Structural Inspection

at

Southport Pier
Promenade
Southport
PR8 1QX

for

Sefton Metropolitan Borough Council
Magdalen House
Trinity Road
Bootle
L20 3NJ

Contract No: LV1255
Dated: April 2023

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Issue	Description	Date	Originator	Approved
01	First Issue for Comment	18/05/23	AJJ	IJB
02	Second Issue for Comment	05/06/23	AJJ	IJB
03	Final Issue	05/06/23	AJJ	IJB
04	Updated Final Issue	15/08/23	AJJ	IJB
05	Revised following Client comments	11/09/23	AJJ	IJB

Whilst every effort has been made to fully inspect those parts of the building requested of us, no permanent or secured fixtures and fittings will have been removed. We will not have inspected woodwork or other parts of the structure which were covered, unexposed or inaccessible, and we are therefore unable to report that any such part of the property is free from defect.

Thomason Partnership Limited certify that they have carried out the work contained herein with due care and diligence to their best belief and knowledge based on the time and information available.
This report is made on behalf of Thomason Partnership Limited. By receiving it and acting on it, the client – or any third party relying on it – accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

THOMASONS

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1.0 INTRODUCTION

1.1 Thomasons was instructed by Sefton Metropolitan Borough Council to undertake a visual inspection of Southport pier. The inspection was to be broken down to two elements, the first included the timber decking and supporting timber joists. The second element was to inspect isolated sections of the supporting steel frame underneath, this frame consists of a mix of cast iron and steelwork members.

1.2 The purpose of this report is to summarise the condition of the timber decking and supporting joists and advise if the pier could be opened to the public for the summer season or a time thereafter and make recommendations for remedial works, if or where appropriate. This was a visual assessment of the deck conditions following numerous insurance related claims from members of the public due to deck boards collapsing below. This report is to advise on the potential lifespan of the existing timbers with the likelihood of achieving a 20-year remaining lifespan, and where this is not possible, recommend any measures that would be required to achieve this or advice on the longevity in its current condition.

1.3 The pier was closed following a visual inspection by Thomasons, Davies Maintenance and Sefton Council to assess the extent of the current loose and visually damaged condition of the decking – Thomasons opinion was that due to the extent of the visual condition they could not provide assurances that further damage or injury to the public could be prevented and recommend the pier is closed to the public until a full inspection of deck and supporting structure was implemented and all remedial works had been addressed.

1.4 We confirm that representatives of Thomasons attended site from 22nd February 2023 to start a non-intrusive investigation of the existing timber forming the deck of the pier.

1.5 Southport Pier is a Grade II listed structure originally opened in 1860. The pier has undergone significant changes due to damage and fires over the years and was fully refurbished over a four-year period from 1998. The pier originally had a steam train running along the south side edge of the deck. During the refurbishment, the rails were moved to the centre of the deck to allow the running of a new electric tram along the full length of the pier, and the deck widened to one side.

The tram has since been decommissioned (2017), but the surface running train has continued in use since its introduction following the extensive 2002 refurbishment works. In December 2022, the structure was closed to the public for health and safety concerns relating to the condition of the timber decking.

1.6 Documentation provided prior to the survey included a topographical survey carried out by Formby Surveys, Sefton Council drawings dated October 2021 relating to a former Phase 1 of the deck replacement scheme carried out previously, and a timber condition report produced by BM TRADA dated July 2022. These documents and drawings are included in the Appendices.

1.7 A full inspection of the deck boards was carried out from above and below, and the joists also surveyed from below with ladder and MEWP access. Greater detail was recorded during the inspection of the first half of the pier, and the seaward section of the pier just had a visual inspection carried out above and below. Thomasons were assisted with access by Davies Maintenance.

2.0 OBSERVATIONS

Photograph 1 - Aerial image of Southport Pier (Google maps)

2.1 Along the pier, there are a number of overhead light frames that are numbered, see photograph 2, in co-ordination with Formby Surveys topographical survey. Thomasons commenced the survey adjacent to light frame 2, which was noted as the extent of the Phase 1 deck refurbishment.

Photograph 2 – Indicating light frame numbers (No. 4 shown)

2.2 The initial inspection of the pier deck determined the record drawings received to be incorrect. Sefton Council were aware of these errors and these corrections made within the as-built information on completion of the further phase of works, as these showed the end of the currently refurbished decking being approximately 50m closer to the start of the pier. This delineation was highlighted by the position of the temporary hoarding that had been erected, to restrict public access. The extent of the investigation was carried out using the topographical survey as a reference for our notes and co-ordination with reference points on site.

