



**PROFESSIONAL STRUCTURAL CONDITION ASSESSMENT -
(STRUCT – PROF)**

OF

THE TUNNEL UNDER MRCC DOVER

AT

LANGDON BATTERY, DOVER

OCTOBER 2015

ISSUE 01

For:

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Prepared By:

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TASK REF – STRUCT - PROF

PROFESSIONAL APPRAISAL

OF

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Prepared on behalf of Mitie Facilities Management by:
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Site Appraisal and Report by:

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Reviewed by:

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1.0 INTRODUCTION

ASSET INSPECTED	:	Tunnel Under MRCC Dover
ASSET NUMBER	:	T.B.C.
DATE OF INSPECTION	:	15 October 2015
WEATHER CONDITIONS	:	Dry with occasional cloud

- 1.1 M.R.C.C. Dover is located on Langdon Cliffs approximately 1km northeast of Dover Harbour and overlooks the eastern arm of the harbour. The tunnel originally formed part of Langdon Battery providing access an observation point. The tunnel is currently unused.
- 1.2 The Tunnel was inspected by Peter Grills and Graham Quigley of High - Tech Services Ltd., Chartered Engineering Surveyors and Consulting Engineers on behalf of Mitie Facilities Management.
- 1.3 The inspection is a professional structural appraisal and is based on Task STRUCT - PROF for D.I.0 (Works) Specification, issue 2013. This report gives the results of the inspection and provides a professional structural appraisal of the tunnel. The last building survey was undertaken in December 2010 by Parsons Brinckerhoff. There were no record drawings available to review as part of this appraisal. The tunnel does not fall within any specific category of Schedule A requiring appraisals however the Occupiers Liability Act does require the provision of the a safe working place (H&SAWA) and therefore the requirement has been categorised under 1a) – Assets where there is a statutory requirement for professional structural surveys. This should be confirmed by the client.
- 1.4 The tunnel was constructed as part of the Langdon Battery in 1904 leading from a disused Victorian Magazine under the M.R.C.C. to a WW11 observation point. The tunnel has been closed with brickwork at the southeast end preventing access to the observation point. The responsibility for access, inspection and maintenance of this section of the tunnel is unknown and has not been included in this report.
- 1.5 The report is based on a visual inspection of both the external and internal features, and as such no intrusive investigation was carried out and no samples of materials were extracted for laboratory testing.
- 1.6 No breaking out or opening up was carried out to expose any structural elements and therefore does not relate any defects that were obscured, buried or otherwise hidden at the time of the site appraisal.
- 1.7 Photographs were recorded to show the general nature of the construction of the tunnel together with any significant defects and are enclosed in Annex A.
- 1.8 This report details any actual or suspected structural deficiencies found during the appraisal and makes recommendations for action, including the requirement for a further survey or investigation, if required, of the more complex defects.
- 1.9 This report must not be construed to include anything other than the items referred to within it.

