2
Surface Restoration (Roads with VCI ≥7)	Arterial	$5,800	$49/m^2
	Collector	$4,800	
	Local	$3,800	

4. IMPLEMENTATION OF PAVEMENT DEGRADATION FEE

On January 1, 2015, The City implemented the Pavement Degradation Fee. A utility (or developer) is charged a pavement degradation fee for the right to cut pavement in a public right-of-way. Surface Restoration Fee has historically been on the Roads Construction Standard Specifications but lacked proper implementation. The intent of these fees is to recover the cost of repairing the long term damage caused by pavement cutting even when repaired to specifications, resulting in a measurable decrease in the pavement life. In addition, pavement degradation fees also create an economic incentive for Developers and utilities to coordinate construction projects and use alternative methods such as trenchless technology and less damaging types of cuts to minimize pavement cuts.

Public and private utility companies including Water and Sewer which are part of the city are subject to the pavement degradation fee. The fee schedule is based on the classification of road and impacted area. Revenue collected from this fee is dedicated for pavement rehabilitation program.

In order to perform work on their infrastructure buried in rights-of-way, the indemnified contractors representing utilities must obtain excavation permit from The City, which regulates and issues permits for all utility construction, reconstruction, or maintenance activities performed in The City's rights-of-way. Where the permit is for new developments, a Permission to Permit (PTP) will be issued to the developer upon paying the pavement degradation fees and if applicable surface restoration fees. The intent of the PTP number is to charge the developer directly therefore the contractors have a level playing field while bidding for these jobs. An excavation permit application accompanied by the PTP number will be charged permit processing fees only and are not charged pavement degradation or surface restoration fees. Contractor is still responsible for rehabilitation of excavated area as per specifications.

[1] Zone of influence for Surface Restoration should consider 1 m from the farthest point on all sides of the cut and should form a definite shape.

The amount paid as pavement degradation fee is estimated, and calculated by the size of the cut shown on the drawings. Once the project is complete it is inspected, and the contractor is invoiced based on the actual area of cut. If the developer chooses to use an indemnified contractor to perform surface restoration, the fee will be refunded. The onus is on the Developer to ensure the work is performed as per the required standards.

5 PERMITTING PROCESS –

5.1 E-PERMITS AND PLAN SUBMISSION REQUIREMENT

The ePermits is an online service provided by The City of Calgary to allow the public to apply for, pay and receive Roads permits using the web 24 hours a day, seven days a week.

Registration to e-Permits is required to use the application. myID created at the time of registration is to be used for applying for permits. Excavation permits can be applied by business users (contractors or developers) only and citizens or individuals will not be able to apply for this type of permit. Currently e-Permits provide the following information to assist the applicant in planning and estimating the fees. The graphical representation is as shown in Figure 1 : Screenshot of e-Permit Application.

- Roads with VCI ≥ 7.0
- Roads that are less than two years old
- Roads planned for current year paving
- Roads planned for next year paving (available in August, one year before paving)

Information to be provided by the applicant is mentioned below:

- Mandatory legal address (can be selected on the map)
- Ability to draw on the map to show impacted area
- Provide plans as attachments to illustrate the length and width of affected area
- Payment can be made in person or via phone using a credit card.

Prior to the implementation of pavement degradation fees, plans showing impacted area was not mandatory. This had resulted in the cutting of roads that were newly rehabilitated. To alleviate such problems and to clearly identify the impacted area, the future step is to make these plans mandatory as well showing the number of cuts and the area for them.

