REPORT

Whakatane Commercial Wharf

Condition Assessment and Repair Options Report

Prepared for:

Whakatane District Council

February 2015

Job No: 851847

Tonkin & Taylor

ENVIRONMENTAL AND ENGINEERING CONSULTANTS

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REPORT

Whakatāne District Council

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Report prepared for:

WHAKATĀNE DISTRICT COUNCIL

Report prepared by:

Tonkin & Taylor Ltd

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1 Introduction

Whakatāne District Council (WDC) commissioned Tonkin & Taylor Ltd (T&T) to undertake a structural condition assessment on the concrete structural elements of the Whakatāne Commercial Wharf and prepare options and cost estimates for repair works. This report summarises the findings of this assessment.

2 Background

In 2009 WDC commissioned Opus to undertake an inspection of the Whakatāne Commercial Wharf and prepare a report regarding its condition, structural capacity and future repair options. Regarding the condition of the structure, the Opus report[1] concluded that:

> *'All sections of the wharf are showing signs of significant corrosion of reinforcing steel, spalling and other evidence of corrosion.'*

Based on the condition of the structure in 2009, and assumed material properties, Opus carried out a structural analysis of the deck slab, beams and piles using section 6.5.3 of the Transit NZ Bridge Manual. Opus concluded that:

> *'Calculations show that the limiting member to carry the above loads are the deck slabs, as these are likely to fail primarily in flexure due to sagging moments…The calculations show that the wharf should be weight restricted to vehicles having an axle limit of 2,000kg for safety reasons.'*

Regarding options for repair, Opus concluded that:

> *'The ingress of chlorides into the structure means that repairs will be a costly exercise. Full replacement is considered to be the only long term economic option. Given the life of the structure it is recommended that Council adopt a policy of monitoring until incipient failure (i.e. sagging deck or holes in the deck) requires replacement. Staged replacement of the sections can be undertaken over a 20 year period as funding permits.'*

3 Scope

The scope of our assessment, as per our proposal of June 2014 and clarification letter of 20 August 2014, was as follows:

- Visual condition assessment of the wharf (1919, 1936 and 1940 sections) at low tide, and comparison of the wharf condition with the 2009 Opus report;
- Consideration of repair options, including:
  - Whether repairs could be deferred until 2017;
  - Whether short term repairs (e.g. to extend the life of the structure by 5 to 10 years) may be appropriate;
- Cost estimates for both short term (if appropriate) and long term repair options.

[1] Opus International Consultants Ltd, 5 August 2009. Whakatane Wharf Structural Assessment Report. Reference 288081.04, Report # 09/023

The scope was extended to undertake an Initial Evaluation Procedure (IEP) to assess whether the wharves would be classified as Potentially Earthquake Prone Buildings and to consider the potential impact on the repair options.

4 Wharf Structure

The Whakatāne Commercial Wharf is located on the right bank of the Whakatāne River, some 900 m upstream of the river mouth.

The wharf is a piled reinforced concrete structure, consisting of three separate sections. The upstream section was constructed in 1919 and has a berth length of around 40 m. The downstream section was constructed in 1936 and has a berth length of around 30 m long. The intermediate section between the upstream and downstream sections was constructed in 1940 and has a berth length of approximately 70 m.

The structural form of each section is similar, consisting of a grid of square reinforced concrete piles linked by longitudinal and transverse reinforced concrete beams. In addition to these main beams, there are smaller intermediate beams at 1.2 m spacing which span from front to back. The beams support a cast *in situ* reinforced concrete deck slab. Site measurements indicate that the deck slab is typically in the order of 190 mm – 200 mm thick. Each pile bent is laterally braced by a diagonal reinforced concrete raking beam.

The 1936 and 1940 sections of the wharf are approximately 7.5 m wide and are supported by three rows of piles. The 1919 section (at the western end of the wharf) is approximately 11 m wide and is supported by four rows of piles.

Buildings are located directly behind (to the south) of the 1940 section of wharf, and partially above the 1919 section of wharf.

Signage is present on the wharf restricting axle loading to 2000 kg, as recommended in the 2009 Opus report (refer section 2 above).

A light and webcam pole, approximately 8 m high, is present at the eastern end of the wharf. This pole was referred to in the Opus report. Since the 2009 report, an additional similar pole has been fixed to the seaward edge of the wharf at the western end of the 1940 section. The Opus report also noted the presence of a light pole fixed to the landward edge of the 1940 wharf. This pole has since been removed.

5 Condition Assessment

5.1 Methodology

A visual inspection was undertaken on all three sections of the wharf on 5 November 2014.

Our condition assessment consisted of a visual and photographic survey of the deck top surface and underside of the wharf, conducted at low tide. The accessible parts of the piles, beams and underside of the slab were tested using a hammer to identify hollow, drummy or loose areas of concrete. A limited visual inspection of the front face of the wharf was also carried out from the available access ladders.

Defects such as cracking and spalling that have occurred since the Opus 2009 report were recorded on a copy of the Opus drawings (refer Appendix B). This allows a comparison to be made between the 2009 condition and current condition, and illustrates the rate of deterioration of the structure.

Photographs of typical defects are included in Appendix A. Not all defects have been photographed due to poor light conditions below the wharf.

5.2 Results

5.2.1 1936 Section

The members of the 1936 section are extensively deteriorated, with a significant number of additional / exacerbated defects observed relative to the 2009 Opus report. Longitudinal cracking up to 20 mm wide and spalling of cover concrete was observed in the piles, beams and raking beams. A number of the cracks observed were in previous patch repairs that are failing.

Additional areas of spalling from the slab soffit were noted. Significant corrosion of the exposed reinforcement was observed in the spalled areas, with total loss of reinforcing bar cross section in some areas. In some areas the depth of spalling was severe, with daylight visible through the slab between gridlines A1 and A2. **This section of slab (between A1 and A2) is considered dangerous and we recommend that this section of slab is fenced off immediately to prevent vehicle loading.**

The top surface of the slab was generally found to be in reasonable condition, with some longitudinal (east – west) cracking noted near gridlines 2 and 3, and a number of transverse cracks noted between gridlines A1 and A2. An area of crazed cracking was also noted around gridline A5.

5.2.2 1940 Section

The members of the 1940 section are not as extensively deteriorated as the 1936 section. However, cracking and spalling of concrete is evident in most of the beams and piles, and has worsened since the 2009 survey. A number of previous patch repairs to the beams and piles are continuing to fail.

Some minor areas of spalling were noted in the underside of the slab, however this does not appear to have worsened significantly since the 2009 survey.

The top surface of the slab appeared to be in good condition. However some transverse (north-south) cracking was noted between gridlines B3 and B4.

5.2.3 1919 Section

The condition of the beams and piles in the 1919 section is similar to the 1940 section. However, spalling from the underside of the slab is more extensive than in the 1936 or 1940 sections. A number of previous patch repairs were found to be either delaminated or cracked.

The top surface of the slab contains a large number of longitudinal cracks. A number of transverse joints at approximately 1.1 m spacing were also noted, where it appears the slab has been poured in strips.

6 Repair Options

6.1 General

The wharf is in a deteriorated state, and has continued to deteriorate in the five years since the previous condition assessment.

Based on our condition assessment of the wharf, we have considered the following options for the wharf. These options are detailed in the subsections below.

1. Closure;
2. Monitor and staged closure;
3. Short term repairs;
4. Medium term repairs;
5. Replace existing wharf.

6.2 Option 1 – Closure

We have considered whether the deterioration of the wharf requires immediate closure. Based on our inspection we consider that Section A1-A2 of the wharf should be immediately closed. However, the remaining sections of the wharf still have residual capacity at current loadings to remain open. On-going monitoring of the wharf should be undertaken as detailed in Option 2 below.

6.3 Option 2 – Monitor and staged closure

We consider that sections of the wharf still have residual capacity and can continue to remain open in the short term until either repairs are undertaken, or until deterioration of the wharf reaches a condition where closure of additional sections of the wharf, and ultimately the entire wharf, is recommended.

Sections A1 – A2 should be closed immediately.

The residual life of the remaining sections of the wharf is unable to be accurately quantified. However, we have noted significant deterioration since the 2009 inspection, particularly to the soffit of the deck which indicates that additional areas can be expected to be closed within the next 1 to 2 years, and potential complete closure of the 1919 and 1935 sections within the next 5 to 10 years.

The wharf should be regularly monitored (twice annually as a minimum) by a structural engineer for additional deterioration.

A managed process should be put in place to communicate to wharf users and tenants that any notification of closure of a section of wharf will be effective immediately.

Issues that would need to be considered for this option include:

1. The stability of the building which is partly supported by the 1919 section of the wharf which is exhibiting deterioration. Immediate closure of the building may be advised following future inspections if the deterioration reaches critical levels.
2. Continued access to all of the buildings bordering the wharf would need to be considered. Currently the wharf is used to access the buildings by delivery trucks and pedestrians;
3. The safety of boat users near the wharf, in the event of partial/complete collapse of the wharf. This is not considered to be an issue in the short term, but could be relevant if the structure was allowed to severely deteriorate.

6.4 Options 3 and 4 - Structural repairs

6.4.1 General

Options 3 and 4 below incorporate structural repairs to the wharf. The methodology of repair is essentially the same for both options with the extent and timing of the repairs being the differentiator between the two.

A specific repair detail of the defects has not been prepared as part of this report. However, a typical structural repair would likely consist of the following process:

i. The majority of the works will be undertaken below the deck level of the wharf within the intertidal zone, with a small staging area located on the top of the deck or adjoining land area. The access for repairs will only be able to be attained during the lower half of the tidal cycle each day. This will limit the working hours each day, and typically every second week there will be limited work during the middle of the day. Repair work is likely to be programmed to include two or three pile bays at a time, with all members requiring repair being completed prior to moving to the next section of wharf. The upper deck area above the area being repaired should be locally closed off during the repairs, and berthing adjacent to or near the section being repaired will also be restricted to reduce the risk of spray concrete 'drift' and subsequent damage claims from vessel owners;

ii. The identified defect areas consisting of weak / loose / cracked concrete will be broken out using hydro demolition or pneumatic hammers. Typically, the concrete will be broken back past the depth of the reinforcing bars to remove chloride contaminated concrete surrounding the reinforcing. Construction platforms will be required to allow access to the deck and beam soffits of the seaward sections of the wharf, and these are typically suspended from the wharf structure itself. Given the level of the seabed beneath the wharf, it is conceivable that for this wharf, a contractor may choose to support its construction platform from the seabed;

iii. The reinforcing steel should be cleaned of corrosion to bright steel. The Engineer should inspect and measure the residual cross-section of the exposed reinforcing steel. Typically, if the reinforcing has a residual cross-section of 90% of the original diameter, the bar would be considered acceptable and no additional steel would be required. However, if a greater level of corrosion to the reinforcing steel is encountered then the bar would be exposed with additional concrete breakout, until acceptable steel is encountered. Additional reinforcing steel bars will need to be spliced to the corroded steel and welded onto the acceptable steel at each end of the bars;

iv. The exposed reinforcement and broken back concrete would be coated in a corrosion inhibiting slurry to reduce the potential of residual chlorides within the original concrete from corroding the concrete.

v. Depending on the extent of cracking and or corrosion of reinforcing steel on the deck slabs and intermediate beams, it may be more practical to drill and epoxy fix starter bars into the beams and place new reinforcing steel or mesh on the underside of the deck;

vi. All broken out areas should be reinstated with a marine grade concrete. Depending of the location of the repair, this would be undertaken using a sprayed concrete or if the repair area is small the Contractor may elect to locally box the repair and pour in micro (small aggregate) concrete.

6.4.2 Option 3 – Short term repairs

As noted in Option 2, the wharf still has a limited remaining life allowing options to be considered for repair or replacement of the wharf. We have considered whether a 'short term' repair can be undertaken to keep the wharf open for the next 5 to 10 years.

The main structural element limiting the capacity of the wharf at present is the spalling to the soffit of the decking. Repairs to the currently identified defect areas of the deck will extend the life of the wharf in the short term, and reduce the potential for short notice closure of sections of the wharf. Closure of sections A1-A2 should be undertaken immediately until repairs are undertaken. Repairs to the spalling to the remaining sections of decking over all three sections of wharf, plus repairs to the beams and piles beneath the building in the 1919 section, should be undertaken within the next 1 to 2 years, if the wharf is to remain open for the next 5 to 10 years.

The wharf should be inspected annually to assess for further deterioration. Areas of spalling on the underside of the deck, or deterioration to other structural elements reaching a critical level, identified in subsequent inspections should be repaired within a timeframe as recommended by the inspecting engineer at the time. At this stage it seems probable that further repairs may be required at approximately year 4 and year 8, in order to keep the wharf operational.

It is expected that full structural repairs to the structural beams and columns as detailed in Option 4 below should be undertaken within the next ten years, if the life of the wharf is to be extended beyond this period. Delays to repairing these structural elements in the intervening years will likely result in additional deterioration and a higher cost of medium term repairs detailed in Option 4, and higher overall costs.

6.4.3 Option 4 – Medium term repairs

This option involves undertaking structural repairs to all the identified defects in the concrete beams, piles and slab elements.

Given the existing level of deterioration, it is unlikely that all chloride contaminated concrete could be removed from the structure. Therefore, deterioration of the repaired areas may continue, albeit at a slower rate. If well executed, this form of repair is likely to last in the order of 15 to 20 years, although this will depend on the degree of contamination in the remaining concrete.

It should be noted that these repairs will not prevent further deterioration of unrepaired sections of the wharf. Further deterioration of unrepaired areas, including areas which do not currently exhibit any signs of deterioration, can be expected due to chloride ingress into the old concrete which in turn will corrode the old reinforcing steel. Repairs to these other areas are likely to be required within the next 10 to 15 years.

We recommend that a waterproofing membrane is applied to all concrete piles, beams and the underside of the concrete decking to reduce the potential for future oxygen and chloride penetration into the concrete, which is the mechanism for the corrosion of the reinforcing steel. Some waterproofing membranes come with a supplier guarantee of 10 years and if applied we would expect that deterioration of unrepaired areas may be reduced over this ten year period. We would also expect that the repaired areas would then last between 20 to 30 years, before further deterioration becomes evident.

6.4.3.1 Repair schedule

A schedule of repairs is presented in Appendix C. In the schedule we have prioritised the repairs into three categories:

Immediate Priority: This relates to the section of slab at the rear of the wharf between gridlines A1 and A2. **This section of slab is considered dangerous and we recommend that this section of wharf deck is fenced off immediately to prevent vehicle loading until repairs are completed.**

High Priority: This relates to the longitudinal and transverse beams, slab and piles for all sections of the wharf, plus the raking beams of the 1919 section (which are included as the 1919 section is partially supporting the building above). It is recommended that these repairs are undertaken within the next one to two years.

Low Priority: This relates to the raking beams for the 1936 and 1940 sections of the wharf. These are considered to be a lower priority than the other elements, as the wharf is no longer used as a commercial wharf subject to large berthing and mooring forces. If limited budget is available for repairs at the same time as the High Priority repairs, then these can be undertaken within the next five to ten years.

It should be noted that undertaking these repairs would not necessarily allow the 2000 kg axle limit to be removed, unless the repairs also include a degree of wharf deck strengthening.

6.4.4 Seismic considerations

The structural options discussed above are to repair defects within discrete sections of the wharf. However, the wharves were constructed well before current seismic codes and the repairs will not increase the capacity of the wharf to sustain dynamic (i.e. seismic) loads.

All Territorial Authorities in New Zealand are required by the Building Act 2004 to have developed and implemented a policy on determining which buildings mightbe prone to significant damage as the result of an earthquake. The WDC has developed a policy document entitled “Earthquake-prone, dangerous and insanitary buildings policy" dated 26/8/2012. This document sets out the intended practice for the WDC with regard to earthquake-prone, dangerous and insanitary buildings including processes and timeframes for assessing and strengthening buildings.

The 1919 section of wharf has a commercial building occupying the space above the wharf structure, and the remaining section of wharf is open to the public. The wharf structure does not appear to be included within the exclusion provisions within Section 6.1.6 of the policy. Based on its current use we would expect that all three wharves would be considered Importance Level 3 (IL3) structures as they are facilities where more than 300 people can congregate in one area.

We understand that a check of the seismic performance of the wharf has not been undertaken so far by WDC. As part of the present report we have undertaken an Initial Evaluation Procedure (IEP). The IEP procedure was developed in 2006 by the New Zealand Society for Earthquake Engineering (NZSEE) and updated in 2013 to reflect experience with its application and as a result of experience in the Canterbury earthquakes. It is a tool to assign a percentage of New Building Standard (*%NBS*) score and associated grade to a building as part of an initial seismic assessment of existing buildings. The process and the associated *%NBS* and grade should be considered as only indicative of the building’s compliance with current code requirements. The assessment assumed that the wharf has been repaired to reinstate spalled / cracked concrete and replace corroded reinforcing bars. The results of this assessment is presented below:

Table 6-1 NZSEE Initial Evaluation Procedure

Wharf section	Percentage New Building Standard (%NBS)	Seismic Grade
1919	10	E
1936	15	E
1940	15	E

The assessment indicates that the wharf has a seismic capacity well below the minimum level for strengthening of 33% New Building Standard (%NBS) and significantly below the WDC preferred level of 67% NBS, and are considered Potentially Earthquake Prone Buildings.

Based on Table 4 of the WDC policy, the structure would be classified as a High Priority and the maximum timeframe for strengthening is 10 years.

A methodology for a seismic upgrade to the wharf is not included as part of this assessment. Further studies would need to be undertaken to assess the options and associated costs of a seismic upgrade of the wharves.

6.5 Option 5 – Replace existing wharf

This option involves demolition and replacement of all three sections of the wharf. If the wharf demolition and replacement is undertaken in stages, the remaining wharves should be subject to regular (twice annually) inspections by an experienced engineer to monitor their condition.

This option was discussed and costed in the 2009 Opus report. The 2009 costing has not been updated for this report.

7 Repair costs

A high level construction cost estimate based on current estimated rates (exclusive of GST), and based on our mapping of the existing identified defects has been prepared for Option 3 (Short term) and Option 4 (Medium term) repairs.

Table 7-1 Summary of repair costs

Option	Year 1-2	Year 3-5	Year 6-9
Option 3 (Short term)	Deck soffit repairs plus repairs under building $220,000 to $280,000	Localised deck soffit, beam and column repairs $120,000 to $150,000[1]	Localised deck soffit, beam and column repairs $120,000 to $150,000[1,2]
Option 4 (Medium Term)[3]	$1,000,000 to $1,400,000	-	-

1. Assumes additional repairs are undertaken following identification of additional elements requiring repairs during annual inspections. Estimate based on additional defects identified between 2009 and 2014.

2. Assumes Option 4 Medium term repairs are undertaken in year 10 following the short term repairs.

3. Repairs to existing identified damage only. Additional repair costs may be incurred in subsequent years due to corrosion of reinforcing steel within the 'un-repaired' sections. The costs exclude seismic upgrade.

The Medium term repair option cost estimate includes repairs to presently identified defects plus applying a waterproofing membrane. If the low priority items (i.e. raking beams in the 1936 and 1940 sections) were not repaired at this stage, we would expect the costs to reduce by about $150,000 in the first year.

A separate consideration is the requirement for a seismic upgrade. Further studies are required to develop options and prepare a cost estimate for a seismic upgrade. However, it would be reasonable to assume that the costs will be significantly higher than the medium term repair option alone.

This construction cost estimate above is based on an estimated volume of concrete required to repair the wharf based on our inspections. The cost of structural repair options has uncertainties as the extent of corrosion of the reinforcing steel beneath the existing repairs is unable to be determined until the concrete is broken out. In addition the extent of breakout can also increase significantly once the repair works commence. Accordingly, the cost estimates includes a contingency of 50%.

We note that repairs can be staged to suit budget constraints, however, as mobilisation costs are likely to be a significant component of cost, splitting the repairs into several contracts will likely result in higher costs.

Costs associated with design, supervision and any consenting requirements are excluded from the above repair cost estimates.

8 Conclusions

The Whakatāne Commercial Wharf has undergone additional deterioration since the last reported inspection undertaken by Opus in 2009. The additional deterioration includes increased cracking and spalling of concrete beams, piles and slabs under the wharf, indicating further corrosion of reinforcing steel due to chloride ingress has occurred.

Of immediate concern is the wharf slab at the south eastern corner of the 1936 wharf (between gridlines A1 and A2 and gridlines 2 and 3), where the reinforcement has completely corroded in places and daylight is visible through the slab. **This section of slab is considered dangerous and we recommend that this section of slab is fenced off immediately to prevent vehicle loading.**

Of the remaining sections, we consider that overall the wharf has a relatively short remaining life without repair, in the order of 5 to 10 years.

We have considered five options for the future of the wharf. The options considered were:

1. Closure;
2. Monitor and staged closure;
3. Short term repairs;
4. Medium term repairs;
5. Replace existing wharf.

Of these five, four appear to be valid management options which will allow further use of the wharves. These are:

- Option 2 – Monitor and staged closure. Immediate closure of sections of the wharf may be recommended by the inspecting engineer;
- Option 3 – Short term repairs to the soffit of the deck, plus to the piles and beams under the building in the 1919 section of wharf, which has an initial construction cost estimate of $220,000 to $280,000, plus monitoring and on-going repairs to deteriorating sections of the wharf in subsequent years. This is expected to extend the life for a short period to enable decisions on the future of the wharf to be made. Additional repairs of a similar order of costs would be expected to be required in years 4 to 5, and years 8 to 9, in order to extend the wharf life to 10 years;
- Option 4 – Medium term repairs which have a construction cost estimate of between $1,000,000 and $1,400,000 and should be undertaken within the next 2 years, with acceptance that some areas of the wharf may need to be closed in the interim. The serviceable life of the wharf could be extended to between 20 to 30 years with these repairs taking place in the near future (i.e. within the next 2 years). Further repairs are also likely to be required to the unrepaired sections within the next 15 years to get the wharf to the 20 to 30 year additional life. Note the estimated costs do not include any costs for seismically upgrading the wharf, to meet Councils policy regarding earthquake prone buildings, as this requires a separate more detailed assessment; and
- Option 5 – Replacement with a new wharf.

An initial evaluation assessment indicates that the seismic capacity of all the wharves are significantly below the minimum 33% of New Building Standard required for seismic strengthening. The wharves are considered Potentially Earthquake Prone Buildings under the Building Act 2004. Based on the WDC document entitled “Earthquake-prone, dangerous and insanitary buildings policy", the wharves would be classified as a High Priority with a maximum timeframe for assessment and strengthening of 10 years assuming an Importance Level 3 building. Further investigations will be required to assess options and costs for a seismic upgrade. This should be undertaken before decisions are made regarding the short and medium term

structural repair options discussed within this report. It may be that when costs for seismically upgrading the structures are assessed, that the most cost effective long term strategy is to plan for staged replacement of the wharves with new structures.

9 Applicability

This report has been prepared for the benefit of Whakatāne District Council with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

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Appendix A: Photographs

Appendix A - Site Visit Photos 05 November 2014

Photo T01 - view from east end of wharf

Photo T02 - pole at east end of wharf

Photo T03 - cracking in slab (1936 section)

Photo T04 - cracking in slab (1936 section)

Appendix A - Site Visit Photos 05 November 2014

Photo T05 - cracking in slab (1940 section)

Photo T06 - cracking in slab (1940 section)

Photo T07 - view to east

Photo T08 - cracking in slab (1919 section)

Photo T09 - cracking in slab (1919 section)

Photo T10 - cracking in slab (1919 section)

Photo T11 - cracking in slab (1919 section)

Photo T12 - cracking in slab (1919 section)

Photo T13 - pole on wharf (1940 section)

Photo A01 - gridline A1

Appendix A - Site Visit Photos 05 November 2014

Photo A02 - gridline A1

Photo A03 - beam cracking between A1 and A2

Photo A04 - slab spalling between A1 and A2

Photo A05 - slab spalling between A1 and A2

Photo A06 - slab spalling between A1 and A2

Photo A07 - beam cracking / spalling between A1 and A2

Photo A08 - beam cracking / spalling between A1 and A2

Photo A09 - View along wharf from gridilne A2

Photo A10 - spalling of raker beam at A2

Photo A11 - spalling of raker beam at A2

Photo A12 - spalling / corrosion at A2

Photo A13 - spalling of slab between A2 and A3

Photo A14 - spalling of slab between A2 and A3

Photo A15 - cracking of beam between A2 and A3

Photo A16 - cracking of beam between A2 and A3

Photo A17 - spalling of beam at A3

Photo A18 - Pile cracking at A3

Photo A19 - Cracking of beam between A3 and A4

Photo A20 - spalling of beam between A3 and A4

Photo A21 - spalling of beam between A3 and A4

Photo A22 - spalling of beam at A4

Photo A23 - spalling of beam at A4

Photo A24 - spalling of beam at A4

Photo A25 - Pile cracking at A4

Photo A26 - cracking of raker beam at A4

Photo A27 - Cracking of pile at A4

Photo A28 - Cracking at A5

Photo A29 - Cracking of beam at A5

Photo A30 - cracking of beam between A5 and A6

Photo A31 - spalling of beam between A5 and A6

Photo A32 - cracking of raker beam at A6

Photo A33 - cracking of raker beam at A6

Photo A34 - spalling of raker beam at A6

Photo A35 - Spalling of beam between A6 and A7

Photo A36 - cracking of beam between A6 and A7

Photo B01- Staining at B1

Photo B02 - Staining at B1

Photo B03 - slab spalling between B1 and B2

Photo B04 - slab spalling between B1 and B2

Photo B05 - rear beam spalling between B2 and B3

Photo B06 - beam spalling between B4 and B5

Photo B07 - Pile cracking at B5

Photo B08 - Cracking of raker beam at B6

Photo B09 - spalling of rear beam between B6 and B7

Photo B10 - cracking of raker beam at B9

Photo B11 - spalling of raker beam at B11

Photo B12 - spalling of raker beam at B12

Photo B13 - spalling of raker beam at B12

Photo B14 - spalling of raker beam at B13

Photo B15 - spalling of raker beam at B13

Photo B16 - spalling of rear beam between B15 and B16

Photo B17 - cracking of rear beam between B15 and B16

Photo B18 - cracks in beams at B15

Photo C01 - cracking in beam at C2

Photo C02 - slab spalling between C2 and C3

Photo C03 - beam spalling between C1 and C2

Photo C04 - cracking of pile repair

Photo C05 - cracking of beam

Photo C06 - spalling of slab

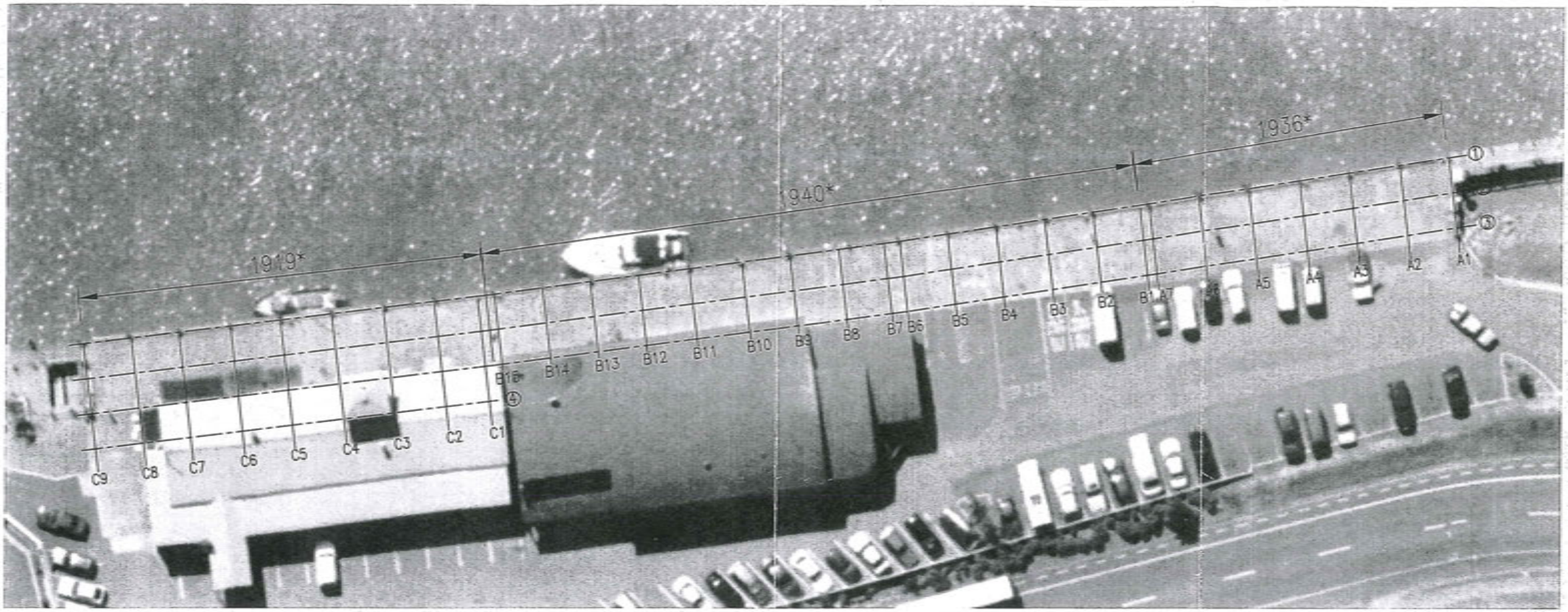
Photo C07 - cracking of raker at C7

Photo C08 - cracking of raker at C6

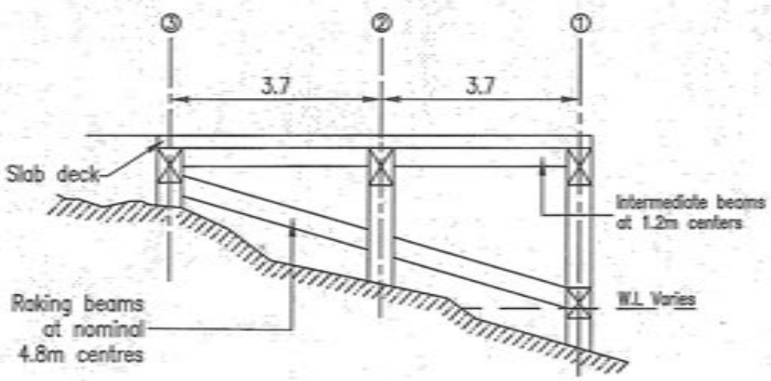
Photo C09 - spalling of beam

Appendix B: Drawings (from 2009 Opus Report)

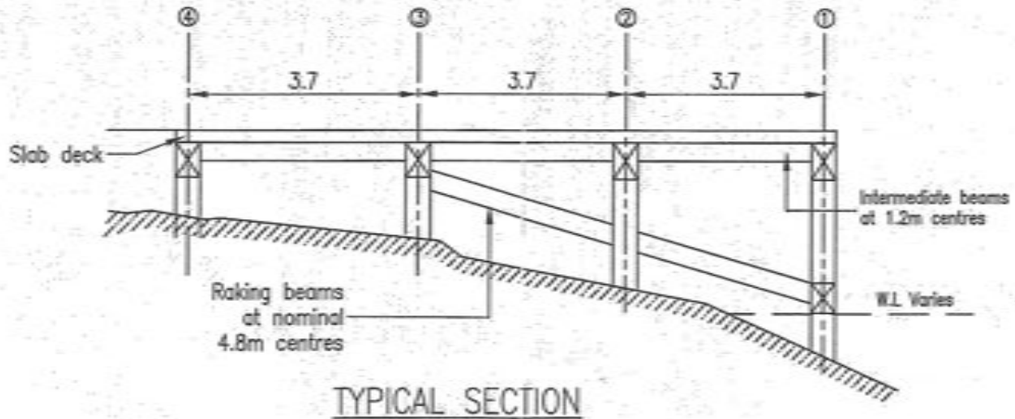
Note: Hand markups (in blue) showing additional defects noted in T&T's inspection of November 2014



PLAN
N.T.S



TYPICAL SECTION
1936 to 1940
Scale 1:100



TYPICAL SECTION
1940 to 1919
Scale 1:100

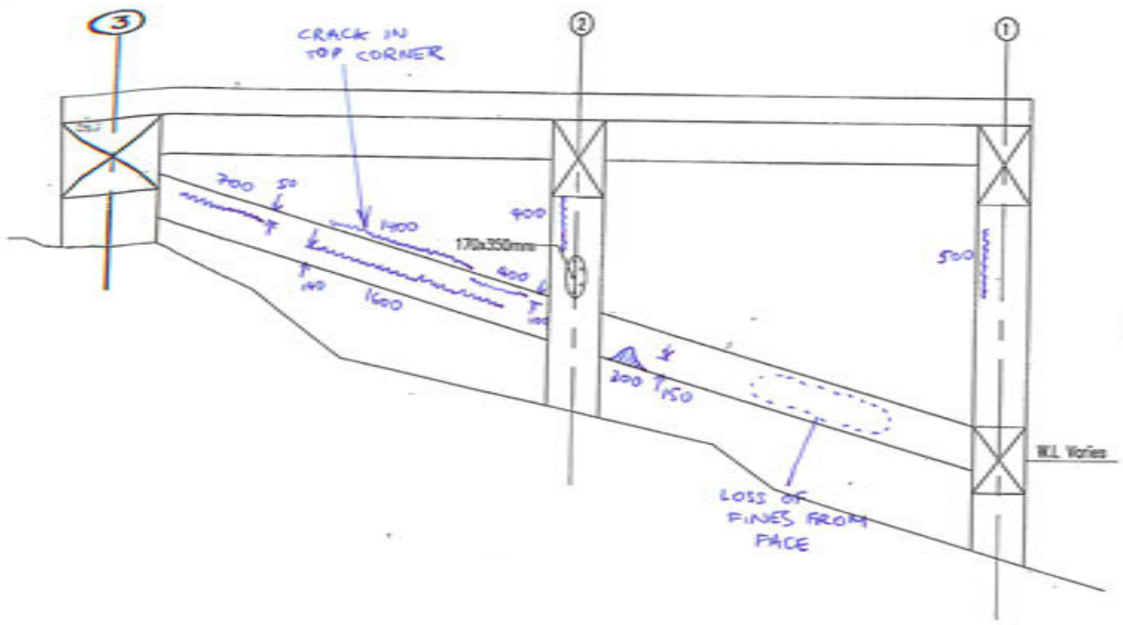
* Indicates year constructed

Whakatane District Council
Wharf Repairs

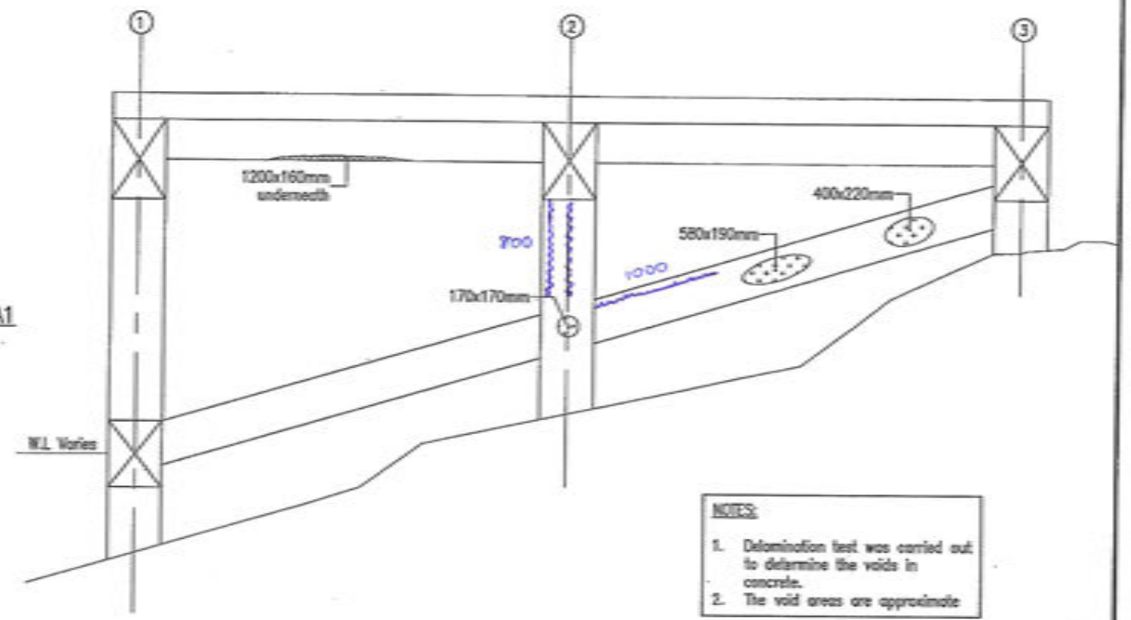
Existing Plan and Typical Sections

288081.04

ISSUE DATE 29 March 2007

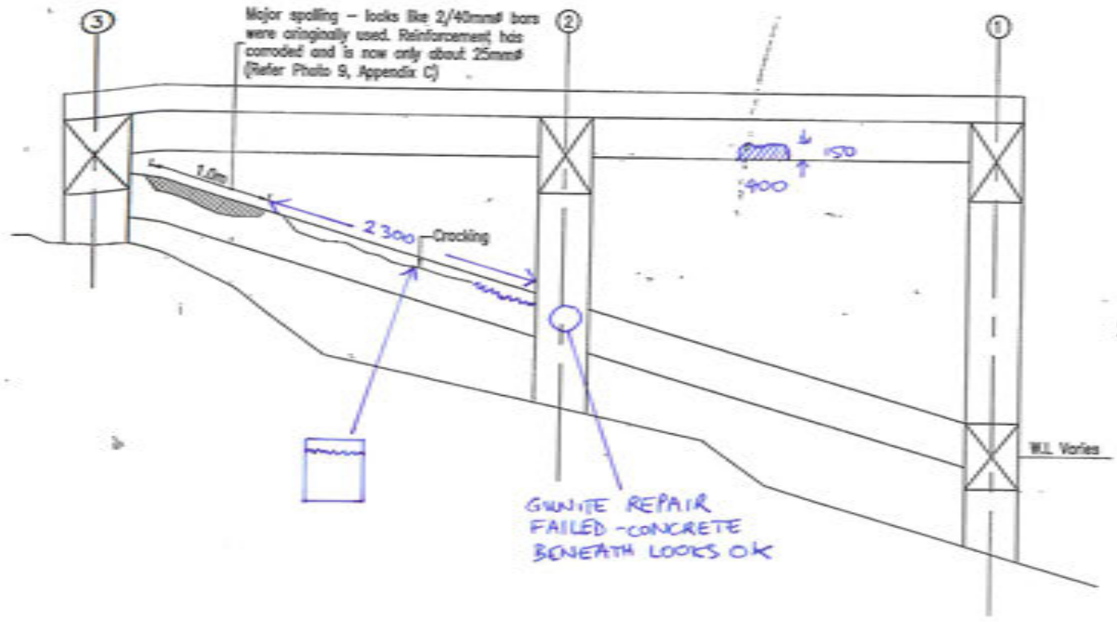


GRID ELEVATION – A1
Scale 1:25(A1)