2.0 HISTORY & ASSET DESCRIPTION

- 2.1 Langdon Battery, overlooking the eastern arm of Dover Harbour was constructed at the start of the 20th Century to be the most powerful of the gun batteries protecting the harbour. It was designed as an 'Examination Battery' for Dover Harbour that was, when shipping approached the harbour in times of war would have to lay in the channel until entry had been approved.
- 2.2 The Second World War Observation Post for Landon Battery was sited on the cliff top and was joined to the Battery by the tunnel which leads from the old Victorian magazines. It is understood that a short length of the tunnel can still be accessed inside the Observation Post but the main length is now only accessible from inside the Coastguard station with an escape hatch provided, which leads from the tunnel through a chamber at the point he tunnel has been closed with brickwork.
- 2.3 During the 1970's the site of the Langdon Battery was chosen for the Coastguard station which was constructed over the Victorian brick magazines, one of which forms the entrance to the tunnel.
- 2.4 Access to the tunnel is via a pedestrian door which is closed and locked when not in use.
- 2.5 The access door opens to an arched brickwork lined, approach which is 1,100mm wide x 1,600mm to the spring point and 2,700mm long. The arch of the approach is constructed of 2 brick rings with an intrados of 500mm to the barrel. The brickwork is of stretcher bond with lime mortar pointing to the joints of the side walls and replacement cement mortar to the barrel. The approach construction is likely to form part of the original tunnel construction.
- 2.6 From the approach the tunnel is 74,000mm long and has been formed by cutting through the chalk and flint layers with tool marks evident along its length. The tunnel base falls approximately 5,700mm over its length in what appears to be a steady gradient and it is assumed that the contours of the ground above fall to a lesser gradient.
- 2.7 There are two intermediate sections of brickwork lining along the length of the tunnel which are of similar construction as the approach however these appear to have been constructed around the late 1930's with sand and cement mortar and pointing and have been referenced Lining Section 1 and Lining Section 2 for the purposes of this report. There is one lining section at 17,000mm which is 6,000mm long and a further lining section at 38,000mm which is 20,000mm long and are assumed to have been constructed to provide safe and stable areas under what may have been fissured or weak layers of chalk. The remaining lengths of the tunnel between are of exposed chalk and flint layers.
- 2.8 The tunnel has been closed by a brick wall at approximately 74,000mm length with a brickwork chamber formed with 2 flights of reinforced concrete roof and steps which lead to the escape hatch which is currently not operational. The wall prevents access to the remaining section of the original tunnel.
- 2.9 The base of the tunnel is of crushed stone which forms a firm base and it is assumed that the lining walls are constructed off this material.
- 2.10 Lighting is provided along the full length of the tunnel by a series of surface mounted luminaries and conduit that are fitted at high level along one side of the wall.

3.0 CONDITION AND RECOMMENDATIONS

- 3.1 The Tunnel would appear to be structurally stable with no evidence of significant movement, cracking or structural distress. However, there are a number of maintenance related defects that were noted during the inspection, and are listed below:

Brickwork Lined Approach (2,700mm length)

- 3.2 The brickwork side walls are of English bond and constructed with clay bricks and lime mortar pointing to the joints. The side walls are generally in satisfactory condition with no evidence of significant cracking or movement.
- 3.3 The barrel has been constructed in stretcher bond and pointed with sand and cement. The joints of the barrel are saturated with calcite deposits evident which imply that the water ingress has been occurring over a long period. The brickwork of the barrel remains stable.
- 3.4 The lighting conduit is corroding at the interface with the wall.

Recommendations

- 3.5 The sand and cement pointing to the joints of the barrel appear to be replacement mortar which was presumably placed to prevent the water ingress however this would not be effective and will contribute to the degradation of the brick arrises over time. The pointing should be replaced with a lime based mix which will not prevent water ingress but will assist with preferential evaporation through the joints and reduce the degradation of the brickwork.
This work should be undertaken within 2 years of the date of this report at an estimated cost of £1,500.00 excluding V.A.T.

Chalk Tunnel Between Approach and Lining Section No. 1 (17,000mm length)

- 3.6 The tunnel face is of exposed chalk with layers of flint which appears to contain high levels of iron that is evident by its colour. The tooling marks are also evident in the chalk at some locations.
- 3.7 The surface of the chalk is stable but loose in some locations of the formed barrel, which is evident by the small fallen fragments of chalk.
- 3.8 There are embedded steel or iron support plates and conduit clips that have been mortared in position which are corroding but appear to have no impact on the surface condition of the chalk tunnel.

Recommendations

- 3.9 The surface of the chalk barrel should be carefully and lightly de-scaled to remove all loose and detached chalk.
This work should be undertaken within 3 years of the date of this report and supervised by a Chartered Professional Engineer or Geologist at an estimated cost of £1,500.00 to £2,000.00 excluding V.A.T.

Brickwork Lining Section No. 1 (6,000mm length)

- 3.10 The brickwork side walls are of English bond and the barrel is of Stretcher bond and is constructed with clay bricks and sand / cement pointing to the joints. The side walls are generally in satisfactory condition with no evidence of significant cracking or movement and there is no evidence of significant water ingress. The brickwork appears to be of later construction than the approach.