2.3 This deck report covers:

- The timber deck boards between Light Frame 2 up to the bridge crossing Marine Drive
- The decking boards on the bridge
- The timber joists from the bridge back to the Leisure Park entrance
- The joists on the underside of the entrance to the pier
- The deck and joists from bridge to the pier head

2.4 Photograph 3 indicates the orientation of the decking boards along the pier. This is the typical configuration, except at the entrance to the pier and at the pier head due to the widening of the deck. At the pier entrance the boards have been replaced as part of a previous phase of works and the rails removed. Based on the typical layout of the pier, descriptions for locations and positions are: the pier head to the west, the pier entrance to the east, and the sides of the deck labelled north and south respectively.

Photograph 3 – View along pier looking west towards the sea.

2.5 Reviewing the deck boarding, the referencing was split across the pier into three sections, north, south, and central boards. The north and south sections run longitudinally along the pier, and the central boards span perpendicular across the pier. The longitudinal boards span between timber joists, and the central boards span between noggins at joist edges and the timber rail supports. Refer to typical section in figure 1 below.

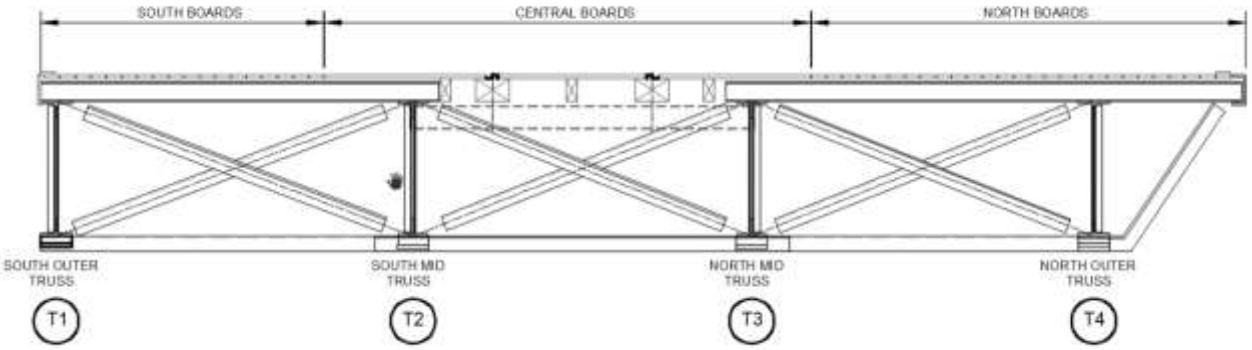
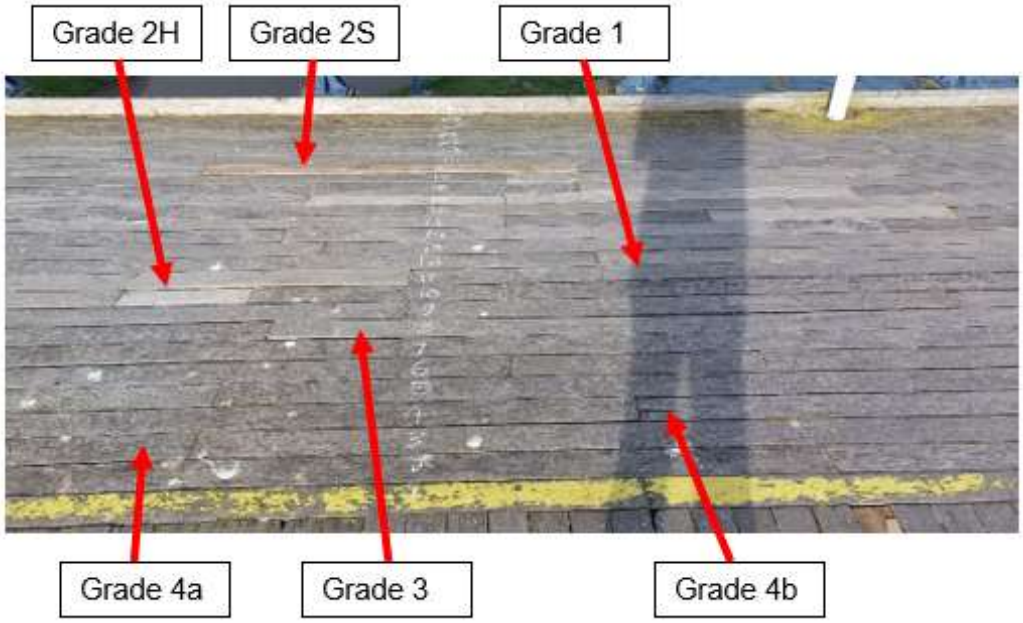


