

Taunton Deane Borough Council

Executive - 12 September 2012

Orchard Multi-storey Car Park, Taunton - Structural Survey and Lifts

Report of the Parking and Civil Contingencies Manager

(This matter is the responsibility of Executive Councillor Edwards)

1. Executive Summary

The report outlines the findings and recommendations of specialist investigations into the condition of the multi-storey car park structure and its integral lifts. It draws Members' attention to the potential costs of fully implementing the recommended works in the context of the Project Taunton town centre retail redevelopment proposals. It recommends proceeding with the works and including them within the Council's Capital Programme, making the necessary financial provisions to do so as part of the budget setting process for 2013/2014.

2. Background

- 2.1 The Orchard multi-storey car park was erected in the early 1970s. It is primarily constructed of pre-cast concrete panels and in-situ waffle slab decks. Being a concrete structure with steel reinforcement there have been concerns about its structural integrity after a 40 year life. Some condition surveys have been undertaken, but nothing recently.
- 2.2 The car park is inextricably linked with the plans for retail redevelopment of the town centre. For some years it has been understood that the car park would be demolished as part of such redevelopment. Maintenance activities have therefore been minimal and certainly nothing of substance structure-wise. A recent version of the redevelopment plans indicated that whilst the spiral entrance and exit ramp might be demolished the main body of the car park would be incorporated within a retail centre.
- 2.3 If the car park is to remain in public use for a further substantial period, in whatever form, it was considered essential to have a full structural survey carried out to establish the condition of the building and what work might be needed to remedy any defects. An item was included in this year's Capital Programme for a survey and for subsequent works.
- 2.4 Members will also be aware that the three passenger lifts within the car park are of a similar age and are not working as they should. Breakdowns are not an irregular

occurrence, leading to public frustration and complaint. The lift maintenance contractor was asked to provide a costed schedule of works needed to fully refurbish all three, including replacement of major parts where necessary. As the lifts are an essential feature of the multi-storey car park, their refurbishment is being looked at concurrently to the structure itself.

3. Structural Survey

3.1 Property Services commissioned the survey from Waterman Transport & Development Limited. Their report has recently been received. The Conclusions, Recommendations and Costings sections are attached at Appendix A.

3.2 From these it can be seen the structure has performed well and is not in danger of failing. However, repairs and protective measures are necessary to prevent further deterioration and to provide a parking environment that is both safe and attractive to motorists. The latter factor is of particular importance given the car park's location and potential redevelopment.

3.3 The works fall into three categories

Capital	
Structural repair work required within 12 months	£27,500
Preventative maintenance work required within 5 years (to give a life beyond 10 years)	£705,000
Revenue	
Minor repairs and redecorations	£25,000

3.4 The approved 2012/13 Capital Budget provision is for £245,000. This also has to cover all professional fees associated with the survey and any works subsequently undertaken.

3.5 The approved 2012/13 Revenue Budget for car parks maintenance is £63,000 and covers all maintenance activities in all Council car parks. It is at least fully expended every year and could not fund an item of £25,000 in one car park. Although the minor repairs and redecorations are not essential in terms of the integrity of the building itself there has been little work of this nature done for several years. The customer experience would certainly be enhanced by this – at a time when attracting motorists is very important. Additional revenue funding has been identified from the Interest Budget and vired with the agreement of the Executive Cllr and the Section 151 Officer.

4. Lifts

4.1 The suggested improvement programme for the three lifts is included at Appendix B

4.2 The works fall into three time frames

Capital	
12-18 months – Replacement of control mechanisms,	£57,000

rewiring and upgrading	
Mid-term 5 years – Replacement of gear and winding unit complete with ropes and pulleys, and car safety gears	£58,500
Mid-term 5-7 years - Re-lining of lift cars and replacement of landing / car door sets	£64,500

5. Conclusions

- 5.1 The works proposed to the car park and the lifts are intended to ensure both are fit for purpose for periods in excess of the next ten years. In total these require much more of a financial investment by the Council than is currently within the Capital Works Programme.
- 5.2 The items identified as being needed within 12 – 18 months can be carried out within this year's funding allocation so should proceed.
- 5.3 Members will need to be advised of the latest Project Taunton proposals for the retail redevelopment before making decisions on whether the other identified works should be funded. However, if it is likely that any part of these works will be required to be funded from 2013/14 onwards Full Council will need to make provision for this to happen.
- 5.4 The current proposals for the town centre retail development do not require demolition of this car park.