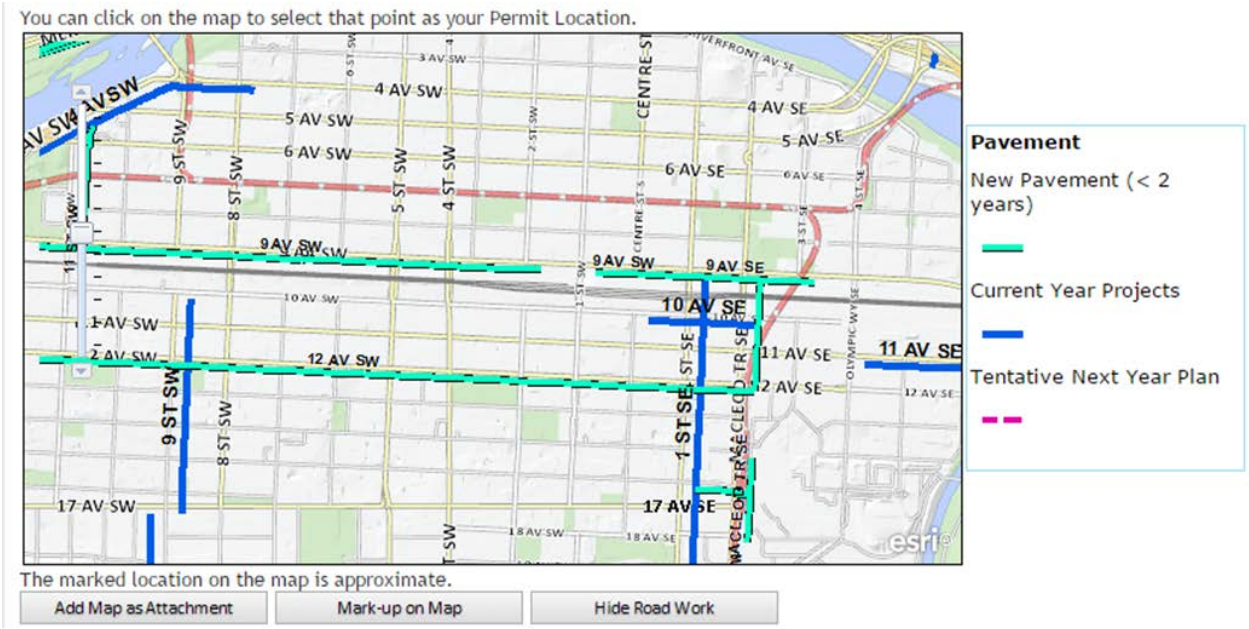

Figure 1 : Screenshot of e-Permit Application

5.2 APPROVAL PROCESS

The Excavation Permit Clerks review the application to ensure relevant fees are accounted for and the submitted drawings clearly show the impacted area. These will be saved to verify dimensions after completion of work. If the approval is for roads that are less than two years old, the application will be forwarded to Director for decision. Additional information may be asked to understand the urgency of work.

5.3 PRE-CONSTRUCTION

The Contractor needs to ensure the traffic detour and pedestrian accommodation plans are in place. The excavation permit is valid for the duration that is indicated. If the permit has expired, a reapplication will be needed.

5.4 CONSTRUCTION

All utility duct road crossings must be placed in conjunction with road base construction and ensure the backfilling meets the specifications. City Works Inspectors .are to be notified of the work 24 hours in advance who on-site will ensure the layered backfill is performed using the right type of material. Density testing is performed to ensure all layers meet the compaction requirements. The asphalt placement can be done either by the contractor or The City based on the nature of the permit issued.

5.5 POST-CONSTRUCTION

The contractor has the financial liability for two years from the date of completion. Where surface restoration is needed, the permit location is inspected after one freeze thaw cycle. Repairing the settlement of re-compaction within in the warranty period is contractor's responsibility. Surface restoration will be performed after the defects gave been rectified.

6 FUTURE DEMAND FOR UTILITY COORDINATORS

Utility coordination has become an integral part of delivering project on time and budget. Due to the extent of coordination, considerable amount of Project Engineer's time is utilized on this component. Efficient coordination requires dedicated personnel working on these aspects of project. To alleviate any conflicts within the projects limits, the utility coordinator can work with the contractor and developers to explore potential solutions.

7 CONCLUSIONS

The City of Calgary successfully implemented the pavement degradation fees in January 2015.The extensive coordination with the stakeholders' involved significant time and effort. The process of implementation was arrived at through consultation with various groups and subsequent revisions based on the comments received.

While these fees are implemented, the first year will be a year of learning and enhancements to the e-permit process. The area considered for flat rates need to be evaluated at the end of the year. The purpose of the fee is to provide a partial recovery for the reduced life of pavement due to localized repairs.

REFERENCES

[1] Karim, Mohammad; Rizvi, Rabiah; Henderson, Vimy; Uzarowski, Ludomir; Chyc-Cies, Joe: Effect of Utility Cuts on Serviceability of Pavement Assets - A Case Study from the City of Calgary, paper presented at 2013 Transportation Association of Canada Annual Conference, Montreal, Quebec