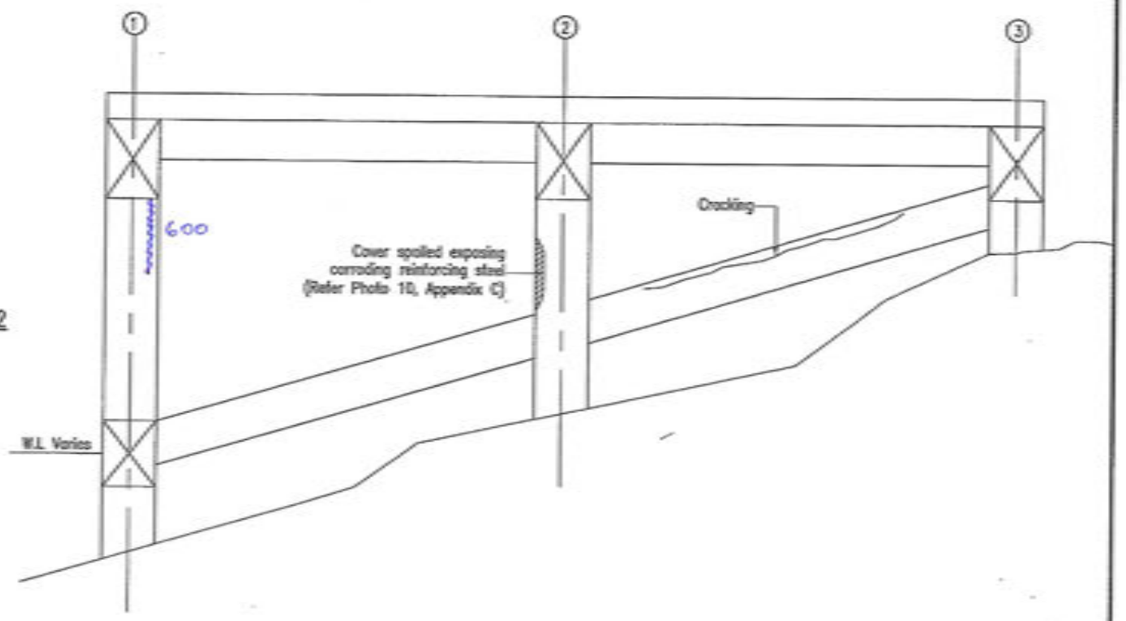


NOTES:

1. Delamination test was carried out to determine the voids in concrete.
2. The void areas are approximate



GRID ELEVATION – A2
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Muir	March 08
APPROVED			

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TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

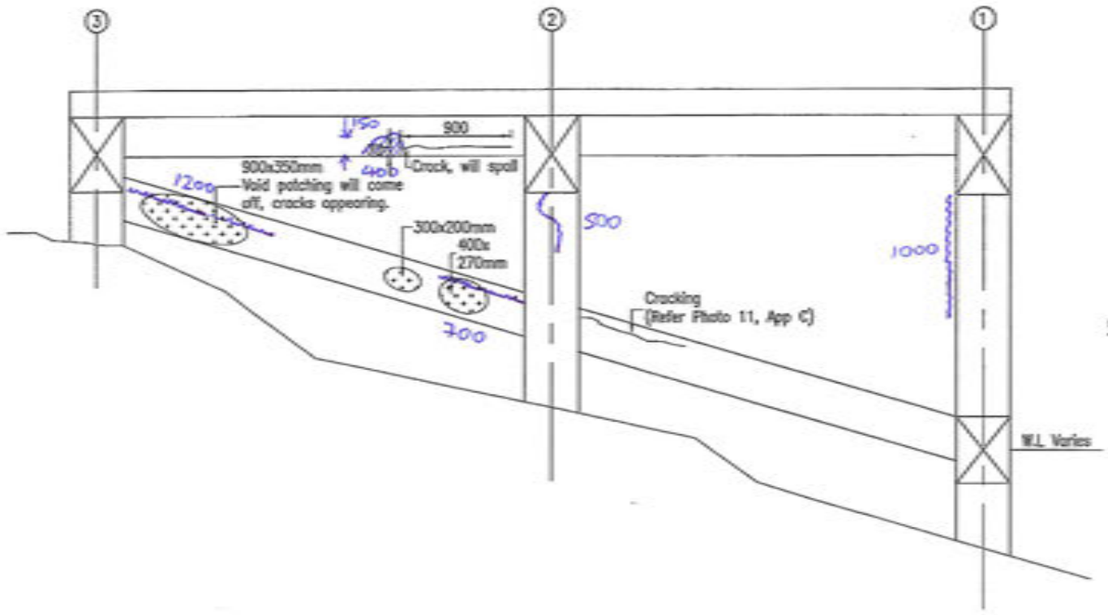
1936 SECTION
GRID ELEVATIONS A1–A2

STATUS	FILE
DRAFT	288081.04

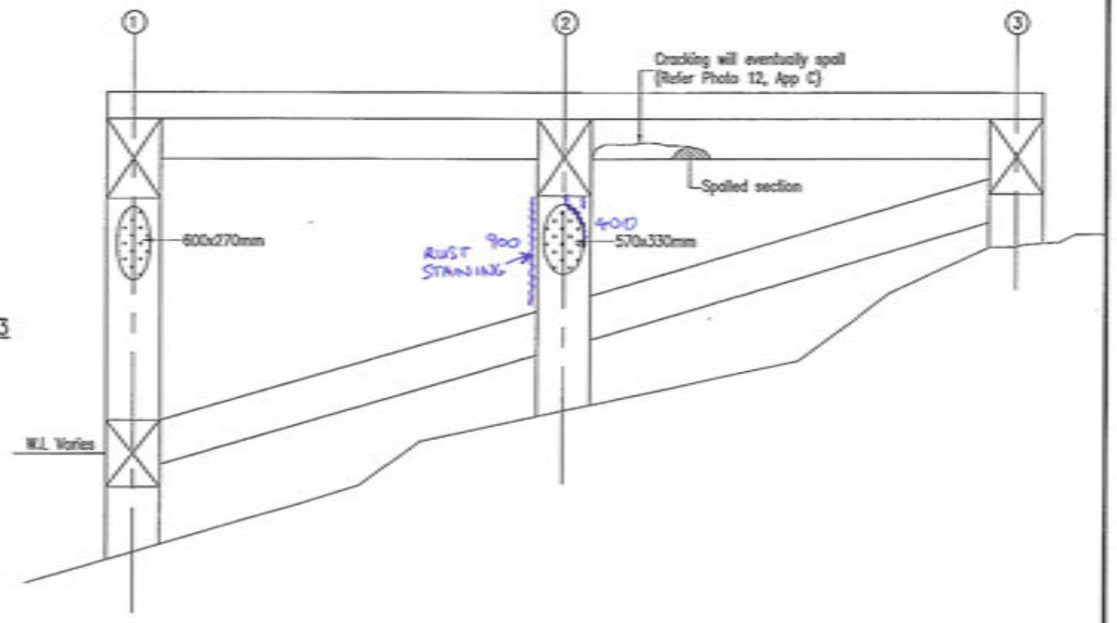
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204	1	R0

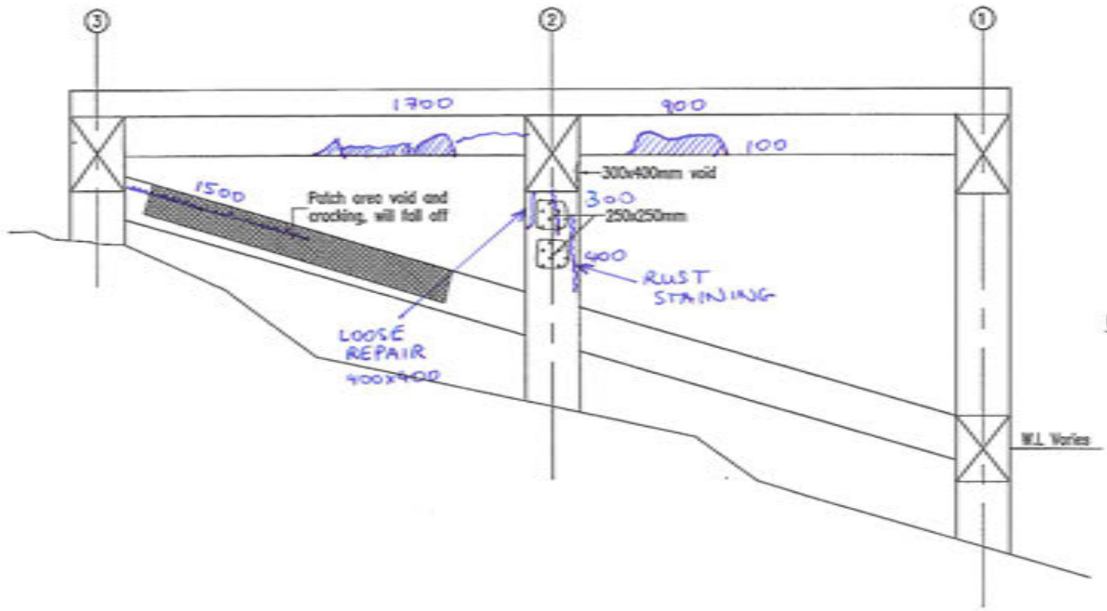
GRAPHIC SCALES: 1:25 @ A1 — 0 400 800 1200 1600 2000 2400 mm

s:\288000\88081.04_100ac whakatane wharf\gacad\2_214_177_2204_1-5.dwg – 100 ORIGINAL SHEET SIZE A1 [1682x594]

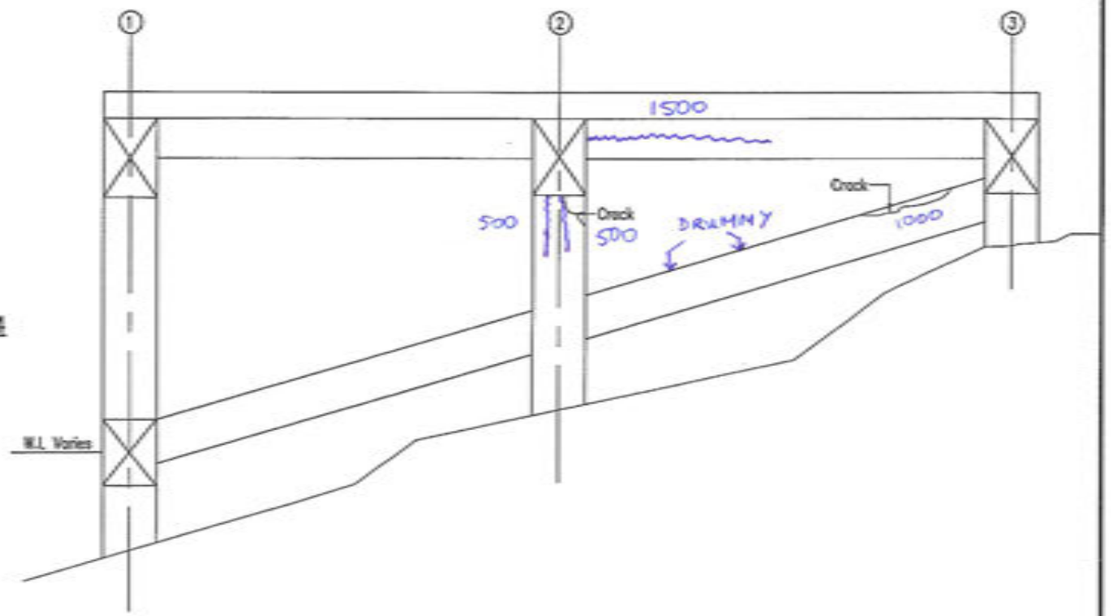


GRID ELEVATION – A3
Scale 1:25(A1)





GRID ELEVATION – A4
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Muir	March 08
APPROVED			

AMENDMENT | APP'D | DATE

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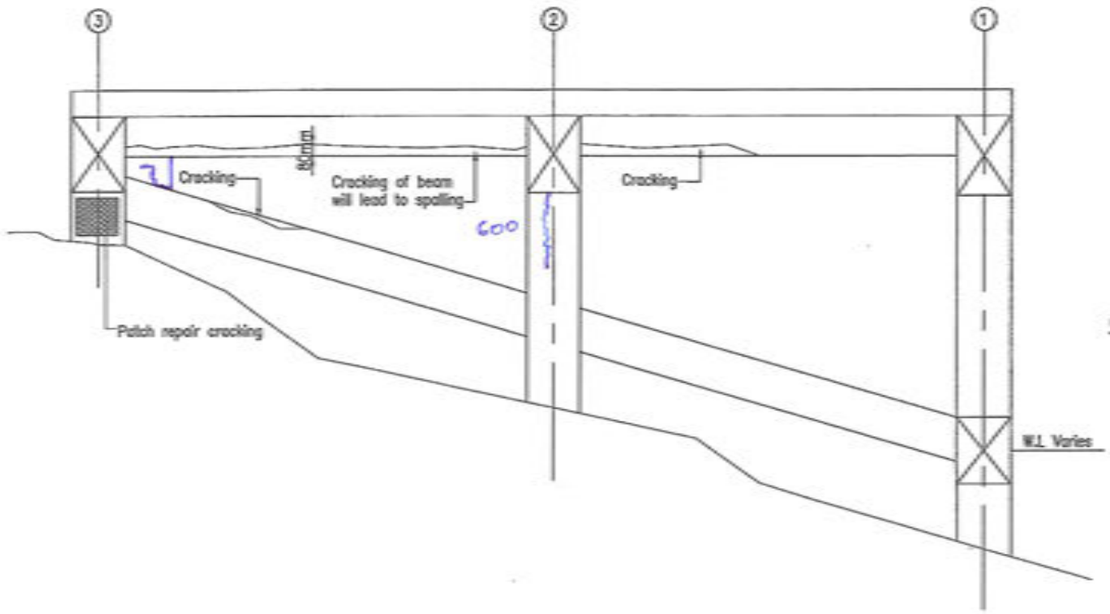
1936 SECTION
GRID ELEVATIONS A3–A4

STATUS	DRAFT	FILE	288081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204	2	R0

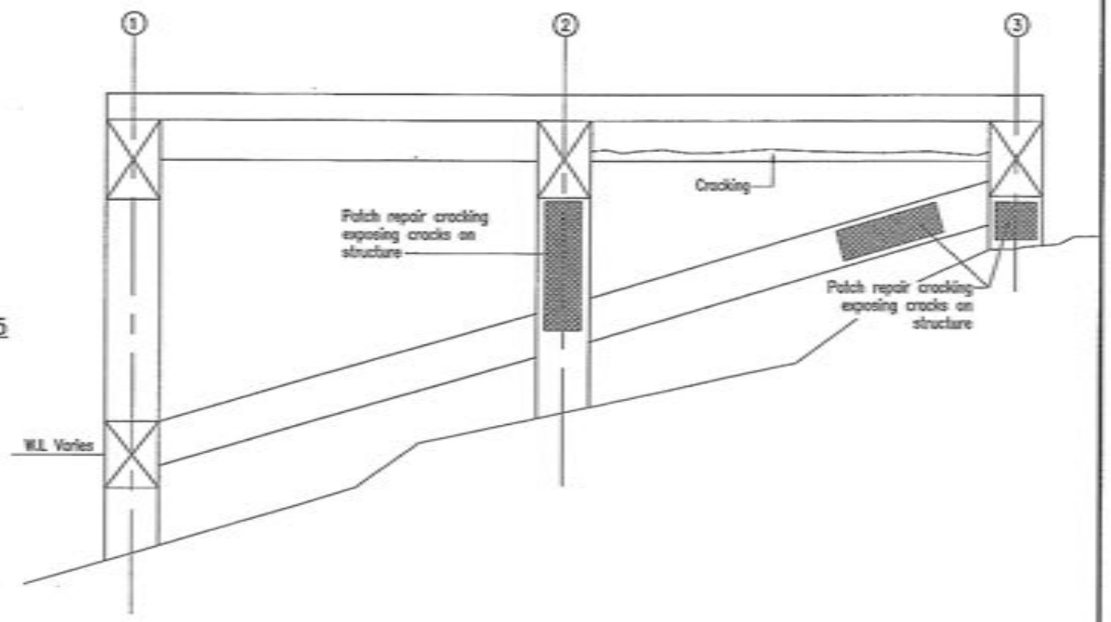
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

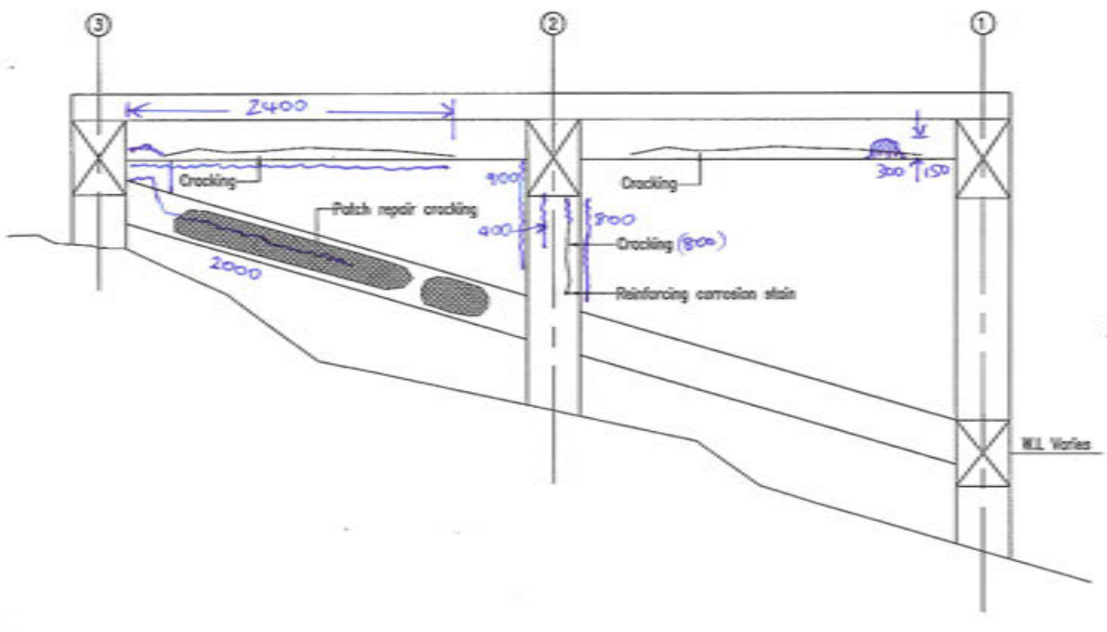
g:\288000\288081.04_100hc whakatane wharf\prod\2_214_177_2204_1-6.dwg – 288 ORIGINAL SHEET SIZE A1 [MetaSize]

20/03/2008 13:01

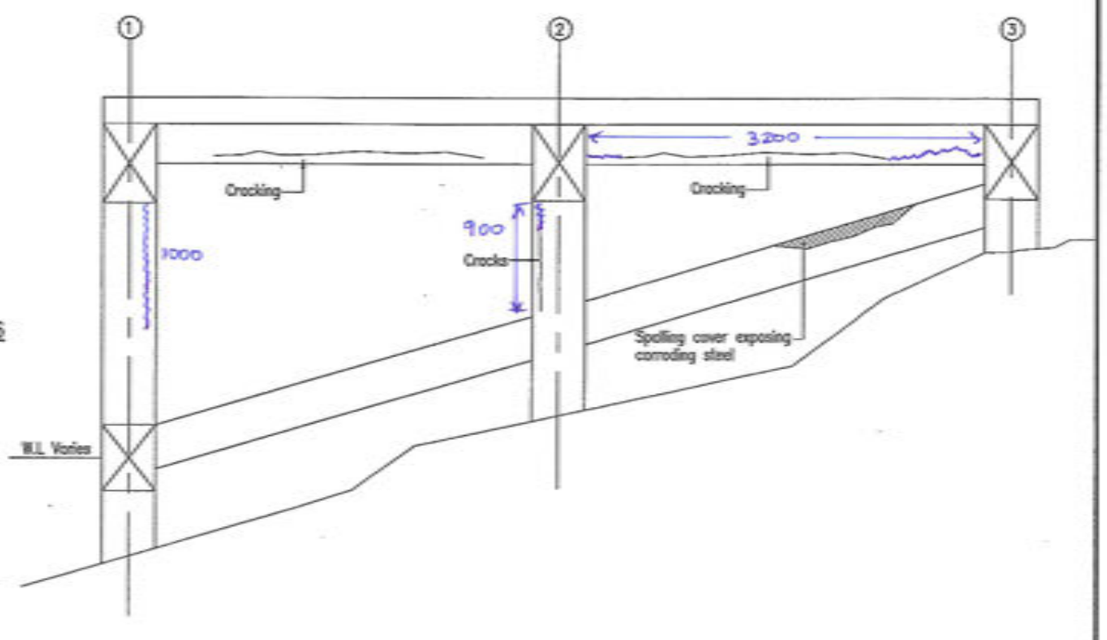


GRID ELEVATION – A5
Scale 1:25(A1)





GRID ELEVATION – A6
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Blair	March 08
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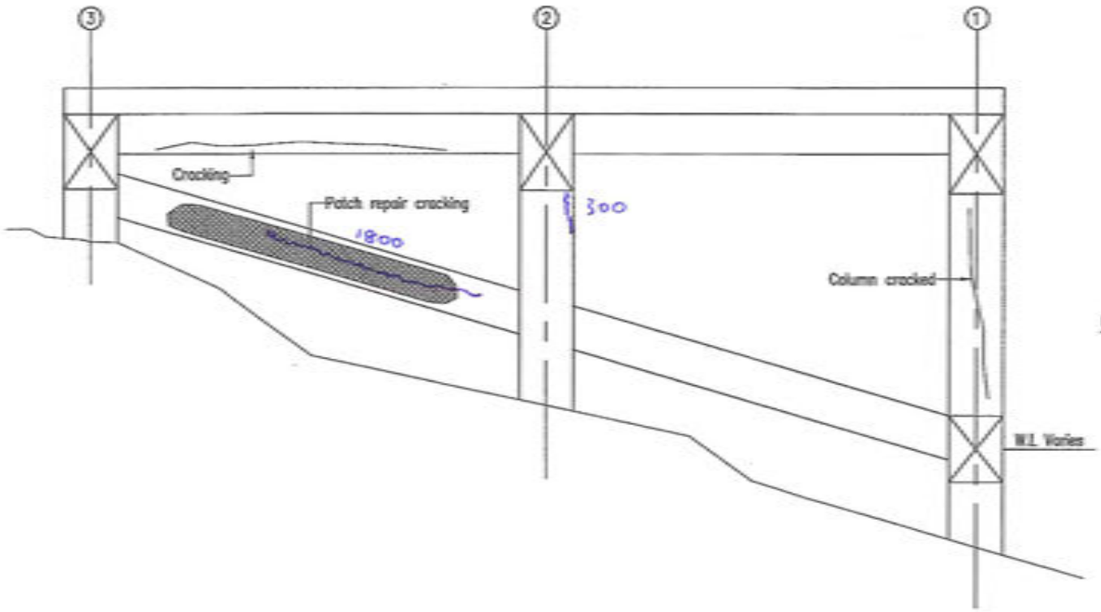
1936 SECTION
GRID ELEVATIONS A5–A6

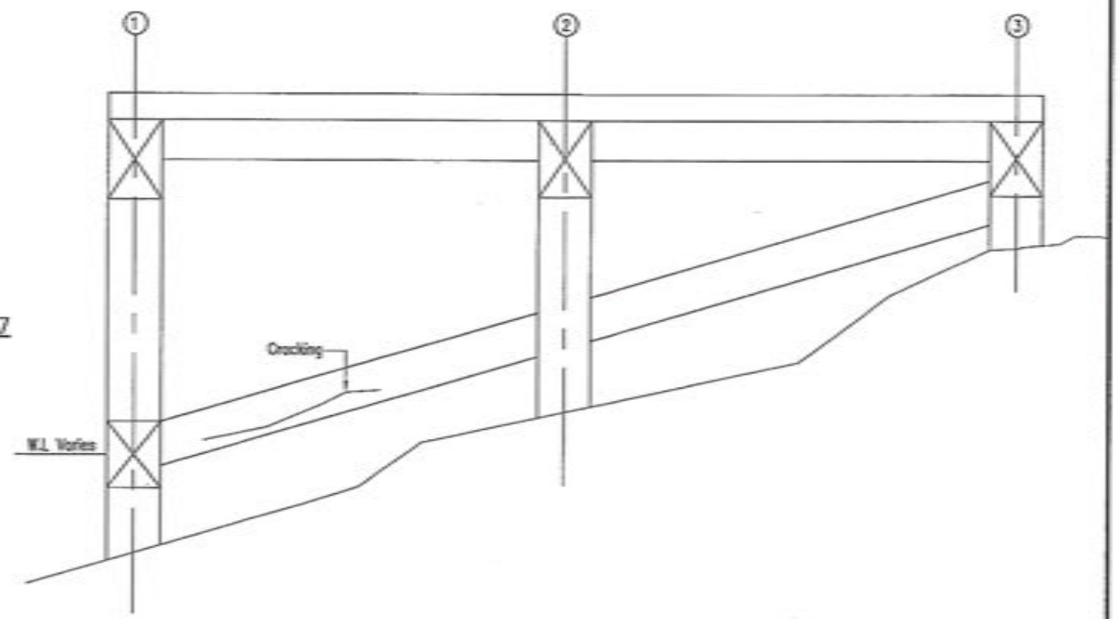
STATUS		FILE	
DRAFT		288081.04	
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE / SHEET / REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204 / 3 / R0

GRAPHIC SCALE 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

g:\288000\288081.04_100bc whakatane wharf\prod\2_214_177_2204_3-8.dwg – 3RD ORIGINAL SHEET SIZE A1 [841x594]



GRID ELEVATION – A7
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	K.Pullyn	D.Muir	March 08
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1936 SECTION
GRID ELEVATION A7

STATUS	FILE
DRAFT	288081.04

SCALE	PLOT DATE	WDC IDENTIFIER	ITEM	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204	4	R0

GRAPHIC SCALES: 1:25 @ A1 — 0 400 800 1200 1600 2000 2400 mm

20/03/2008 13:02

s:\288000\288081.04_100nc whakatane wharf\gcad\2_214_177_2204_1-4.dwg – 480 ORIGINAL SHEET SIZE A1 [841x594]

EXPOSED STEEL SEVERELY CORRODED - ALMOST TOTAL LOSS ACROSS SPAN

Bar exposed

900x500mm

Reinforcing steel

50mm cover (Refer Photo 3, App C)

1300x900mm, spalling exposed and rusted steel

800x700x50mm spalling exposed and rusted steel

Side, 450x150mm void

Underneath spalled body

Void repair, concrete coming off

Side, 250x250mm void

(Refer Photo 5, Appendix C)

Rusted body, ϕ=24mm Stirrup 16mm@=180–230crs(varies)

Bottom spalling, 40mm cover to stirrup, 50mm cover to main steel.

Side, 1400x350mm void, Has been repaired but patch is coming off.

Side, 500x500mm void

PLAN – A1 to A2
Scale 1:25(A1)

STEEL SEVERELY CORRODED

Underside of deck spalled +800x900mm, cover to steel 30–40mm range

Side, 1000x180mm patch is void, crack has appeared

Side, 1300x200mm patched void

500x220 patched void

Underside, 90mm thick coming off

Side, 700x150mm void

Side, 400x200mm void Has been patched but will come off.

Side, 200x150mm void

Side, 700x200mm void

Side, 700x500mm void

Side, 400x200mm. These are patch repair cracks appearing and sounds void.

Side 450x200mm patched void

LOOSE REPAIRS

Side, 600x120mm void

Underside, patch is coming off. Underside from A2–A3 has been patched previously, sounds void.

PLAN – A2 to A3
Scale 1:25(A1)

Sides cracked & will spall off, exposing corroding reinforcing steel.

HAS SPALLED. STEEL IN OK CONDITION.

Sides cracked & will spall off, exposing corroding reinforcing steel.

Sides cracked & will spall off, exposing corroding reinforcing steel.

Underside spalled section = 1m long

Side, 350x250mm void

Spalled section +800mm

Side, 500x200mm void

Underside, 200x100mm void

Side, 800x230mm void

PLAN – A3 to A4
Scale 1:25(A1)

Underside cracked, will spall exposing reinforcing steel.

Underside spalled (Refer Photo 6, App C)

Underside cracked

Side, 1600x500mm patched void

Side, 1000x500mm patched void

Underside–40mm thick crack, going to reinforcing, will spall

PLAN – A4 to A5
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Nair	March 08
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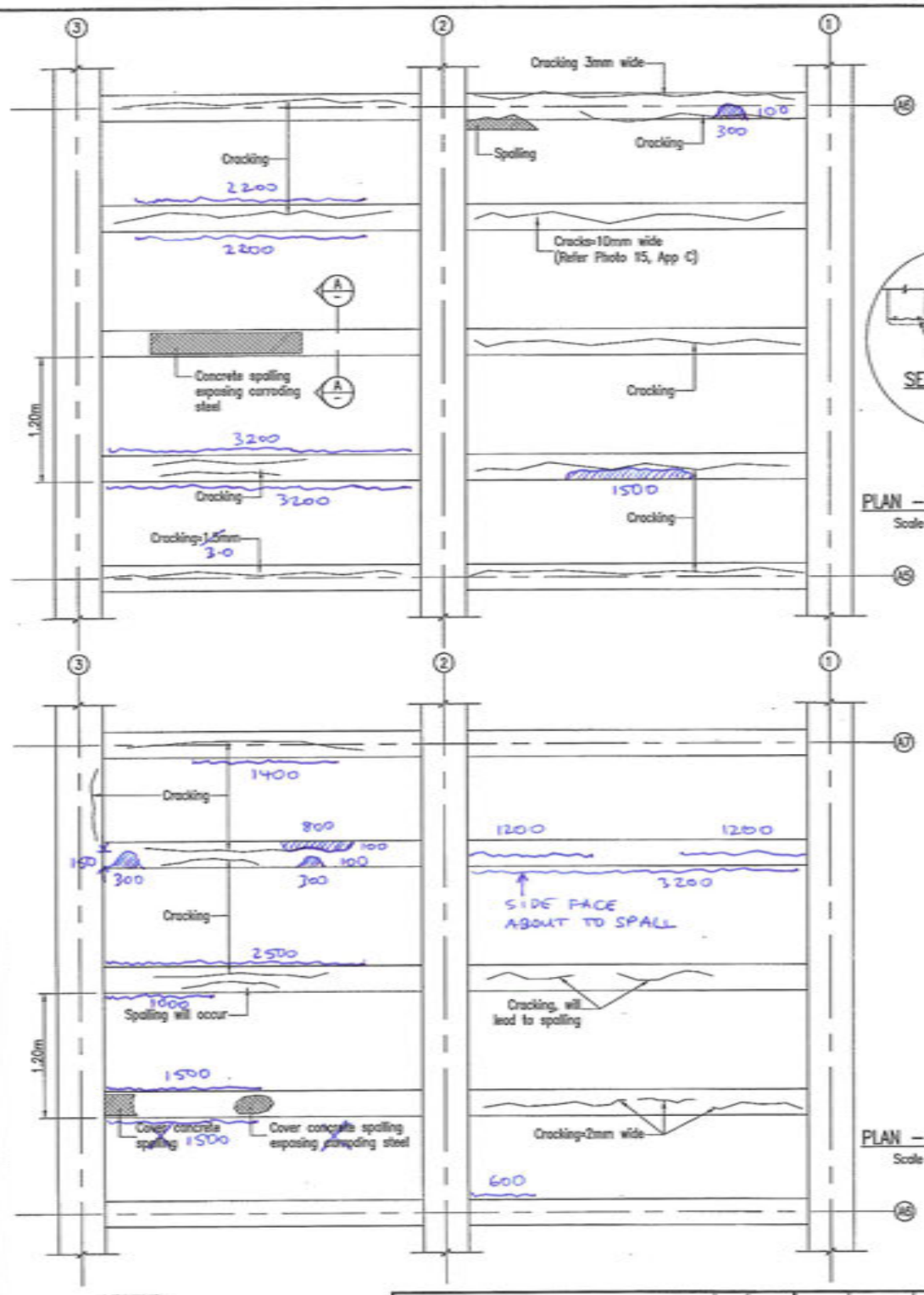
WHAKATANE

1936 SECTION
PLAN BETWEEN GRIDS A1/A2, A2/A3, A3/A4, A4/A5

STATUS	FILE
DRAFT	288081.04

SCALE	PLOT DATE	FEATURE IDENTIFIER	JOB NO.	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204	5	R0

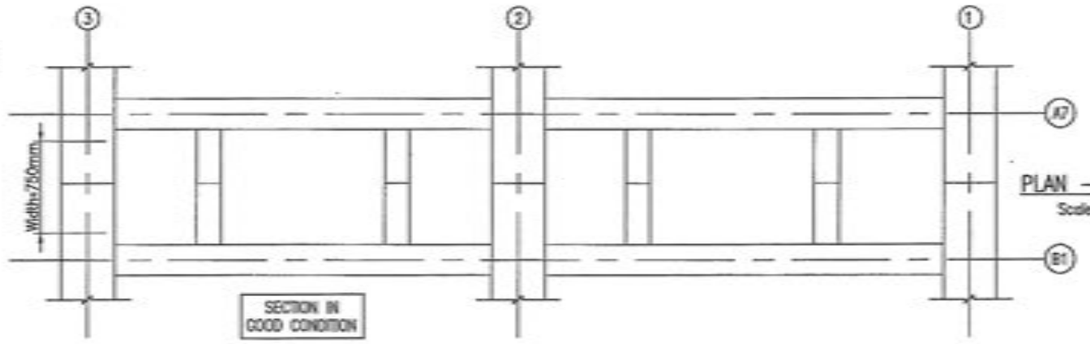
GRAPHIC SCALES 1:25 @ A0: 0 400 800 1200 1600 2000 2400 mm



60mm cover to stirrup, 80mm cover to main steel

SECTION A–A
N.T.S

PLAN – A5 to A6
Scale 1:25(A1)



PLAN – A7 to B1
Scale 1:25(A1)

PLAN – A6 to A7
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Nair	March 08
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WHAKATANE

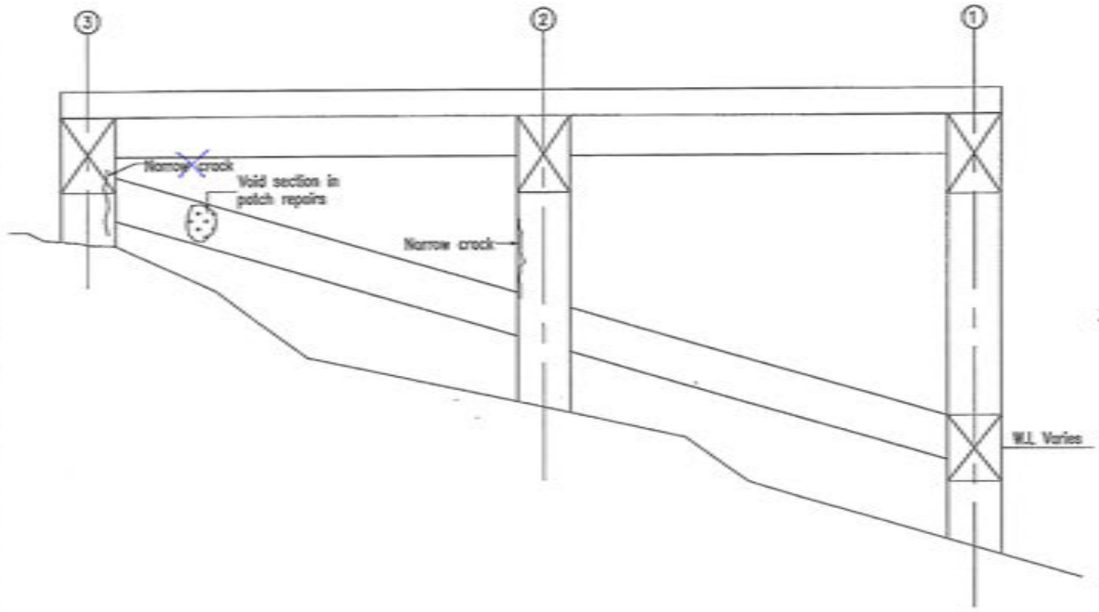
1936 SECTION
PLAN BETWEEN GRIDS A5/A6, A6/A7, A7/B1

STATUS	FILE				
DRAFT	288081.04				
SCALE	PLOT DATE	ISSUANCE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:42	2/214/177	2204	6	R0

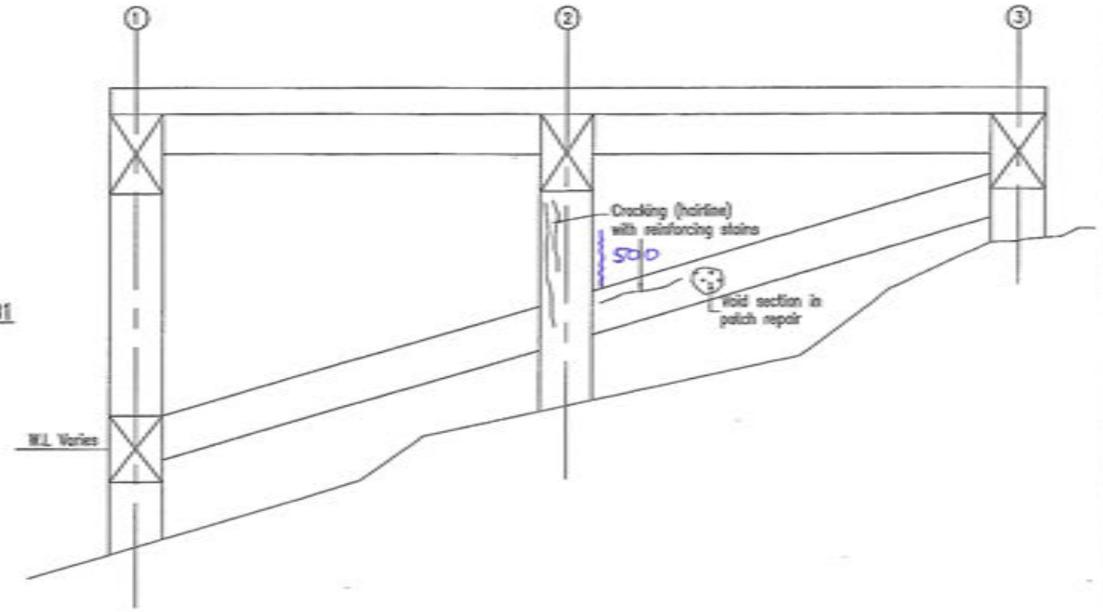
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