6. Finance Comments

- 6.1 The total approved budget for the project is currently £245,000. The total budget requirement for this project over the next 7 years is up to £912,500 making a funding gap of £667,500.

Capital investment of this size should only go ahead if the car park is to be retained under the Project Taunton proposals.

The table below summarises the expected capital costs:

	Actual / Commitment £000
2012/13 Capital Commitments	28
Work required in the next 12-18 months	57
Work required over next 5 years	763
Work required in 5-7 years	65
Total Capital Budget Required	913
Current budget available	245
Budget Gap	668

The additional revenue costs have been dealt with as described above.

The work required in 2012/13 and the next 12-18 months can be funded from the current budget allocation of £245k.

Further funding of £668k will need to be identified for the work required over the next 5-7 years.

The main options are to use the £164k revenue budget set aside at budget setting for capital projects, set aside a proportion of the Councils expected future capital receipts to fund the work or to approve additional borrowing.

To give an estimate of borrowing costs for the council to borrow £668k over 10 years would result in indicative annual repayment costs of principal and interest of £73k.

Other funding options could include the use of revenue resources to fund or part fund e.g New Homes Bonus or General Fund reserves. The most economic funding proposal would be put to Members for consideration as part of the overall Capital Programme for the next 5-7 years. It is recommended at this stage that the funding basis for the scheme is determined when the 2013/14 Capital Programme is presented for approval in February 2013

7. Legal Comments

7.1 There are no legal issues raised in this topic.

8. Links to Corporate Aims

8.1 There is no direct link to Corporate Aims, other than the overall aim of maintaining assets to ensure the greatest return is achieved.

9. Environmental Implications

9.1 There are no specific environmental implications associated with the recommendation.

10. Community Safety Implications

10.1 There are no Community Safety Implications related to this.

11. Equalities Impact

11.1 There are no specific Equalities issues related to this.

12. Risk Management

12.1 The risks are addressed above and in the Summary Business Case

13. Partnership Implications

13.1 There are no implications for any existing Partnerships.

14. Comments from Corporate Scrutiny

14.1 The report was considered by the Corporate Scrutiny Committee on 16 August 2012 who commented as follows:-

"We welcome the report of John Lewis and the detailed structural reports provided as appendices. We note that the total costs to refurbish the car park and its lifts are of the order of £912,500 to be spent over the next 7 years. We also note that the Council has set aside in the current Revenue Budget the sum of £245,000 towards this capital programme.

We suggest that the Executive consider the creation of a programme for the next 7 years of making a Revenue Contribution to Capital of some £95.500 per annum towards the upkeep and build this into the Medium Term Financial Strategy."

15. Recommendations

15.1 Members are recommended

- (1) to accept the contents of the report and the need for the works on the car park structure and lifts to be carried out in order to maintain the Council's physical assets and protect the parking income stream; and
- (2) to recommend to Full Council the inclusion of the works in the future Capital Programme, including the proposed funding basis as part of Budget Setting in February 2013.

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EXTRACT FROM WATERMAN TRANSPORT & DEVELOPMENT LIMITED REPORT

6. Conclusions

6.1 Visual Inspection

6.1.1 Internal Structure

The structure has generally performed well in comparison to other reinforced concrete multi-storey car parks constructed at the time. However the concrete elements have now reached the stage where the development of age related defects such as reinforcement corrosion can be expected to accelerate unless effective concrete repairs and protective measures are undertaken.

The concrete cracks in the corbels supporting the east end straight vehicle ramps on Levels 3 & 4 and the areas of spalled concrete on the slab soffits above Levels 3, 3A & 4 are thought to be due to expansion of the reinforcement caused by water penetration induced corrosion.

The hairline cracks in the slab soffit are probably the result of thermal movements as it is noticeable that they are more common on the half-levels on the south side of the structure where temperature variations are highest.

The honeycombing on the slab soffit above Level 3 is believed to be a construction fault caused by inadequate concrete vibration.

The deterioration and lack of adhesion of the sealant in the expansion joints is most likely age related as it is well past its original design life.

