**SITE INSPECTION & APPROVAL RECORDS FOR TUNNELLING WORKS**

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| **Project Ref: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Project Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| This form is to be prepared and certified for tunnelling works **for each construction stage listed in Section A or critical construction stage, as stipulated in the approved plans.** The QP(S) is required to keep a copy of each of these completed forms on site. QP(S) is required to send a copy of the completed form to design QP(ST), and when applicable, to design QP(Geo), AC and AC(Geo). |
| **Section A: by Builder** | **Section B1: by QP(S) & QP(Geo)(S) for GBW** |
| **Applicable chainage \_\_\_\_\_\_\_\_\_\_\_** (please tick the applicable box) | **Declaration of Builder** | **Date of inspection** | **Status and Comments** (Report any deviations from approved plans) |
| At change in geological formations, or at interval of not more than 200m section of bored tunnels | I attached the relevant instrumentation results, as-built information of the tunnelling works and actual ground conditions encountered at the site together with this form.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Name & Signature of Technical Controller for & on behalf of the builder\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Name, UEN & stamp of builderDate: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | By QP(S) on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_By QP(Geo)(S)(when applicable) on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| At interval of not more than 20m section of mined tunnels |
| Before tunnelling below or horizontally within 1D clear distance from any structure |
| Restart of TBM (after CHI, stoppage exceeding 72 hours) |
| others, please specify:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Section B2: by QP(S) and QP(Geo)(S) for GBW (please tick box when applicable)** |
| We have inspected the site and its neighbouring areas, assessed the performance of constructed tunnelling works, results of instrumentation and monitoring readings, the face pressure and other key performance indicators for ensuring stability and safety of tunnelling works, and the actual ground conditions. - (*please tick only one of the boxes below*)We are satisfied that the constructed tunnelling works are in accordance with the approved plans and the instrumentation results are within the allowable limits shown in the approved plans. We hereby grant approval to the builder to proceed to the next construction stage in accordance with the approved plans. There are changes at site, which in our opinion do not involve material change and do not require a re-design of tunnelling works. We are satisfied that the constructed tunnelling works are in accordance with the approved plans and the instrumentation results are within the allowable limits shown in the approved plans. We hereby grant approval to the builder to proceed to the next construction stage. |
| **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(S)****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(Geo)(S) for GBW****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**SITE INSPECTION & APPROVAL RECORDS FOR CUTTERHEAD INTERVENTION (CHI)**

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| **Project Ref: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Project Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| This form is to be prepared **before every cutterhead intervention (CHI) and daily during every CHI**. The QP(S) is required to keep a copy of each of these completed forms on site. |
| **Section A: by Builder** |
|  **Applicable chainage \_\_\_\_\_\_\_\_\_\_\_\_\_\_**  ***Before CHI*** |
| I attached a part print of the approved plan or recommendation letter(s) from Design QP and when applicable, Design QP(Geo). ***Daily during CHI***I attached the latest completed face inspection form. |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Name & Signature of Technical Controller** **for & on behalf of the builder** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Name, UEN, stamp of builder****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Section B: by QP(S) and QP(Geo)(S) for GBW (please tick when applicable)** |
| **Date of inspection:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by QP(S) / QP(Geo)(S) / RE(tunnel)(Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)#  ***Before CHI***We confirm that:1. We have briefed RE(Tunnel) and Site Supervisors on i) the requirements stated in the Specific Conditions of Permit for Bored Tunnelling works; ii) what is flushing of TBM and how to monitor and detect flushing of TBM; iii) on how to identify soil and rock, how to classify whether the tunnel face is full face soil, mixed face or full-face rock, how to measure the water ingress rate, and how to perform pressure step down procedure.
2. The specified monitoring instruments for the CHI have been installed at site.
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|  ***During CHI (Form to be completed daily for the entire period of CHI)***We have briefed and instructed RE(Tunnel):1. to continuously monitor the excavation or material removal volume for the entire period of CHI and to implement Annex 4 of the Control Framework for Bored Tunnelling Works in Circular dated 15 September 2017
2. to continuous monitor TBM excavation management system to detect any flushing during CHI for slurry TBM and implement item (d) of the Specific Conditions of Permit for Projects Involving Bored Tunnelling Works
3. to carry out 6 hourly inspection of tunnel face with strength measurement (e.g., pocket penetrometer in OA and grout block) and water ingress rate of the exposed tunnel face to detect any signs of instability (e.g., face ravelling, bulging and inadequate strength) and assess if the tunnel face is stable.
4. to monitor instruments 6 hourly and review the instrumentation results.
5. to instruct the builder to carry out probe and grout from surface when sign of instability at the tunnel face is observed, leading to unsuccessful/ abandoned CHI​.