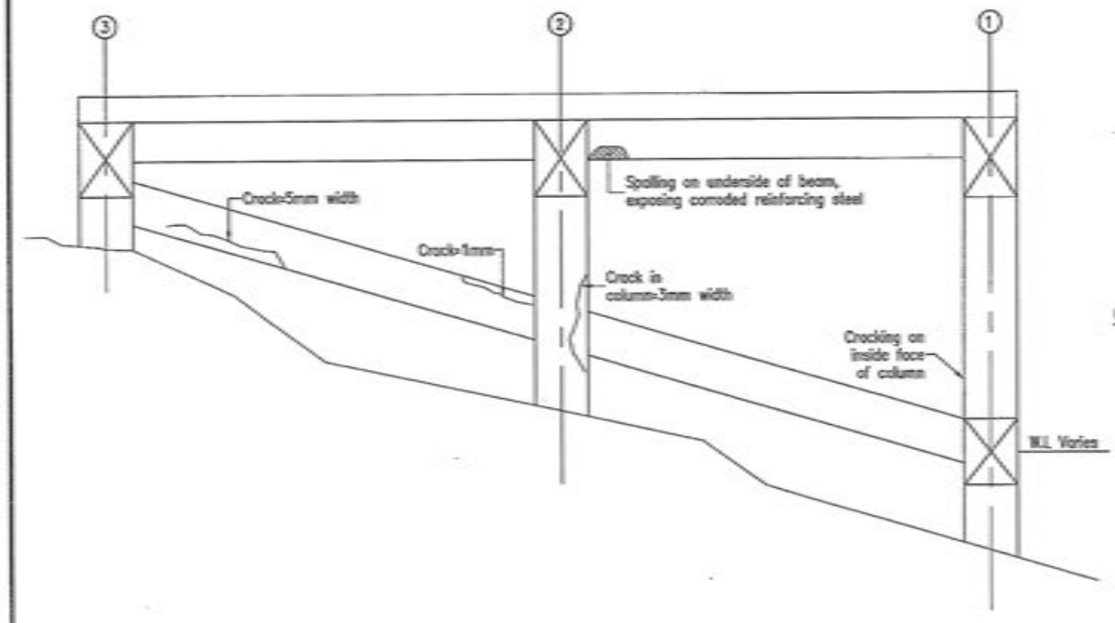
g:\288081\288081.04_100inc whakatane wharf\prod\g2_214_177_2204_1-6.dwg – 6R0 ORIGINAL SHEET SIZE: A1 [840x594]

20/03/2008 13:28

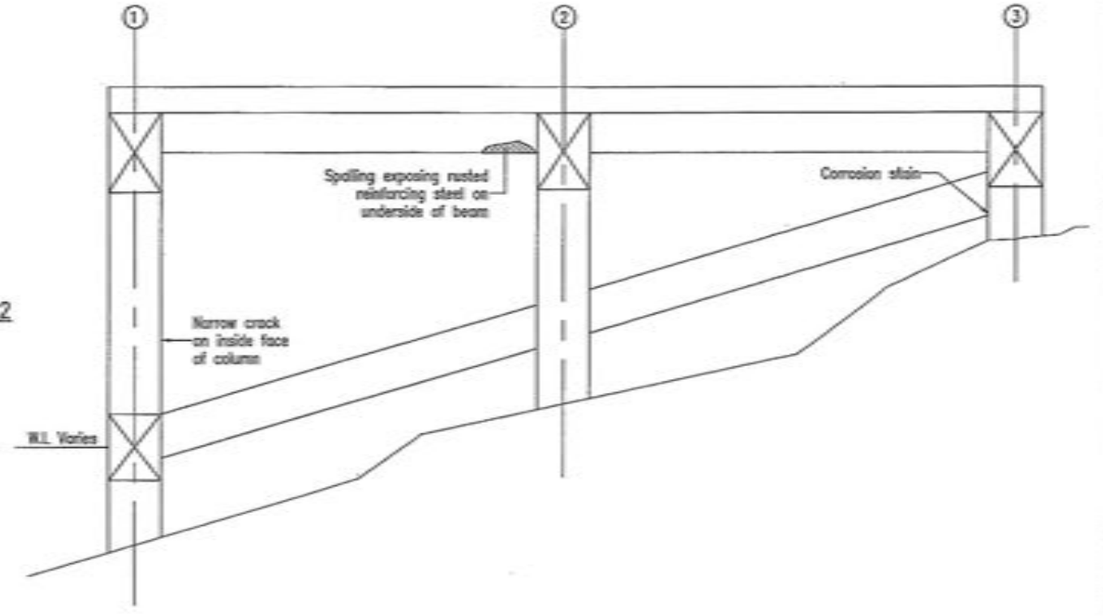


GRID ELEVATION – B1
Scale 1:25(A1)





GRID ELEVATION – B2
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	K.Pollyn	S.Muir	March 2008
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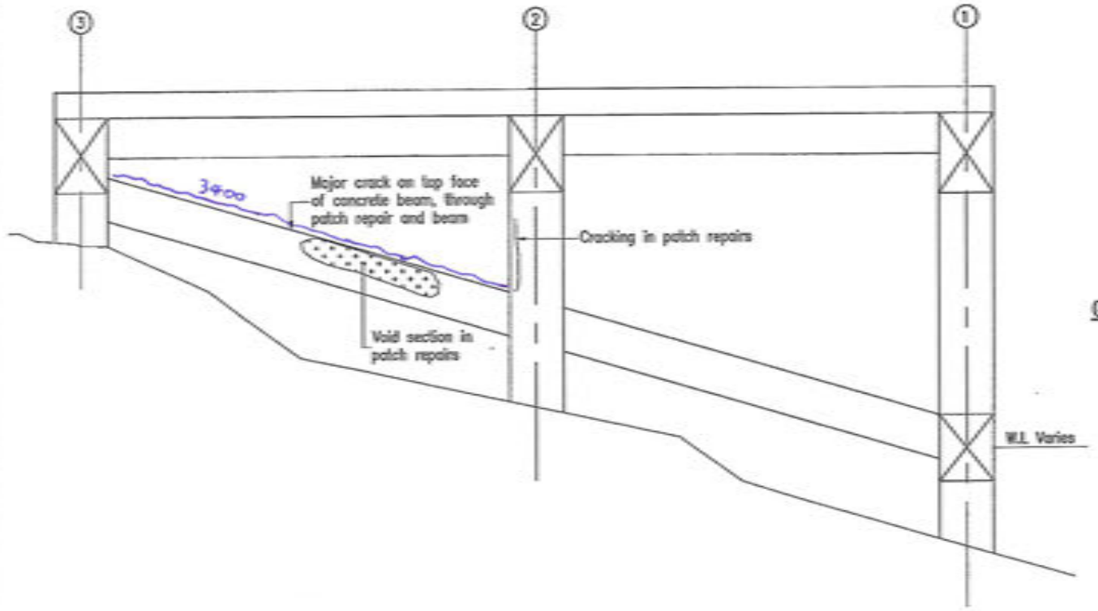
1940 SECTION
GRID ELEVATIONS B1–B2

STATUS	FILE
DRAFT	288081.04

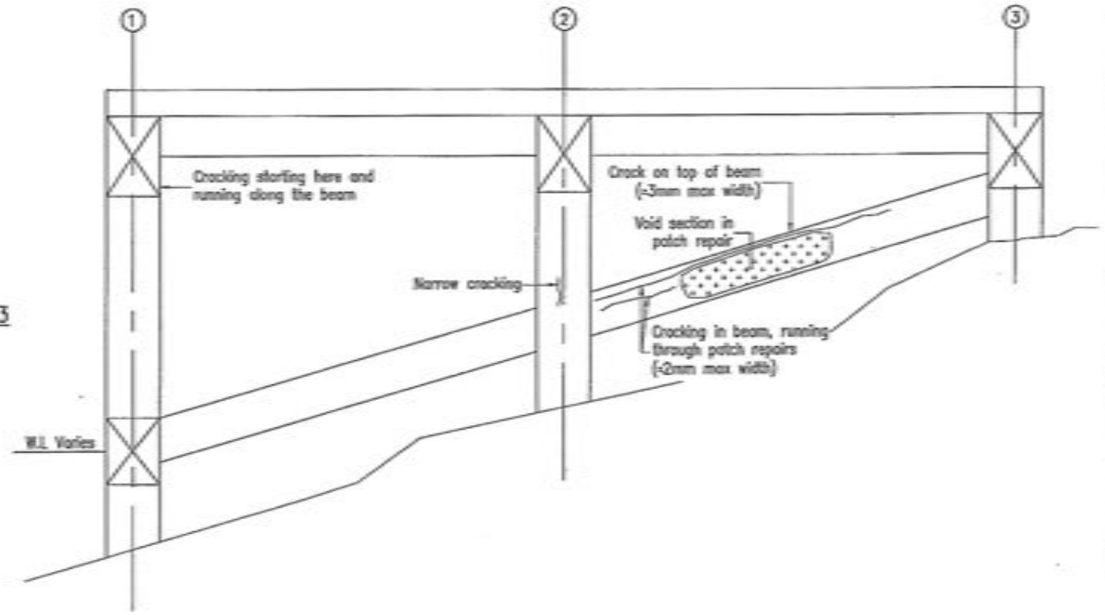
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	7	R0

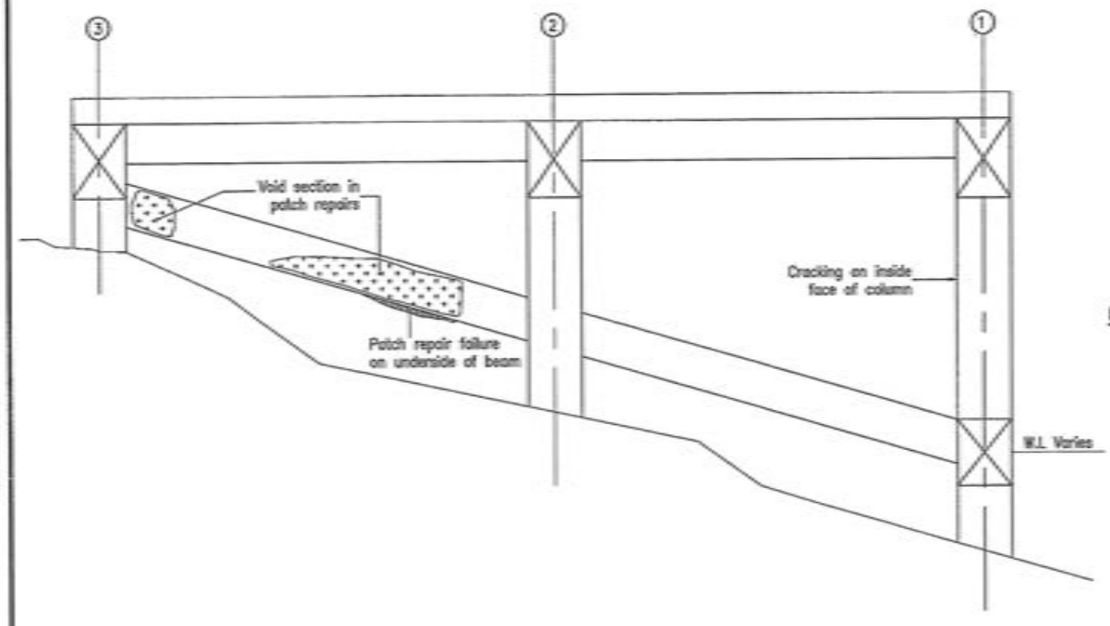
DRAWING SCALES: 1:25 @ A1 (0, 400, 800, 1200, 1600, 2000, 2400 mm)

g:\288000\288081.04_108bc whakatane wharf\acad\2_214_177_2204_7-18.dwg – 2RD ORIGINAL SHEET SIZE: A1 [841x594]

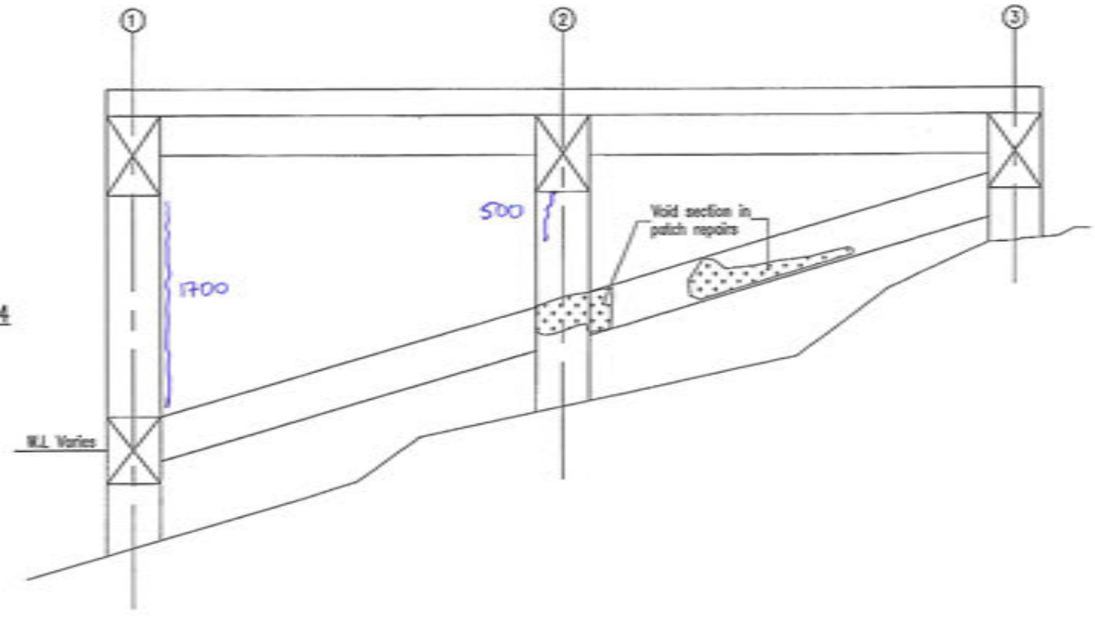


GRID ELEVATION – B3
Scale 1:25(A1)





GRID ELEVATION – B4
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Weir	March 2008
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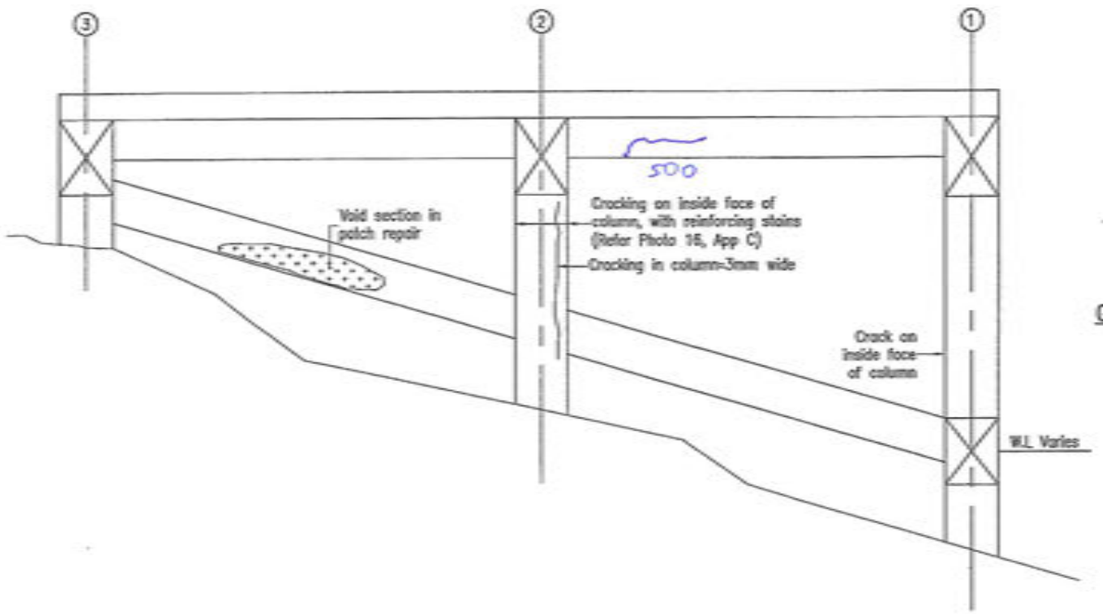
1940 SECTION
GRID ELEVATIONS B3–B4

STATUS	DRAFT	FILE	2B8081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	8	R0

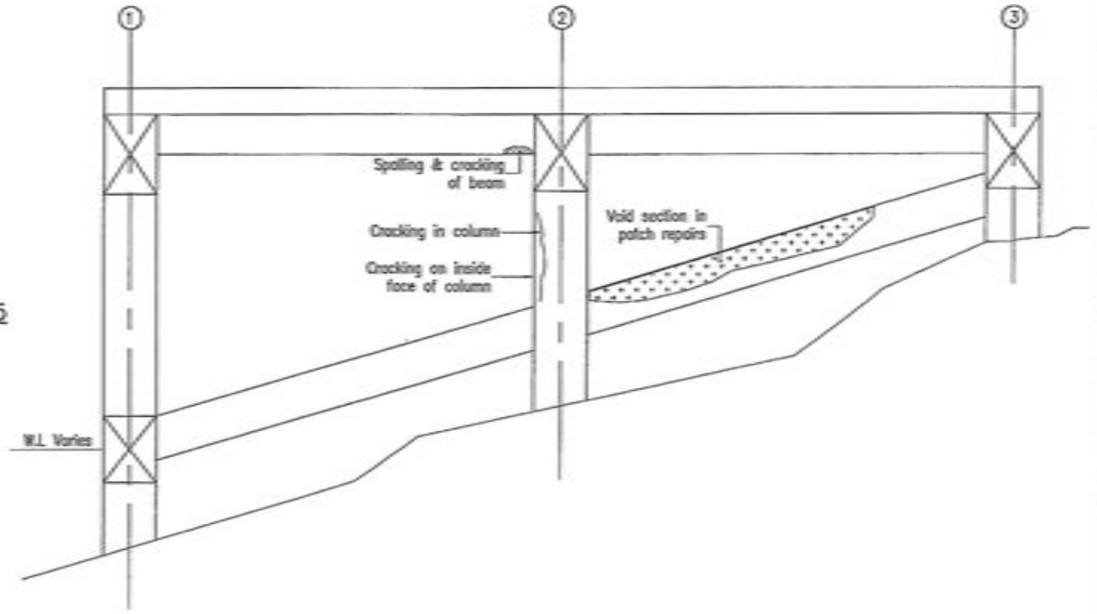
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

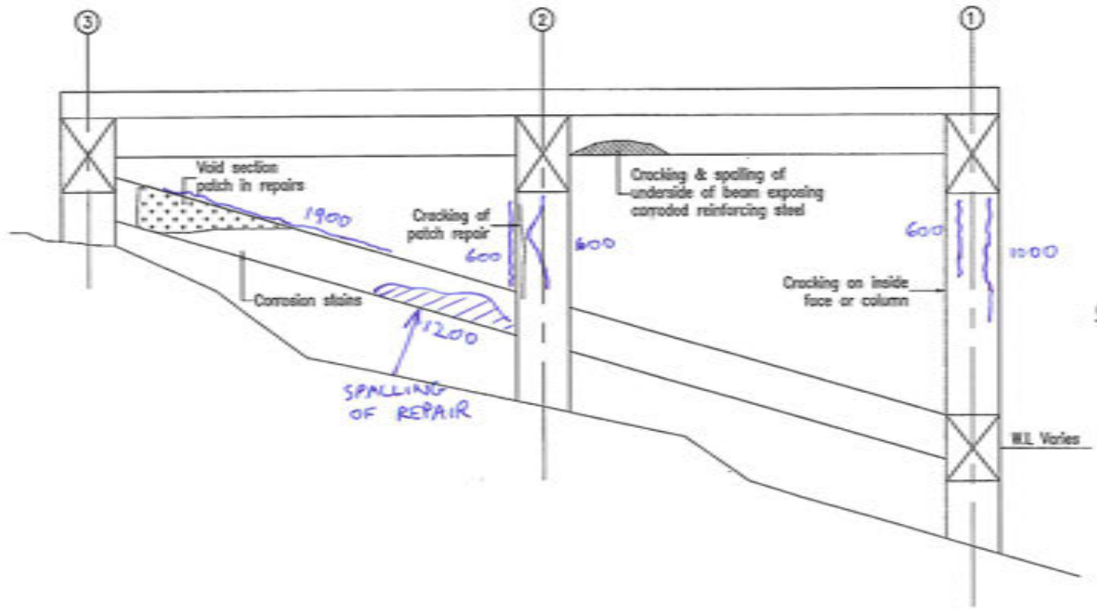
25/03/2008 8:18

g:\2b8000\2b8081.04_100inc whakatane wharf\acad\2_214_177_2204_7-18.dwg – BRD ORIGINAL SHEET SIZE A1 [841x594]

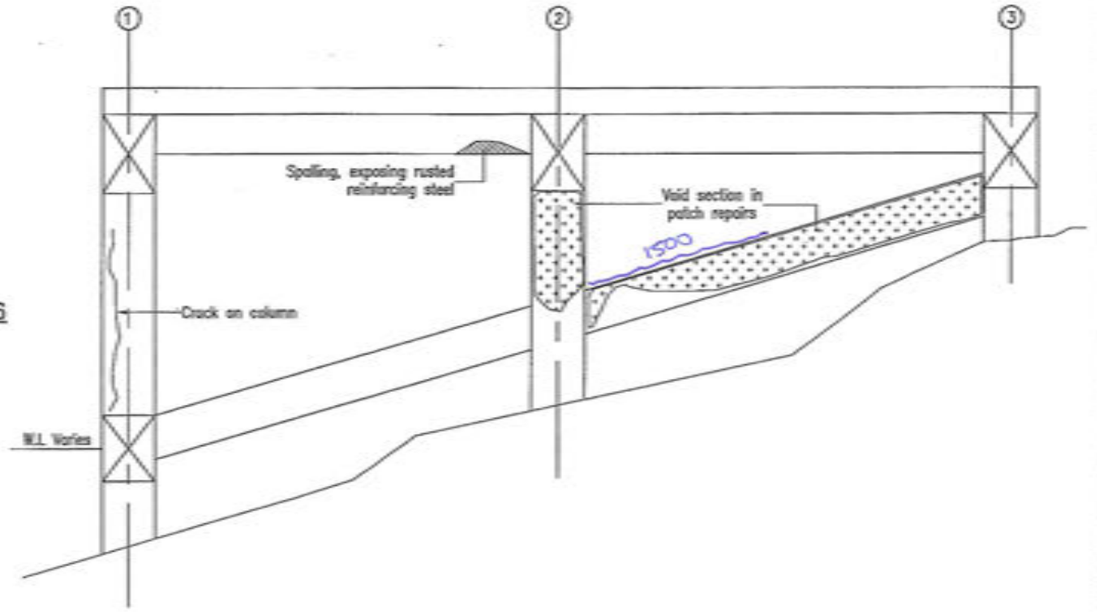


GRID ELEVATION – B5
Scale 1:25(A1)





GRID ELEVATION – B6
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pudjo	D.Muir	March 2008
APPROVED			

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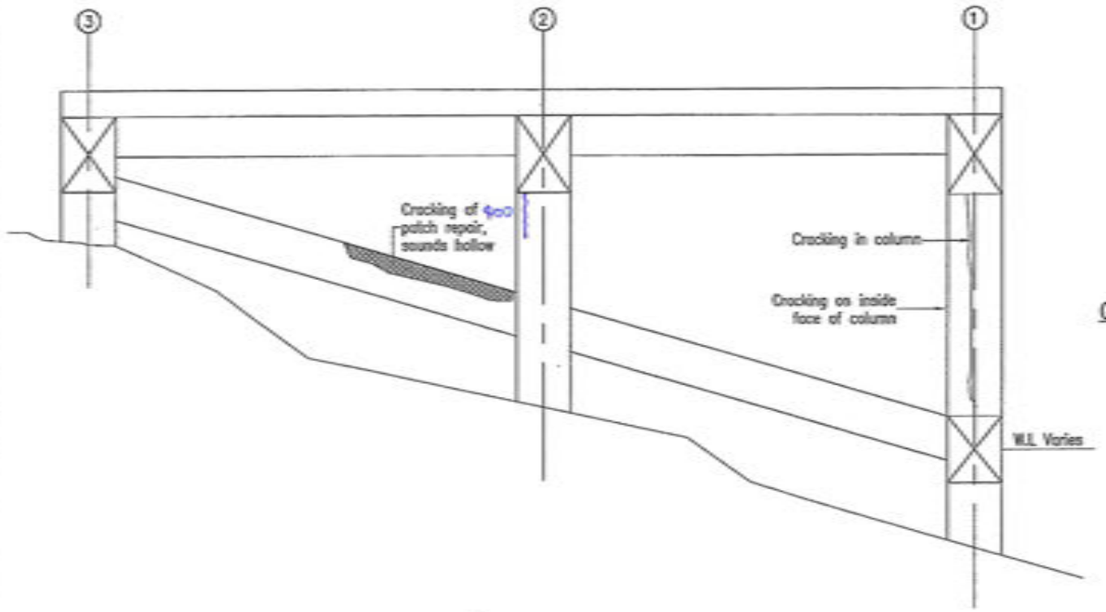
1940 SECTION
GRID ELEVATIONS B5–B6

STATUS	FILE			
DRAFT	2B8081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	9	R0

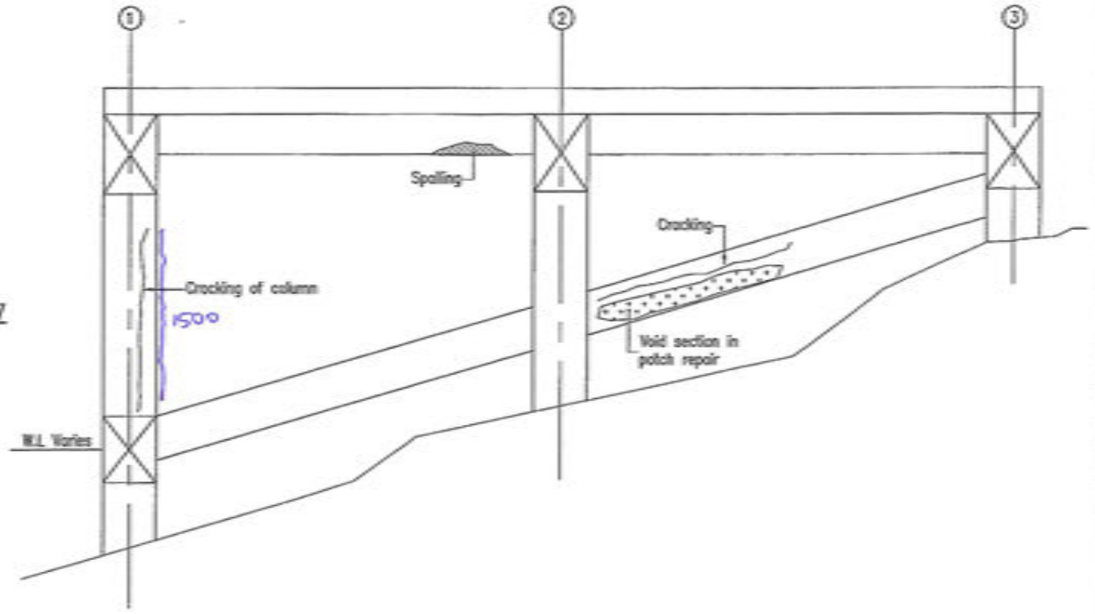
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

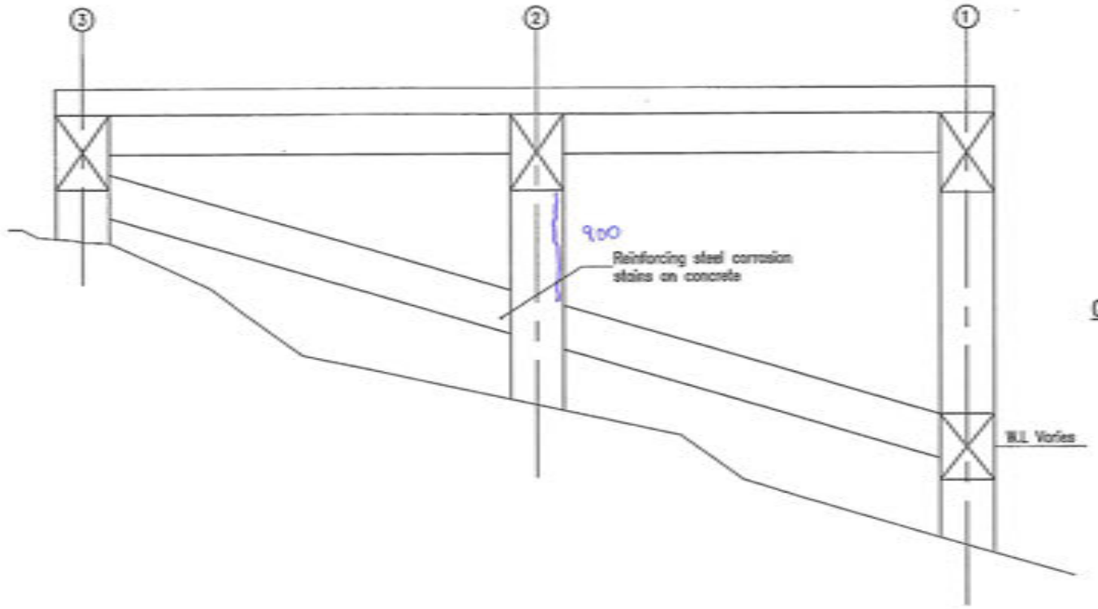
g:\2B0000\2B8081.04_100hc whakatane wharf\pcad\2_214_177_2204_3-18.dwg – WHI ORIGINAL SHEET SIZE A1 [841x594]

16/03/2008 9:18

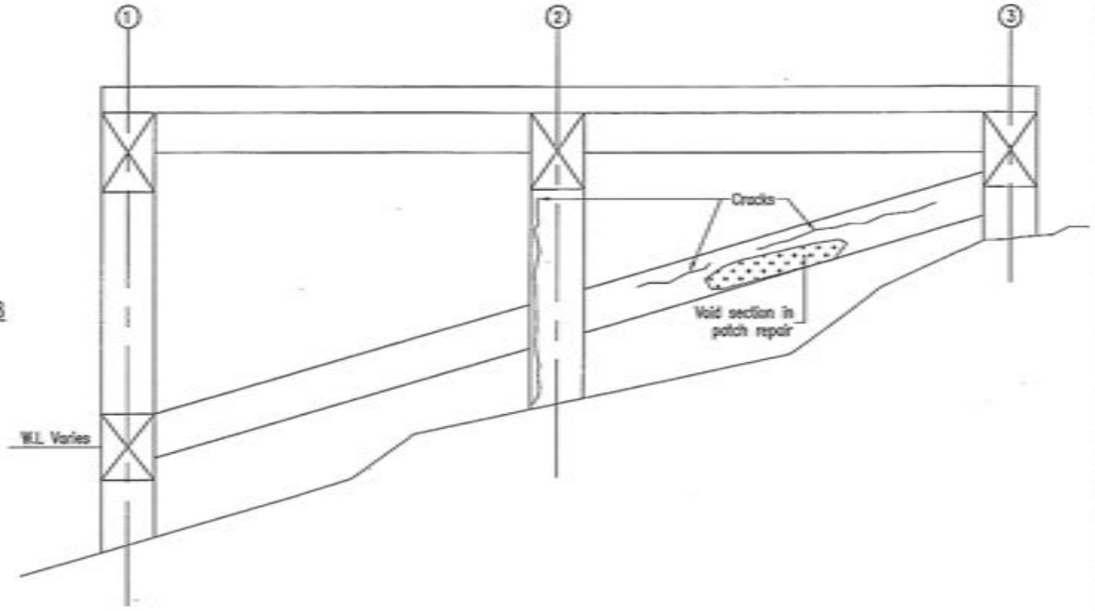


GRID ELEVATION – B7
Scale 1:25(A1)





GRID ELEVATION – B8
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Muir	March 2008
APPROVED			

WHAKATANE DISTRICT LIVING WITH THE SUN

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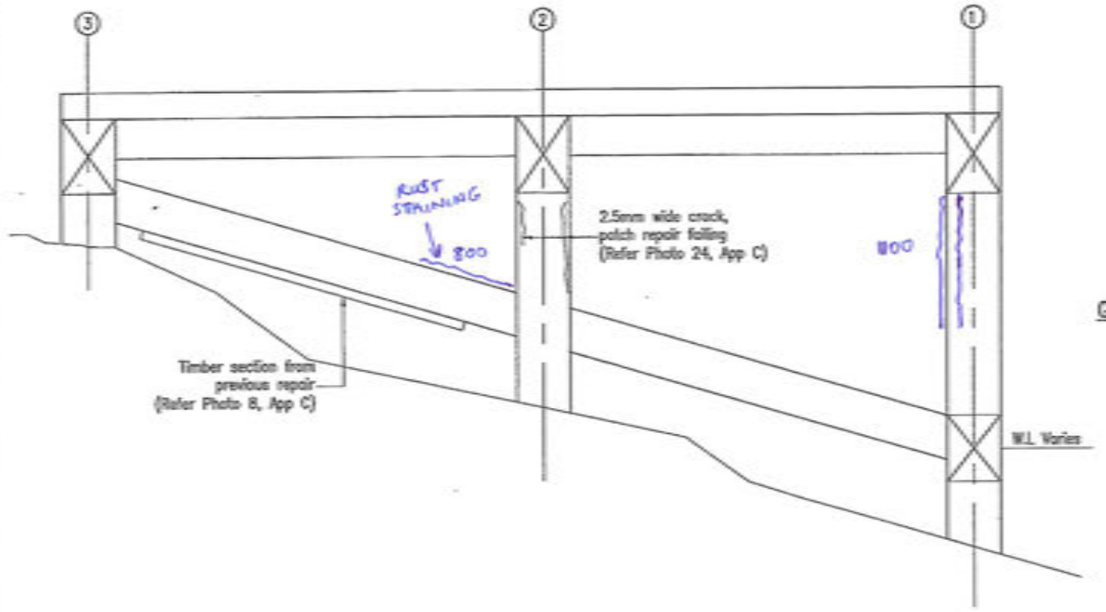
TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

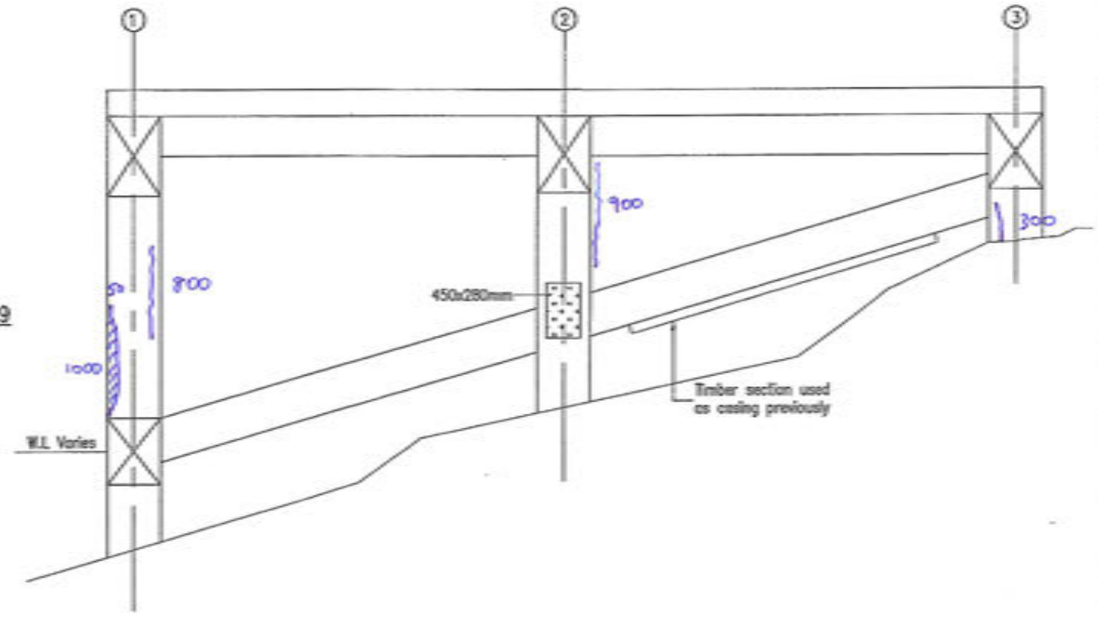
1940 SECTION
GRID ELEVATIONS B7–B8

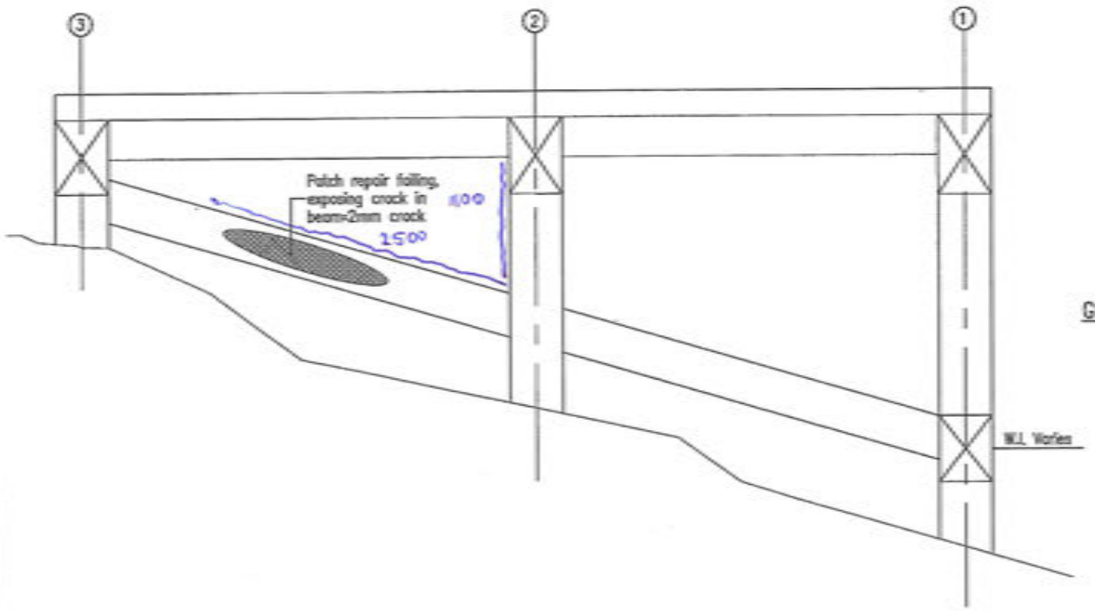
STATUS	DRAFT	FILE	2B8081.04			
SCALE	PLOT DATE	DRAWING IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	10	R0