The cracking in the brickwork near the entrance could be caused by vehicle impact damage, however the absence of chipping suggests that concrete frame shortening is more likely. If brickwork is built tightly between concrete floor slabs with no provision for vertical movement then long term shrinkage and compression due to imposed loads in the columns can result in each storey being shortened by 2 to 3 mm. At the same time the brickwork is susceptible to reversible moisture expansion of 4 to 5 mm per storey depending on the type of brick and the level of exposure to rainwater. The combined effect of these phenomena can lead to excessive compressive stresses in the brickwork causing cracking.

6.1.2 External Structure

The diagonal hairline cracks in the external pre-cast concrete parapet slabs all occur in the bottom corner, suggesting a generic cause. This could possibly be relative movement between adjacent panels and friction between them.

6.1.3 Entrance & Exit Ramps

Most of the steelwork supporting the vehicle entrance ramp and the lower part of the vehicle exit ramp exhibits some degree of corrosion with some of it significant. The three main causes are likely to be a) inadequate maintenance of the paintwork resulting in exposure to moisture, b) blocked gullies on the ramps leading to increased flow of water down the ramps and c) the use of road salt on the ramps in the winter to reduce the risk of ice formation. None of the corroded steelwork was judged to have lost sufficient section through lamination to require replacement, however some of the connections at the inner end of the beams exhibit reduced factors of safety.

Map cracking, such as that observed on several exit ramp parapet panels, is an indication of alkali silica reaction. However, concrete testing in both this and previous surveys suggests that the level of ASR is likely to be at a low. The extent of the cracking does not appear to have increased since the previous surveys and it is likely that any gel formation or microcracking associated with ASR has now ceased.

6.1.4 Rainwater Drainage

The numerous and extensive areas of water ponding observed following heavy rain, even in areas on the lower decks and some distance from the perimeter, suggest that water is penetrating through cracks and joints in the slabs. This problem is being exacerbated by poor maintenance of gullies, some of which are blocked by silt. In winter we would anticipate the formation of icy patches which would be a hazard to car park users and could potentially damage the concrete surfaces.

6.2 Concrete Testing

6.2.1 On Site Testing

Reinforcement in a structure of this type would normally be expected to have a minimum of between 40 and 50 mm of concrete cover. Most of the readings obtained on site exceed this and are therefore considered satisfactory. This is borne out by the fact that there are very few areas in the structure where reinforcement is visible due to spalling of the concrete cover.

Reinforcement surrounded by alkaline concrete is covered by a thin layer of regenerating oxide and this affects the electrical potential of the steel. Positive half-cell potentials and negative values numerically lower than -200 mV are generally taken to indicate that there is less than 10% probability of corrosion occurring in the reinforcement steel. Most of the readings obtained on site fall into this category so the risk of corrosion occurring is low. This is borne out by the fact that there are very few areas where the expansion of corroded steel has caused spalling of the concrete cover. There were no high risk areas found on the structure with negative half-cell potentials numerically greater than -350 mV.

At no point on the concrete structure was carbonation found to penetrate even close to those depths at which the steel reinforcement is situated. This is significant because carbonated concrete is not sufficiently alkaline to protect the reinforcement from corrosion, particularly in damp environments where road salt may be present.

6.2.2 Laboratory Testing

Where the level of chloride ions by weight of cement is less than 0.4% (all but one reading, and this near the surface) and the concrete is not carbonated the corrosion risk to the reinforcement is considered to be low. In higher quantities there is the potential for the chloride to disrupt the protective oxide layer around the reinforcement so that it no longer passive.

In concrete where the alkali content is less than 3% (as in 62% of the tests) alkali-silica reaction rarely occurs and even at levels of 4% it is unlikely to cause problems. The highest measurement of 4.9% represents a low risk of ASR if siliceous aggregates are present as these can expand in a chemical reaction with the alkaline cement and water to form calcium silicate hydrate gel, causing cracks and ultimately spalling.

Cement contents of structural concrete are typically between 10% and 25% so an average measured value of 16.9% is the middle of the normal range.

Sulphates can occur in concrete either due to the presence of gypsum in the aggregate or from external sources such as the use of materials containing gypsum to mop up oil spills. In the presence of water this can lead to the formation of a hydrous calcium aluminium sulphate known as ettringite which expands and causes spalling. When sulphate levels are below 4% the risk of this occurring is considered to be low, so the measured average of 3.9% does not give reason to be concerned.