**Observations and recommendations**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_We confirmed that the Design QP(Geo) or his/her representative had assessed monitoring results and ground conditions at tunnel face are within design assumptions and parameters, and signed off the inspection form together with Builder, RE(tunnel) or Supervision QP.During CHI, we have assessed the site and its neighbouring areas, results of instrumentation and monitoring readings, the ground conditions at the tunnel face, the face pressure, the face inspection form, and concluded that the tunnel face is stable and allow the Builder to start or continue the CHI. |
| **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(S)****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(Geo)(S) for GBW****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**#** To delete as appropriate

**SITE INSPECTION & APPROVAL RECORDS FOR TUNNELLING WORKS – RECORDS OF EXCAVATION VOLUME**

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| **Project Ref: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Project Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| This form is to be prepared for tunnelling **in close proximity to building or in mixed face condition**. The QP(S) is required to **submit** a copy of the completed form(s) to the Commissioner of Building Control (CBC) via **CORENET** **weekly**. When over-excavation is suspected or the over-excavation reading at the end of each ring excavated has exceeded the allowable limit# for over-excavation, QP(S) and QP(Geo)(S) are to inform CBC **immediately** and to submit the completed form by **12 noon** the next working day. |
| **Section A: by Builder and QP(S)’s Resident Engineer (Tunnel)** |
| **Tunnelling Activity***(Please tick at least one of the following boxes)*For cutter head position located **in close proximity^** to building *(^ - tunnelling directly or partially underneath buildings or within a horizontal distance of 0.5 tunnel diameter (D) for Category 1 ground or 1D for Categories 2 and 3 ground)*For cutter head position in mixed face condition during tunnelling *Mixed face:- Presence of a) boulder/core-stone; or* *b) rock (grade III or less weathering) with rock content between 25% to 80%; or* *c) rock content < 25% in which the rate of advancement of TBM drops by more than 50% below normal average due to ground condition; or* *d) interface between soft soil and hard soil, for example between Marine Clay and OA.* Allowable limit# for over-excavation: \_\_\_\_\_\_ % of theoretical volume at the end of each ring excavated.

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|  |  | **Builder’s Tunnelling Manager** **or Site Supervisor** | **QP(S)s’ Resident Engineer (Tunnel)** |
| **Tunnel Ring No.** | **Change in excavated volume (%) from theoretical volume (±)** | **Name** | **Date** | **Time** | **Signature** | **Within allowable limit?****(Y/N)** | **Name** | **Date** | **Time** | **Signature** |
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| **Section B: by Builder** |
| I have reviewed the data and declare that *(Please tick the applicable box)*:The excavated volume was within the allowable limit# for over-excavation. The over-excavated volume reading has exceeded the allowable limit# for over-excavation. I have suspended the TBM excavation and advancement immediately and shall proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by QP(S) and when applicable, by QP(S)(Geo). I have then verified that the allowable limit# for over-excavation **has not been exceeded**. I shall carry out probe drilling and grouting from the ground surface and implement necessary measures to mitigate risk of ground movements as determined by QP(S) and when applicable, by QP(S)(Geo). The over-excavated volume reading has exceeded the allowable limit# for over-excavation. I have suspended the TBM excavation and advancement immediately and shall proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by QP(S) and when applicable, by QP(S)(Geo). I have then verified that the allowable limit# for over-excavation **has been exceeded**. I shall carry out probe drilling and grouting etc. as per item 3) in Annex 4 explanatory notes of the Circular “Requirements on Bored Tunnelling Works”.The over-excavated volume reading **has exceeded 25%**. I have suspended the TBM excavation and advancement immediately and shall proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by QP(S) and when applicable, by QP(S)(Geo). I shall carry out probe drilling and grouting etc. as per item 3) in Annex 4 explanatory notes of the Circular “Requirements on Bored Tunnelling Works”. |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Name & Signature of Technical Controller** **for & on behalf of the Builder** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Name, UEN, stamp of Builder****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **Section C: by QP(S) and QP(Geo)(S) for GBW (please tick when applicable)** |
| We have reviewed the data and declare that:*(Please tick the applicable box)* |
| The excavated volume was within the allowable limit# for over-excavation.The over-excavated volume reading has exceeded the allowable limit# for over-excavation and we have notified BCA. *The builder has suspended*\* / *We have instructed the builder to suspend*\* the TBM excavation and advancement immediately. We have instructed the builder to proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by us. We have then verified that the over-excavation limit **has not been exceeded**. We have assessed that probe drilling and grouting from ground surface *and other mitigation measures as attached*\* to be implemented by the builder to mitigate risk of ground movements *is*\* / *is not*\* required. We will notify BCA before allowing the tunnelling works to continue when we are satisfied that all the voids formed from the over-excavation have been filled up.The over-excavated volume reading has exceeded the allowable limit# for over-excavation and we have notified BCA. *The builder has suspended*\* / *We have instructed the builder to suspend*\* the TBM excavation and advancement immediately. We have instructed the builder to proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by us. We have then verified that the over-excavation limit **has been exceeded**. *The builder has proceeded to\* / We have instructed the builder to\** carry out probe drilling and grouting etc. as per item 3) in Annex 4 explanatory notes of the Circular “Requirements on Bored Tunnelling Works”. We will notify BCA before allowing the tunnelling works to continue when we are satisfied that all the voids formed from the over-excavation have been filled up.The over-excavated volume reading has **exceeded 25%** and we have notified BCA. *The builder has suspended\* / We have instructed the builder to suspend\** the TBM excavation and advancement immediately. We have instructed the builder to proceed to carry out, for tunnelling in close proximity to building, appropriate grouting at the front part of TBM shield; or for other cases, actions as determined by us. *The builder has proceeded to\* / We have instructed the builder to\** carry out probe drilling and grouting etc. as per item 3) in Annex 4 explanatory notes of the Circular “Requirements on Bored Tunnelling Works”. We will notify BCA before allowing the tunnelling works to continue when we are satisfied that all the voids formed from the over-excavation have been filled up. |
| **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(S)****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_****Name, stamp & signature of QP(Geo)(S) for GBW****Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

*# Allowable over-excavation limit as shown in approved plan or in contract specifications or in QP(D)s’ specifications.*

 *(not exceeding 15% for one ring)*

*\* To delete as appropriate.*