GRAPHIC SCALES: 1:25 @ A1 — 0 400 800 1200 1600 2000 2400 mm

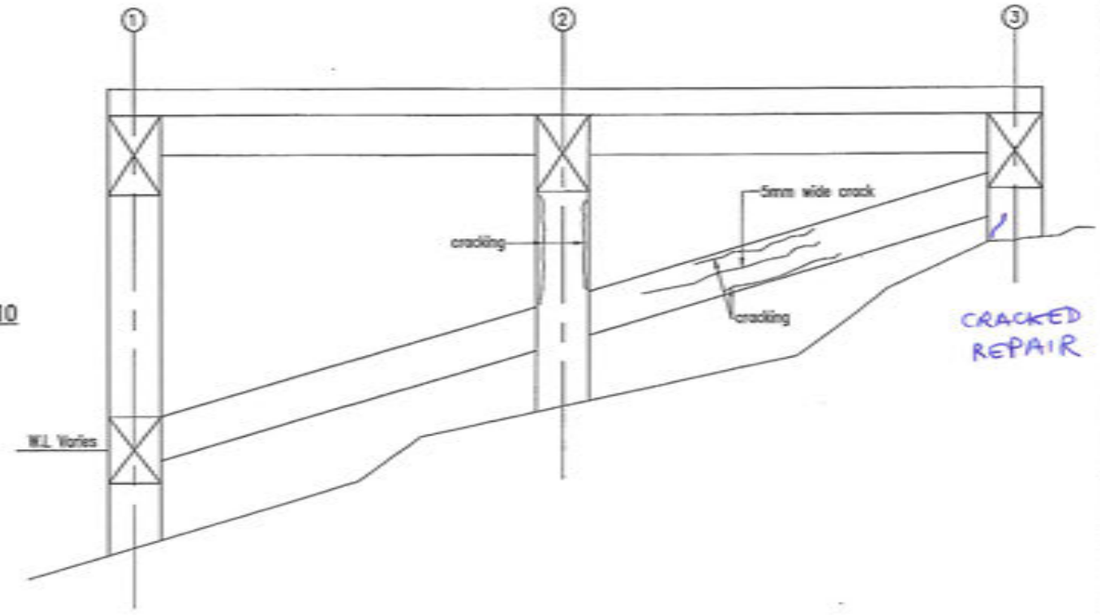


GRID ELEVATION – B9
Scale 1:25(A1)





GRID ELEVATION – B10
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	M.Pullyn	D.Blair	March 2008
APPROVED			

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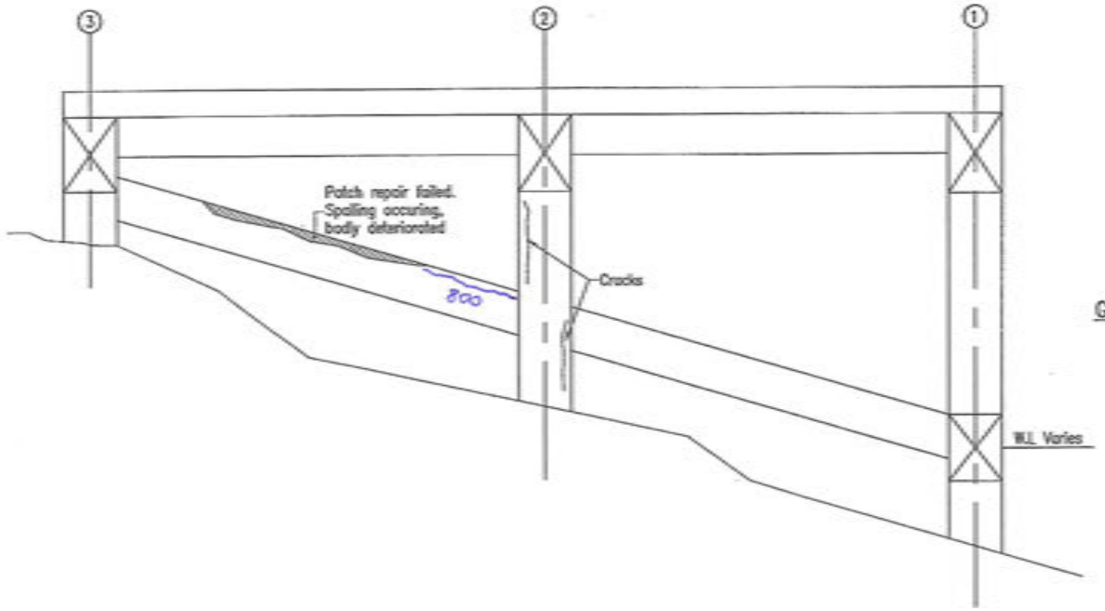
WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

1940 SECTION
GRID ELEVATIONS B9–B10

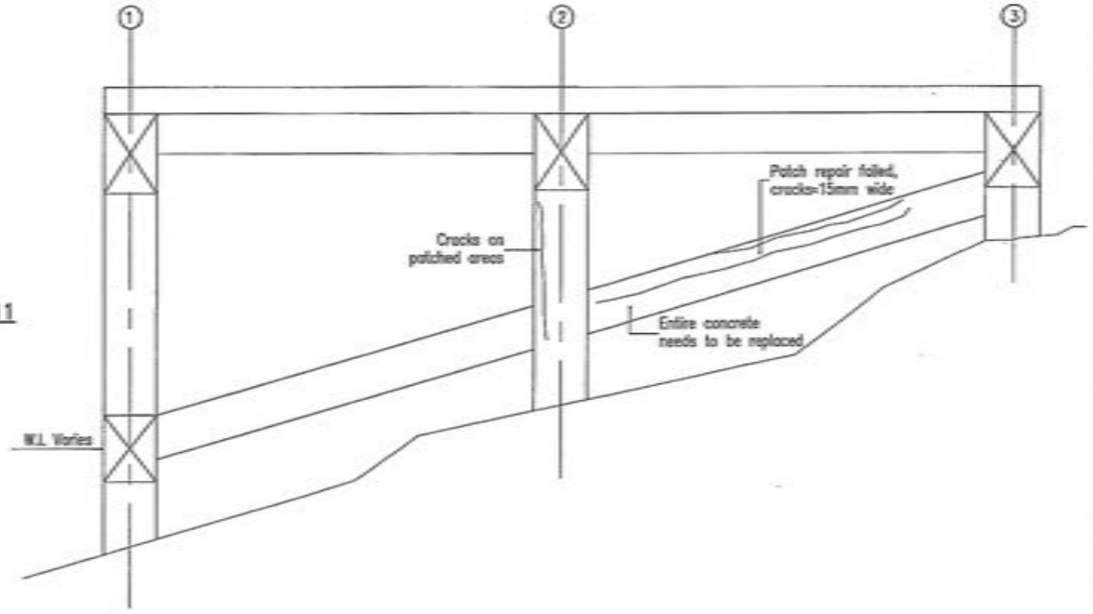
STATUS	DRAFT		FILE	2B8081.04		
SCALE	PLOT DATE		FIGURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44		2/214/177	2204	11	R0

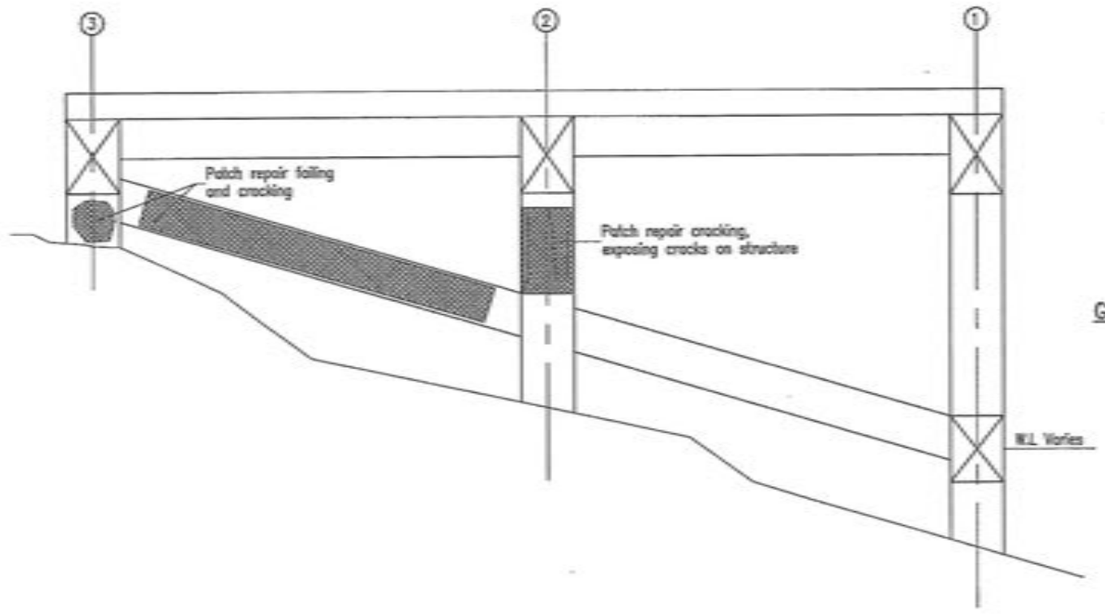
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

p:\2B8081\2B8081.04_100\cc whakatane wharf\pcad\2_214_177_2204_3-18.dwg – 1:25 ORIGINAL SHEET SIZE A1 (594x841)

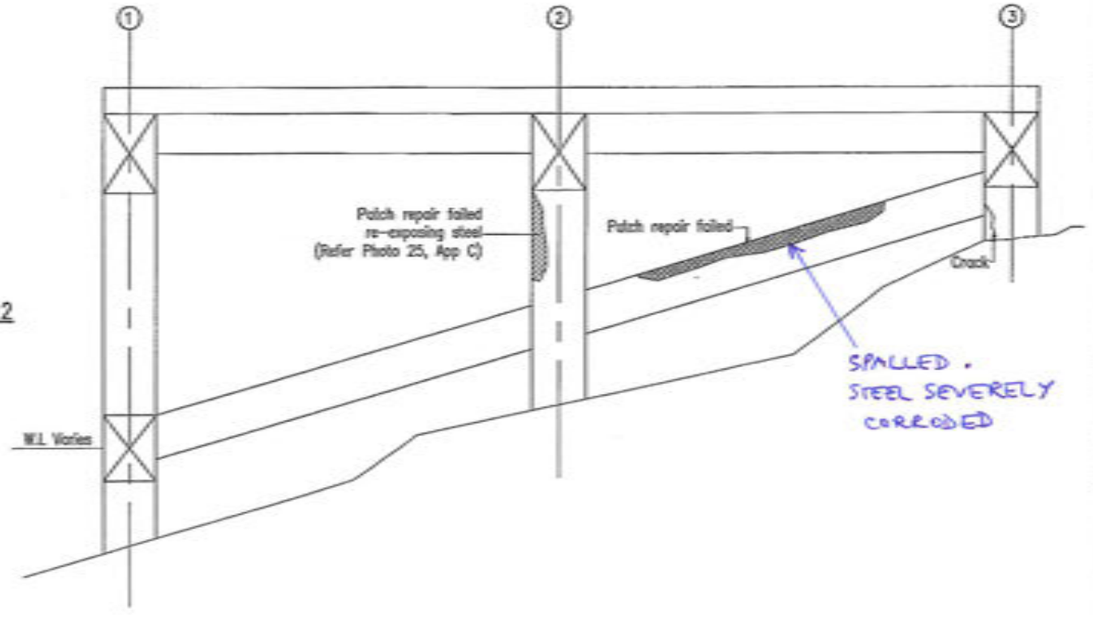


GRID ELEVATION – B11
Scale 1:25(A1)





GRID ELEVATION – B12
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	K.Pullyn	S.Muir	March 2008
APPROVED			

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WHAKATANE

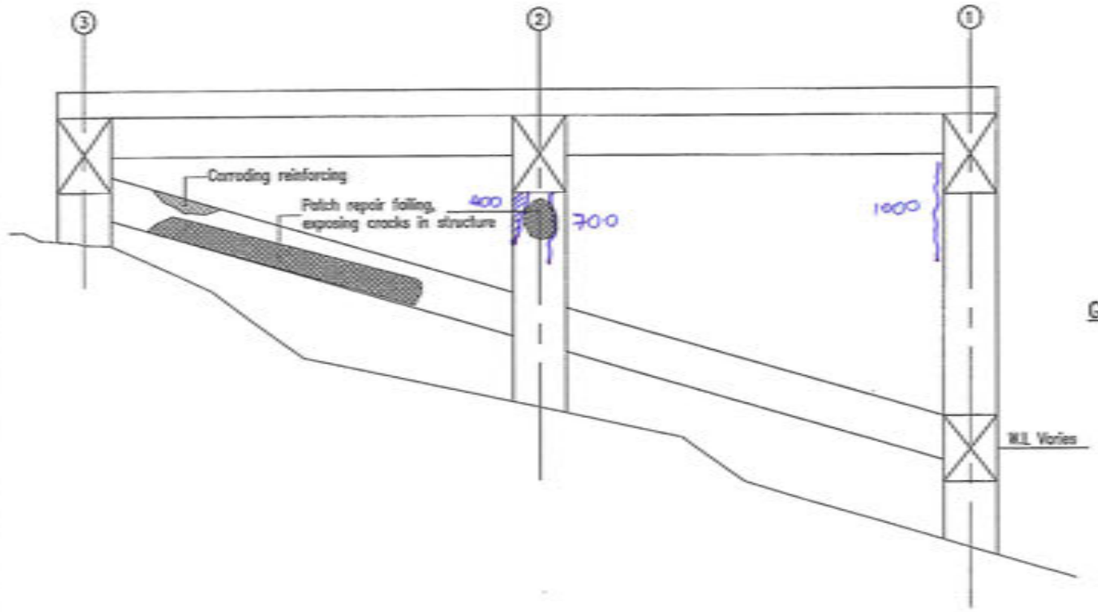
1940 SECTION
GRID ELEVATIONS B11–B12

STATUS	FILE				
DRAFT	298081.04				
SCALE	PLOT DATE	TENDERING IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	12	R0

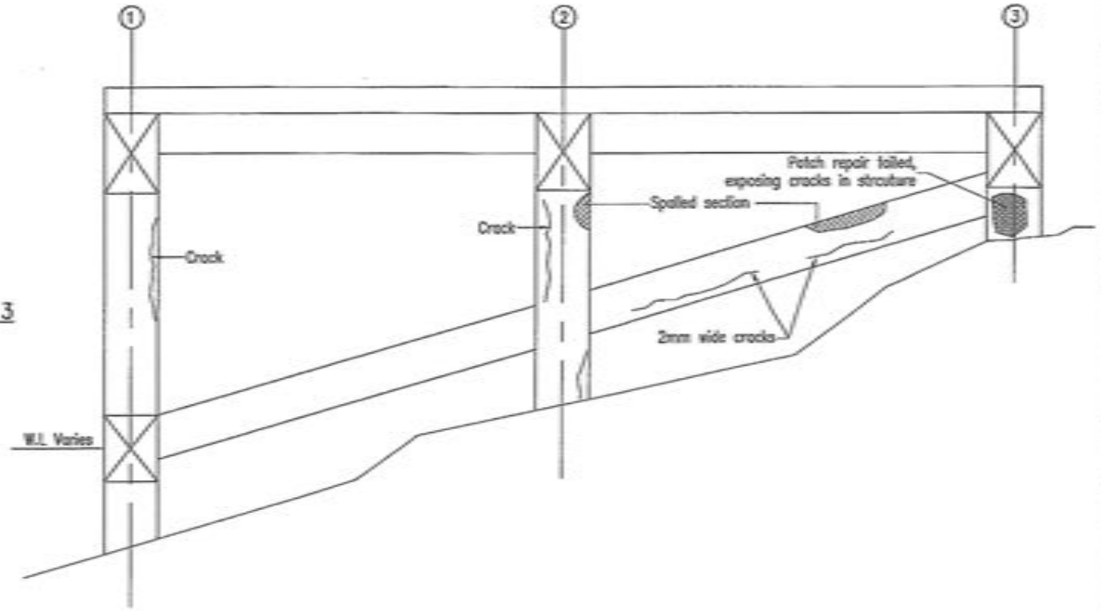
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

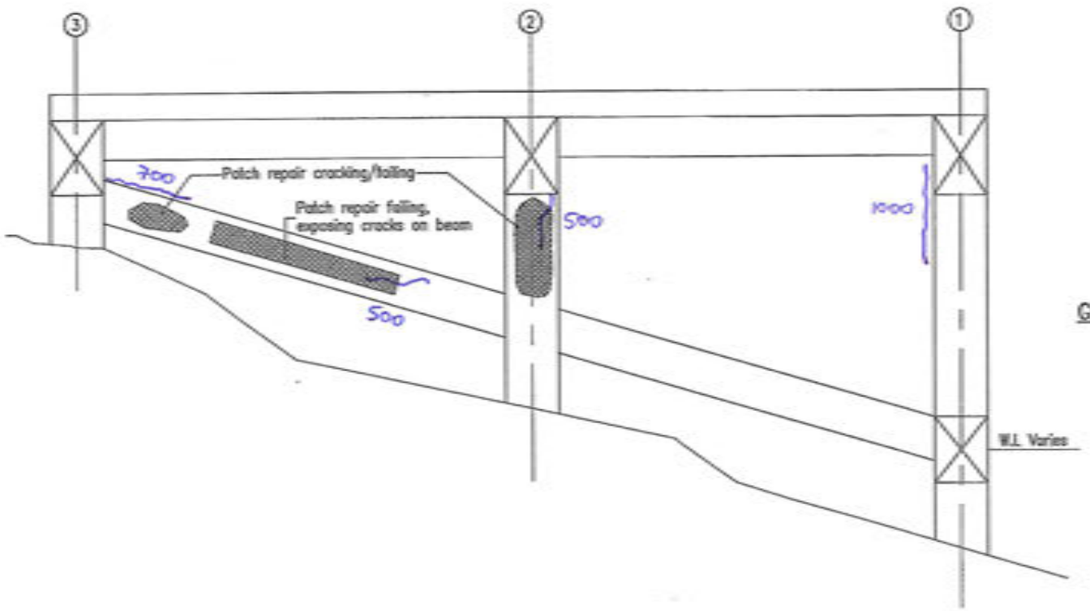
g:\298000\298081.04_100hc wholestone wharf\acad\2_214_177_2204_1-18.dwg – 1280 ORIGINAL SHEET SIZE AT [SHEETSIZE]

15/03/2008 8:18

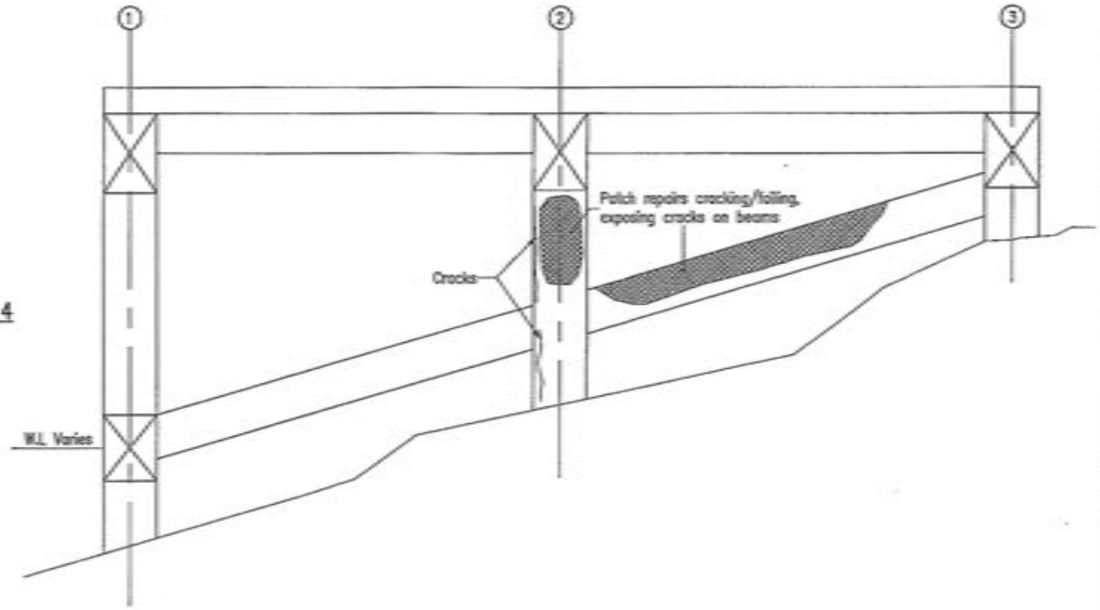


GRID ELEVATION – B13
Scale 1:25(A1)





GRID ELEVATION – B14
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Muir	March 2008
APPROVED			

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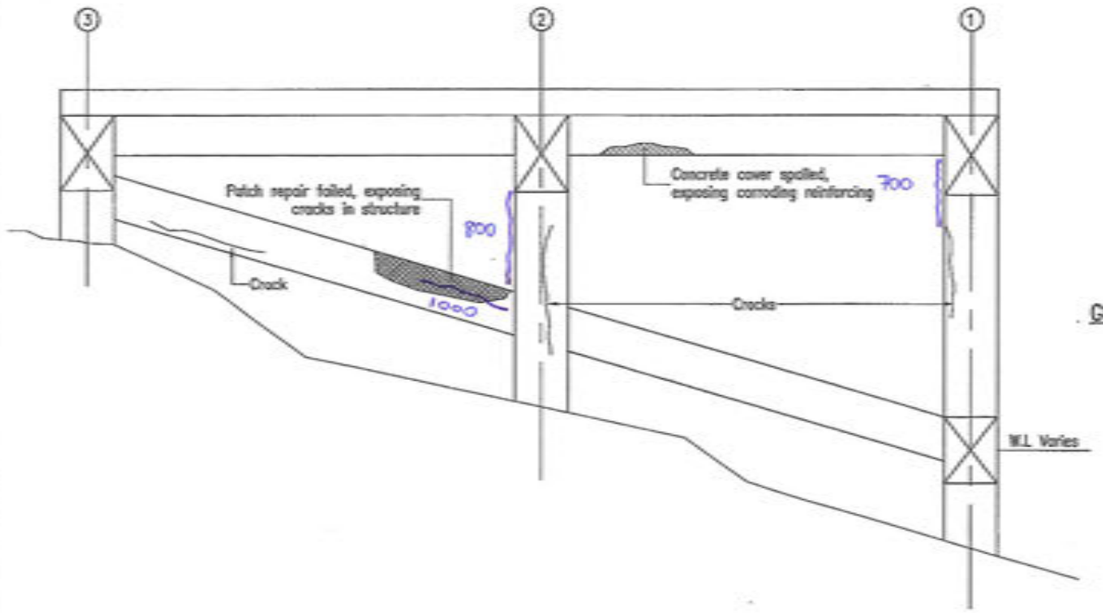
1940 SECTION
GRID ELEVATIONS B13–B14

STATUS	FILE				
DRAFT	288081.04				
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	13	R0

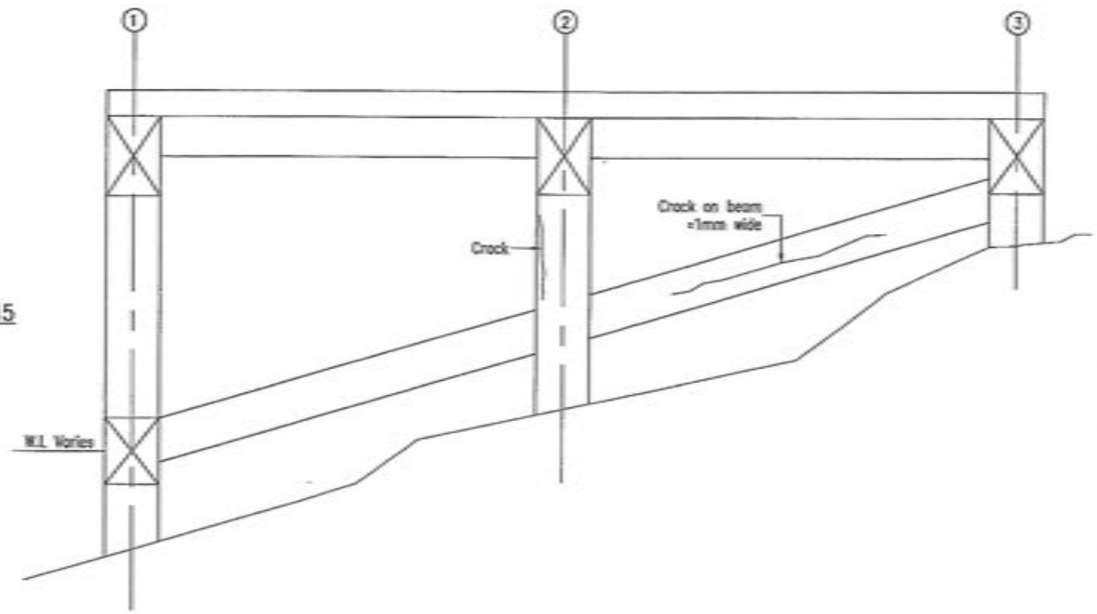
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

25/03/2008 9:19

g:\288000\288081.04_100bc whakatane wharf\pcad\2_214_177_2204_13-18.dwg – 1:25 ORIGINAL SHEET SIZE A1 [841x594]



GRID ELEVATION – B15
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Weir	March 2008
APPROVED			

AMENDMENT	APP'D	DATE

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WHAKATANE

1940 SECTION
GRID ELEVATION B15

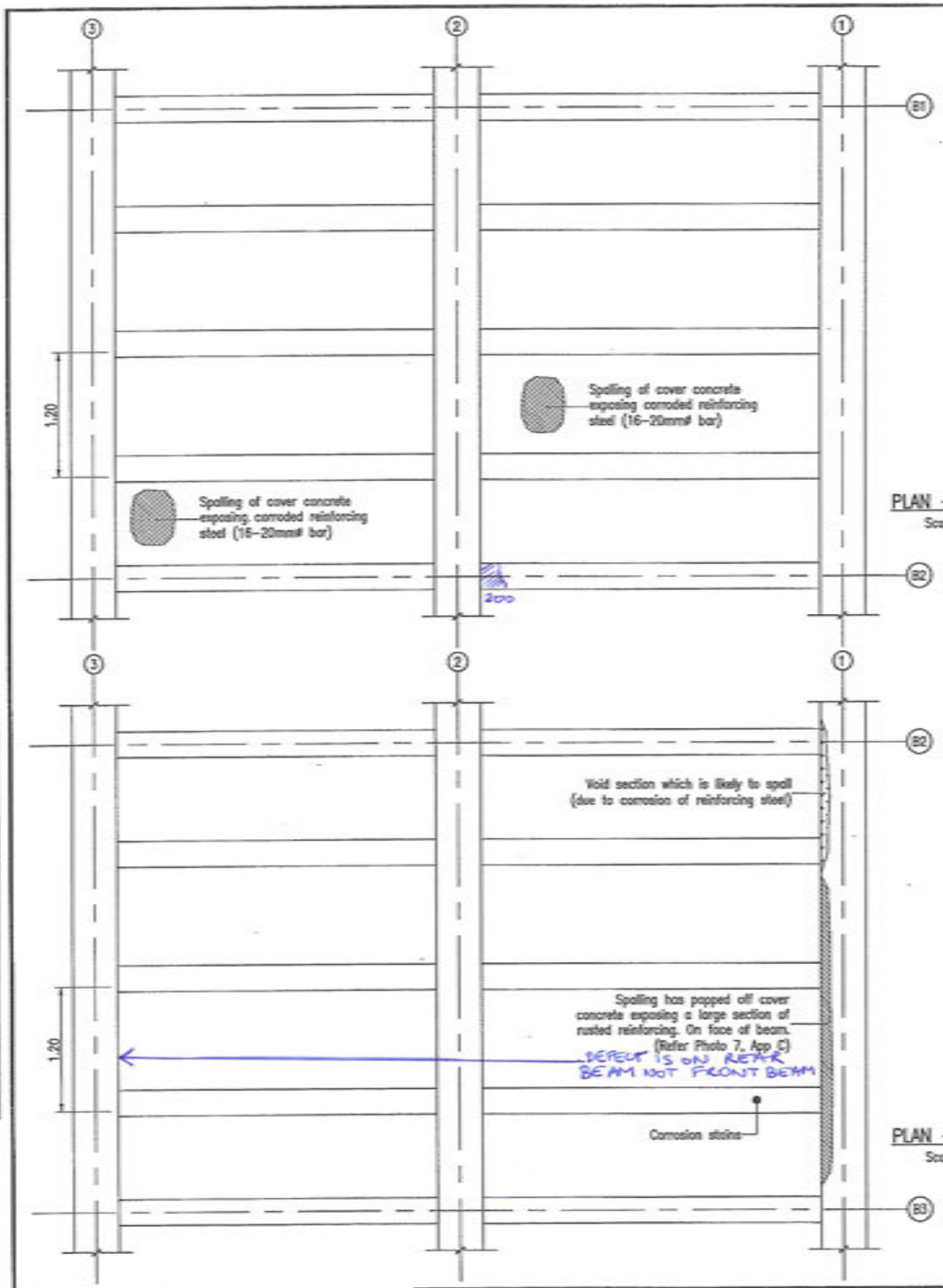
STATUS	FILE
DRAFT	288081.04

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	14	R0

GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

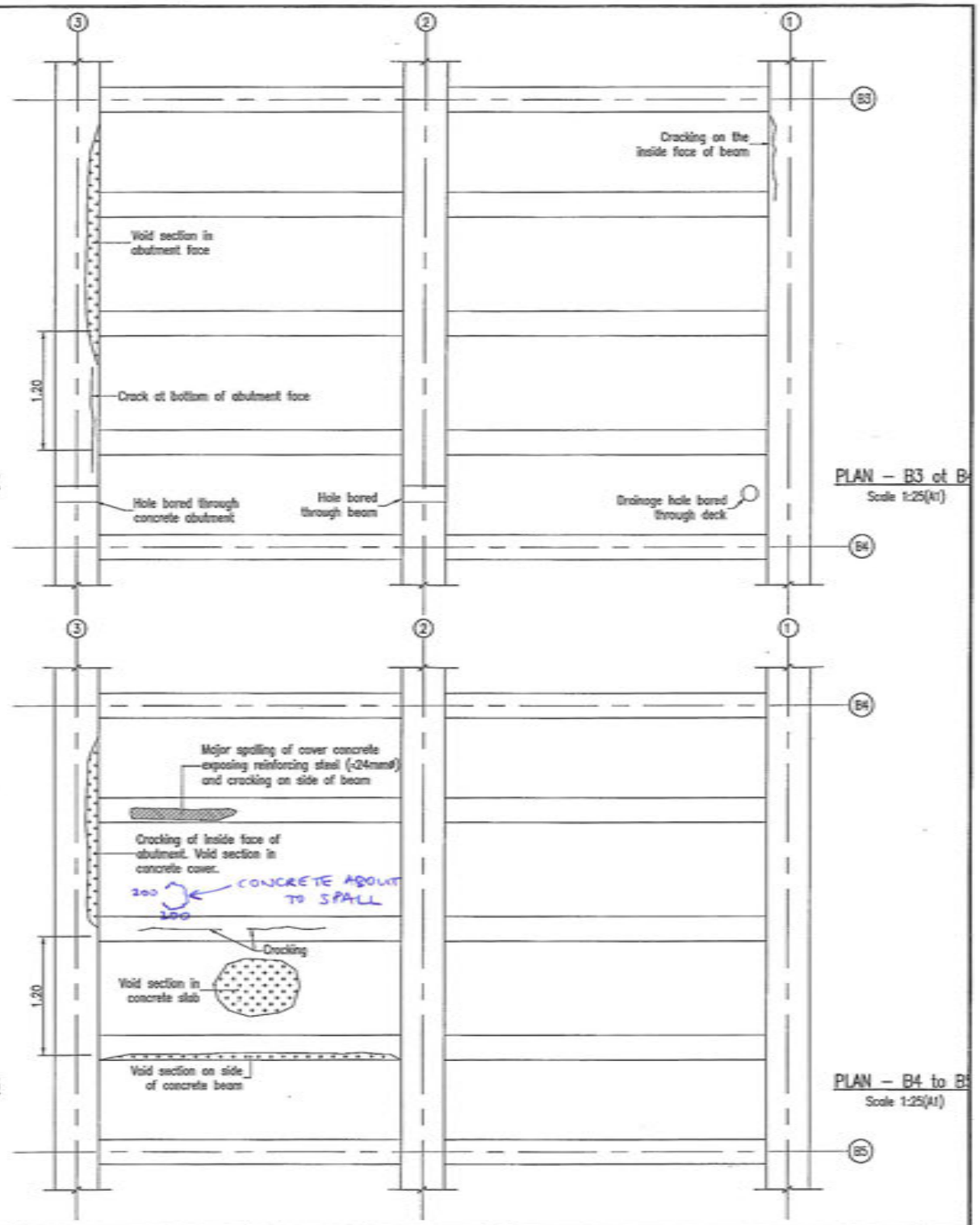
s:\288000\288081.04_100bc whakatane wharf\acad\2_214_177_2204_7-18.dwg – 1400 ORIGINAL SHEET SIZE AT [841x594]

300 mm
200
100
50
0 10 mm
18/03/2008 8:19



PLAN – B1 to B2
Scale 1:25(A1)

PLAN – B2 to B3
Scale 1:25(A1)



PLAN – B3 ot B4
Scale 1:25(A1)

PLAN – B4 to B5
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pulja	D.Blair	March 2008
APPROVED			

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WHAKATANE WHARF : INSPECTION
WHAKATANE

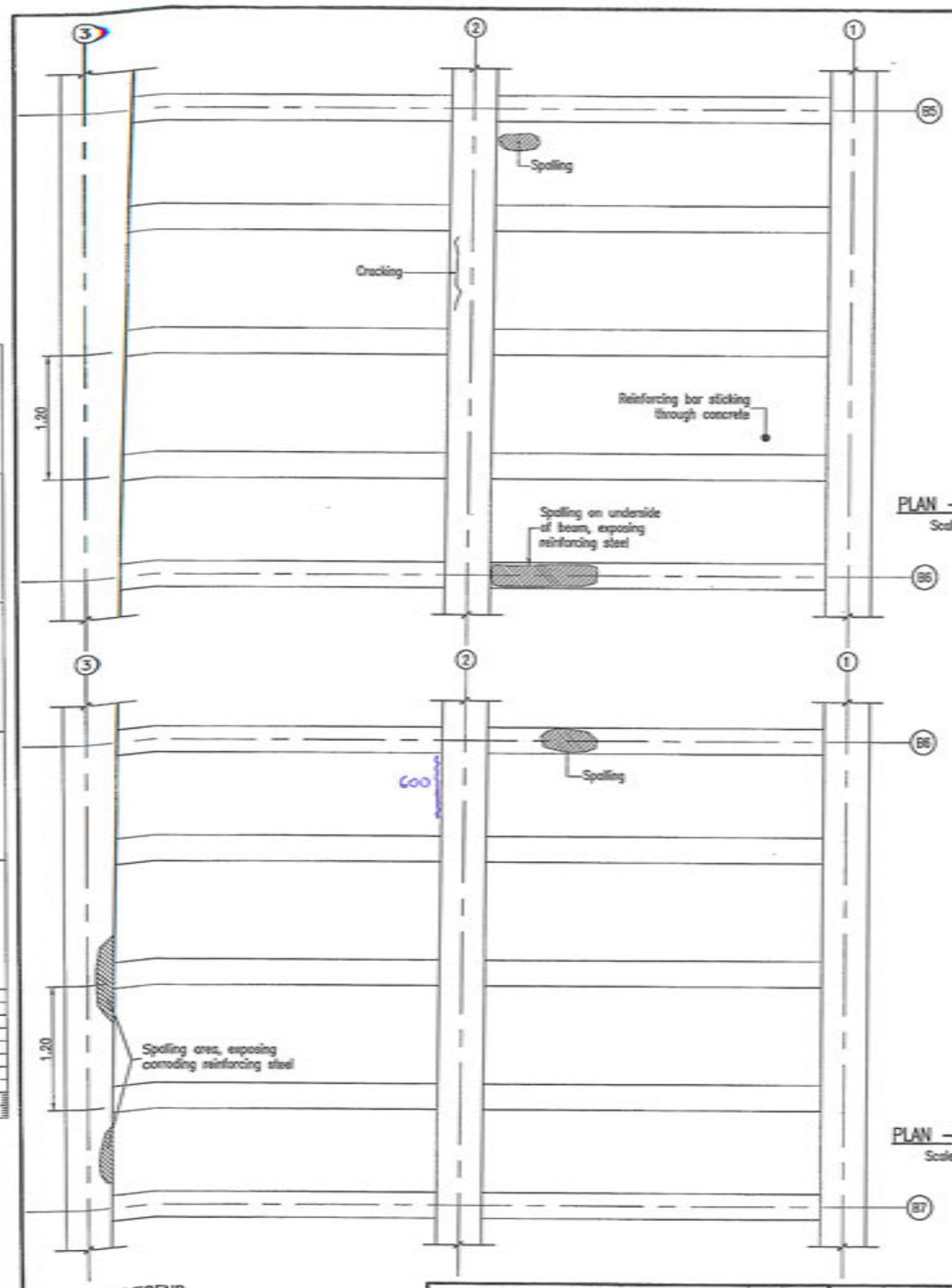
1940 SECTION
PLAN BETWEEN GRIDS B1/2, B2/3, B3/4, B4/5

STATUS		FILE	
DRAFT			2B8081.04
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE / SHEET / REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204 / 15 / R0