CONDITION AND RECOMMENDATIONS (Cont)

Recommendations

- 3.11 The brickwork and sand cement joints appear to be in satisfactory condition and requires no maintenance or intervention at present.

Chalk Tunnel Between Lining Section No. 1 and 2 (15,000mm length)

- 3.12 The tunnel face is of exposed chalk with layers of flint and the tooling marks are also evident in the chalk at some locations.
- 3.13 The surface of the chalk is stable but loose in some locations of the formed barrel, which is evident by the small fallen fragments of chalk. There are also roots from vegetation above which are penetrating the barrel and should be treated to prevent further detachment of the chalk
- 3.14 There are embedded conduit clips that have been mortared in position which are corroding but appear to have no impact on the surface condition of the chalk tunnel.

Recommendations

- 3.15 The surface of the chalk barrel should be carefully and lightly de-scaled to remove all loose and detached chalk. The vegetation over should be treated to prevent further root growth.
This work should be undertaken within 1 year of the date of this report and supervised by a Chartered Professional Engineer or Geologist at an estimated cost of £2,500.00 to £3,500.00 excluding V.A.T.

Brickwork Lining Section No. 2 (20,000mm Length)

- 3.16 The brickwork side walls are of English bond and the barrel is of Stretcher bond and is constructed with clay bricks and sand / cement pointing to the joints. The side walls are generally in satisfactory condition with no evidence of significant cracking or movement and there is no evidence of significant water ingress. The brickwork appears to be of later construction than the approach.
- 3.17 There are embedded steel or iron support plates and conduit clips that have been mortared in position which are corroding but appear to have no impact on the surface condition of the brickwork at present.

Recommendations

- 3.18 The brickwork and sand cement joints appear to be in satisfactory condition and requires no maintenance or intervention at present.

Chalk Tunnel Between Lining Section No. 2 and Tunnel End (11,000mm length)

- 3.19 The tunnel face is of exposed chalk with layers of flint.
- 3.20 The surface of the chalk is stable but loose in some locations of the formed barrel, which is evident by the small fallen fragments of chalk.

Recommendations

- 3.21 The surface of the chalk barrel should be carefully and lightly de-scaled to remove all loose and detached chalk.
This work should be undertaken within 3 years of the date of this report and supervised by a Chartered Professional Engineer or Geologist at an estimated cost of £1,500.00 to £2,000.00 excluding V.A.T.

CONDITION AND RECOMMENDATIONS (Cont)

Tunnel End and Escape Chamber

- 3.22 The tunnel end and escape chamber is of English bond and is constructed with clay bricks and sand / cement pointing to the joints. The roof has been formed by cast insitu reinforced concrete which incorporates two flights of reinforced concrete steps leading to the steel escape hatch which has been cast into a reinforced concrete surround. The walls are generally in reasonable condition however there is evidence of spalling above the concrete steps.
- 3.23 The steel door frame leading to the escape chamber is severely corroded.
- 3.24 There is significant corrosion to the underside of the escape hatch which is inoperable.
- 3.25 There are considerable amounts of condensation on the underside of the reinforced concrete slab which is likely to be due to the effects of cold bridging.

Recommendations

- 3.26 The brickwork and sand cement joints appear to be in reasonable condition but the area is generally damp and would benefit from ventilation being provided in the end wall and the corroding steel door frame should be removed.
This work should be undertaken within 3 years of the date of this report at an estimate cost of £750.00 excluding V.A.T.

Escape Hatch

- 3.27 The escape hatch is inoperable due to the effects of corrosion but provided the only alternative means of escape in the event of a tunnel collapse.

Recommendations

- 3.28 The escape hatch should be regularly maintained and no person should enter the tunnels for maintenance purposes or any other reason unless the hatch can be demonstrated as being operable and should be kept open for the period the tunnel is occupied.
This work should be undertaken as soon as possible at an estimated cost of £1,000.00 excluding V.A.T.

General Maintenance

- 3.29 The tunnel is currently unused but it is assumed that the lighting is inspected and maintained on a regular basis which should continue.