Figure 1 – Typical section through deck

2.6 As part of the survey the decking boards were numbered across all three sections, so that any defects detected could be accurately recorded, site records/notes are included in Appendix A. These were co-ordinated with the overhead light frames that are present along the pier. During the inspection, boards were classified using the following grading criteria:

1. Good condition
2. Previously replaced boards (recorded as Softwood (S – assumed to be temporary) or Hardwood (H)
3. Loose Board
4. Damaged Board (sub-split into minor (a) and major (b) damage)
5. Board needs replacing



Photograph 4 – Typical examples of board grading criteria.

2.6 Replaced boards had additional notation added to indicate if the timber was softwood or hardwood. Where softwood was present, it was noted that the boards were bending under applied pressure when stood on. Some of the replaced boards were also thinner than the original boards creating uneven trip hazards for members of the public walking along the deck.

2.7 Damage to the boards was split into minor and major damage. Minor damage included small cracks, missing screws and chips in the timber. Major damage included large cracks and significant loss of section in timber that had no ability to be fixed down. Extensive areas of damage led to labelling the member as requiring replacement. Additional boards that were labelled to be replaced was due to severe cracks and could break if members of the public stepped on them.

2.8 Along the pier there are four shop units that are built on extended sections of the pier. These are located at approximately quarter points along the pier.

The shops at the equivalent quarter and three-quarter points were originally sheltered seating and in the last 10 years have been converted into the current shop units, this was determined from historical photos and Google historical street views. The pier head has a relatively new structure that houses a shop and amusement arcade and projects/extends out over the beach.

2.9 Central Section:

2.10 The three sections of central boards span perpendicular either side of the existing tram rails, as shown in figure 2 below. To the underside of each rail is an oak beam, the boards span between these on the central section, and between the beams and noggins to the outer edge of the section. The noggins are fixed between the joists supporting the north and south decking boards.

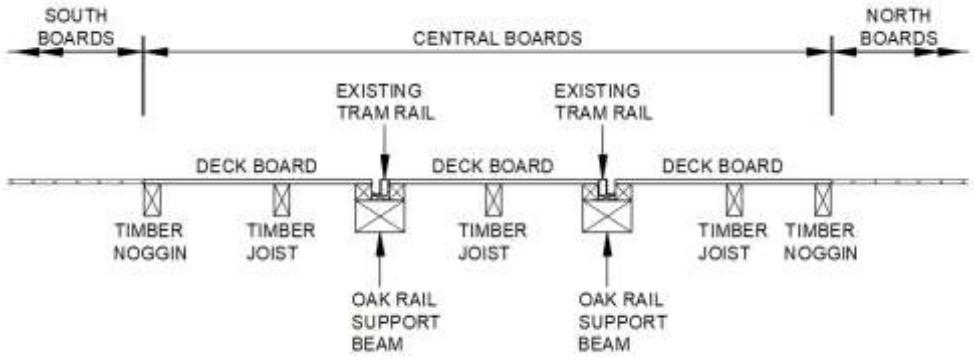


Figure 2 – Central board supports.

2.11 It could be seen at the noggin ends of the boards, that to the top of the joists in the north and south sections of the pier that moss or vegetation is forming on the top of the joists causing the central deck boards at these locations to displace by being pushed upwards. This is creating inverted vee's over the joists, or solitary raised boards, this is highlighted in photograph 5 and figure 3 below. This issue is creating trip hazards along the pier, due to the uneven surface. Where this occurs, and any additional trip hazards, their location was added to the notes taken.

Photograph 5 – Indicating the inverted “vee” caused by movement of boards.