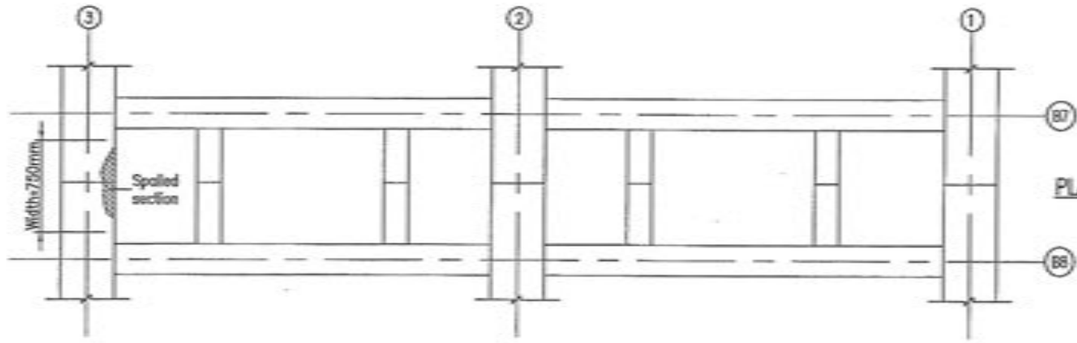
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

25/03/2008 8:10

g:\2B8081\2B8081.04_100hc whakatane wharf\acad\2_214_177_2204_7-18.dwg – 1:25 ORIGINAL SHEET SIZE A1 [841x594]

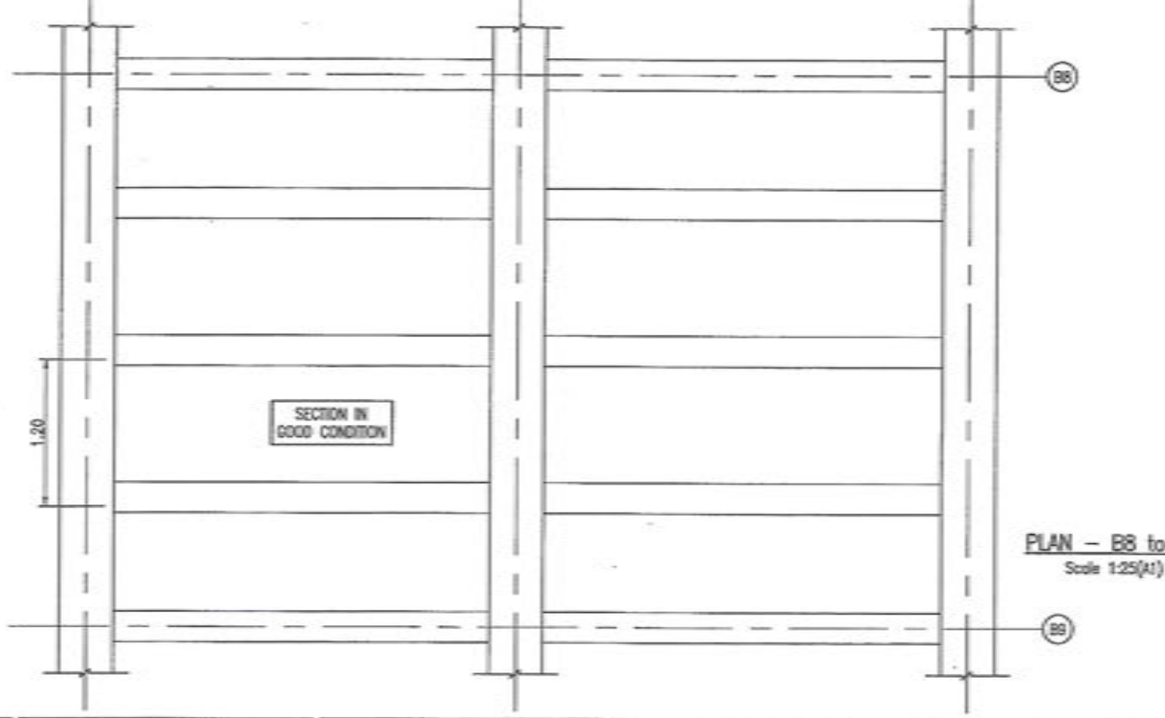


PLAN – B5 to B6
Scale 1:25(A1)



PLAN – B7 to B8
Scale 1:25(A1)

PLAN – B6 to B7
Scale 1:25(A1)



PLAN – B8 to B9
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Blair	March 2008
APPROVED			

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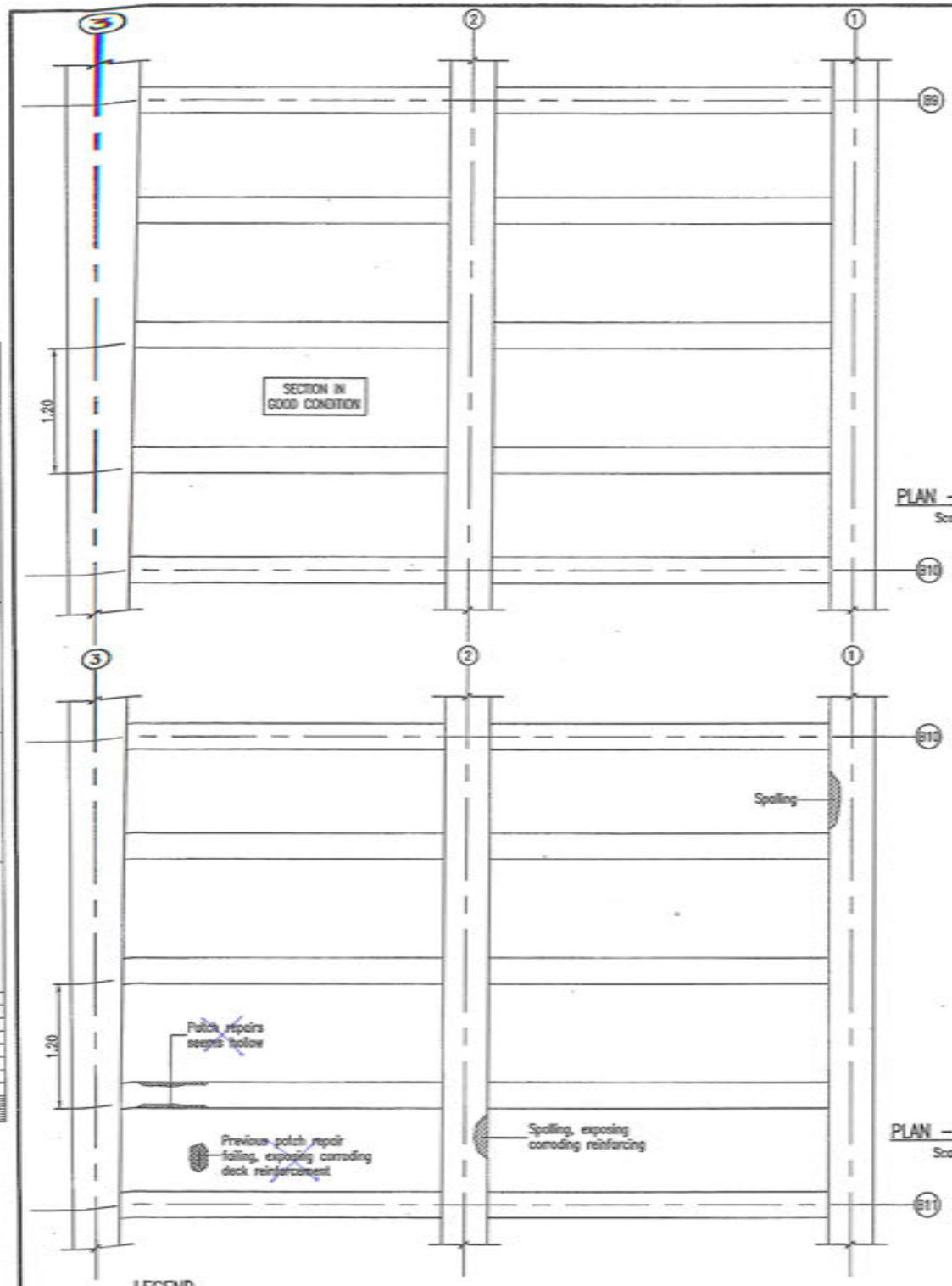
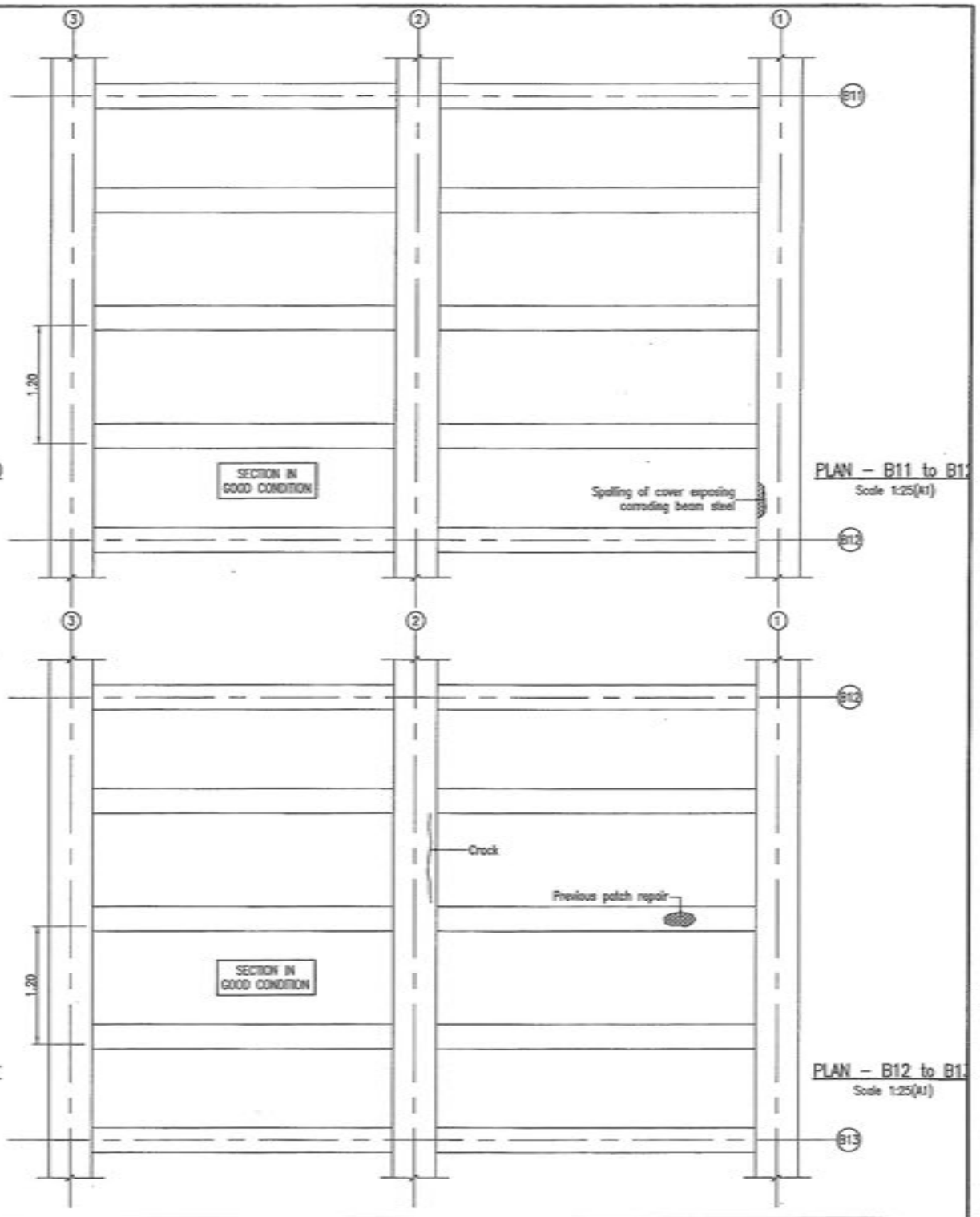
TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

1940 SECTION
PLAN BETWEEN GRIDS B5/6, B6/7, B7/8, B8/9

STATUS	DRAFT	FILE	288081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	16	R0

GRAPHIC SCALES @ A1: 0 400 800 1200 1600 2000 2400 mm





LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	K.Pullyn	D.Muir	March 2008
APPROVED			

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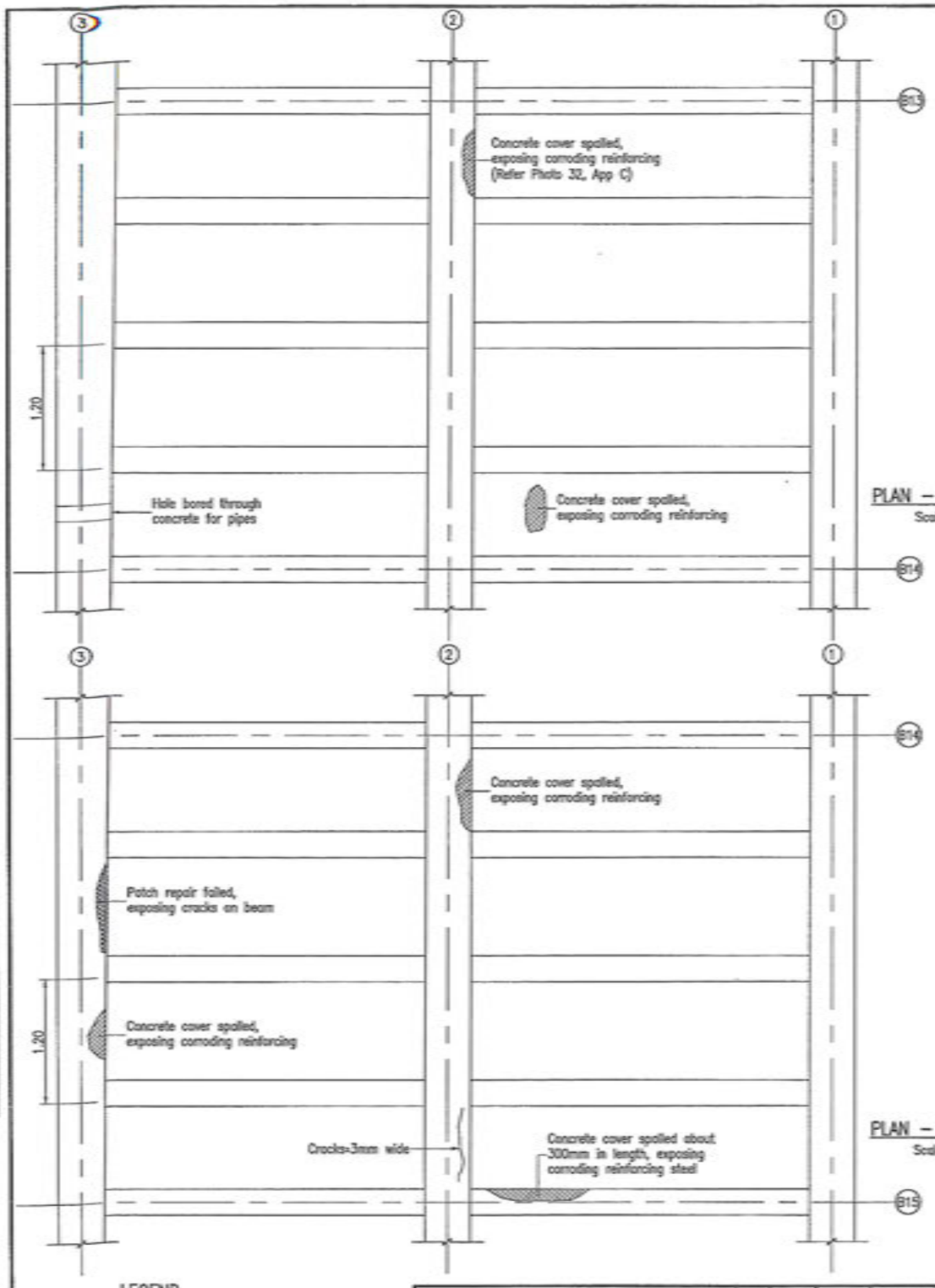
TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

1940 SECTION
PLAN BETWEEN GRIDS B9/10,B10/11,B11/12,B12/13

STATUS	DRAFT	FILE	2880081.04			
SCALE	PLOT DATE	ASHBURE IDENTIFIER	ZONE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	17	R0

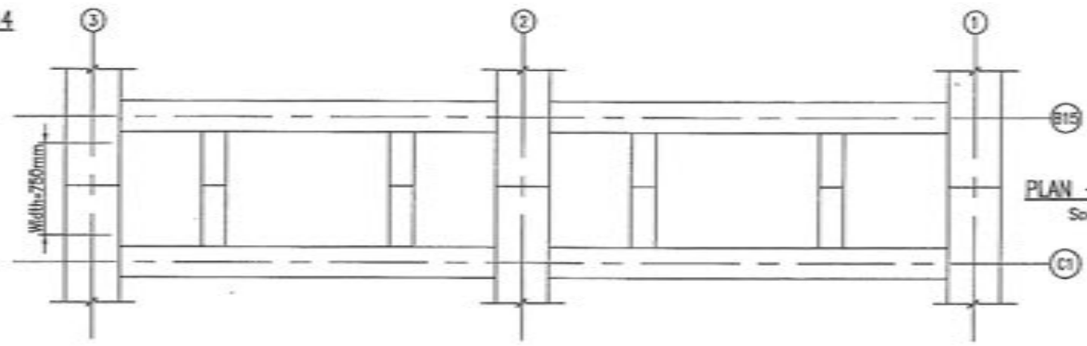
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

g:\2800001\2880081.04_300bc whakatane wharf\gcad\2_214_177_2204_3-18.dwg – 1780 ORIGINAL SHEET SIZE A1 [ENGLISH]



PLAN – B13 to B14
Scale 1:25(A1)

PLAN – B14 to B15
Scale 1:25(A1)



PLAN – B15 to C1
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Muir	March 2008
APPROVED			

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TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

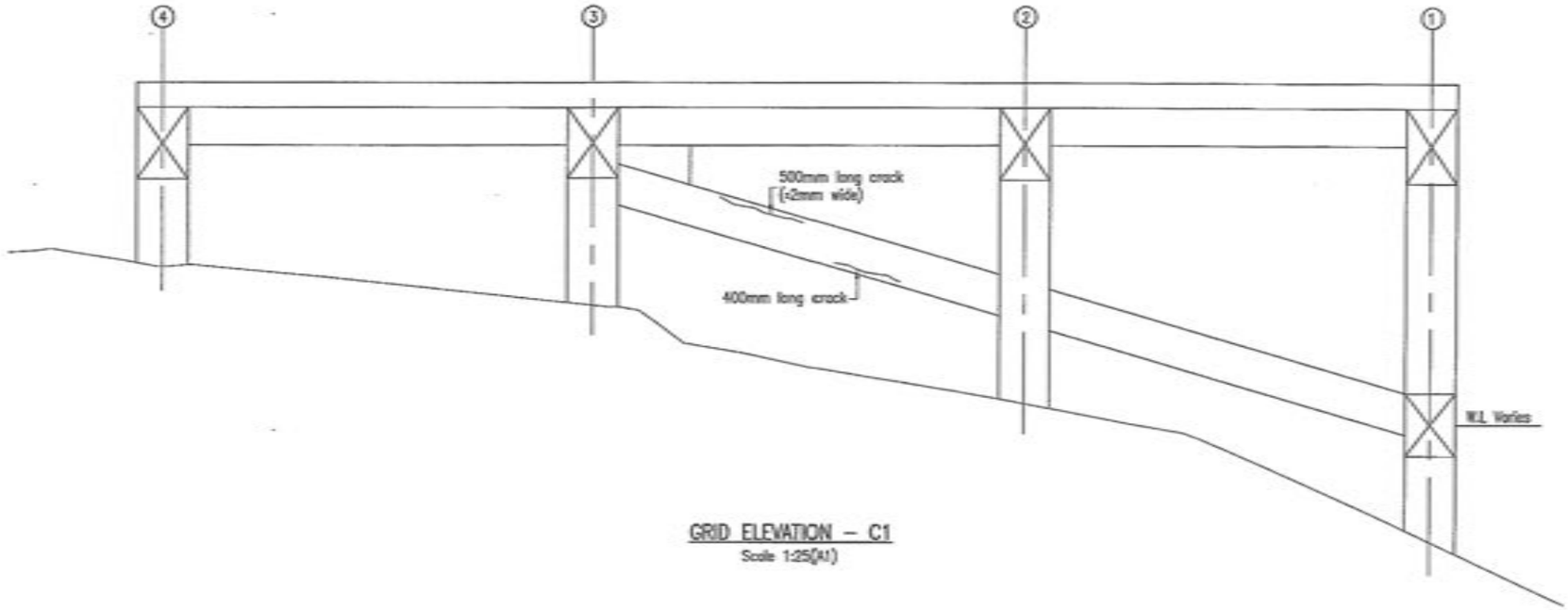
1940 SECTION
PLAN BETWEEN GRIDS B13/14, B14/15, B15/C1

STATUS	FILE			
DRAFT	288081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	18	R0

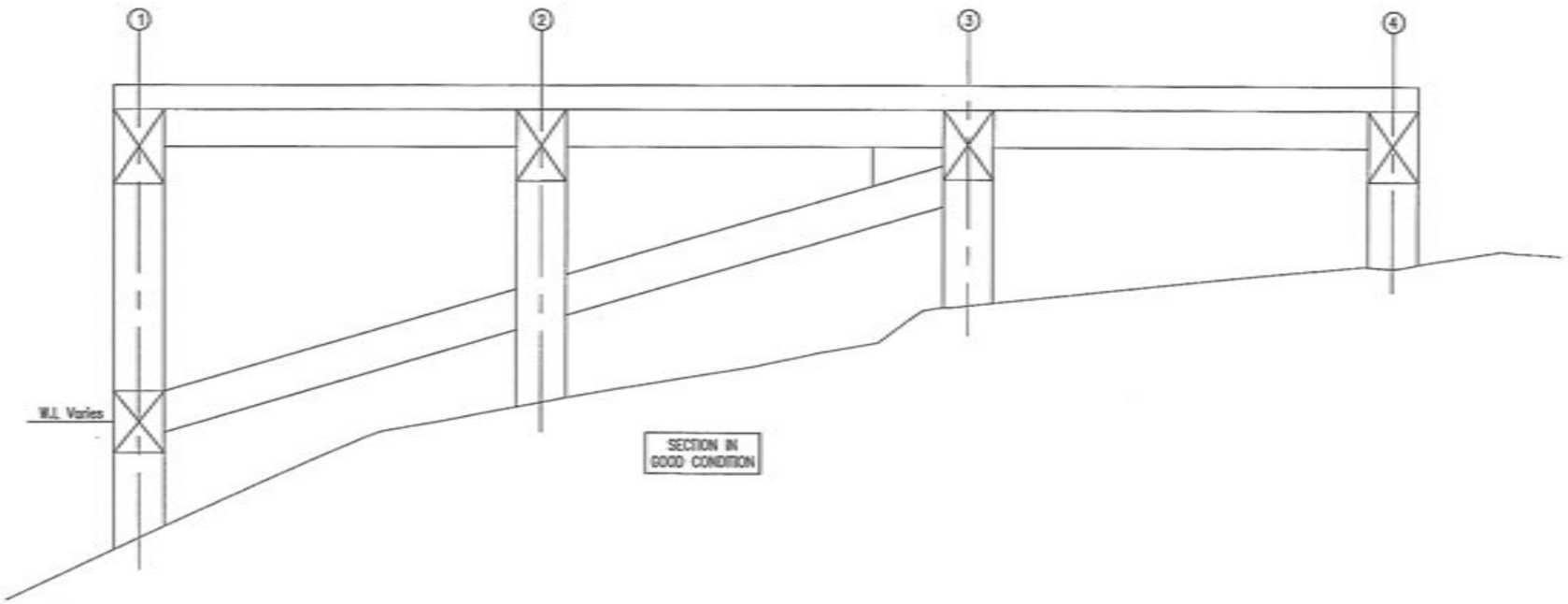
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

25/03/2008 8:20

g:\288081\288081.04_100bc whakatane wharf\pcad\2_214_177_2204_7-18.dwg – 1890 ORIGINAL SHEET SIZE A1 [840x594]



GRID ELEVATION – C1
Scale 1:25[A1]



SECTION IN GOOD CONDITION

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pulyn	S.Nair	March 2008
APPROVED			

AMENDMENT | APP'D | DATE

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TITLE: WHAKATANE DISTRICT COUNCIL
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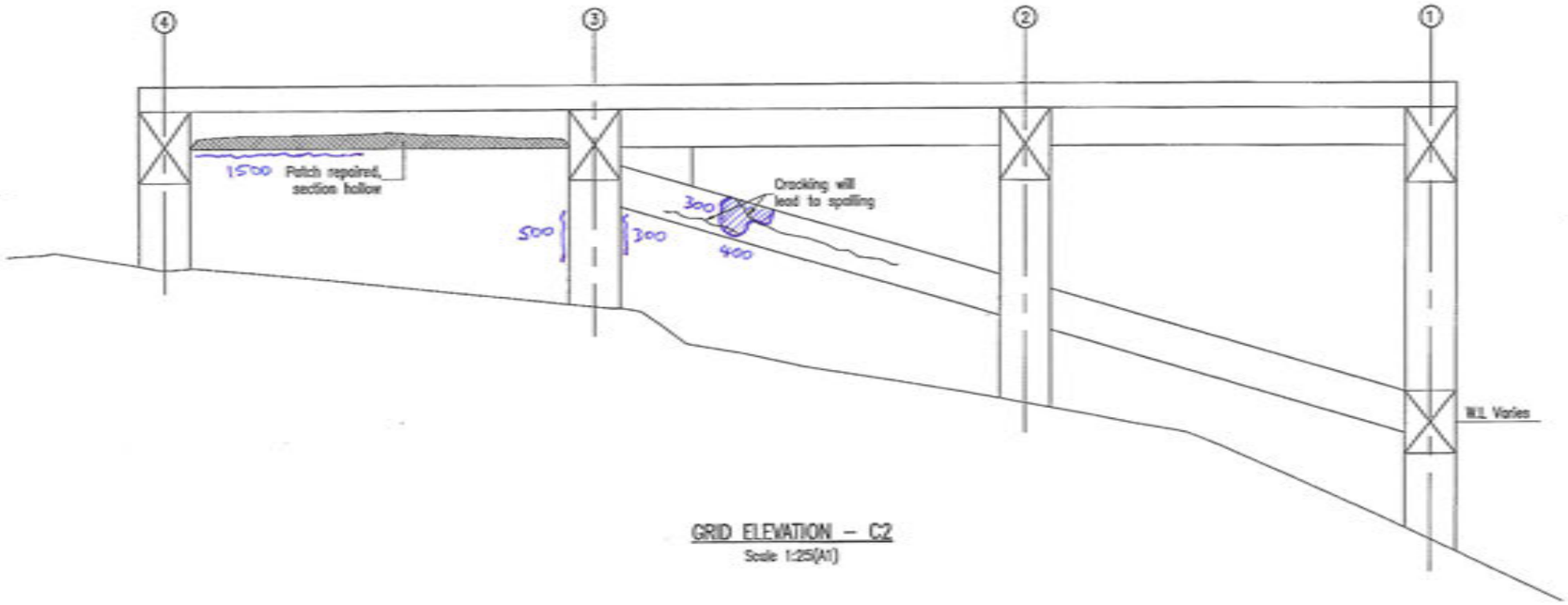
WHAKATANE

1919 SECTION
GRID ELEVATIONS C1

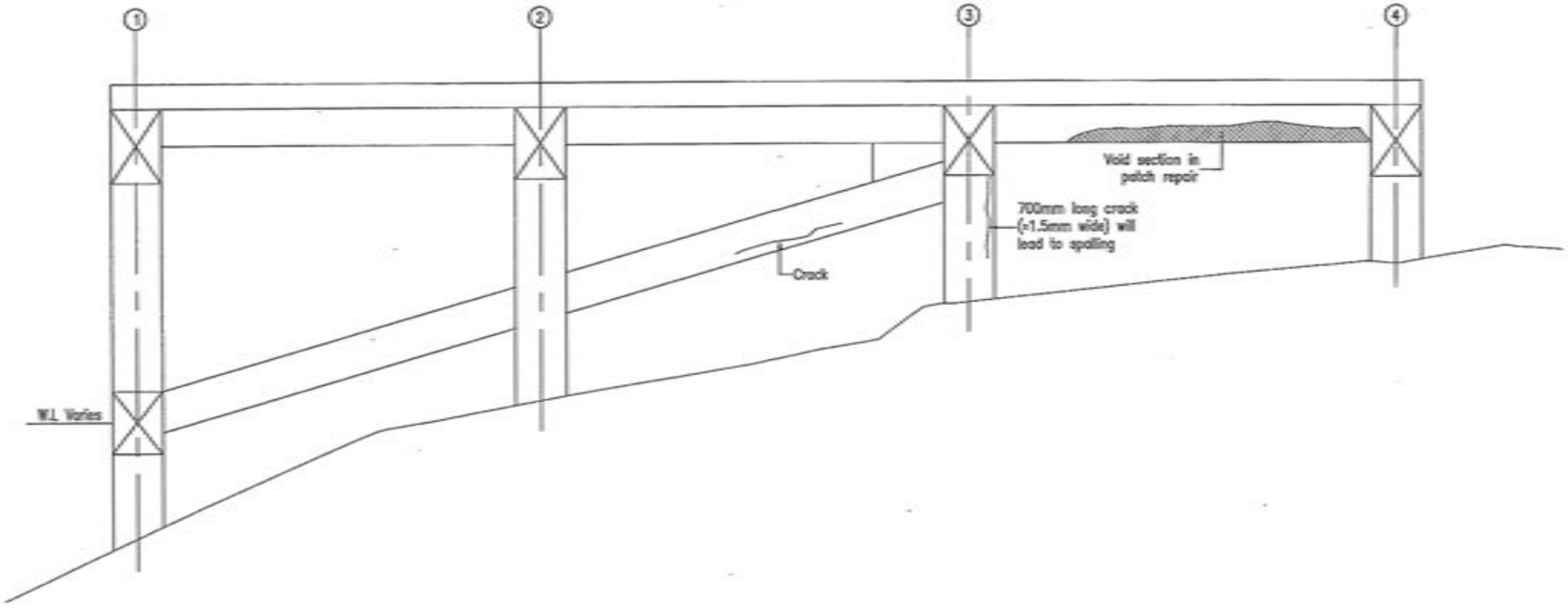
STATUS	FILE				
DRAFT	288081.04				
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	19	R0

GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

25/03/2008 11:14



GRID ELEVATION – C2
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Weir	March 2008
APPROVED			

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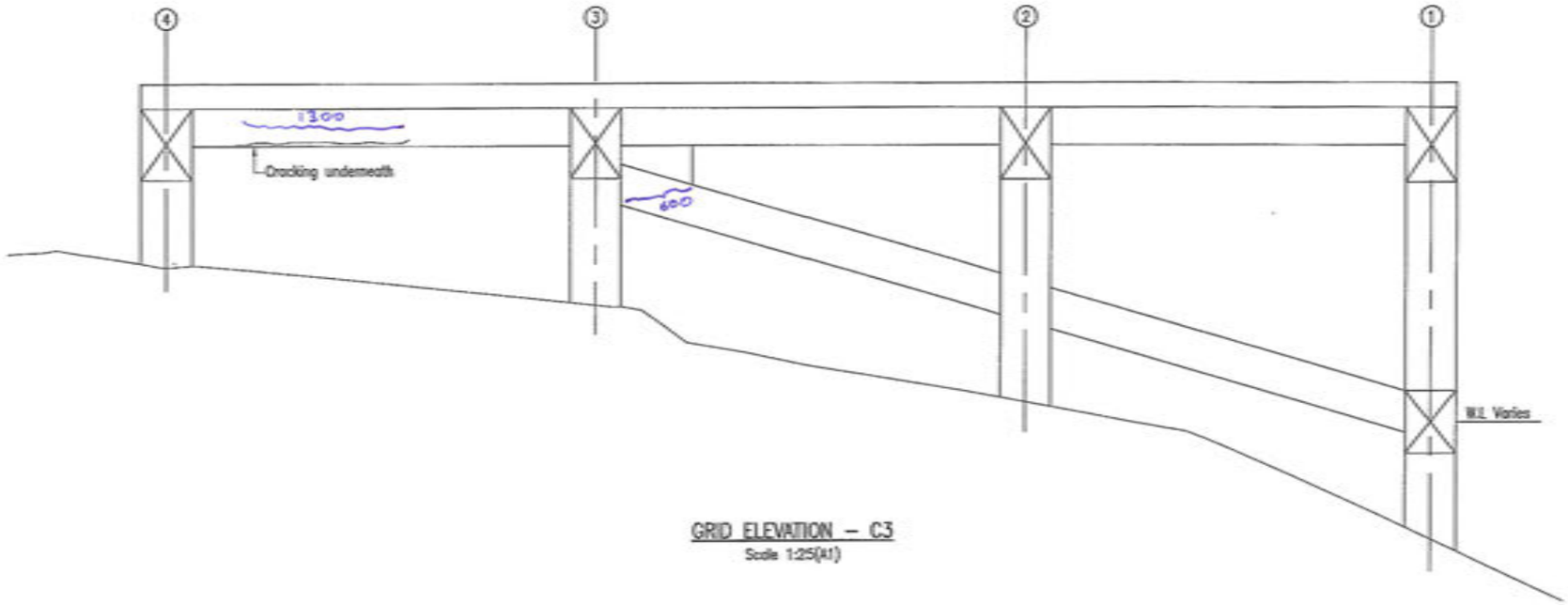
WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

1919 SECTION
GRID ELEVATIONS C2

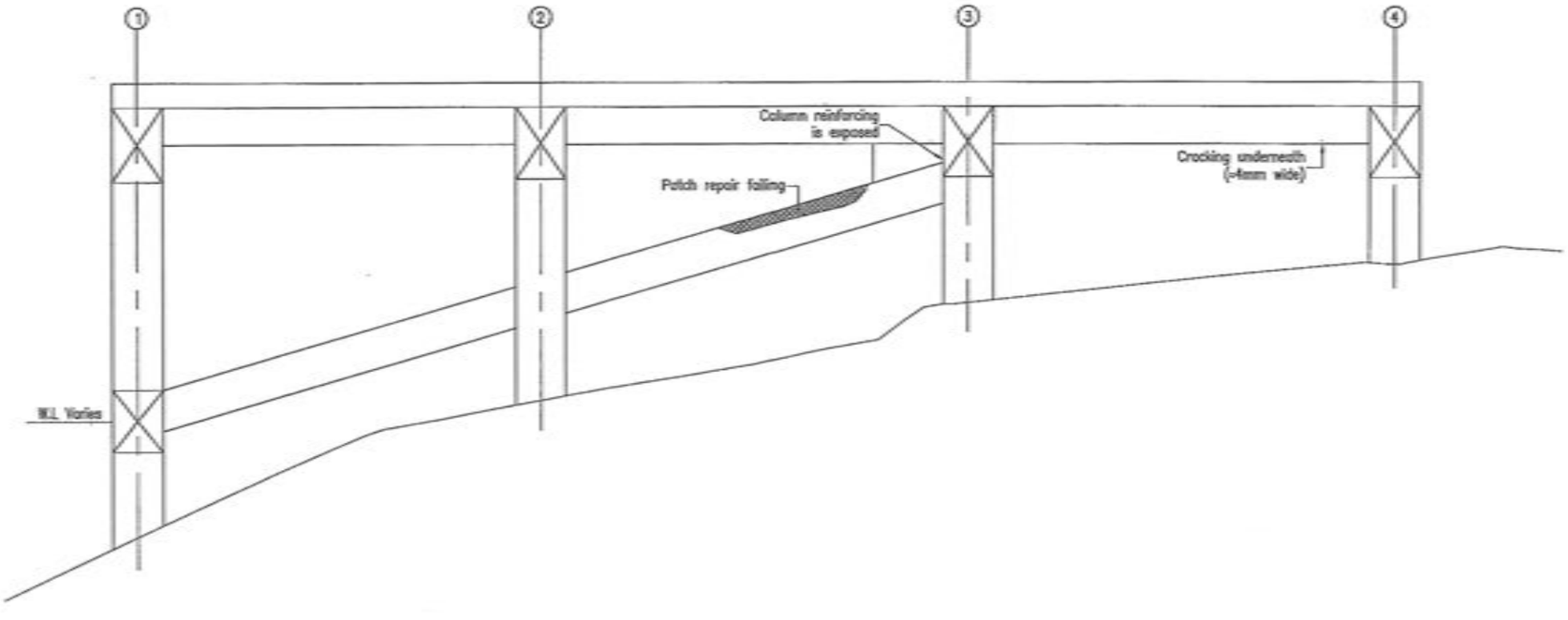
STATUS	DRAFT	FILE	288081.04		
SCALE	PLOT DATE	FEATURE IDENTIFIER	ISSUE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	20	RD

GRAPHIC SCALES: 1:25 @ A1 — 0 400 800 1200 1600 2000 2400 mm

g:\288000\288081.04_1000c whakatane wharf\gcad\2_214_177_19-21.dwg – 2DRG ORIGINAL SHEET SIZE: A1 [840x594]



GRID ELEVATION – C3
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Muir	March 2008
APPROVED			

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TITLE: WHAKATANE DISTRICT COUNCIL
WHAKATANE WHARF : INSPECTION
WHAKATANE

1919 SECTION
GRID ELEVATIONS C3

STATUS	FILE
DRAFT	288081.04

SCALE	PLOT DATE	DRAWING IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	21	R0