Future Inspection and Reports

- 3.30 It is recommended that a log is maintained by all personnel entering the tunnel to provide a facility for reporting defects and recording maintenance.
- 3.31 It is also recommended that a professional appraisal is undertaken on a 3 yearly basis.

ANNEX A
PHOTOGRAPHIC RECORD



Photograph 1 – Entrance Door to Tunnel



Photograph 2 – View of Tunnel length from Approach



Photograph 3 – Brickwork with Lime Mortar Pointing



Photograph 4 – Chalk with Flint



Photograph 5 – Tool Marks In Chalk



Photograph 6 – 2 Ring Arch Construction Forming Intermediate Brick lining Sections



Photograph 7 – Roots from Vegetation Above Growing Though Barrel of Chalk



Photograph 8 – Fallen Chalk form Barrel



Photograph 9 – End Wall and Escape Chamber



Photograph 10 – Corroding Steel Door Frame



Photograph 11 – Spalling Brickwork Above Concrete Steps

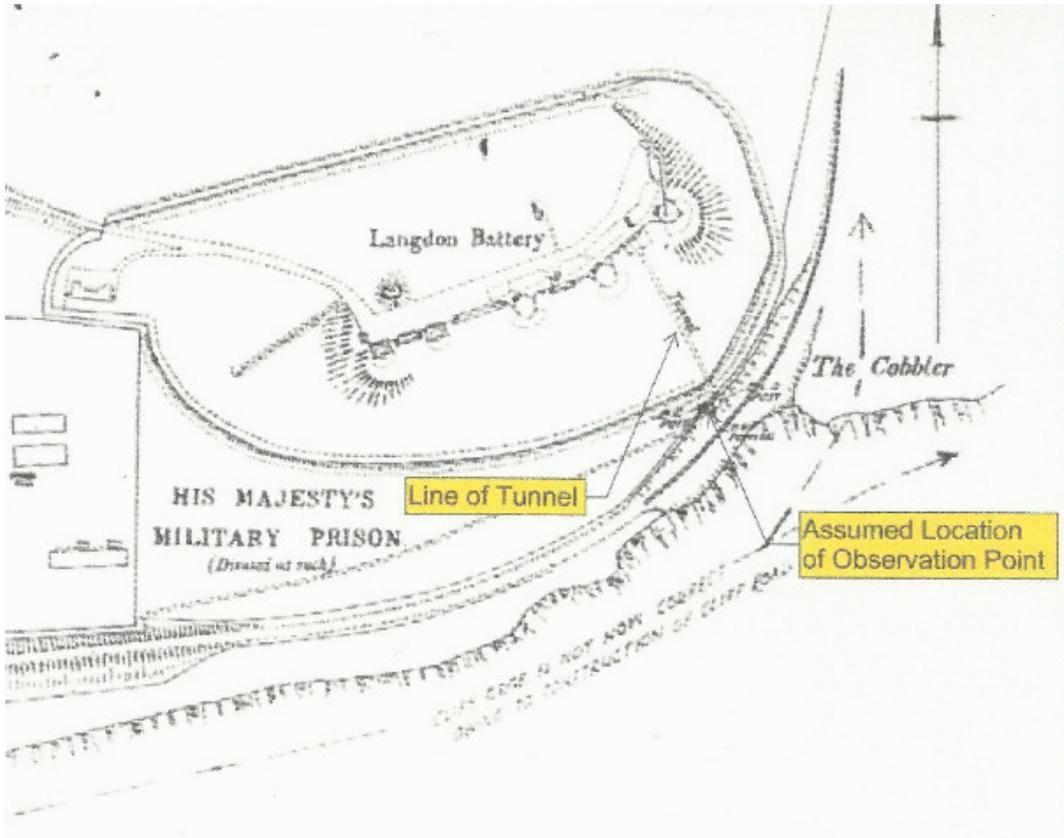


Photograph 12 – Corroded Escape Hatch Mechanism



Photograph 13 – Escape Hatch - External

ANNEX B
HISTORIC PLAN



ANNEX C
LOCATION PLAN