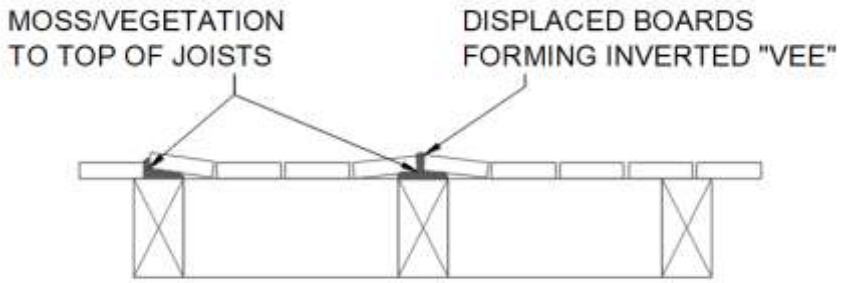


Figure 3 – Detail showing displacement of boards.

2.12 A typical observation along the deck was the moss growing on or between the boards occurred mostly over the land-based section rather than the seaward side. Some examples of the moss and fungi present between the boards can be seen in photographs 6 and 7 below.

Photograph 6 – Evidence of vegetation/moss growing in board joints.

Photograph 7 – Evidence of vegetation/fungi growing in board joints.

2.13 Boards that have been replaced previously were also noted. From the photograph below, the replacement boards are lighter than the original boards, and the variation in colour highlights if the boards are unweathered softwood (brown – assumed to be temporary) or hardwood (grey).

Photograph 8 – Highlighting boards that have previously been replaced in the centre section.

2.14 The outer edges of the central boards show evidence of movement in the noggins to the underside. This movement has likely been caused by the train that runs up and down the surface of the pier. Since the train doesn't require rails, it can use the full width of the deck. The noggins to the underside have deteriorated along the pier loosening any fixings, therefore the wheels from the train will gradually push them down. This has caused the decking boards to become loose, forming an uneven surface, and created trip hazards between adjacent decking sections. This is evidenced in photograph 9 below and highlighted by figure 4. It has been advised that the current road train weighs 9.81kN (1000kg) and the passenger carriages when fully loaded weigh up to 11.28kN (1150kg), both running on four wheels with an axle width of 1220mm. Appendix B includes calculations that indicates the maximum loading a typical 6"x3" joist can withstand has been determined to be 2No. max point loads of 2.84kN (290kg), when spaced 1.22m apart along the span of a joist, this capacity is greater than the force imposed by the Road Train engine, 2.45kN (250kg) and the passenger carriage 2.82kN (287.5kg).

2.15 Some of the boards adjacent to the rails show evidence of crushing of the board edges, this is likely to have been caused by the original tram wheels overhanging the rails.

Photograph 9 – Highlighting movement in timber noggins to underside of centre section.

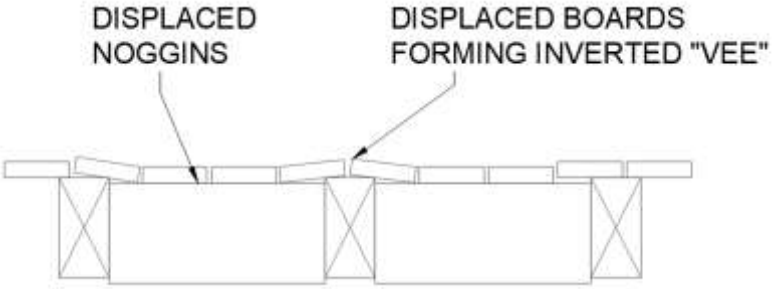


Figure 4 – Detail showing displacement of noggins.

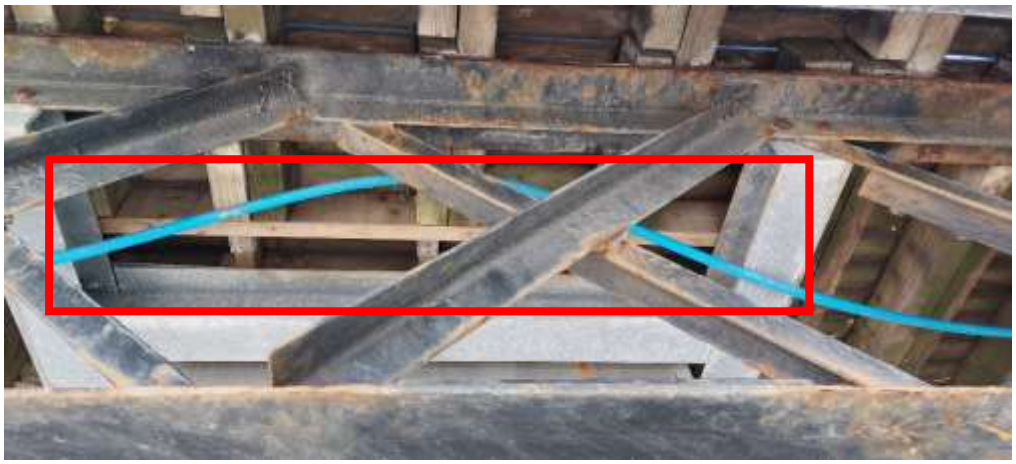
2.16 North and South Sections:

2.17 Inspection of the longitudinal boards found any damage present was typically at the board ends. Any damage along the board was found located at a natural defect in the board, such as knots or the orientation of the wood grain. These defects have allowed water ingress, and due to exposure to the elements, a constant saturation and drying out process will cause cracking at these natural defect locations. This will also have been aided by the constant pressure applied by pedestrian footfall and the train. There is evidence of uneven decking boards due to loose or missing screw fixings, and where insufficient repairs have been carried out.

Photograph 10 – North (shown near side above) boards indicating damage at ends or fixing points.

Photograph 11 – South boards indicating damage at fixing points.

2.18 At the first shop unit, a rectangular section of decking has been cut away to allow the installation of mechanical plant to the underside of the deck. When the decking has been replaced, smaller section joists have been utilised, these can be seen through the boards and in photograph 12. There is a lot of movement under foot of the decking timbers when walking across.



Photograph 12 – View on smaller replacement joists (highlighted) to underside of cut-out outside second shop.

2.19 When reviewing the boards above the area on photograph 12 the decking boards are dipping, as seen in photograph 13, and have settled at the edges creating a trip hazard to members of the public. There is also a similarly cut section to the front of the second unit along the pier, seen in photograph 14. It is understood these modifications leading to the cause of the dipping is due to alterations undertaken for Mechanical and Electrical installation works in 2017.

Photograph 13 – Decking cut out and replaced outside first shop.

Photograph 14 – Decking cut out and replaced outside second shop unit.

2.20 Additionally, across the front of the first unit, there is also a section of decking boards that do not match the adjacent boards, these were likely installed when the shop had some refurbishment works carried out mid 2010's. It was noted that some of these boards are loose likely due to continuous footfall in and out of the shop.

2.21 Around the perimeter of the first and third shop units the decking forms a walkway around and there are seats backing onto the side and rear walls. This arrangement is a carryover from the original sheltered seating that were in these locations up until the reconfiguration/refurbishment of the shelters added shop units.

2.22 When viewed from the underside, the floor of the first and second shop units have been formed using precast concrete planks supported off the steel/iron frame below. Originally the first shop unit had a timber floor construction, as seen in some historical photographs, and would appear to have been replaced during the installation of the shop units, it is assumed that the floor construction under the second unit was similarly constructed.

2.23 As a general note, along the pier numerous boards have been replaced in the central and side sections. This has been to repair general wear and tear of the decking and where members of the public have had boards break whilst walking over them.

Photograph 15 – Highlighting boards that have previously been replaced in the north section.

Photograph 16 – Indicating some replacement boards and dropped noggins to the south side of the deck.

2.24 Bridge Deck over Marine Drive:

2.25 Access onto the bridge is via gates on the eastern side of the bridge. Due to the construction of the bridge, the trusses spanning over Marine Drive create walkways along the sides of the bridge, see photograph 17 below, the central section utilised for the train tracks to cross the bridge. The deck boards over the bridge are short span members, similar to the central section of the rest of the pier, and all five sections span perpendicular to the span of the bridge.

Photograph 17 – View looking East over Marine Drive Bridge

2.26 Due to the narrower width of the pier across the road bridge and the single route for the train the decking in this area is more concentrated than other open, wider areas of the pier. Whilst the original train utilised the existing rails, the wheels wouldn't have transferred any load onto the deck boards, since the train now runs along the top of the deck, a travelling load is now applied to the boards. This loading will not have been allowed for as part of the original design and will have caused a more detrimental effect on the boards, causing bouncing, which has lifted fixings and loosened boards.