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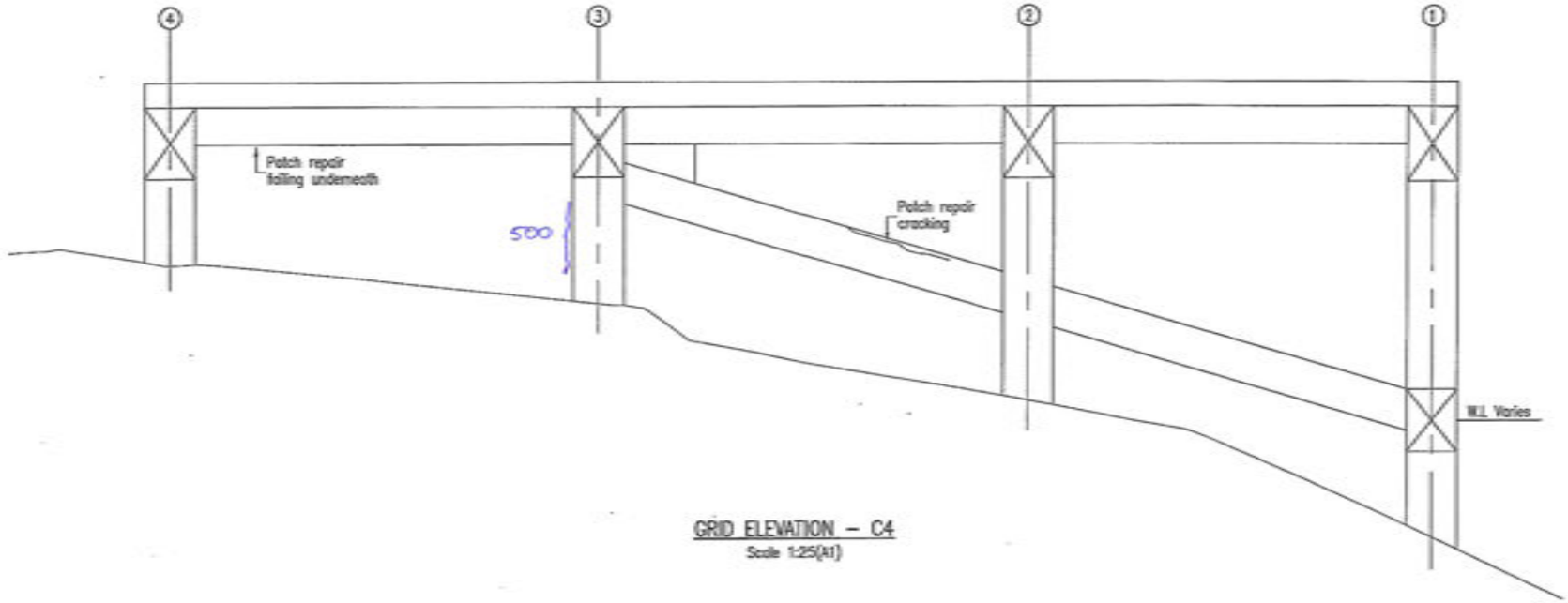
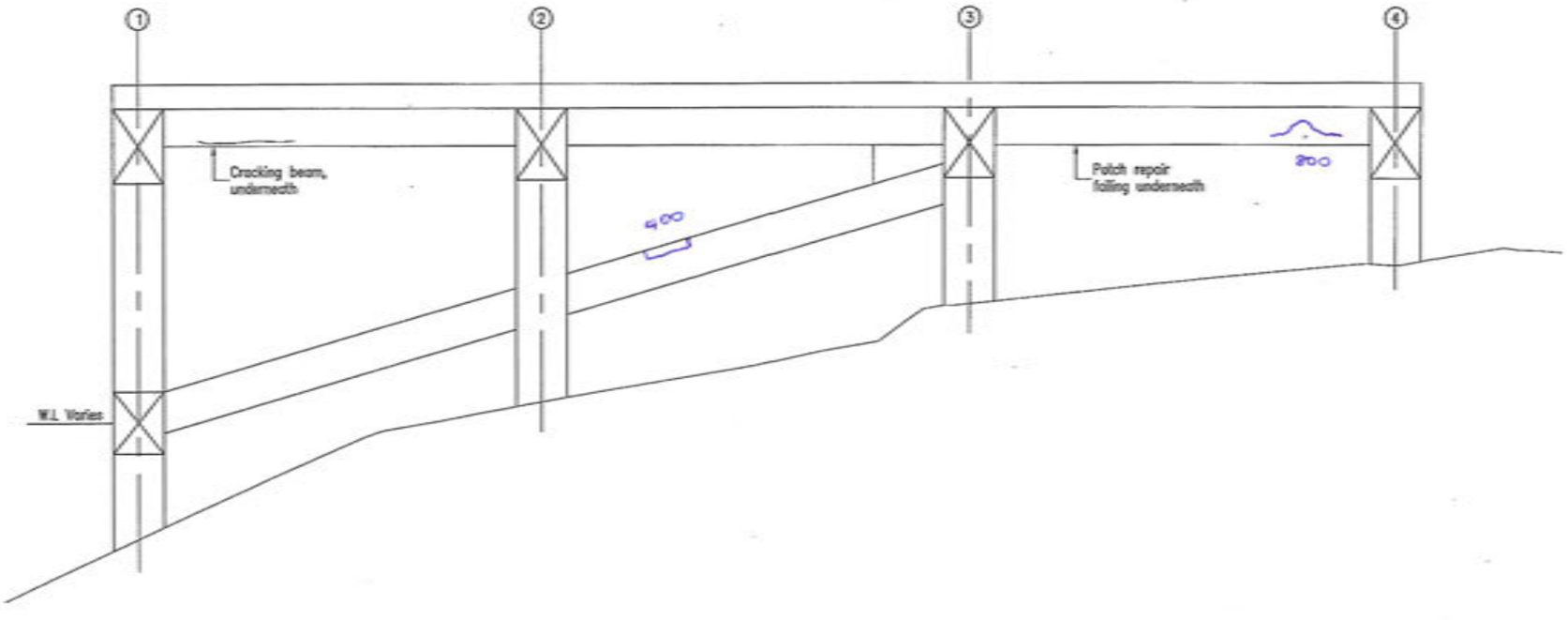
25/03/2008 11:14



GRID ELEVATION – C4
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Keir	March 2008
APPROVED			

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TITLE: WHAKATANE DISTRICT COUNCIL
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WHAKATANE

1919 SECTION
GRID ELEVATIONS C4

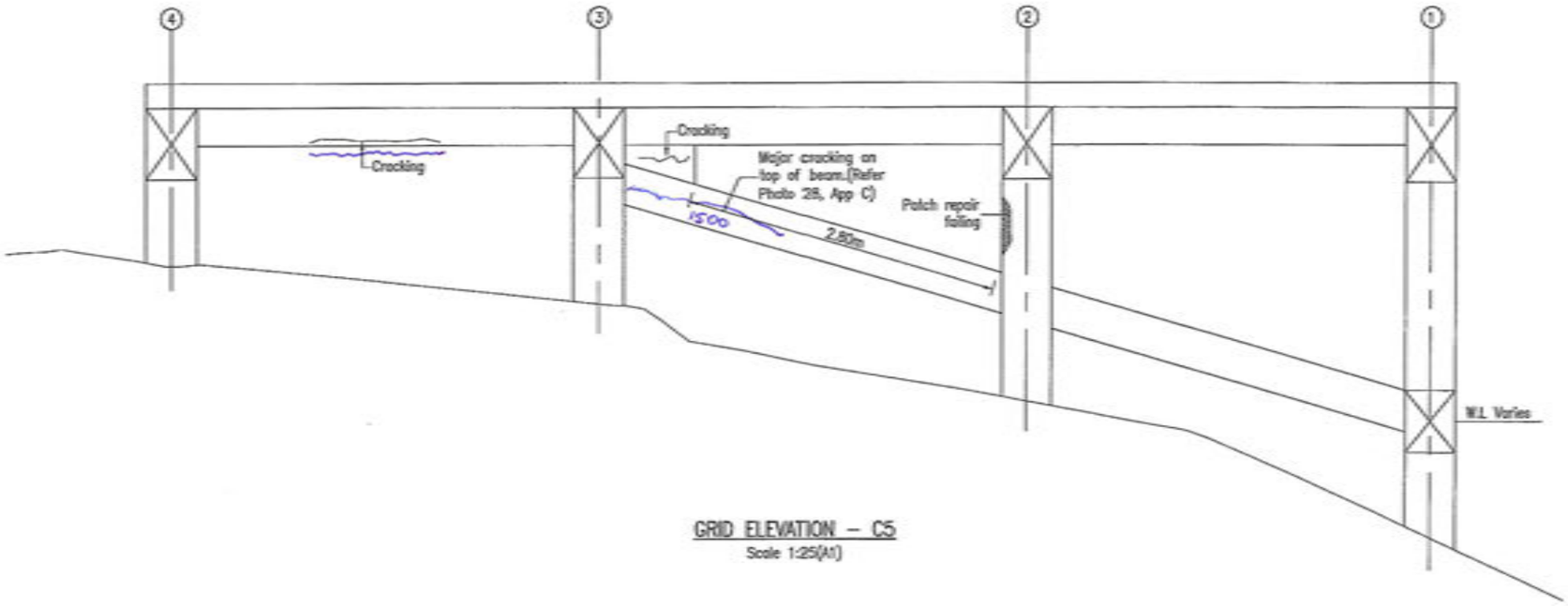
STATUS	FILE
DRAFT	288081.04

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	22	R0

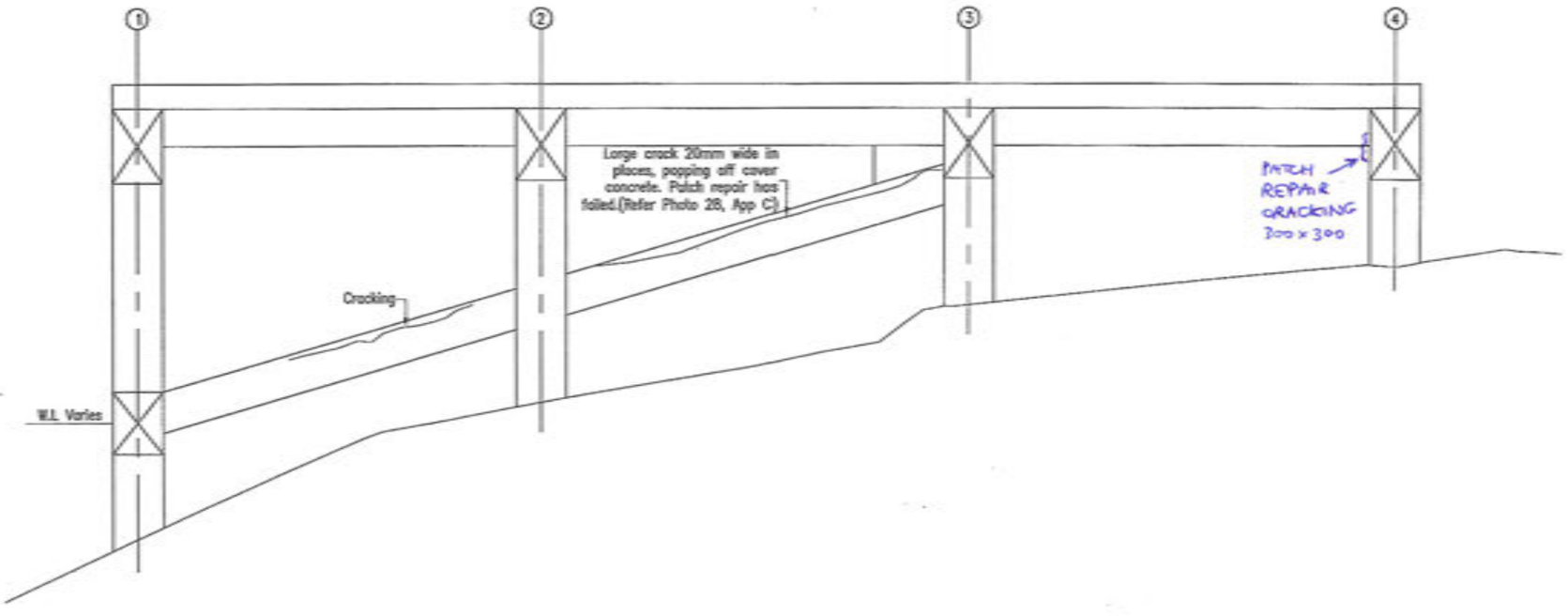
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

s:\288000\288081.04_1000sc whakatane wharf\pcad\2_214_177_19-31.dwg – 2380 ORIGINAL SHEET SIZE A1 [840x594]

35/03/2008 11:14



GRID ELEVATION – C5
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pidjo	S.Hicks	March 2008
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1919 SECTION
GRID ELEVATIONS C5

STATUS	FILE				
DRAFT	288081.04				
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
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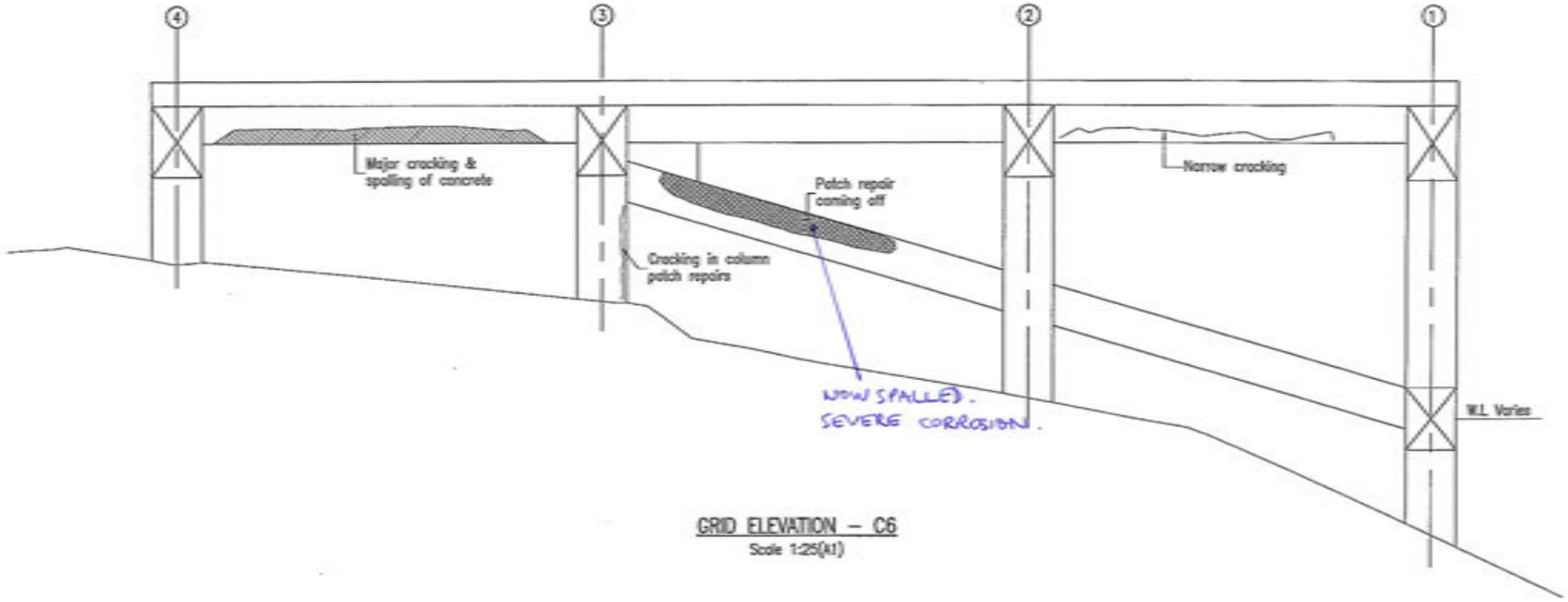
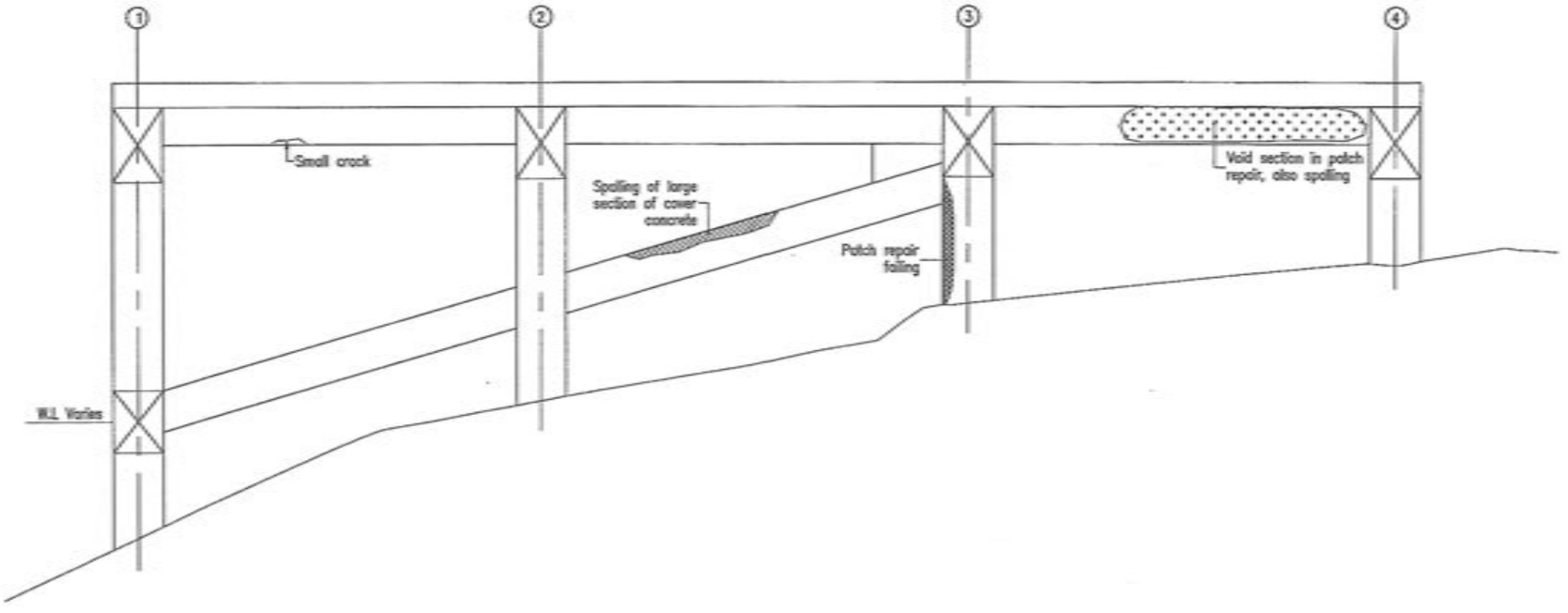
GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

s:\288081\288081.04_1919c whakatane wharf\panel\2_214_177_19-21.dwg – 1390 ORIGINAL SHEET SIZE A1 [841x594]

25/03/2008 11:14



GRID ELEVATION – C6
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pulja	D.Muir	March 2008
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WHAKATANE

1919 SECTION
GRID ELEVATIONS C6

STATUS		FILE	
DRAFT		288081.04	

SCALE	PLOT DATE	DRAWING IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	24	R0

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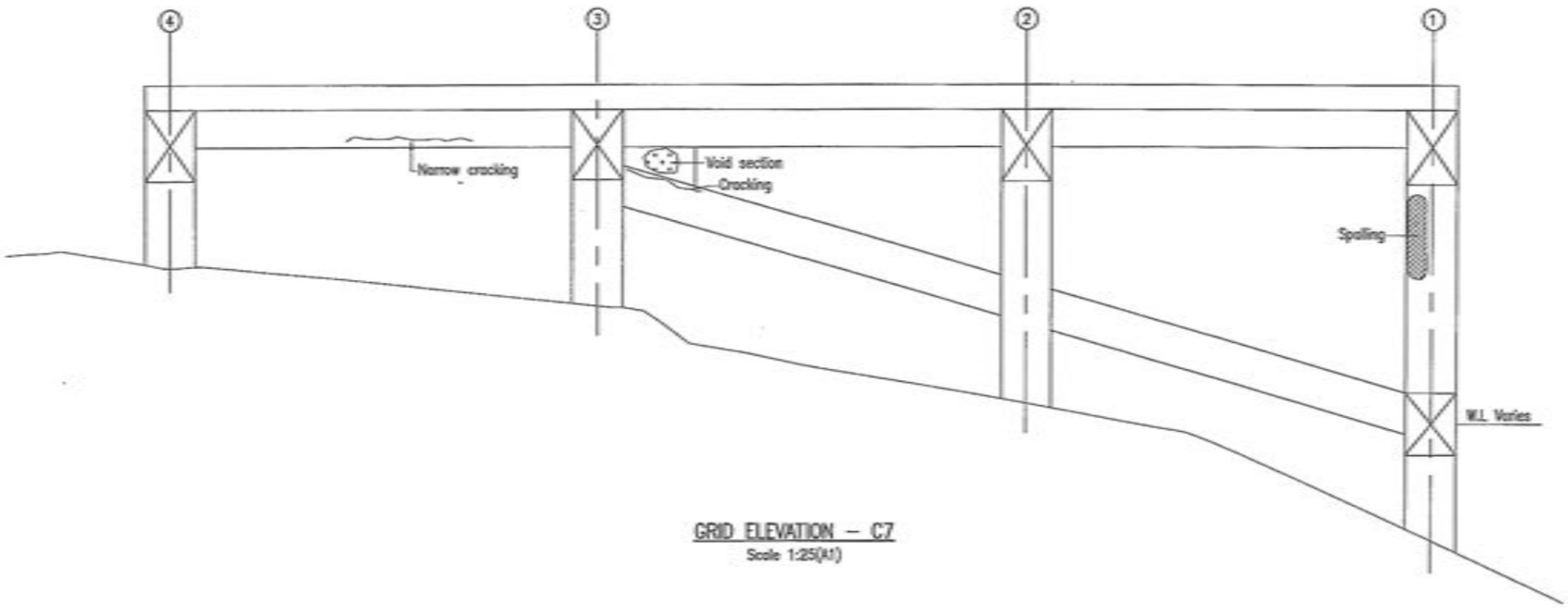
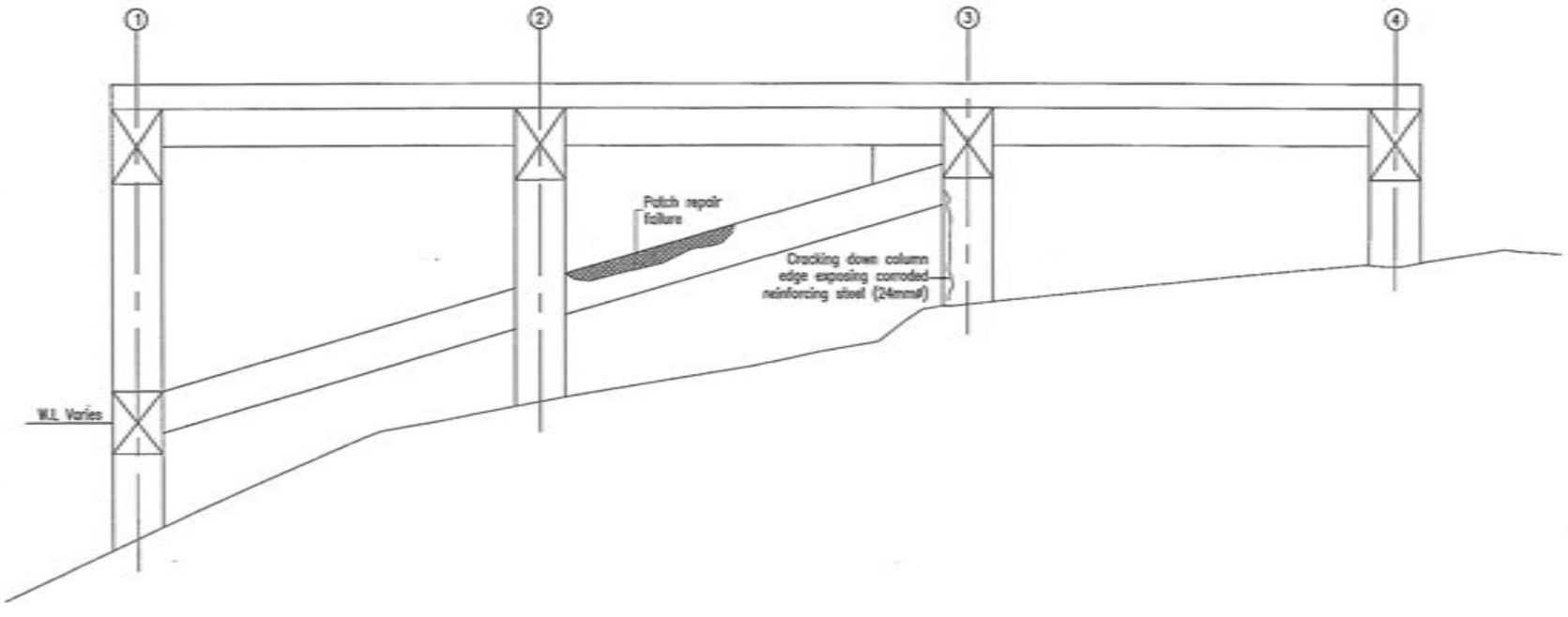
25/03/2008 11:14

s:\288081\288081.04_100c whakatane wharf\pcad\2_214_177_19-31.dwg – 2400 ORIGINAL SHEET SIZE A1 [841x594]



GRID ELEVATION – C7
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	S.Weir	March 2008
APPROVED			

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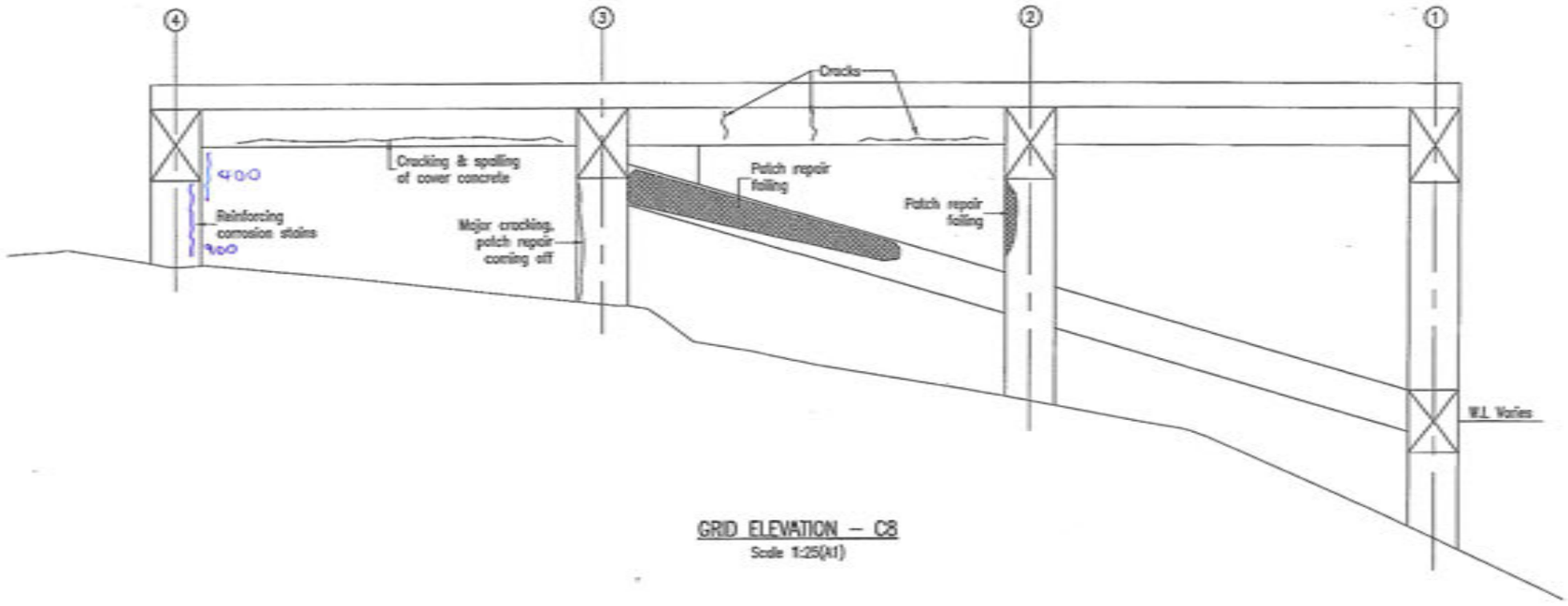
1919 SECTION
GRID ELEVATIONS C7

STATUS	DRAFT		FILE	288081.04			
SCALE	PLOT DATE		PENDING ENGINEER	JOB	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44		2/214/177	2204	25	R0

GRAPHIC SCALES @ A1: 1:25 — 0 400 800 1200 1600 2000 2400 mm

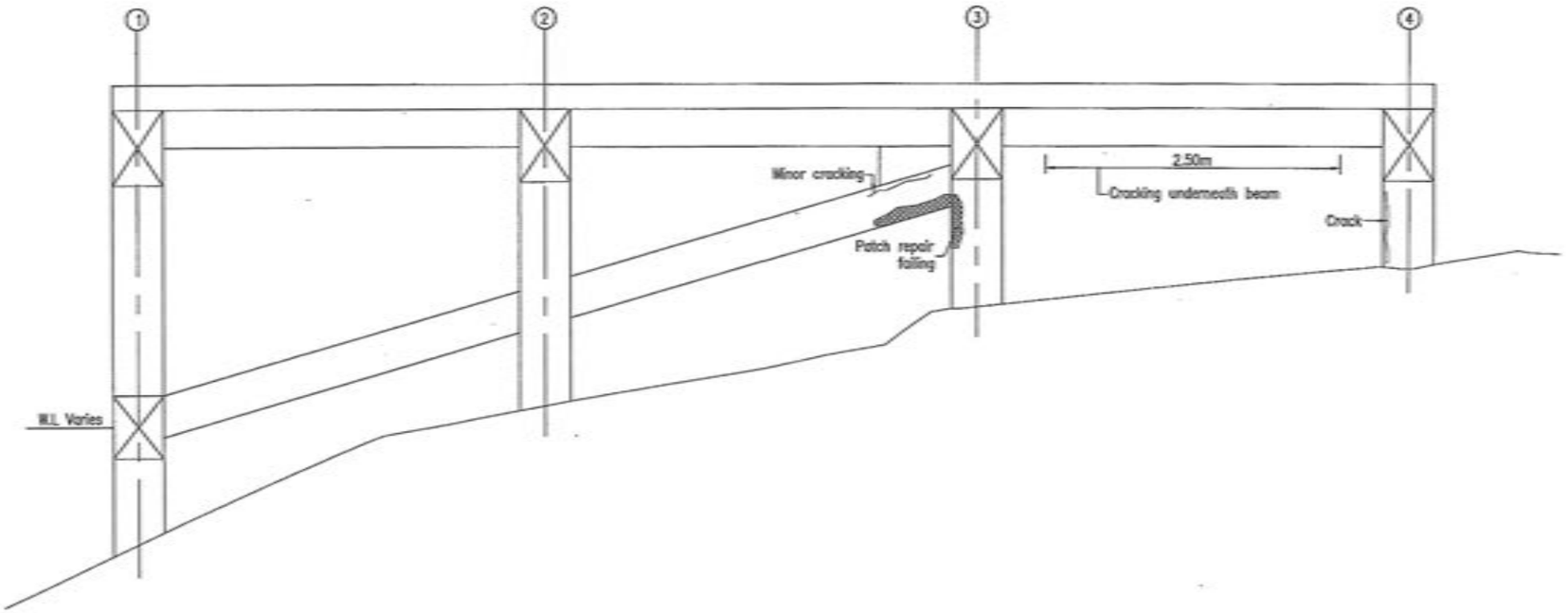
25/03/2008 11:15

s:\280081\288081.04_100hc whakatane wharf\pcad\2_214_177_19-31.dwg – 25R0 ORIGINAL SHEET SIZE A1 (841x594)



GRID ELEVATION – C8

Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Muir	March 2008
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1919 SECTION
GRID ELEVATIONS C8

STATUS	FILE				
DRAFT	289081.04				
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	26	R0

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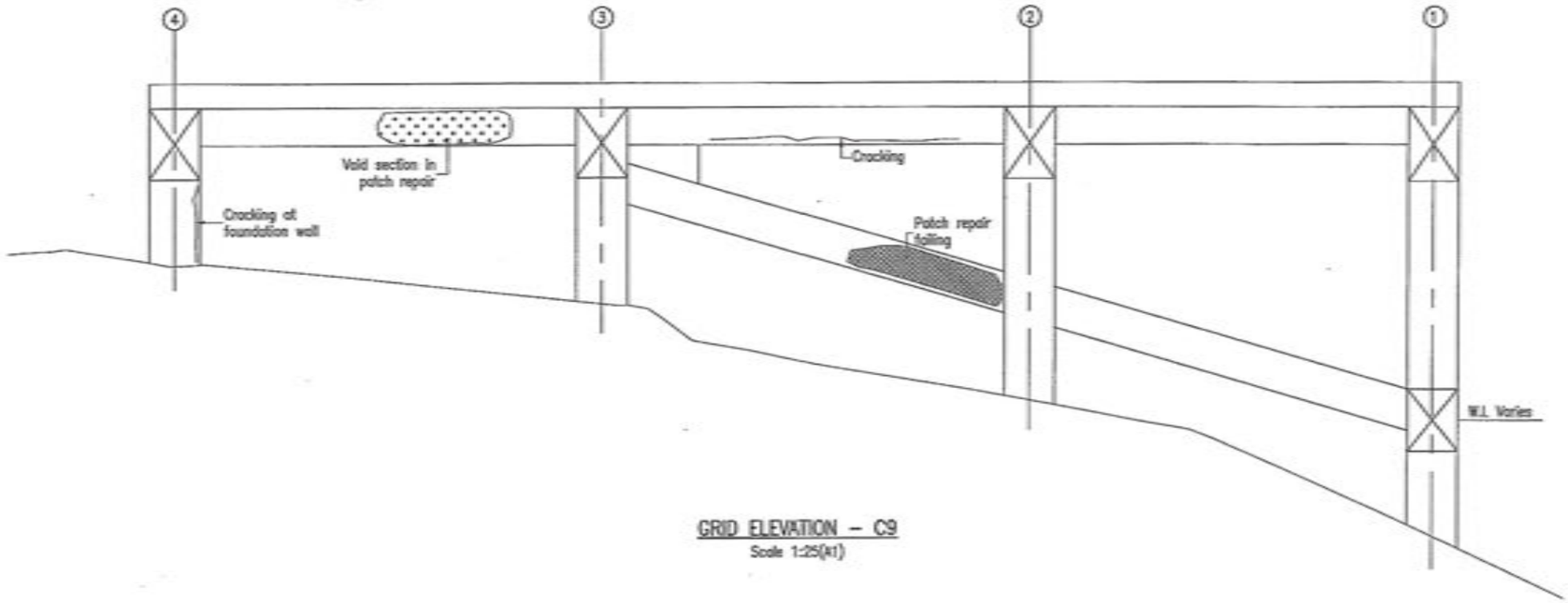
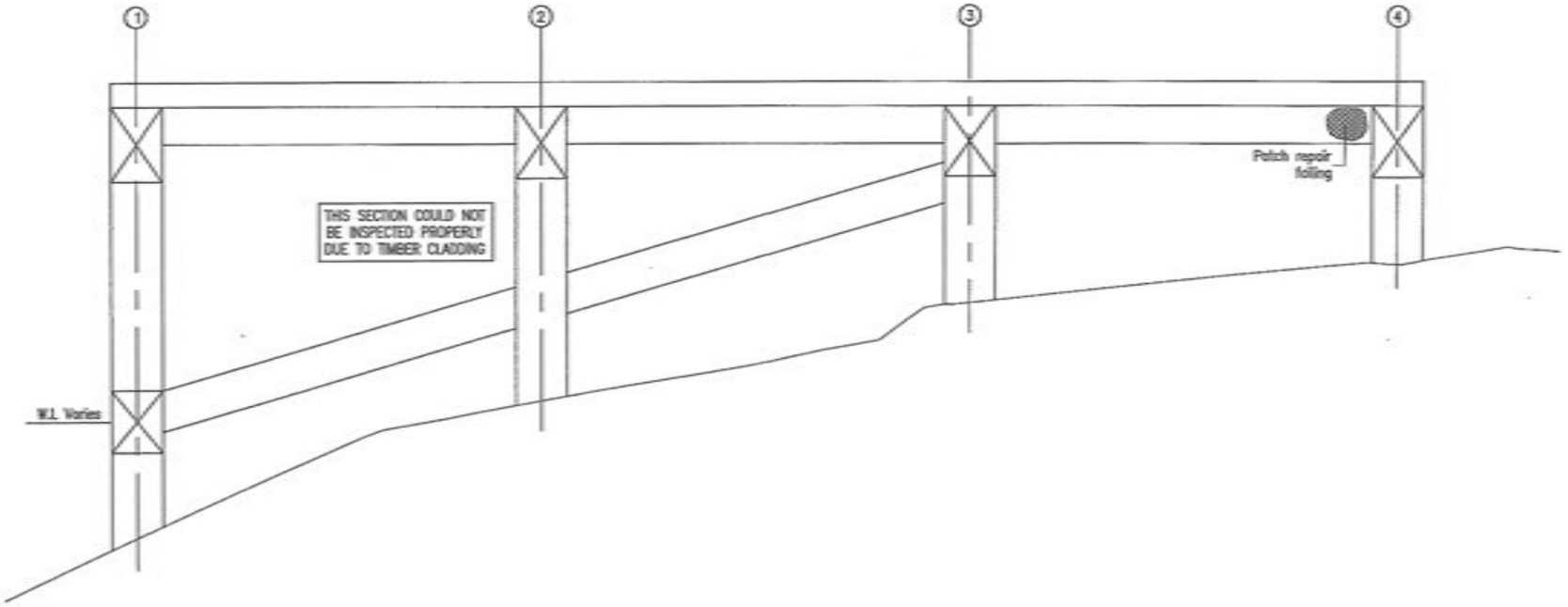
15/03/2008 11:15

g:\289000\289081.04_100ac whakatane wharf\pcad\2_214_177_10-31.dwg – 289D ORIGINAL SHEET SIZE A1 [BW&SW]



GRID ELEVATION – C9
Scale 1:25(A1)



LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Phillips	D.Mair	March 2008
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1919 SECTION
GRID ELEVATIONS C9