Compressive strengths for cylindrical cores taken from 40 year old structural concrete would be expected to be in the range from 25 N/mm² to 65 N/mm² so the readings obtained from the structure of between 25.8 N/mm² and 50.0 N/mm² are low, but within the normal range. The fourth reading of 21.4 N/mm² was taken from the lower part of the ramp rather than the main structure.

6.2.3 Petrographic Examination

The absence of alkali-silica reaction in Core 4, despite the presence of potentially vulnerable siliceous aggregates, suggests that not all of the other necessary conditions are present. ASR cannot occur unless the concrete is sufficiently alkaline and sufficient moisture is present. The relatively low levels of alkali have been confirmed by testing (see above).

It should be noted, however, that Core 4 is part of the in-situ concrete structure and that the precast components could have used different materials. This could explain the map cracking, which is often an indication of incipient ASR, in the parapet panels on the helical vehicle exit ramp

7. Recommendations

7.1 Structural Repairs

Several areas were noted as being in need of prompt repair in order to prevent further deterioration and possible risk to the public. We would recommend that this work is carried out within twelve months, regardless of any future plans for the building.

7.1.1 Internal Structure

The spalled concrete on the east end vehicle ramp corbels and on various deck soffits should be broken out to expose a clean undamaged surface without feathered edges. Where reinforcement is exposed this should be mechanically cleaned and painted with a zinc-rich primer. The missing concrete should then be replaced with a polymer-modified cement based repair mortar which is rated Class R3 under BS EN 1504-3.

The movement joints running north-south across each deck should be cleaned out with all existing filler and sealant removed. Following the application of a primer, and the provision of a supporting filler where necessary, the joints should be sealed with at least 10 mm of an elastomeric pavement joint sealant which meets the requirements of BS 5212.

7.1.2 External Structure

The diagonal cracks across the bottom corners of several pre-cast panels on the East Elevation should be injected with low viscosity epoxy resin. As these corner sections are directly above a pedestrian precinct they represent a potential danger to the public if reinforcement corrosion or frost causes them to break off (as one already has).

7.1.3 Entrance & Exit Ramps

The steelwork supporting the lower parts of the helical entrance and exit ramps should be blast cleaned, primed with a coat of zinc-rich primer and repainted with two coats of high-build epoxy micaceous iron oxide (MIO). Further corrosion and lamination will result in the strength of this steel supporting structure being compromised.

7.2 Preventative Maintenance

Large quantities of rainwater were noted as ponding on all decks of the car park during heavy rain. Although resealing the movement joints will reduce this, further measures are required to prevent the reoccurrence of structural deterioration. We would recommend that this work is carried out within five years if it is intended that the building is still to be in use in ten years time.

7.2.1 Rainwater Drainage

All gullies on the helical ramps and the car parking decks should be cleaned out to expedite the removal of rain water, especially that contaminated with road salt, from the structure. Consideration should also be given to the replacement of those cast iron downpipes which are corroded and their repainting where they are not. It would also be beneficial to install additional gullies as any amount of standing water is potentially a risk in icy weather.

7.2.2 Car Park Decks

Although the concrete deck on Level 3 is protected from water penetration by asphalt, all the other decks would also benefit from being waterproofed and protected from chemical attack. In addition to protecting the concrete this would also provide a skid-resistant surface. Following cleaning of the existing concrete surface a multi-layered flexible polyurethane system should be applied which includes a primer and dried quartz (for skid resistance). The exposed decks on the roof (Levels 5 & 5A) should receive a similar treatment but with the addition of an extra coat of membrane. These products are available in several colours to distinguish driveway areas from parking bays or to delineate disabled parking areas for instance.

7.2.3 Precast Concrete Panels

It is recommended that the external precast concrete parapet panels on the parking decks be protected from water ingress and atmospheric pollutants by giving them a protective coating of silane-siloxane primer and an acrylic co-polymer topcoat.

It is further recommended that the precast concrete parapet panels on the helical ramps (some of which exhibit signs of possible ASR) be similarly protected, but with an elastomeric coating comprising a pure aliphatic acrylic topcoat over the silane-siloxane primer.

7.3 Cosmetic Maintenance

We would recommend that this work is carried out if it is intended to continue using the building beyond the next ten years.

7.3.1 Minor Repairs

During the survey minor damage was noted to some of the doors, windows and paintwork around the west and east stair towers. Consequently these looked shabby in comparison to the more recently decorated north stair tower and were judged to be less inviting to the public to use.