2.27 Timber Joists:

2.28 Inspection of the timber joists was focussed on two areas, the first was to the underside of the pier entrance adjacent to the amusement hall, and the second was adjacent to the bridge over Marine Drive back to the entrance car park to the leisure park access road.

2.29 During the inspection of the timber joists, it should be noted that the weather was wet and cold. Due to the moss on the surface of the joists retaining water, some small defects may not have been noted.

2.30 Area 1 – Underside of Pier adjacent to Marine Drive:

2.31 Timber joists to the underside of the decking are tanalised softwood timber, and span between steel trusses on the south side of the deck, and between the steel trusses and a channel section along the cantilevering deck edge on the north side. Photograph 18 below indicates the typical layout of the joists and noggins in relation to the pier steelwork trusses.

Noggins are typically located over the steel trusses. Additional noggins have been installed between the joists to support the outer edges of the central decking boards. In the cantilevered section of the north deck, there is a line of noggins set back approximately 300mm from the edge member.

Photograph 18 – Indicating typical joist and noggin configuration to underside of deck.

2.32 Fixing of noggins was with skewed nails through the ends of the noggins into the joists. Where the noggins sat between joists and steel beams, the noggins were seated into the web of the beam, and skew nailed into the joist at the opposite end. The skew nail fixing is not a controllable structural fixing, penetration depths and edge and spacing distances are erratic and can cause failure in the supported and supporting members which is generally observed throughout the deck.

Photograph 19 – Indicating fixing of noggins over steel trusses.

2.33 Some of the damage seen in the timber can be seen in photographs 20 and 21 below. Some minor cracking along the sides of the joists are natural splits within the grain where the timber has dried out, this is seen in photograph 20. Other splits in the timber are damage caused by the nails when fixing the noggins to the joist, see photograph 21, and caused shear failures in locations.

Photograph 20 – example of cracking along sides of joists.

Photograph 21 – example of splitting in joist at fixing location.

2.34 A large amount of moss, vegetation and fungi was present on the deck underside, this is evidenced in photograph 22. In some areas there were ferns growing in the joints of the joists and boards.

Photograph 22 – example of vegetation and moss present on timber.

2.35 Photograph 23 below shows an example of a makeshift repair to the deck underside, using untreated timber as a replacement noggin. The fixing at the ends of the timber has caused it to split, and in order to provide a new fixing to the decking boards, numerous screws have been installed to the boards. This repair work is suitable for a short term/temporary repair, but long term will have a detrimental effect on the adjacent timber work. The screws are too long for the timber and have penetrated the underside, this creates a point of ingress for water. As noted in paragraph 2.32 the skew nail fixing is not a controllable structural fixing, penetration depths and edge and spacing distances are erratic and can cause failure in the supported and supporting members which is generally observed throughout the deck.

Photograph 23 – example of makeshift replacement noggin.

2.36 Some of the repairs along the deck appear to have been carried out using the incorrect timber. The incorrect timber has been used for the noggins and also the deck boards that have been replaced at various locations along the pier.

2.37 Area 2 – Underside of Pier Entrance:

2.38 The layout of the deck at the pier entrance from the remainder of the pier due to the widening of the south section of the deck. This wider section has the decking boards spanning perpendicular across the joists, which are supported off the pier steelwork. This area of the pier has had the decking boards replaced as part of an earlier phase of refurbishment works.

2.39 Initial inspection from ground level looking up at the underside of the pier noted some timber joists had been replaced previously and could be distinguished by their colouring, as indicated in photograph 24 below. Upon closer inspection, these were noted to be softwood timber and appeared to be untreated.

Photograph 24 – Indicating typical steelwork and joist configuration to pier entrance.

2.40 Noggins to the underside of the deck in this area are typically full depth timber and have been wedged between the joists with no physical fixing noted. Photograph 25 below indicates that the noggins to the right-hand side have dropped, and this detail occurs frequently at noggin positions. At the start of the pier, the decking boards span over the joists, and do not rely on the noggins for support, this happens on the main span of the deck and will be discussed later in this report.

Photograph 25 – Indicating displacement of noggins between joists.

