Building and Construction Authority

An MND Statutory Board

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Dear Sir/Mdm

SUPERVISION OF PRECAST STRUCTURAL ELEMENTS

Objective

1. Further to our earlier circular on the above subject dated 5 Aug 2010, this circular is to –

   a) remind Supervising Qualified Persons ("**QPS**") and Site Supervisors ("**SS**") of their supervisory duties under the Building Control Act 1989 ("**BC Act**") and regulations;

   b) remind QPS that under section 7A(1) of BC Act read with regulation 39(1) of the Building Control Regulations 2003 ("**regulations**"), they shall cause to be carried out any tests, including on-site tests, in connection with building works as may be prescribed in the regulations or required by the Commissioner of Building Control ("**CBC**"). Paragraph 6 of the Fifth Schedule to the regulations requires "tests that are appropriate to the materials and building works concerned to be performed on those materials and building works"; and

   c) set out recommended good practices that should be adopted in respect of fabrication of precast structural elements.

Background

2. Under the BC Act, all building works shall be carried out under the supervision of an appropriate QPS. QPS and SS appointed to supervise the carrying out of building works shall take all reasonable steps and exercise due diligence in supervising and inspecting such building works to ensure that the same are being carried out in accordance with the BC Act, building regulations, relevant plans approved by the CBC and any terms and conditions imposed by the CBC. Amongst others, QPS shall ensure that all precast structural elements installed as part of building works in Singapore comply with the technical specifications, design and material codes as prescribed in the building regulations.

Supervision of precast structural element at the precast yards

3. QPS appointed to supervise precast structural elements are advised to visit prefabrication yards regularly to ensure that the precast structural elements are fabricated in accordance with plans approved by the CBC. QPS may arrange for additional visits by design engineer to supplement the visits by QPS. The QPS shall also ensure that the Site Supervisors (SS) stationed at the prefabrication yard carry out supervision of the precast structural elements under the QPS' direction and control. All materials used in fabricating precast structural elements (such as concrete, rebars, connectors, wire rope) shall be inspected and tested in accordance with code requirements.

4. Amongst others, SS shall witness and document with photographic evidence that all the reinforcement bars of the precast structural elements are fabricated and installed in accordance with plans approved by the CBC before closure of formwork/ concreting. SS must communicate and seek clarification from QPS immediately to clarify any deviation of reinforcement (sizes and spacings) from the approved plans. SS must not agree with any rebar removal or change in rebar sizes based on his/her judgement without the QPS' approval.

Fabrication and supervision of Prefabricated Prefinished Volumetric Construction (PPVC) modules

5. There are increasingly more projects adopting PPVC construction and the structural modules are often fabricated overseas. The fabrication of these PPVC modules entails higher complexity. Therefore, PPVC fabrication must be carried out by a competent Specialist Builder (Precast Concrete Work). The developers should specify in the contract specifications requirements for the engagement of Specialist Builder (Precast Concrete Work) with a higher level of QA/QC at the yard.

6. Initial inspection of the fabrication yard shall be carried out by QPS to assess if the QA/QC procedure and resources allocated for the fabrication are adequate. Mock-up inspection for the PPVC shall be arranged to address possible fabrication issues (e.g. rebar congestion, accuracy of dowel/box-out provision, too many rebar sizes, quality of mould and finishing) early before commencing regular production. If necessary, QPS should review and revise the arrangement and detailing of the reinforcement to facilitate fabrication.

7. QA/QC engineer from the Specialist Builder (Precast Concrete Work) shall be deployed to ensure that the rebars required for each PPVC module are prepared and packed according to the bar bending schedule ("**BBS**") and sign off on the BBS when the rebars are transferred to the installation/production team to ensure that every rebar is accounted for. Rebar shall be colour coded to differentiate the bar sizes for ease of identification during installation and checking. SS shall check to ensure that the colour coded rebars are installed in accordance with the approved plans.

8. CCTV should be installed at prefabrication yards for continuing surveillance and recording of the fabrication process of precast structural elements. The QPS and builder shall be granted access to observe the fabrication process at the prefabrication yards anytime.

On-site sampling test for precast structural elements and PPVC modules fabricated overseas

9. To ascertain that precast structural elements and PPVC modules fabricated overseas comply with the approved plans before these modules are transferred to and installed at the project sites, QPS shall propose a comprehensive supervision plan, including onsite tests, in respect of precast structural elements delivered to Singapore. The precast elements and PPVC modules to be tested shall be randomly selected by SS for testing when they are delivered prior to installation. Test results shall be kept and maintained on site. This requirement will be applicable to all building works with precast structural elements and PPVC modules fabricated overseas.

10. Onsite tests shall include the carrying out of non-destruction test (e.g. ground penetrating radar scanning to verify the total number or spacing of main reinforcement bars) and partially exposing main reinforcement bar within the structural element for verification of the as-built reinforcement bar size if the reinforcement bars are concealed. GPEs and QPS shall include onsite sampling tests to be carried out for the precast structural elements and PPVC modules in the tender documents and structural plans.

11. Where any onsite test reveals that any element or PPVC module fails to meet the requirements stipulated in the approved plan and shop drawing, the QPS shall notify CBC in writing as soon as practicable. SS shall be briefed by QPS on the test method and sampling test frequency and QPS must include the test requirements in the Site Supervision Plan. Template for the onsite test requirements and acceptance criteria can be downloaded via www1.bca.gov.sg › building-control › template-for-site-supervision-plan.

Post installation checks of precast structural elements and PPVC modules

12. After the precast element and PPVC modules are installed on site, QPS shall ensure that SS supervise and keep photographic record of all subsequent works (e.g. grouting of column rebar splice/dowel, proper installation of tie/dowel rebar between PPVC modules and grouting between PPVC modules) are carried out in accordance with the approved plan. In this regard, SS shall supervise the grouting process to ensure that voids within the joints and between the modules are fully grouted and free of any defects. Tests to detect voids by suitable instrument and method (e.g. ultrasonic pulse-echo array) should be carried out.

Clarification

13. Please disseminate the contents of this circular to your members. Should you need any clarification, please submit your enquiry through BCA's Online Feedback Form at https://www.bca.gov.sg/feedbackform/ or call us at 1800 342 5222.

Yours faithfully



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