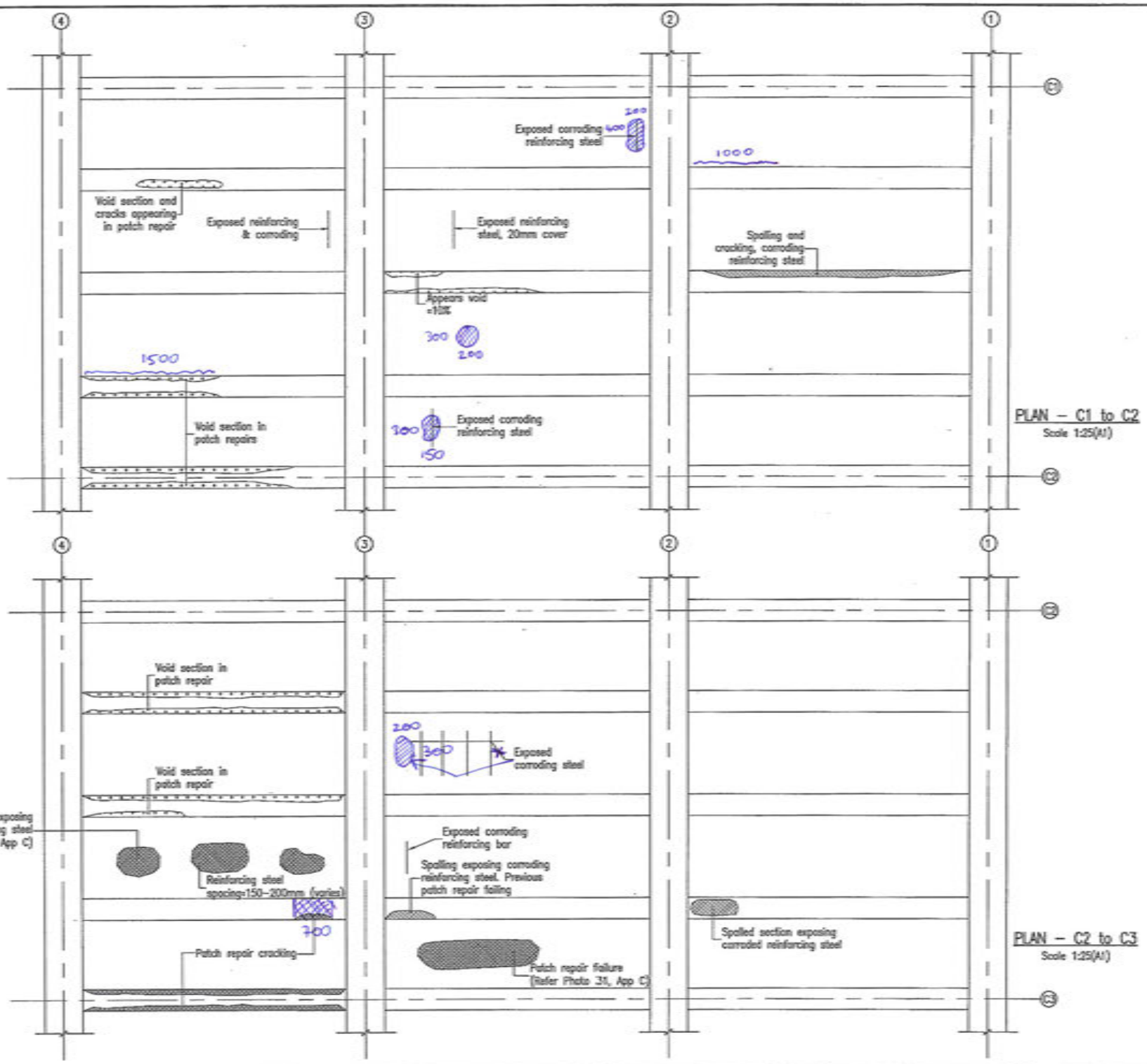
STATUS	FILE
DRAFT	258081.04

SCALE	PLOT DATE	JOB/DRG NUMBER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	27	R0

GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

14/03/2008 11:15

g:\258000\258081.04_100dc whakatane wharf\acad\2_214_177_19-31.dwg – 2700 ORIGINAL SHEET SIZE A1 [841x594]



PLAN – C1 to C2
Scale 1:25(A1)

PLAN – C2 to C3
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Blair	March 2008
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TITLE: WHAKATANE DISTRICT COUNCIL
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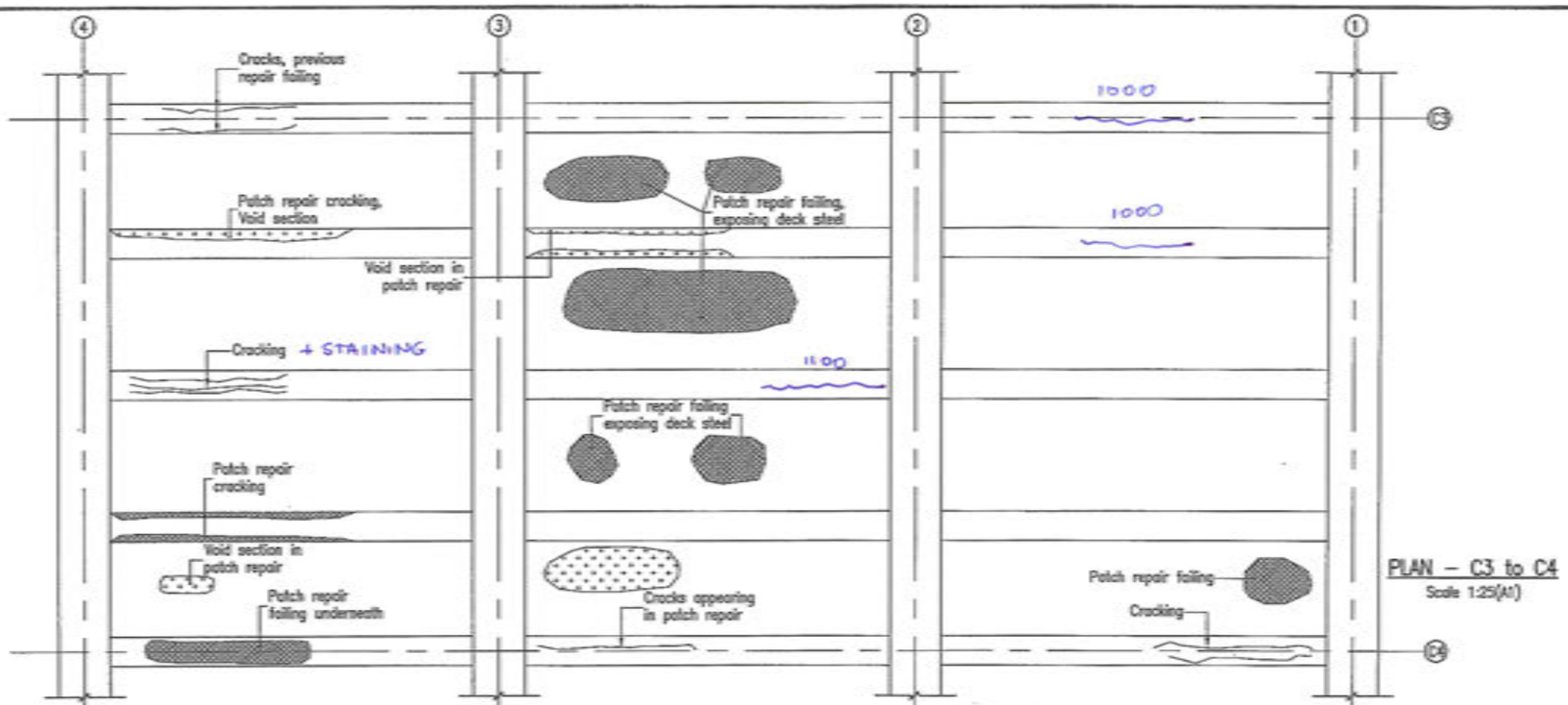
1919 SECTION
PLAN BETWEEN GRIDS C1/C2, C2/C3

STATUS		FILE			
DRAFT		288081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	28	R0

g:\288081\plan\04_100dc whakatane wharf\cad\2_214_177_19-31.dwg – DWG ORIGINAL SHEET SIZE A1 (841x594)

GRAPHIC SCALES 1:25 @ A1 — 0 400 800 1200 1600 2000 2400 mm

14/03/2008 11:15



PLAN – C3 to C4
Scale 1:25(A1)

PLAN – C4 to C5
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
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WHAKATANE

1919 SECTION
PLAN BETWEEN GRIDS C3/C4, C4/C5

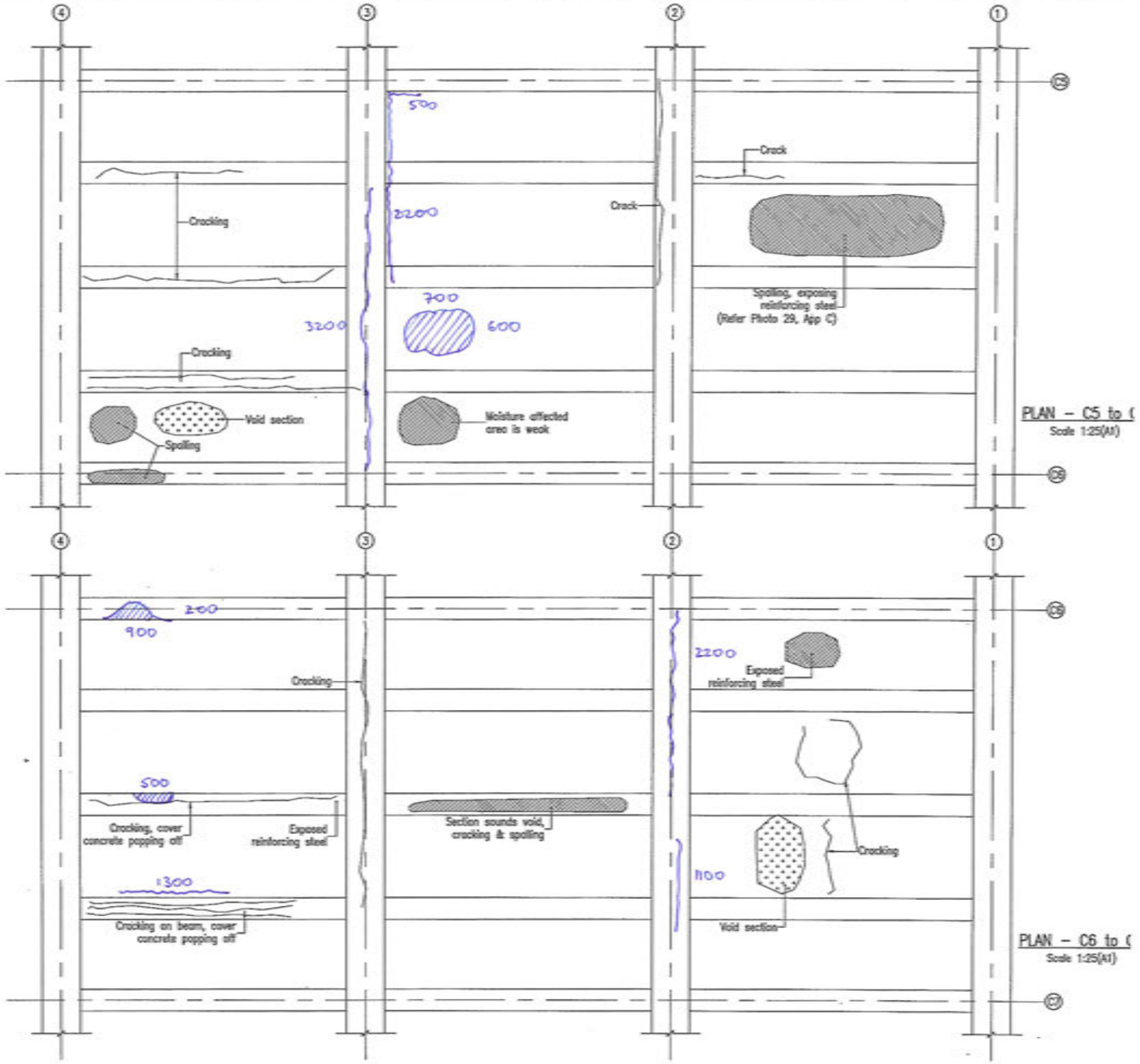
STATUS	FILE				
DRAFT	2B8081.04				
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	29	R0

GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm

300mm 200 100 50 0 10mm

28/03/2008 11:15

g:\2B8000\2B8081.04_100hc whakatane wharf\pcad\2_214_177_19-31.dwg – 2901 ORIGINAL SHEET SIZE A1 [841x594]



PLAN – C5 to C
Scale 1:25(A1)

PLAN – C6 to C
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

AMENDMENT	APP'D	DATE

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pullyn	D.Hall	March 2008
APPROVED			

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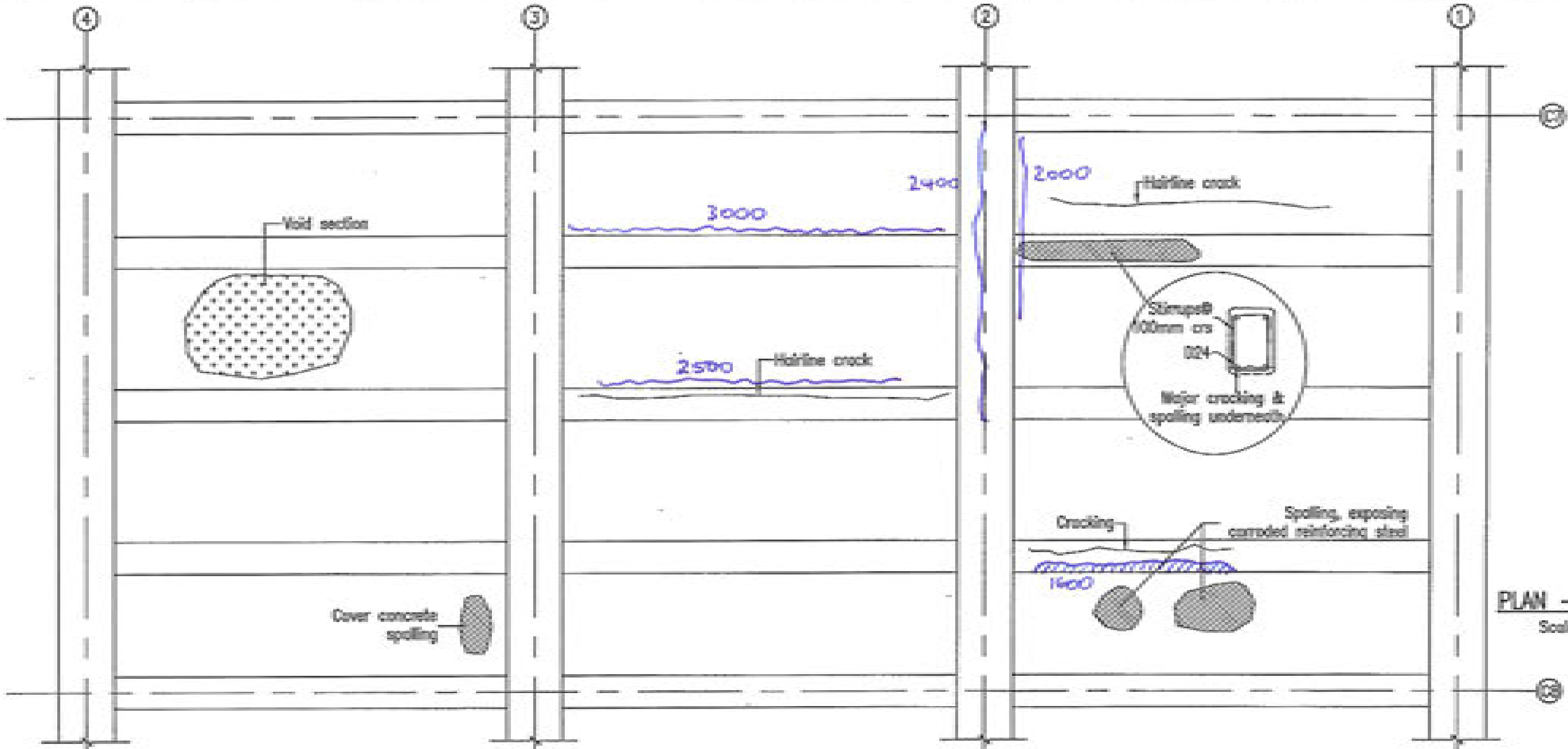
TITLE: PLAN BETWEEN GRIDS C5/C6, C6/C7
WHAKATANE WHARF : INSPECTION
WHAKATANE

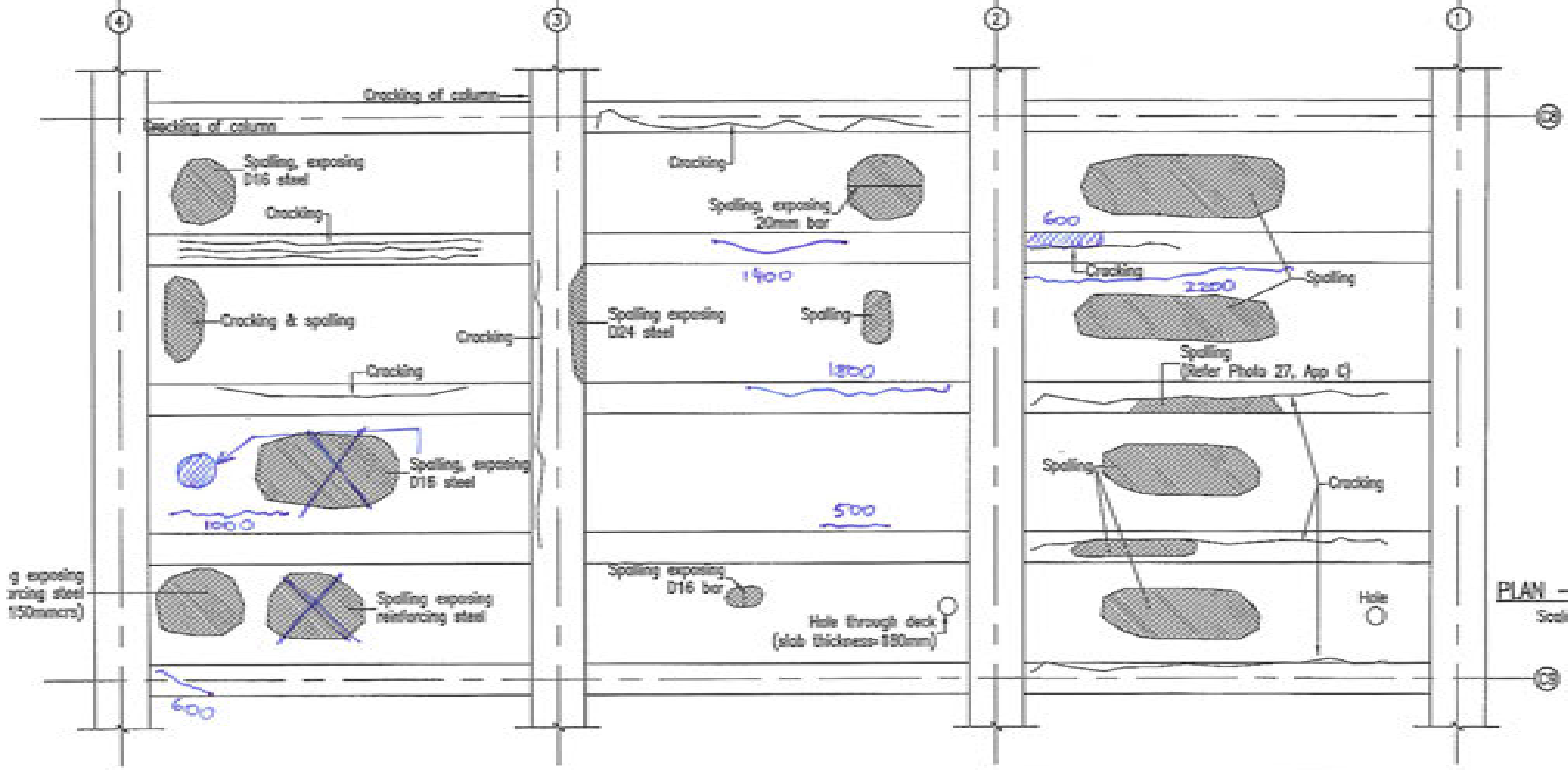
1919 SECTION
GRID ELEVATIONS C1

STATUS	DRAFT	FILE	2S8081.04			
SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	30	R0

GRAPHIC SCALES 1:25 @ A1: 0 400 800 1200 1600 2000 2400 mm



PLAN – C7 to C8
Scale 1:25(A1)



PLAN – C8 to C9
Scale 1:25(A1)

LEGEND

- Void in concrete
- Spalling of concrete
- Patch repair failure

	BY	CHECKED	DATE
DESIGN			
DRAWN	N.Pollyn	D.Nair	March 2008
APPROVED			

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WHAKATANE WHARF : INSPECTION
WHAKATANE

1919 SECTION
PLAN BETWEEN GRIDS C7/C8, C8/C9

STATUS	DRAFT	FILE	28B081.04

SCALE	PLOT DATE	FEATURE IDENTIFIER	CODE	SHEET	REVISION
AS SHOWN	14/03/08 @ 10:44	2/214/177	2204	31	R0

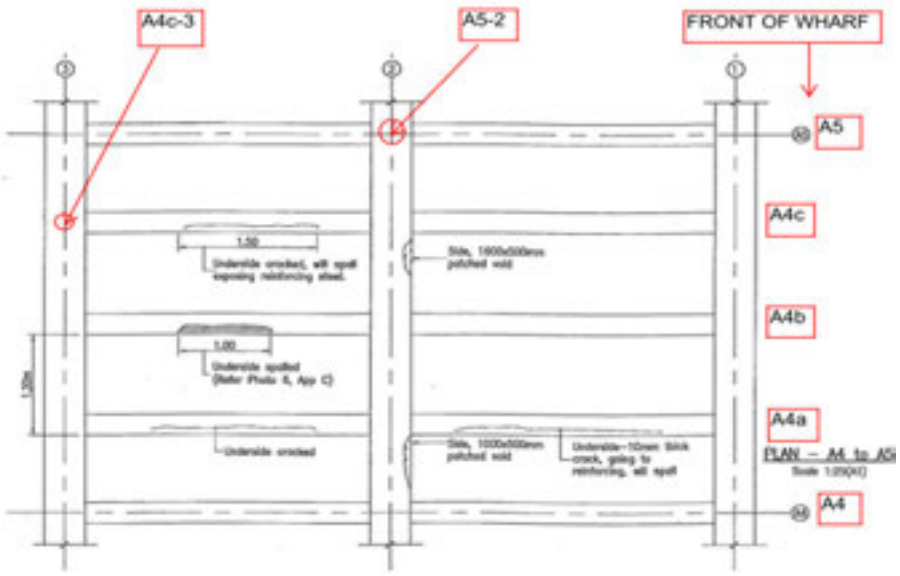
ORIGINAL SHEET SIZE A1 [840x594]

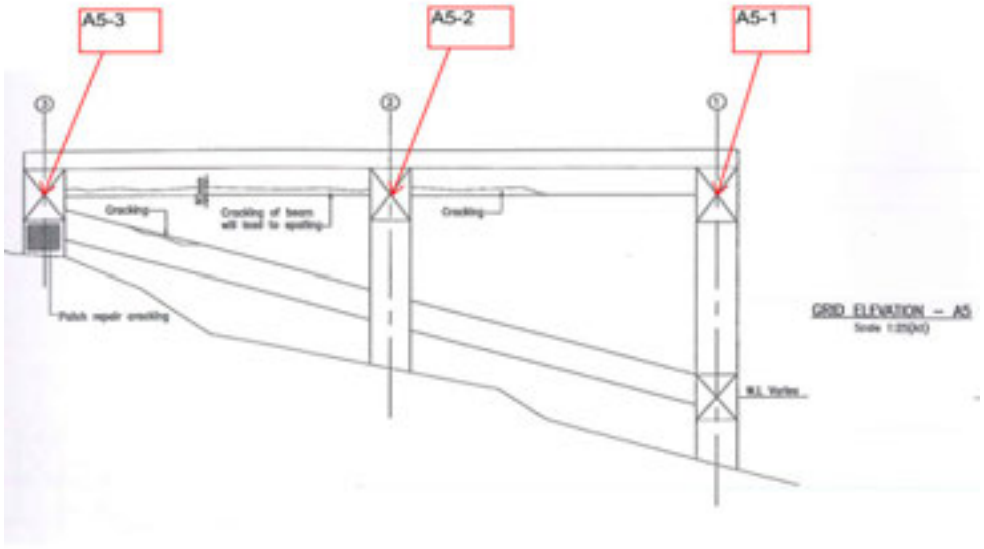
GRAPHIC SCALES 1:25 @ A1 0 400 800 1200 1600 2000 2400 mm

Appendix C: Schedule of Repair Costs

T&T Job No. 851847.0000
Wharf Condition Assessment and Repair Options Report
Appendix C - Schedule of Concrete Repairs

Member Location Key:





Inspected 5th November 2014

Concrete repair cost / m3
$ 30,000.00 $ 37,500.00

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
1936 - Bay A1-A2	Pile	A1-2		Crack	E	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Pile	A1-2		Crack	W	0.8	0.4	0.1	0.032	High	$ 960.00	$ 1,200.00
	Pile	A1-1		Crack	E	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Raking beam	A1-2	A1-3	Crack	E	1.6	0.15	0.1	0.024	Low	$ 720.00	$ 900.00
	Raking beam	A1-2	A1-3	Crack	E	0.7	0.1	0.1	0.007	Low	$ 210.00	$ 262.50
	Raking beam	A1-2	A1-3	Crack	E	0.4	0.1	0.1	0.004	Low	$ 120.00	$ 150.00
	Raking beam	A1-2	A1-3	Crack	W	1	0.1	0.1	0.01	Low	$ 300.00	$ 375.00
	Raking beam	A1-2	A1-3	Crack	T	1.4	0.1	0.1	0.014	Low	$ 420.00	$ 525.00
	Longitudinal beam	A1-2	A2-2	Crack	B	2	0	0	0	High	$ -	$ -
	Longitudinal beam	A1-2	A2-2	Crack	B	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Longitudinal beam	A1-2	A2-2	Crack	N	2.3	0.4	0.1	0.092	High	$ 2,760.00	$ 3,450.00
	Longitudinal beam	A1-2	A2-2	Void	N	0.45	0.15	0.1	0.00675	High	$ 202.50	$ 253.13
	Intermediate beam	A1a-1	A1a-2	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	A1c-1	A1c-2	Cracks, spalling	B,E,W	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Intermediate beam	A1c-2	A1c-3	Cracks	B	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Slab	A1-2	A2-3	Spalling	B	0.8	0.7	0.1	0.056	High	$ 1,680.00	$ 2,100.00
	Slab	A1-2	A2-3	Spalling	B	1.3	0.9	0.1	0.117	High	$ 3,510.00	$ 4,387.50
	Slab	A1-2	A2-3	Spalling	B	1	1	0.1	0.1	High	$ 3,000.00	$ 3,750.00
	Slab	A1-2	A2-3	Spalling	B	1	0.4	0.1	0.04	High	$ 1,200.00	$ 1,500.00
	Slab	A1-1	A2-2	Spalling	B	0.6	0.3	0.1	0.018	High	$ 540.00	$ 675.00
1936 - Bay A2-A3	Pile	A2-1		Crack	W	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	A2-2		Spalling	W	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	A2-2		Void	E	0.5	0.6	0.1	0.03	High	$ 900.00	$ 1,125.00
	Raking beam	A2-2	A2-3	Spalling	E	1	0.3	0.1	0.03	Low	$ 900.00	$ 1,125.00
	Raking beam	A2-2	A2-3	Crack	E,W	2.3	0.3	0.1	0.069	Low	$ 2,070.00	$ 2,587.50
	Transverse beam	A2-1	A2-2	Spalling	E,B	0.5	0.15	0.15	0.01125	High	$ 337.50	$ 421.88
	Transverse beam	A2-1	A2-2	Crack	B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Transverse beam	A2-2	A2-3	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Longitudinal beam	A2-2	A3-2	Spalling	B	0.5	0.2	0.1	0.01	High	$ 300.00	$ 375.00
	Longitudinal beam	A2-2	A3-2	Crack	B	1.5	0.2	0.1	0.03	High	$ 900.00	$ 1,125.00
	Longitudinal beam	A2-2	A3-2	Void	S	0.7	0.6	0.5	0.21	High	$ 6,300.00	$ 7,875.00
	Longitudinal beam	A2-2	A3-2	Void	S	0.2	0.6	0.15	0.018	High	$ 540.00	$ 675.00
	Longitudinal beam	A2-3	A3-3	Crack	B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	A2a-2	A2a-3	Void	E,W	0.8	0.2	0.3	0.048	High	$ 1,440.00	$ 1,800.00
	Intermediate beam	A2b-1	A2b-2	Crack	B	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Intermediate beam	A2b-2	A2b-3	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	A2b-2	A2b-3	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	A2b-2	A2b-3	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	A2b-2	A2b-3	Spalling	B	0.3	0.3	0.15	0.0135	High	$ 405.00	$ 506.25
	Intermediate beam	A2c-1	A2c-2	Crack	B	3	0.25	0.1	0.075	High	$ 2,250.00	$ 2,812.50
	Intermediate beam	A2c-2	A2c-3	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	A2c-2	A2c-3	Void	B	1.3	0.3	0.2	0.078	High	$ 2,340.00	$ 2,925.00
	Intermediate beam	A2c-2	A2c-3	Crack	B	1.5	0.2	0.1	0.03	High	$ 900.00	$ 1,125.00
	Intermediate beam	A2c-2	A2c-3	Void	B	1	0.18	0.3	0.054	High	$ 1,620.00	$ 2,025.00
	Slab	A2a-2	A2b-3	Spalling	B	0.8	0.5	0.1	0.04	High	$ 1,200.00	$ 1,500.00
	Slab	A2b-2	A2c-3	Spalling	B	0.9	0.9	0.1	0.081	High	$ 2,430.00	$ 3,037.50
	Slab	A2b-2	A2c-3	Void	B	0.5	0.22	0.1	0.011	High	$ 330.00	$ 412.50
	Slab	A2c-1	A3-2	Spalling	B	0.2	0.2	0.1	0.004	High	$ 120.00	$ 150.00
	Slab	A2c-1	A3-2	Spalling	B	0.4	0.3	0.1	0.012	High	$ 360.00	$ 450.00

Concrete repair cost / m3
$ 30,000.00 $ 37,500.00

Inspected 5th November 2014

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
1936 - Bay A3-A4	Pile	A3-1		Crack	S	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	A3-1		Void	W	0.6	0.27	0.1	0.0162	High	$ 486.00	$ 607.50
	Pile	A3-2		Crack	E	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Pile	A3-2		Crack	N	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Pile	A3-2		Crack	W	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Pile	A3-2		Void	W	0.57	0.33	0.1	0.01881	High	$ 564.30	$ 705.38
	Raking beam	A3-1	A3-2	Crack	E	1	0.1	0.1	0.01	Low	$ 300.00	$ 375.00
	Raking beam	A3-2	A3-3	Crack	E	0.7	0.1	0.1	0.007	Low	$ 210.00	$ 262.50
	Raking beam	A3-2	A3-3	Void	E	0.4	0.27	0.1	0.0108	Low	$ 324.00	$ 405.00
	Raking beam	A3-2	A3-3	Void	E	0.3	0.1	0.2	0.006	Low	$ 180.00	$ 225.00
	Raking beam	A3-2	A3-3	Crack	E	1.2	0.1	0.1	0.012	Low	$ 360.00	$ 450.00
	Raking beam	A3-2	A3-3	Void	E	0.9	0.35	0.1	0.0315	Low	$ 945.00	$ 1,181.25
	Transverse beam	A3-2	A3-3	Crack	E	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Transverse beam	A3-2	A3-3	Spalling	E,B,W	1.2	0.25	0.15	0.045	High	$ 1,350.00	$ 1,687.50
	Longitudinal beam	A3-1	A4-1	Void	N	0.6	0.23	0.1	0.0138	High	$ 414.00	$ 517.50
	Longitudinal beam	A3-1	A4-1	Void	B	0.3	0.15	0.1	0.0045	High	$ 135.00	$ 168.75
	Longitudinal beam	A3-1	A4-1	Void	N	0.5	0.2	0.1	0.01	High	$ 300.00	$ 375.00
	Longitudinal beam	A3-1	A4-1	Void	S	0.35	0.25	0.1	0.00875	High	$ 262.50	$ 328.13
	Longitudinal beam	A3-3	A4-3	Crack	N	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	A3a-1	A3a-2	Spalling	E,B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	A3a-2	A3a-3	Crack	E,W,B	1.8	0.25	0.1	0.045	High	$ 1,350.00	$ 1,687.50
	Intermediate beam	A3a-2	A3a-3	Spalling	W,B	0.3	0.25	0.15	0.01125	High	$ 337.50	$ 421.88
	Intermediate beam	A3a-2	A3a-3	Crack	W,B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Intermediate beam	A3b-2	A3b-3	Crack	E,W,B	1	0.25	0.1	0.025	High	$ 750.00	$ 937.50
	Intermediate beam	A3c-1	A3c-2	Crack	B	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Intermediate beam	A3c-1	A3c-2	Crack	B	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Intermediate beam	A3c-1	A3c-2	Crack	B	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Intermediate beam	A3c-1	A3c-2	Crack	B	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Intermediate beam	A3c-2	A3c-3	Spalling	B	3	0.25	0.1	0.075	High	$ 2,250.00	$ 2,812.50
1936 - Bay A4-A5	Pile	A4-2		Void	E	0.25	0.25	0.1	0.00625	High	$ 187.50	$ 234.38
	Pile	A4-2		Void	E	0.25	0.25	0.1	0.00625	High	$ 187.50	$ 234.38
	Pile	A4-2		Void	S	0.4	0.4	0.1	0.016	High	$ 480.00	$ 600.00
	Pile	A4-2		Crack	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Pile	A4-2		Crack	E	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Pile	A4-2		Crack	W	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Pile	A4-2		Crack	W	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Raking beam	A4-2	A4-3	Crack	E	1.5	0.3	0.1	0.045	Low	$ 1,350.00	$ 1,687.50
	Raking beam	A4-2	A4-3	Crack	W	1	0.1	0.1	0.01	Low	$ 300.00	$ 375.00
	Raking beam	A4-2	A4-3	Void	E	3	0.4	0.1	0.12	Low	$ 3,600.00	$ 4,500.00
	Transverse beam	A4-1	A4-2	Spalling	E	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Transverse beam	A4-2	A4-3	Crack	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Transverse beam	A4-2	A4-3	Spalling	E	1.7	0.15	0.15	0.03825	High	$ 1,147.50	$ 1,434.38
	Transverse beam	A4-2	A4-3	Crack	W	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Longitudinal beam	A4-2	A5-2	Void	N,B	1	0.5	0.1	0.05	High	$ 1,500.00	$ 1,875.00
	Longitudinal beam	A4-2	A5-2	Crack	B	1.4	0.1	0.1	0.014	High	$ 420.00	$ 525.00
	Longitudinal beam	A4-2	A5-2	Crack	B	0.45	0.1	0.1	0.0045	High	$ 135.00	$ 168.75
	Longitudinal beam	A4-2	A5-2	Void	N,B	1.6	0.5	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Longitudinal beam	A4-2	A5-2	Crack	B	0.45	0.1	0.1	0.0045	High	$ 135.00	$ 168.75
	Intermediate beam	A4a-1	A4a-2	Crack	B	2.6	0.25	0.1	0.065	High	$ 1,950.00	$ 2,437.50
	Intermediate beam	A4a-2	A4a-3	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	A4b-1	A4b-2	Crack	B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Intermediate beam	A4b-1	A4b-2	Crack	B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Intermediate beam	A4b-1	A4b-2	Crack	B	1	0.1	0.25	0.025	High	$ 750.00	$ 937.50
	Intermediate beam	A4b-2	A4b-3	Spalling	B	1	0.2	0.25	0.05	High	$ 1,500.00	$ 1,875.00
	Intermediate beam	A4c-1	A4c-2	Crack	B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Intermediate beam	A4c-1	A4c-2	Spalling	B	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Intermediate beam	A4c-2	A4c-3	Crack	B,E,W	1.8	0.25	0.1	0.045	High	$ 1,350.00	$ 1,687.50
1936 - Bay A5-A6	Pile	A5-2		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	A5-2		Spalling	E	1.1	0.1	0.3	0.033	High	$ 990.00	$ 1,237.50
	Pile	A5-3		Spalling	E	0.35	0.1	0.3	0.0105	High	$ 315.00	$ 393.75
	Pile	A5-3		Spalling	W	0.35	0.1	0.3	0.0105	High	$ 315.00	$ 393.75
	Raking beam	A5-2	A5-3	Crack	E	0.6	0.1	0.1	0.006	Low	$ 180.00	$ 225.00
	Raking beam	A5-2	A5-3	Spalling	W	1	0.1	0.3	0.03	Low	$ 900.00	$ 1,125.00
	Transverse beam	A5-1	A5-2	Crack	E,W,B	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Raking beam	A5-2	A5-3	Spalling	W	1	0.1	0.3	0.03	Low	$ 900.00	$ 1,125.00
	Transverse beam	A5-1	A5-2	Crack	E,W,B	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Transverse beam	A5-2	A5-3	Crack	E,B	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Intermediate beam	A5a-1	A5a-2	Spalling	E	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Intermediate beam	A5a-1	A5a-2	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	A5a-2	A5a-3	Crack	E,W,B	3.2	0.1	0.25	0.08	High	$ 2,400.00	$ 3,000.00
	Intermediate beam	A5b-1	A5b-2	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	A5b-2	A5b-3	Spalling	B	1.4	0.1	0.25	0.035	High	$ 1,050.00	$ 1,312.50
	Intermediate beam	A5c-1	A5c-2	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	A5c-2	A5c-3	Crack	E,W,B	2.2	0.2	0.25	0.11	High	$ 3,300.00	$ 4,125.00
	Slab	A5c-1	A6-2	Spalling	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
1936 - Bay A6-A7	Pile	A6-1		Crack	W	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	A6-2		Crack	E,W	0.9	0.1	0.4	0.036	High	$ 1,080.00	$ 1,350.00
	Pile	A6-2		Crack	S,E,N	0.8	0.1	0.4	0.032	High	$ 960.00	$ 1,200.00
	Raking beam	A6-2	A6-3	Crack	E,T	2	0.1	0.1	0.02	Low	$ 600.00	$ 750.00
	Raking beam	A6-2	A6-3	Spalling	W	1.2	0.1	0.1	0.012	Low	$ 360.00	$ 450.00
	Transverse beam	A6-1	A6-2	Spalling	E	0.3	0.15	0.15	0.00675	High	$ 202.50	$ 253.13
	Transverse beam	A6-1	A6-2	Crack	E,W,B	2.4	0.1	0.25	0.06	High	$ 1,800.00	$ 2,250.00
	Transverse beam	A6-2	A6-3	Crack	E,W	3.2	0.1	0.25	0.08	High	$ 2,400.00	$ 3,000.00
	Longitudinal beam	A6-3	A7-3	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	A6a-1	A6a-2	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	A6a-2	A6a-3	Crack	E,W	1.5	0.1	0.25	0.0375	High	$ 1,125.00	$ 1,406.25
	Intermediate beam	A6b-1	A6b-2	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	A6b-1	A6b-2	Crack	B	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Intermediate beam	A6b-2	A6b-3	Crack	E,W,B	2.5	0.1	0.25	0.0625	High	$ 1,875.00	$ 2,343.75
	Intermediate beam	A6c-1	A6c-2	Crack	E	3.2	0.3	0.1	0.096	High	$ 2,880.00	$ 3,600.00
	Intermediate beam	A6c-1	A6c-2	Crack	B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	A6c-1	A6c-2	Crack	B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	A6c-2	A6c-3	Crack	B	2.4	0.1	0.25	0.06	High	$ 1,800.00	$ 2,250.00