2.41 Along the eastern edge of the pier where it butts up to the rear of the chip shop above, there is a section of timber decking that hasn't been replaced as part of the phase 1 of the refurbishment works. This is indicated in photographs 26 and 27 below. The joists to this section also appear to have been left in place. This is likely due to the original ticket office located on the deck above. From our observations on site, it was noted that the deck replacement works had been carried out around the perimeter of the ticket office walls above the deck, and the respective joists below have been left untouched.

Photograph 26 – highlighted area of decking boards not replaced during Phase 1 works.

Photograph 27 – highlighted area of decking boards not replaced during Phase 1 works.

2.42 Around the base of the ticket office located over this section of pier decking the timber is rotten. The area of rot present, and seen in photograph 28, appears to have grown to include to the supporting timbers below, and has started to affect the adjacent replaced timbers due to the excess retention of moisture at interfaces, this was observed and noted in the BM Trada reports of 2017 and 2022, Sections 6.0 & 7.0, during which time the estimated number of boards affected grew from 1% to 6%, this has further increase and is verified in Section 3 below.

Photograph 28 – view on base of original ticket office indicating decay of timbers.

2.43 Due to the DPM laid over the existing timber joists the new timber decking appears to be holding moisture for longer than the unsupported section of board as can be seen in photograph 29 below. This will affect, and reduce, the life span of the new decking in the whole southern triangular section of the deck adjacent to the ticket office above due to the retention of this excessive moisture.

Photograph 29 – Indicating example of moisture retention found at the support of new timber decking supported off existing timbers.

3.0 CONCLUSIONS

3.1 Thomasons conclude that the majority of the damage could be seen within the central section, this is the general area the current passenger tram/train is known to travel and probably the cause of the observed more extensive damage and the failure of the nominal fixings supporting the noggins. The outer sections have damaged boards but not in the same concentration, albeit with localised areas of replacement boards and a number of loose boards. Please note – The above is relative to the deck, noggins and joists – the percentage tables are for the deck boards only – combining the boards and the joists/noggins the central section has the majority of the damage.

3.2 As the road train is able to travel anywhere within the width of the pier an assessment of the supporting timber joists was undertaken and the calculations presented in Appendix B demonstrate that the fully loaded advised weight of the road trains passenger carriage is within 1% of the capacity of the supporting joists under Load Case Scenario 2 and therefore suitable to be used on the pier.

3.3 As noted, the main area of concern was the central section due to the high number of loose/damaged boards noted, and the amount of boards that require replacing. The damage to this central section of boards is typically minor; compressed edges, minor splits in timber at fixing positions and screws loose or missing. Where there is significant damage, whilst it may not necessarily immediately fail, due to the age of the timber the deterioration will exponentially quicken to the point of failure as has occured in the areas of replaced boarding to date

3.4 As a general note, along the pier numerous boards have been replaced in the central and side sections. This has been to repair general wear and tear of the decking and where members of the public have had boards break whilst walking over them. It should be noted that the design life of the timber decking is approximately 25-30 years based on Ekki hardwood and a similar life span for the tanalised softwood joists. Based on the timescale of the previous replacement scheme, approximately 2000, the timbers are coming to the end of their design life and even more severe defects will start to arise.

3.5 Some of the recent repairs carried out have used unsuitable timber for the conditions and constant use required, of which some replacement members are untreated softwood, and there is deflection underfoot as pressure is applied. The softwood will also absorb and retain moisture, and as they dry out cracking is likely to occur which would weaken the timber further.

This type of repair is detrimental to the surrounding hardwood timbers as due to the form of construction a greater load will be passed to the adjacent stronger timbers than the original design intent intended.

3.6 It was noted at the location of the handrail standards along the pier, the joists have been doubled up at these locations. This was to allow the bolting of a flitch plate between them to provide some overturning restraint caused by the handrail. At some locations, these handrail standards clashed with the location of the trusses/frame underneath and an alternative fixing to the edge channel member was used instead. Any replacement of the timber joists underneath will need to keep the same fixing detail to ensure the stability of the handrail standards is maintained.

3.7 Review of damage to the timber:

3.8 The damage to the boards is classified as follows -

- Category 1: Trip hazard due to 'popped' / lifting boards.
- Category 2: Previously replaced.
- Category 3: Loose.
- Category 4: Major damage.
- Category 5: Require immediate replacement.

3.9 The deck assessment has been further sub-divided into three areas as viewed from the pier entrance – South, Central and North sections. Assessment of the boards on the bridge over Marine Drive was sub-divided into five areas: South, South-Central, Central, North-Central and North.