The cracked pointing to the brickwork near the vehicle entrance ramp on Level 1 should be raked out and repointed.

7.3.2 Decoration

It is common practice on contemporary multi-storey car parks for the staircases, concrete columns and parking deck soffits to be painted a different colour on each floor, not only to make the building appear less dingy but also to aid motorists to find their cars.

8. Costings

Budget cost rates for the recommended repairs and protective maintenance have been obtained from Matrix Solutions UK Limited. Matrix Solutions are a specialist concrete repair contractor with a local base in Taunton. They have been utilised by Waterman for the repair and maintenance of a number of multi-storey concrete car parks throughout the UK and are also used by the managing agents of the Orchard Centre for routine and preventative maintenance.

The costs obtained should be treated as budget figures and are based on current day prices and do not include VAT. An allowance has been made for preliminaries but not for contingencies.

- The estimated cost of the recommended work in the first year is £27,500. This includes repairing concrete cracks, replacing sealant in movement joints and cleaning and repainting the ramp support steelwork.
- The estimated cost of the recommended work to be completed over the following four years is £705,000. This includes applying an anti-carbonation coating to all exposed concrete, waterproofing all parking decks, restoring line markings and improving the drainage system.
- Carrying out minor repairs and decorations in the staircase towers and repairing the cracked brickwork could add another £25,000.

REPORT OF ORONA LIFT COMPANY

Part 6 Planned Improvement / Time Frame

In our opinion the lifts should undergo a full modernisation program to bring them up to the latest standards as far as the existing fabric of the building will allow. The modernisation would improve lift service and safety and extend the overall life of the installation, giving another 15 / 20 years service.

Phase 1 - 12 / 18 months

Replace the complete control systems to include for VVVF operation to all three lifts.

Benefits

Greater control of floor levelling.

Added features such as required by DDA

Giving added longevity to the existing gear units.

Better Lift control logic meeting new standards

Replace the car door operator and sundry car door items Lifts 1 and 3

Fit new car operating buttons, car alarm and indicator.

Fit new landing call buttons.

Re-wire to complete installation

To complete these works a budget cost of £17000.00 plus VAT PER LIFT should be allowed (excludes door operators to lifts 1 & 3 which a budget of £3000.00 plus VAT per lift should be allowed.)

Note as lifts 1 and 2 are a duplex pair then the works to these lifts would have to be carried out together – one lift being out of service at any one time until full completion.

Phase 2 Mid Term 5 Yrs

Replace the gear and winding unit complete with ropes and pulleys

Replace car safety gears to bi directional

Carry out health and safety works

To complete these works a budget cost of £19500.00 plus VAT PER LIFT should be allowed

Phase 3 Mid Term 5 – 7 yrs

Re-line the lift car

Replace the landing / car door sets complete

Complete the outstanding health and safety issues

To complete these works a budget cost of £21500.00 plus VAT PER LIFT should be allowed

This gives a total budget cost of £58000 for lift 2 and £61000 for lifts 1 & 3.

Under the present economic climate we are of the opinion that competitive tenders could be obtained certainly for the next 12 / 18 months. Should Taunton Deane Borough Council wish to proceed on an ongoing phased refurbishment plan then the tendering companies should be made aware of the future requirements so that all parts / components supplied and fitted will be compatible with the further phases.

On completion of all 3 phases the lifts would be able to run for a further 10 / 15 years.

We strongly recommend that all equipment is Non-Proprietary and that no service tooling is required to reset parameters or interrogate the control systems.

In our opinion the lifts as installed were to a good standard and the ideal solution is to commence a planned modernisation program which upon completion will offer a further 10 / 15 years life to the installation. Lifts 1 & 2 could have new lifts fitted into the shafts with ease whereas Lift 3 has limited pit depth and may pose a problem with compliance to the lift regulations. In any event the new package lifts available are valued engineered for an expected life span of 12 / 15 years and construction is not as robust as that of the original leading to greater costs throughout the life of the unit due to damage.

The three phase plan has been recommended to allow a progressive improvement to the installations whilst keeping costs controlled and spread over a 5 / 8 year period. There would be a cost saving should the work be completed at one time, however this may well be offset by the CDM costs incurred as the project would no doubt extend over the period.