October 31, 2005

OCP 971 0767
c/o Oakside Management & Realty Ltd.
#420, 1100 – 8 Avenue SW
Calgary, Alberta
T2P 3T8

Attention: Mr. Jerry Park

RE: WESTMOUNT PLACE – POST-TENSIONING SYSTEM REVIEW

1.0 INTRODUCTION

At the request of Oakside Management & Realty Ltd., on behalf of Westmount Place Condominium, a review of the post-tensioning system was completed. The purpose of the review program was to qualify the condition of the subject slabs, and to provide recommendations for analysis, repair, replacement, upgrading, or additional investigations.

2.0 DESCRIPTION OF STRUCUTRE

Westmount Place is a 27 storey residential/office style building with four levels of underground parking. The main floor and the three suspended parking levels were constructed incorporating post-tensioned construction techniques. The lowest parking level was constructed as a concrete slab-on-grade. Drawings for this site were not provided.

3.0 REVIEW METHODOLOGY

The review program consisted of two parts:

- Review of engineering reports prepared by Manticore Engineering Ltd., dated December 1995 and July 27, 2000.
- Review of post-tensioning cables at existing recesses.

Steel plates that cover the cables at the existing recesses were removed. The condition of the cables and the presence of moisture and corrosion were observed at the recesses. Penetration tests were conducted on the cables to qualify stress. After the test, the insulation which was removed was replaced, and the steel cover plates were reattached to conceal each recess opening.

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Engineering Consultants

The environment around the cables within the recesses can change as a result of the original exposure. There is a possibility that moisture observed within the sheaths during the initial exposure has evaporated over time. Thus, comparisons of observations regarding the presence of moisture from the initial investigation to subsequent reviews are not made.

5.0 OBSERVATION AND DISCUSSIONS

The condition of 220 cables was reviewed at 66 existing recesses. Table 1 summarizes the condition of the cables observed within the recesses.

Table 1
Summary of Observed Cable Conditions

Cable Location	# of Cables Reviewed	# of Cables Unstressed	# of Cables Broken Wires
Main Floor	78	2*	0
P-1 Level	41	1	0
P-2 Level	48**	0	0
P-3 Level	53	0	0

* *One cable was removed in 1996*
** *One recess containing 2 cables could not be viewed*

Ninety nine percent (99%) of the cables reviewed appeared to be stressed. Three fully unstressed cables were discovered during the review. Two unstressed cables are located in the main floor slab while the other unstressed cable is located in the P-1 level slab. The one unstressed cable within the main floor slab is the cable which was removed in 1996 and identified in our 1996 and 2000 reports. The P-1 level unstressed cable protruded at the recess location.

Some of the cables displayed signs of corrosion at the recess locations. These recesses were located at cracks in the slab and through slab leakage appears to be occurring. Failed caulking along the surface of the slabs was also noted. Injection ports were observed along the soffit of the slabs indicating that a crack injection program had been completed in the past.

Several of the inserts holding the steel cover plates broke during plate removal. In addition, some of the inserts are no longer tight in the concrete and rotated when the nuts were loosened.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

The conditions of the post-tensioning cables within the cable samples have been reviewed. Deterioration of the post-tensioning system has occurred since our 2000 review, as two additional unstressed strands and strands containing corrosion were found. Based on the cables reviewed repairs to the post-tensioning system are not recommended.

As deterioration of the post-tensioning system has occurred, protection of concrete slabs is recommended. CSA S413-94 "Parking Structures" indicates that slabs containing post-tensioning cables must be protected using two different protection systems. Although this standard does not cover existing parking structures, industry standards and good construction practices are to provide protection to existing post-tensioned parking slabs. Protection consists of the application of membrane along the surface of the slabs. Typically, thin traffic deck waterproofing systems are installed on suspended parking slabs. An opinion of probable cost is $110,000 to install a thin membrane system on all three levels of parking.

It is recommended that the condition of the main floor membrane be reviewed. As through slab leakage and failed post-tensioning cables have occurred, the adequacy of waterproofing membrane is in questioned. The review would consist of the removal of site improvements (paving stones, concrete toppings) and a visual review of the membrane both the slab surface and slab edges.

It is assumed that the injection program which was performed was required due to through slab leakage. It is not known if the injection program has eliminated the leakage or has just directed the water to other areas. Care should be taken when performing crack injection on a post-tensioned slab. If the injection material does not fully fill the crack, moisture may be trapped within the slab and can come into contact with the post-tensioning cables. In addition, if the injection material gains access into the plastic sheaths, replacement of the cables is more difficult and repairs costs will increase.

Failure of the inserts holding the cover plates in place has occurred. The inserts are of a lesser size than inserts which are now presently being used to hold the steel cover plates in place. Replacement of the cover plates and the installation of larger inserts are recommended. The estimated cost to install the new plates and inserts is $5,500 based on 67 existing plates.

Ongoing monitoring of the post-tensioning system is essential to ensure that unsafe conditions do not occur due to corrosion induced deterioration. As on-going deterioration is occurring, reviews of the post-tensioning system is recommended every two years. The estimated cost to review the strands within the existing recesses is $2,000 per event.

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7.0 CLOSURE

The intent of this reporting was to identify situations that are obvious to a professional engineer under the current terms of reference. The conclusions and recommendations presented are based on a limited strand sample size and may not represent all strand conditions within the slabs, and conditions may vary widely away from the recess locations.

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Budgeting is based on historical data from similar buildings. Detail quotations for the work were not obtained from contractors.

We trust this information meets with your present requirements. Should you have any questions please contact Manticore Engineering Ltd. at (403) 252-8454.

Yours truly,

MANTICORE ENGINEERING LTD.

Mike Collins, C.E.T.

Reviewed by,

Jeff Small P. Eng
Principal

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