3.10 North and South Sections:

3.11 Currently we've surveyed and recorded damage to 4995 of the longitudinal side boards with the following number and percentage falling into each of the categories:-

- Category 1: 31No. (0.6%)
- Category 2: 356No. (7.1%)
- Category 3: 390No. (7.8%)
- Category 4: 1556No. (31.2%)
- Category 5: 425No. (8.5%)

3.12 Total number of damaged boards needing remedial works: 2402 boards (48.1% of total longitudinal side boards).

3.13 Based on the surveyed plan area of 1734m^2 for this section of deck, remediation required for 834m^2.

3.14 Central Section

3.15 Currently we've surveyed and recorded damage to 10,830 of the central boards with the following number and percentage falling into each of the categories –

- Category 1: 933No. (8.6%)
- Category 2: 308No. (2.8%)
- Category 3: 1653No. (15.3%)
- Category 4: 1701No. (15.7%)
- Category 5: 247No. (8.6%)

3.16 Total number of damaged boards needing remedial works: 4534 boards (41.9% of total central section boards).

3.17 Based on the surveyed plan area of 1237m^2 for this section of deck, remediation required for 518m^2.

3.18 Bridge Section

3.19 Currently we've surveyed and recorded damage to 975 of the bridge boards with the following number and percentage falling into each of the categories –

- Category 1: 21No. (2.2%)
- Category 2: 8No. (0.8%)
- Category 3: 49No. (5.0%)
- Category 4: 295No. (30.3%)
- Category 5: 39No. (4.0%)

3.20 Total number of damaged boards needing remedial works: 412 boards (41.5% of total bridge deck boards).

3.21 Based on the plan area of 142m^2 for this section of deck, remediation required for 59m^2.

3.22 The edges of the central decking boards area are supported at the outer edges off noggins spanning between the joists. Inspection of the noggins underneath determined that a large number of them are not physically fixed. Some of these noggins are displacing to and from the required position with the only fixings provided by the three or four boards fixed to the top of them that are bending over the middle board supports.

3.23 Alternatively, where noggins have dropped, this is due to ongoing pressure applied to the deck surface that has gradually pushed the noggin down. These problems with the noggins are causing loose boards and additional trip hazards along the pier.

3.24 There are on average 20 - 25 loose noggins per bay as noted over the surveyed area, this would account for 240–300 noggins which require some form of mechanical fixing, this combined with additional deck fixings would address some of the issues of the Category 1 and 3 board works above.

3.25 As previously discussed, the joists are treated softwood and have a life span expectation in the coastal environment of between 25-35 years and are therefore nearing that time – if the decking was to be replaced without replacing the joists, then lifting the decking and replacing the joists would be required within the next 3-7 years, therefore it is impractical to retain the joist if the deck is being replaced.

4.0 RECOMMENDATIONS

4.1 Thomasons recommend due to the large and widespread locations where remedial works are required to make the decking safe to walk on, that the pier is kept closed to the public until the remedial works or replacement work can be carried out.

4.2 Thomasons are aware there is now a programme in place for the replacement of the timber joists and decking boards, to the pier which, aligns with the remaining lifespan of the current timbers on site, and that these works need to be programmed to suit repairs to the steel structure elements noted in a separate report.

4.3 Thomasons further recommend that as part of the future of the pier the use of the train or its path along the pier should be strictly limited, or even excluded, to prevent future issues. As a minimum, consideration of any timber replacement/strengthening works need to take due cognisance of the vehicle imposed loadings and design the timbers accordingly or if like for like replacement is to be undertaken strict weight and location limits are imposed and strictly monitored.

4.4 Following any remediation or replacement of timbers on the pier, Thomasons recommend an appropriate maintenance plan be set up to ensure the deck is maintained regularly and removal of any organic growth, moss etc, is maintained to prevent areas of constant saturation to reduce the likelihood of similar damage to the boards re-occurring.

APPENDIX A

Thomasons drawings and site records of deck inspection indicating damage.

APPENDIX B

Typical Timber Joist Check

APPENDIX C

Formby Surveys Topographical Survey dated August 2022

APPENDIX D

Sefton Council Phase 1 Deck replacement drawings dated October 2021

APPENDIX E

2021 BM Trada Timber Condition Report dated July 2022