Concrete repair cost / m3

Inspected 5th November 2014 $ 30,000.00 $ 37,500.00

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
1936 - Bay A7-B1	Pile	A7-1		Crack	E	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Pile	A7-2		Crack	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Raking beam	A7-1	A7-2	Crack	W	1.5	0.1	0.1	0.015	Low	$ 450.00	$ 562.50
	Raking beam	A7-2	A7-3	Crack	E	1.8	0.1	0.2	0.036	Low	$ 1,080.00	$ 1,350.00
	Transverse beam	A7-2	A7-3	Crack	E	2.3	0.1	0.1	0.023	High	$ 690.00	$ 862.50
1940 - Bay B1-B2	Pile	B1-2		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B1-2		Crack	W	1	0.1	0.2	0.02	High	$ 600.00	$ 750.00
	Pile	B1-2		Crack	S	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Raking beam	B1-2	B1-3	Void	E	0.3	0.1	0.2	0.006	Low	$ 180.00	$ 225.00
	Raking beam	B1-2	B1-3	Void	W	0.2	0.1	0.2	0.004	Low	$ 120.00	$ 150.00
	Raking beam	B1-2	B1-3	Crack	W	0.7	0.1	0.1	0.007	Low	$ 210.00	$ 262.50
	Slab	B1b-1	B1c-2	Spalling	B	0.6	0.1	0.4	0.024	High	$ 720.00	$ 900.00
	Slab	B1c-2	B2-3	Spalling	B	0.6	0.1	0.4	0.024	High	$ 720.00	$ 900.00
1940 - Bay B2-B3	Pile	B2-1		Crack	S	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	B2-1		Crack	S	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	B2-2		Crack	E	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Raking beam	B2-2	B2-3	Crack	E	1	0.1	0.1	0.01	Low	$ 300.00	$ 375.00
	Raking beam	B2-2	B2-3	Crack	E	0.6	0.1	0.1	0.006	Low	$ 180.00	$ 225.00
	Transverse beam	B2-1	B2-2	Spalling	E,W	0.3	0.1	0.25	0.0075	High	$ 225.00	$ 281.25
	Longitudinal beam	B2-1	B3-1	Spalling	N	4.3	0.1	0.1	0.043	High	$ 1,290.00	$ 1,612.50
1940 - Bay B3-B4	Pile	B3-2		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B3-2		Crack	W	0.2	0.1	0.1	0.002	High	$ 60.00	$ 75.00
	Raking beam	B3-2	B3-3	Crack	T	3.4	0.1	0.3	0.102	Low	$ 3,060.00	$ 3,825.00
	Raking beam	B3-2	B3-3	Void	E	1.2	0.1	0.2	0.024	Low	$ 720.00	$ 900.00
	Raking beam	B3-2	B3-3	Crack and Void	W	2.6	0.1	0.4	0.104	Low	$ 3,120.00	$ 3,900.00
	Longitudinal beam	B3-1	B4-1	Crack	N	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Longitudinal beam	B3-3	B4-3	Crack	S	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Longitudinal beam	B3-3	B4-3	Void	S	2.4	0.1	0.15	0.036	High	$ 1,080.00	$ 1,350.00
1940 - Bay B4-B5	Pile	B4-2		Crack	W	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Pile	B4-2		Void	W	0.65	0.1	0.35	0.02275	High	$ 682.50	$ 853.13
	Raking beam	B4-2	B4-3	Void	E	1.6	0.1	0.25	0.04	Low	$ 1,200.00	$ 1,500.00
	Raking beam	B4-2	B4-3	Void	E	0.4	0.1	0.25	0.01	Low	$ 300.00	$ 375.00
	Raking beam	B4-2	B4-3	Void	B	0.8	0.1	0.3	0.024	Low	$ 720.00	$ 900.00
	Raking beam	B4-2	B4-3	Void	W	1.4	0.1	0.25	0.035	Low	$ 1,050.00	$ 1,312.50
	Longitudinal beam	B4-3	B5-3	Void	S	2	0.15	0.5	0.15	High	$ 4,500.00	$ 5,625.00
	Intermediate beam	B4a-2	B4a-3	Spalling	B	1	0.1	0.2	0.02	High	$ 600.00	$ 750.00
	Intermediate beam	B4b-2	B4b-3	Crack	B	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Intermediate beam	B4c-2	B4c-3	Void	B	3.2	0.1	0.15	0.048	High	$ 1,440.00	$ 1,800.00
	Slab	B4a-2	B4b-3	Void	B	0.2	0.1	0.2	0.004	High	$ 120.00	$ 150.00
	Slab	B4b-2	B4c-3	Void	B	0.85	0.1	0.7	0.0595	High	$ 1,785.00	$ 2,231.25
1940 - Bay B5-B6	Pile	B5-2		Crack	E,W	1.4	0.1	0.4	0.056	High	$ 1,680.00	$ 2,100.00
	Raking beam	B5-2	B5-3	Void	E	1.4	0.1	0.2	0.028	Low	$ 840.00	$ 1,050.00
	Raking beam	B5-2	B5-3	Void	W	2.4	0.1	0.2	0.048	Low	$ 1,440.00	$ 1,800.00
	Transverse beam	B5-1	B5-2	Crack	E	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Transverse beam	B5-1	B5-2	Spalling	W	0.25	0.1	0.1	0.0025	High	$ 75.00	$ 93.75
	Longitudinal beam	B5-2	B5-3	Crack	B	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Slab	B5-1	B5a-2	Spalling	B	0.3	0.1	0.15	0.0045	High	$ 135.00	$ 168.75
1940 - Bay B6-B7	Pile	B6-1		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B6-1		Crack	E	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	B6-1		Crack	W	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Pile	B6-2		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B6-2		Crack	S	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B6-2		Void	W	1	0.1	0.4	0.04	High	$ 1,200.00	$ 1,500.00
	Raking beam	B6-2	B6-3	Spalling	E	1.2	0.1	0.2	0.024	Low	$ 720.00	$ 900.00
	Pile	B6-2		Void	W	1	0.1	0.4	0.04	High	$ 1,200.00	$ 1,500.00
	Raking beam	B6-2	B6-3	Spalling	E	1.2	0.1	0.2	0.024	Low	$ 720.00	$ 900.00
	Raking beam	B6-2	B6-3	Void	E	1.3	0.1	0.35	0.0455	Low	$ 1,365.00	$ 1,706.25
	Raking beam	B6-2	B6-3	Void	W	3.4	0.1	0.35	0.119	Low	$ 3,570.00	$ 4,462.50
	Transverse beam	B6-1	B6-2	Spalling	E	0.8	0.1	0.15	0.012	High	$ 360.00	$ 450.00
	Transverse beam	B6-2	B6-3	Spalling	W	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Transverse beam	B6-1	B6-2	Spalling	B	1	0.1	0.2	0.02	High	$ 600.00	$ 750.00
	Transverse beam	B6-1	B6-2	Spalling	B	0.6	0.1	0.2	0.012	High	$ 360.00	$ 450.00
	Longitudinal beam	B6-1	B6-2	Spalling	B	0.6	0.1	0.15	0.009	High	$ 270.00	$ 337.50
	Longitudinal beam	B6-1	B6-2	Spalling	B	0.8	0.1	0.15	0.012	High	$ 360.00	$ 450.00
	Slab	B6-2	B6a-3	Crack	B	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
1940 - Bay B7-B8	Pile	B7-1		Crack	E	1.75	0.1	0.1	0.0175	High	$ 525.00	$ 656.25
	Pile	B7-1		Crack	W	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Pile	B7-1		Crack	S	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Pile	B7-2		Crack	E	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Raking beam	B7-2	B7-3	Void	E	1.4	0.1	0.2	0.028	Low	$ 840.00	$ 1,050.00
	Raking beam	B7-2	B7-3	Void	W	1.5	0.1	0.2	0.03	Low	$ 900.00	$ 1,125.00
	Raking beam	B7-2	B7-3	Crack	W	1.6	0.1	0.1	0.016	Low	$ 480.00	$ 600.00
	Transverse beam	B7-1	B7-2	Spalling	W	0.6	0.1	0.15	0.009	High	$ 270.00	$ 337.50
	Longitudinal beam	B7-3	B8-3	Spalling	S	0.75	0.1	0.2	0.015	High	$ 450.00	$ 562.50
1940 - Bay B8-B9	Pile	B8-2		Crack	E	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Pile	B8-2		Crack	W	1.7	0.1	0.1	0.017	High	$ 510.00	$ 637.50
	Raking beam	B8-2	B8-3	Crack	W	0.6	0.1	0.1	0.006	Low	$ 180.00	$ 225.00
	Raking beam	B8-2	B8-3	Crack	W	1.5	0.1	0.1	0.015	Low	$ 450.00	$ 562.50
	Raking beam	B8-2	B8-3	Void	W	1.2	0.1	0.2	0.024	Low	$ 720.00	$ 900.00

Concrete repair cost / m3 $ 30,000.00 $ 37,500.00

Inspected 5th November 2014

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
1940 - Bay B9-B10	Pile	B9-1		Crack	E	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Pile	B9-1		Crack	S	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Pile	B9-1		Spalling	W	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	B9-1		Crack	W	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Pile	B9-2		Cracks	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Pile	B9-2		Crack	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Pile	B9-2		Void	W	0.45	0.1	0.28	0.0126	High	$ 378.00	$ 472.50
	Pile	B9-2		Crack	S	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Pile	B9-3		Crack	W	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Raking beam	B9-2	B9-3	Crack	T	0.8	0.1	0.1	0.008	Low	$ 240.00	$ 300.00
1940 - Bay B10-B11	Pile	B10-2		Crack	S	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Pile	B10-2		Cracks	W	0.8	0.1	0.45	0.036	High	$ 1,080.00	$ 1,350.00
	Pile	B10-3		Crack	W	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Raking beam	B10-2	B10-3	Void	E	1.3	0.1	0.2	0.026	Low	$ 780.00	$ 975.00
	Raking beam	B10-2	B10-3	Crack	T	2.5	0.1	0.1	0.025	Low	$ 750.00	$ 937.50
	Raking beam	B10-2	B10-3	Cracks	W	1.5	0.1	0.35	0.0525	Low	$ 1,575.00	$ 1,968.75
	Longitudinal beam	B10-1	B11-1	Spalling	N	0.5	0.1	0.15	0.0075	High	$ 225.00	$ 281.25
	Longitudinal beam	B10-2	B11-2	Spalling	S	0.4	0.1	0.15	0.006	High	$ 180.00	$ 225.00
1940 - Bay B11-B12	Pile	B11-2		Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Pile	B11-2		Crack	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Pile	B11-2		Crack	W	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Raking beam	B11-2	B11-3	Crack and Spalling	E	2.6	0.1	0.1	0.026	Low	$ 780.00	$ 975.00
	Pile	B11-2		Crack	W	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Raking beam	B11-2	B11-3	Crack and Spalling	E	2.6	0.1	0.1	0.026	Low	$ 780.00	$ 975.00
	Raking beam	B11-2	B11-3	Cracks	W	2.6	0.1	0.2	0.052	Low	$ 1,560.00	$ 1,950.00
	Longitudinal beam	B11-1	B12-1	Spalling	N	0.35	0.1	0.1	0.0035	High	$ 105.00	$ 131.25
1940 - Bay B12-B13	Pile	B12-2		Void	E	0.8	0.1	0.4	0.032	High	$ 960.00	$ 1,200.00
	Pile	B12-2		Void	N	0.7	0.1	0.2	0.014	High	$ 420.00	$ 525.00
	Pile	B12-3		Void	E	0.35	0.1	0.35	0.01225	High	$ 367.50	$ 459.38
	Pile	B12-3		Crack	W	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Raking beam	B12-2	B12-3	Void	E	2.9	0.1	0.3	0.087	Low	$ 2,610.00	$ 3,262.50
	Raking beam	B12-2	B12-3	Spalling	W,T	2.1	0.1	0.15	0.0315	Low	$ 945.00	$ 1,181.25
	Longitudinal beam	B12-2	B13-2	Crack	B	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
1940 - Bay B13-B14	Pile	B13-1		Cracks	N,W	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Pile	B13-2		Crack, Void and Spalling	E	0.7	0.1	0.4	0.028	High	$ 840.00	$ 1,050.00
	Pile	B13-2		Crack and Spalling	W	0.9	0.1	0.4	0.036	High	$ 1,080.00	$ 1,350.00
	Pile	B13-2		Crack	W	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Pile	B13-3		Void	W	0.35	0.1	0.25	0.00875	High	$ 262.50	$ 328.13
	Raking beam	B13-2	B13-3	Spalling	E	2.3	0.1	0.3	0.069	Low	$ 2,070.00	$ 2,587.50
	Raking beam	B13-2	B13-3	Crack	W	1.1	0.1	0.1	0.011	Low	$ 330.00	$ 412.50
	Raking beam	B13-2	B13-3	Crack	W	0.7	0.1	0.1	0.007	Low	$ 210.00	$ 262.50
	Raking beam	B13-2	B13-3	Spalling	W	0.7	0.1	0.15	0.0105	Low	$ 315.00	$ 393.75
	Longitudinal beam	B13-2	B14-2	Spalling	S	0.8	0.1	0.15	0.012	High	$ 360.00	$ 450.00
	Slab	B13c-1	B14-2	Spalling	B	0.4	0.1	0.2	0.008	High	$ 240.00	$ 300.00
1940 - Bay B14-B15	Pile	B14-1		Crack	S	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	B14-2		Void, Crack	E	0.8	0.1	0.3	0.024	High	$ 720.00	$ 900.00
	Pile	B14-2		Void, Crack	W	1	0.1	0.45	0.045	High	$ 1,350.00	$ 1,687.50
	Pile	B14-2		Crack	W	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Raking beam	B14-2	B14-3	Void, Crack	E	1.8	0.1	0.2	0.036	Low	$ 1,080.00	$ 1,350.00
	Raking beam	B14-2	B14-3	Void	E	0.5	0.1	0.2	0.01	Low	$ 300.00	$ 375.00
	Raking beam	B14-2	B14-3	Crack	T	0.7	0.1	0.1	0.007	Low	$ 210.00	$ 262.50
	Raking beam	B14-2	B14-3	Void	W	2.5	0.1	0.25	0.0625	Low	$ 1,875.00	$ 2,343.75
	Longitudinal beam	B14-2	B15-2	Spalling	N,B	0.8	0.1	0.15	0.012	High	$ 360.00	$ 450.00
	Longitudinal beam	B14-2	B15-2	Crack	B	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Longitudinal beam	B14-3	B15-3	Void	N,B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Longitudinal beam	B14-3	B15-3	Spalling	N,B	0.8	0.1	0.2	0.016	High	$ 480.00	$ 600.00
1940 - Bay B15-C1	Pile	B15-1		Crack	E	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Pile	B15-1		Crack	S	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Pile	B15-2		Crack	E	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Pile	B15-2		Crack	S	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Pile	B15-2		Crack	W	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Raking beam	B15-2	B15-3	Crack, Void	E	1.2	0.1	0.2	0.024	Low	$ 720.00	$ 900.00
	Raking beam	B15-2	B15-3	Crack	E	1	0.1	0.1	0.01	Low	$ 300.00	$ 375.00
	Raking beam	B15-2	B15-3	Crack	W	1.8	0.1	0.1	0.018	Low	$ 540.00	$ 675.00
1919- Bay C1-C2	Raking beam	C1-2	C1-3	Crack	E	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Raking beam	C1-2	C1-3	Crack	E	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Intermediate beam	C1a-3	C1a-4	Void	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C1b-1	C1b-2	Spalling	E,B	3	0.1	0.1	0.03	High	$ 900.00	$ 1,125.00
	Intermediate beam	C1b-2	C1b-3	Void	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Intermediate beam	C1b-2	C1b-3	Void	W	1.8	0.1	0.1	0.018	High	$ 540.00	$ 675.00
	Intermediate beam	C1c-3	C1c-4	Crack	E	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Intermediate beam	C1c-3	C1c-4	Void	B	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Intermediate beam	C1c-3	C1c-4	Void	B	1.7	0.1	0.1	0.017	High	$ 510.00	$ 637.50
	Slab	C1-1	C1a-2	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Slab	C1-2	C1a-3	Spalling	B	0.4	0.1	0.2	0.008	High	$ 240.00	$ 300.00
	Slab	C1b-2	C1c-3	Spalling	B	0.3	0.1	0.2	0.006	High	$ 180.00	$ 225.00
	Slab	C1c-2	C2-3	Spalling	B	0.3	0.1	0.15	0.0045	High	$ 135.00	$ 168.75
1919- Bay C2-C3	Pile	C2-3		Crack	S	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Pile	C2-3		Cracks	S,N	0.7	0.1	0.45	0.0315	High	$ 945.00	$ 1,181.25
	Raking beam	C2-2	C2-3	Spalling	E	0.3	0.1	0.4	0.012	High	$ 360.00	$ 450.00
	Raking beam	C2-2	C2-3	Crack	E	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Raking beam	C2-2	C2-3	Crack	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Raking beam	C2-2	C2-3	Crack	W	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Transverse beam	C2-3	C2-4	Cracks, Void	E,W,B	3.3	0.2	0.15	0.099	High	$ 2,970.00	$ 3,712.50
	Intermediate beam	C2a-3	C2a-4	Void	E,W,B	3	0.25	0.1	0.075	High	$ 2,250.00	$ 2,812.50
	Intermediate beam	C2b-3	C2b-4	Void	E,W,B	3	0.25	0.1	0.075	High	$ 2,250.00	$ 2,812.50

Concrete repair cost / m3
$ 30,000.00 $ 37,500.00

Inspected 5th November 2014

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
	Intermediate beam	C2c-1	C2c-2	Spalling	B	0.5	0.2	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C2c-2	C2c-3	Spalling	B	0.6	0.15	0.1	0.009	High	$ 270.00	$ 337.50
	Intermediate beam	C2c-3	C2c-4	Spalling	B	0.7	0.25	0.1	0.0175	High	$ 525.00	$ 656.25
	Slab	C2a-2	C2b-3	Spalling	B	0.2	0.3	0.1	0.006	High	$ 180.00	$ 225.00
	Slab	C2b-3	C2c-4	Spalling	B	0.5	0.3	0.1	0.015	High	$ 450.00	$ 562.50
	Slab	C2b-3	C2c-4	Spalling	B	0.7	0.3	0.1	0.021	High	$ 630.00	$ 787.50
	Slab	C2b-3	C2c-4	Spalling	B	0.5	0.35	0.1	0.0175	High	$ 525.00	$ 656.25
	Slab	C2c-2	C3-3	Spalling	B	1.4	0.35	0.1	0.049	High	$ 1,470.00	$ 1,837.50
1919- Bay C3-C4	Pile	C3-3		Spalling	S	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Raking beam	C3-2	C3-3	Crack	E	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Raking beam	C3-2	C3-3	Void	W	1.5	0.2	0.1	0.03	High	$ 900.00	$ 1,125.00
	Transverse beam	C3-3	C3-4	Crack	E	1.3	0.1	0.1	0.013	High	$ 390.00	$ 487.50
	Transverse beam	C3-3	C3-4	Crack	B	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Transverse beam	C3-1	C3-2	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C3a-1	C3a-2	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C3a-2	C3a-3	Void	E,W,B	1.3	0.25	0.1	0.0325	High	$ 975.00	$ 1,218.75
	Intermediate beam	C3a-3	C3a-4	Void	E	2	0.1	0.1	0.02	High	$ 600.00	$ 750.00
	Intermediate beam	C3b-2	C3b-3	Crack	B	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Intermediate beam	C3b-3	C3b-4	Crack	B	1.3	0.25	0.1	0.0325	High	$ 975.00	$ 1,218.75
	Intermediate beam	C3c-3	C3c-4	Void	E,W,B	2.1	0.25	0.1	0.0525	High	$ 1,575.00	$ 1,968.75
	Slab	C3-2	C3a-3	Spalling	B	0.6	0.4	0.1	0.024	High	$ 720.00	$ 900.00
	Slab	C3-2	C3a-3	Spalling	B	1	0.3	0.1	0.03	High	$ 900.00	$ 1,125.00
	Slab	C3a-2	C3b-3	Spalling	B	2	0.5	0.1	0.1	High	$ 3,000.00	$ 3,750.00
	Slab	C3b-2	C3c-3	Spalling	B	0.4	0.4	0.1	0.016	High	$ 480.00	$ 600.00
	Slab	C3b-2	C3c-3	Spalling	B	0.7	0.4	0.1	0.028	High	$ 840.00	$ 1,050.00
	Slab	C3b-2	C3c-3	Spalling	B	0.4	0.4	0.1	0.016	High	$ 480.00	$ 600.00
	Slab	C3b-2	C3c-3	Spalling	B	0.7	0.4	0.1	0.028	High	$ 840.00	$ 1,050.00
	Slab	C3c-1	C4-2	Spalling	B	0.6	0.4	0.1	0.024	High	$ 720.00	$ 900.00
	Slab	C3c-2	C4-3	Void	B	1.1	0.4	0.1	0.044	High	$ 1,320.00	$ 1,650.00
	Slab	C3c-3	C4-4	Void	B	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
1919- Bay C4-C5	Pile	C4-3		Crack	E	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Raking beam	C4-2	C4-3	Crack	E	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Raking beam	C4-2	C4-3	Crack	W	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Transverse beam	C4-1	C4-2	Crack	W	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Transverse beam	C4-2	C4-3	Crack	B	1.3	0.1	0.1	0.013	High	$ 390.00	$ 487.50
	Transverse beam	C4-3	C4-4	Void	B	1.4	0.25	0.1	0.035	High	$ 1,050.00	$ 1,312.50
	Transverse beam	C4-3	C4-4	Crack	W	0.8	0.1	0.1	0.008	High	$ 240.00	$ 300.00
	Longitudinal beam	C4-2	C5-2	Crack	B	4.5	0.1	0.1	0.045	High	$ 1,350.00	$ 1,687.50
	Intermediate beam	C4a-1	C4a-2	Spalling	B	2.1	0.1	0.1	0.021	High	$ 630.00	$ 787.50
	Intermediate beam	C4b-3	C4b-4	Crack	B	1.4	0.1	0.1	0.014	High	$ 420.00	$ 525.00
	Intermediate beam	C4c-3	C4c-4	Crack	B	1.8	0.1	0.1	0.018	High	$ 540.00	$ 675.00
	Slab	C4-1	C4a-2	Spalling	B	0.2	0.1	0.1	0.002	High	$ 60.00	$ 75.00
	Slab	C4-1	C4a-2	Spalling	B	0.2	0.1	0.1	0.002	High	$ 60.00	$ 75.00
	Slab	C4-2	C4a-3	Spalling	B	0.6	0.25	0.1	0.015	High	$ 450.00	$ 562.50
	Slab	C4-2	C4a-3	Spalling	B	0.6	0.3	0.1	0.018	High	$ 540.00	$ 675.00
	Slab	C4-3	C4a-4	Void	B	1.4	0.15	0.1	0.021	High	$ 630.00	$ 787.50
	Slab	C4a-1	C4b-2	Spalling	B	0.2	0.1	0.1	0.002	High	$ 60.00	$ 75.00
	Slab	C4a-1	C4b-2	Crack	B	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Slab	C4a-2	C4b-3	Spalling	B	0.3	0.2	0.1	0.006	High	$ 180.00	$ 225.00
	Slab	C4b-1	C4c-2	Spalling	B	2	0.75	0.1	0.15	High	$ 4,500.00	$ 5,625.00
	Slab	C4c-1	C5-2	Spalling	B	1.7	0.75	0.1	0.1275	High	$ 3,825.00	$ 4,781.25
1919- Bay C5-C6	Pile	C5-2		Crack	E,S	0.5	0.4	0.1	0.02	High	$ 600.00	$ 750.00
	Pile	C5-4		Spalling	N	0.3	0.3	0.1	0.009	High	$ 270.00	$ 337.50
	Raking beam	C5-1	C5-2	Crack	W	1.7	0.1	0.1	0.017	High	$ 510.00	$ 637.50
	Raking beam	C5-2	C5-3	Crack	T	2.8	0.1	0.1	0.028	High	$ 840.00	$ 1,050.00
	Raking beam	C5-2	C5-3	Crack	E	1.5	0.1	0.1	0.015	High	$ 450.00	$ 562.50
	Raking beam	C5-2	C5-3	Crack	W	3	0.1	0.1	0.03	High	$ 900.00	$ 1,125.00
	Transverse beam	C5-3	C5-4	Crack	E	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Transverse beam	C5-3	C5-4	Crack	B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Longitudinal beam	C5-2	C6-2	Crack	B	2.4	0.1	0.1	0.024	High	$ 720.00	$ 900.00
	Longitudinal beam	C5-3	C6-3	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	C5a-1	C5a-2	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C5a-3	C5a-4	Crack	B	1.7	0.1	0.1	0.017	High	$ 510.00	$ 637.50
	Intermediate beam	C5b-3	C5b-4	Crack	B	2.9	0.1	0.1	0.029	High	$ 870.00	$ 1,087.50
	Intermediate beam	C5c-3	C5c-4	Cracks	B	3.2	0.25	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Slab	C5-2	C5b-3	Crack	B	2.7	0.1	0.1	0.027	High	$ 810.00	$ 1,012.50
	Slab	C5a-1	C5b-2	Spalling	B	2.2	0.7	0.1	0.154	High	$ 4,620.00	$ 5,775.00
	Slab	C5b-2	C5c-3	Spalling	B	0.7	0.6	0.1	0.042	High	$ 1,260.00	$ 1,575.00
	Slab	C5c-2	C6-3	Spalling	B	0.7	0.6	0.1	0.042	High	$ 1,260.00	$ 1,575.00
	Slab	C5c-3	C6-4	Spalling	B	0.7	0.4	0.1	0.028	High	$ 840.00	$ 1,050.00
	Slab	C5c-3	C6-4	Spalling	B	0.5	0.4	0.1	0.02	High	$ 600.00	$ 750.00
1919- Bay C6-C7	Pile	C6-3		Crack	E	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	C6-3		Void	W	1.1	0.3	0.1	0.033	High	$ 990.00	$ 1,237.50
	Raking beam	C6-2	C6-3	Void	E	2	0.2	0.3	0.12	High	$ 3,600.00	$ 4,500.00
	Raking beam	C6-2	C6-3	Spalling	W	1.3	0.15	0.3	0.0585	High	$ 1,755.00	$ 2,193.75
	Transverse beam	C6-1	C6-2	Crack	E	2.4	0.1	0.1	0.024	High	$ 720.00	$ 900.00
	Transverse beam	C6-1	C6-2	Crack	W	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Transverse beam	C6-3	C6-4	Cracking, Spalling	E	2.9	0.2	0.3	0.174	High	$ 5,220.00	$ 6,525.00
	Transverse beam	C6-3	C6-4	Void, Spalling	W	2.1	0.25	0.1	0.0525	High	$ 1,575.00	$ 1,968.75
	Transverse beam	C6-3	C6-4	Spalling	B	0.9	0.1	0.2	0.018	High	$ 540.00	$ 675.00
	Longitudinal beam	C6-2	C7-2	Crack	B	2.2	0.1	0.1	0.022	High	$ 660.00	$ 825.00
	Longitudinal beam	C6-2	C7-2	Crack	B	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Longitudinal beam	C6-3	C7-3	Crack	B	3.2	0.1	0.1	0.032	High	$ 960.00	$ 1,200.00
	Intermediate beam	C6b-2	C6b-3	Spalling	B	2.5	0.1	0.1	0.025	High	$ 750.00	$ 937.50
	Intermediate beam	C6b-3	C6b-4	Crack	B	2.8	0.1	0.1	0.028	High	$ 840.00	$ 1,050.00
	Intermediate beam	C6b-3	C6b-4	Spalling	B	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Intermediate beam	C6c-3	C6c-4	Crack	B	2.3	0.25	0.1	0.0575	High	$ 1,725.00	$ 2,156.25
	Slab	C6-1	C6a-2	Spalling	B	0.6	0.4	0.1	0.024	High	$ 720.00	$ 900.00
	Slab	C6a-1	C6b-2	Crack	B	2.3	0.1	0.1	0.023	High	$ 690.00	$ 862.50
	Slab	C6b-1	C6c-2	Crack	B	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Slab	C6b-1	C6c-2	Void	B	0.9	0.55	0.1	0.0495	High	$ 1,485.00	$ 1,856.25
	Slab	C6b-3	C6c-4	Crack	B	1.3	0.1	0.1	0.013	High	$ 390.00	$ 487.50

Concrete repair cost / m3 $ 30,000.00 $ 37,500.00

Inspected 5th November 2014

Concrete repairs required

Section	Member description	Member location		Defect	Defect Location (North, South, East, West, Top, Bottom faces)	Repair dimensions estimate (assumes break out repair with sprayed concrete)					Estimated Costs	
		Start	Finish			Length (m)	Width (m)	Depth (m)	Volume (m3)	Priority	Baseline cost	Sensitivity
1919- Bay C7-C8	Pile	C7-1		Spalling	E	0.8	0.15	0.1	0.012	High	$ 360.00	$ 450.00
	Pile	C7-3		Crack	W	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Raking beam	C7-2	C7-3	Void	E	0.3	0.2	0.1	0.006	High	$ 180.00	$ 225.00
	Raking beam	C7-2	C7-3	Void	W	1.5	0.2	0.1	0.03	High	$ 900.00	$ 1,125.00
	Raking beam	C7-2	C7-3	Crack	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Transverse beam	C7-3	C7-4	Crack	E	1.1	0.1	0.1	0.011	High	$ 330.00	$ 412.50
	Longitudinal beam	C7-2	C8-2	Crack	B	2.4	0.1	0.1	0.024	High	$ 720.00	$ 900.00
	Intermediate beam	C7a-1	C7a-2	Spalling	B	1.4	0.15	0.1	0.021	High	$ 630.00	$ 787.50
	Intermediate beam	C7b-2	C7b-3	Crack	B	2.9	0.1	0.1	0.029	High	$ 870.00	$ 1,087.50
	Intermediate beam	C7c-1	C7c-2	Crack	B	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Intermediate beam	C7c-1	C7c-2	Spalling	B	1.6	0.1	0.1	0.016	High	$ 480.00	$ 600.00
	Slab	C7-1	C7a-2	Crack	B	2	0.1	0.1	0.02	High	$ 600.00	$ 750.00
	Slab	C7-2	C7a-3	Crack	B	3	0.1	0.1	0.03	High	$ 900.00	$ 1,125.00
	Slab	C7-1	C7b-2	Crack	B	2	0.1	0.1	0.02	High	$ 600.00	$ 750.00
	Slab	C7a-2	C7b-3	Crack	B	2.5	0.1	0.1	0.025	High	$ 750.00	$ 937.50
	Slab	C7c-1	C8-2	Spalling	B	0.35	0.35	0.1	0.01225	High	$ 367.50	$ 459.38
	Slab	C7c-1	C8-2	Spalling	B	0.7	0.35	0.1	0.0245	High	$ 735.00	$ 918.75
	Slab	C7c-3	C8-4	Spalling	B	0.45	0.5	0.1	0.0225	High	$ 675.00	$ 843.75
1919- Bay C8-C9	Pile	C8-2		Spalling	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Pile	C8-3		Crack	E	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Pile	C8-3		Spalling	W	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Pile	C8-4		Crack	E	0.4	0.1	0.1	0.004	High	$ 120.00	$ 150.00
	Pile	C8-4		Cracks	E,W	0.9	0.1	0.1	0.009	High	$ 270.00	$ 337.50
	Raking beam	C8-2	C8-3	Spalling	E	2.5	0.3	0.1	0.075	High	$ 2,250.00	$ 2,812.50
	Raking beam	C8-2	C8-3	Spalling	W	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Raking beam	C8-2	C8-3	Crack	W	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Transverse beam	C8-2	C8-3	Crack	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Transverse beam	C8-2	C8-3	Crack	E	0.3	0.1	0.1	0.003	High	$ 90.00	$ 112.50
	Transverse beam	C8-2	C8-3	Crack	E,B	3	0.3	0.1	0.09	High	$ 2,700.00	$ 3,375.00
	Transverse beam	C8-3	C8-4	Crack	E	2.8	0.1	0.1	0.028	High	$ 840.00	$ 1,050.00
	Longitudinal beam	C8-3	C9-3	Crack	N,B	2.3	0.1	0.1	0.023	High	$ 690.00	$ 862.50
	Longitudinal beam	C8-3	C9-3	Spalling	S,B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Intermediate beam	C8a-1	C8a-2	Spalling	B	0.6	0.1	0.1	0.006	High	$ 180.00	$ 225.00
	Intermediate beam	C8a-1	C8a-2	Crack	B	1.2	0.1	0.1	0.012	High	$ 360.00	$ 450.00
	Intermediate beam	C8a-2	C8a-3	Crack	B	1.4	0.1	0.1	0.014	High	$ 420.00	$ 525.00
	Intermediate beam	C8a-3	C8a-4	Cracks	B	2.5	0.25	0.1	0.0625	High	$ 1,875.00	$ 2,343.75
	Intermediate beam	C8b-1	C8b-2	Crack	B	3	0.1	0.1	0.03	High	$ 900.00	$ 1,125.00
	Intermediate beam	C8b-1	C8b-2	Spalling	B	1.2	0.25	0.1	0.03	High	$ 900.00	$ 1,125.00
	Intermediate beam	C8b-2	C8b-3	Crack	B	1.8	0.1	0.1	0.018	High	$ 540.00	$ 675.00
	Intermediate beam	C8b-3	C8b-4	Crack	B	2	0.1	0.1	0.02	High	$ 600.00	$ 750.00
	Intermediate beam	C8c-1	C8b-2	Crack	B	2.8	0.1	0.1	0.028	High	$ 840.00	$ 1,050.00
	Intermediate beam	C8c-1	C8b-2	Spalling	B	1	0.15	0.1	0.015	High	$ 450.00	$ 562.50
	Slab	C8-1	C8a-2	Spalling	B	1.6	0.5	0.1	0.08	High	$ 2,400.00	$ 3,000.00
	Slab	C8-2	C8a-3	Spalling	B	0.6	0.6	0.1	0.036	High	$ 1,080.00	$ 1,350.00
	Slab	C8-3	C8a-4	Spalling	B	0.5	0.5	0.1	0.025	High	$ 750.00	$ 937.50
	Slab	C8a-1	C8b-2	Crack	B	2.2	0.1	0.1	0.022	High	$ 660.00	$ 825.00
	Slab	C8a-1	C8b-2	Spalling	B	1.6	0.35	0.1	0.056	High	$ 1,680.00	$ 2,100.00
	Slab	C8a-2	C8b-3	Spalling	B	0.2	0.45	0.1	0.009	High	$ 270.00	$ 337.50
	Slab	C8a-3	C8b-4	Cracking & Spalling	B	0.3	0.37	0.1	0.0111	High	$ 333.00	$ 416.25
	Slab	C8b-1	C8b-2	Spalling	B	1.2	0.4	0.1	0.048	High	$ 1,440.00	$ 1,800.00
	Slab	C8b-2	C8b-3	Crack	B	0.5	0.1	0.1	0.005	High	$ 150.00	$ 187.50
	Slab	C8b-3	C8b-4	Spalling	B	0.3	0.3	0.1	0.009	High	$ 270.00	$ 337.50
	Slab	C8b-3	C8b-4	Crack	B	1	0.1	0.1	0.01	High	$ 300.00	$ 375.00
	Slab	C8c-1	C9-2	Spalling	B	1.2	0.4	0.1	0.048	High	$ 1,440.00	$ 1,800.00
	Slab	C8c-2	C9-3	Spalling	B	0.3	0.15	0.1	0.0045	High	$ 135.00	$ 168.75
	Slab	C8c-3	C9-4	Spalling	B	0.7	0.5	0.1	0.035	High	$ 1,050.00	$ 1,312.50
1919- Bay C9	Pile	C9-4		Crack	E	0.7	0.1	0.1	0.007	High	$ 210.00	$ 262.50
	Raking beam	C9-2	C9-3	Spalling	E	1.4	0.25	0.1	0.035	High	$ 1,050.00	$ 1,312.50
	Transverse beam	C9-2	C9-3	Crack	E	2.2	0.1	0.1	0.022	High	$ 660.00	$ 825.00
	Transverse beam	C9-3	C9-4	Void	E	1.2	0.35	0.1	0.042	High	$ 1,260.00	$ 1,575.00
	Transverse beam	C9-3	C9-4	Spalling	W	0.3	0.3	0.1	0.009	High	$ 270.00	$ 337.50
									TOTAL		**$336,189.30**	**$420,236.63**
									Repair volume (2009-2014 defects)	2.12 m3		
									Repair volume (pre-2009 defects)	9.08 m3		
									Total repair volume	**11.21 m3**		

		Base value	Sensitivity
Total high priority repairs		$280,455.30	$350,569.13
Allow for reinforcing steel replacement (Provisional estimate)		$40,000.00	$50,000.00
P&G	30%	$96,136.59	$120,170.74
plus waterproof membrane		$190,000.00	$310,000.00
Contingency	50%	$303,295.95	$415,369.93
Total (High priority)		**$909,887.84**	**$1,246,109.79**
Total low priority repairs		$55,734.00	$69,667.50
Allow for reinforcing steel replacement (Provisional estimate)		$10,000.00	$15,000.00
P&G	30%	$19,720.20	$25,400.25
Contingency	50%	$42,727.10	$55,033.88
Total (Low priority)		**$128,181.30**	**$165,101.63**
Total all repair		$336,189.30	$420,236.63
Allow for reinforcing steel replacement (Provisional estimate)		$50,000.00	$65,000.00
P&G	30%	$115,856.79	$145,570.99
plus waterproof membrane		$190,000.00	$310,000.00
Contingency	50%	$346,023.05	$470,403.81
Total		**$1,038,069.14**	**$1,411,211.42**