13 May 2013

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79B Neil Road
Singapore 088904

The President
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Singapore (ACES)
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The President
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Singapore 289758

The President
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Singapore Shopping Centre
Singapore 239924

The President
Singapore Contractors Association Limited (SCAL)
Construction House
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Singapore 159760

The President
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Council Chairman
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The President
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Singapore 069110

The President
Board of Architects (BOA)
5 Maxwell Road
1st Storey Tower Block
MND Complex
Singapore 069110

Dear Sir/Mdm

CODE OF PRACTICE ON SURFACE WATER DRAINAGE
(SIXTH EDITION – ADDENDUM 1 JUN 2013)

We wish to inform you that the Sixth Edition – Addendum 1 of the Code of Practice on Surface Water Drainage (refer to Annex) will take effect from 1 June 2013. The revised Code will be published on our PUB website at
http://www.pub.gov.sg/general/code/Pages/default.aspx. For the new clauses on reduction of peak flow (Clause 7.1.5) and the endorsement of plans by ABC Waters Professional on ABC Waters Features (Clauses 8.2.2 and 8.2.3), a six (6) months grace period will be applied, i.e. clauses to take effect on 1 Jan 2014.

2 As part of the review process, various stakeholder groups – including public agencies, professional bodies, such as Singapore Institute of Architects (SIA), Association of Consulting Engineers Singapore (ACES) and Institution of Engineers Singapore (IES), and Real Estate Developers’ Association (REDAS) – were consulted on the proposed amendments on Code of Practice on Surface Water Drainage, with various clauses further refined after the consultation.

Thank you

Yours faithfully,

TAN NGUAN SEN
DIRECTOR (CATCHMENT & WATERWAYS)
PUBLIC UTILITIES BOARD

cc  Director
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Building and Construction Authority (BCA)
5 Maxwell Road #16-00
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Housing & Development Board (HDB)
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Director
Land and Planning Group
JTC Corporation
The JTC Summit
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Singapore 609434

Deputy Chief Executive
Infrastructure & Development
Land Transport Authority (LTA)
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Deputy Director
Project Development & Maintenance Branch
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Chief Engineer
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The URA Centre
Singapore 069118
Annex I:
Amendments to Code of Practice on Surface Water Drainage (6th Edition) – 1 June 2013

CLAUSE 2 - PLATFORM, CREST AND RECLAMATION LEVELS

<table>
<thead>
<tr>
<th>Current Version</th>
<th>Revised Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1. (c) Special Facilities</td>
<td>Special Facilities and Developments with Linkages to Special Underground Facilities</td>
</tr>
<tr>
<td>For special facilities, including Rapid Transit stations, airport runways and wafer fabrication plants, the minimum platform level shall not be lower than:-</td>
<td>For special facilities including Rapid Transit stations, airport runways and wafer fabrication plants, and all developments with direct or indirect links to special underground facilities such as underground Rapid Transit stations, the minimum platform level shall not be lower than:-</td>
</tr>
<tr>
<td>(i) 104.0 mRL for developments along the southern coast, and</td>
<td>(i) 104.0 mRL for developments along the southern coast, and</td>
</tr>
<tr>
<td>(ii) 104.5 mRL for developments along the northern coast; or</td>
<td>(ii) 104.5 mRL for developments along the northern coast; or</td>
</tr>
<tr>
<td>(iii) 1 m above the adjacent road/ground level; or</td>
<td>(iii) 1 m above the adjacent road/ground level; or</td>
</tr>
<tr>
<td>(iv) 1 m above the highest recorded flood level, if any, as advised by the Board; or</td>
<td>(iv) 1 m above the highest recorded flood level, if any, as advised by the Board; or</td>
</tr>
<tr>
<td>(v) Any other level as may be specified by the Board; whichever is the highest.</td>
<td>(v) Any other level as may be specified by the Board; whichever is the highest.</td>
</tr>
</tbody>
</table>

2.1.2 Flood Protection Measures

| 2.1.2 (b) Flood protection measures must be included in the design to provide at least the same level of flood protection that the minimum platform and/or crest levels would provide for the building. Details of proposed flood protection measures should be submitted to the Board for approval. | Flood protection measures must be included in the design to provide at least the same level of flood protection that the minimum platform and/or crest levels would provide for the building. Implementation of the flood protection measures shall comply with the requirements stipulated in Clause 2.4. Notwithstanding the above, the Qualified Person shall advise the developer/owner to raise the platform level and/or crest level to the highest possible levels before considering the deployment of flood protection measures. In addition, the developer/owner shall be advised that the development site may be subject to flood risks despite the implementation of flood protection measures. |

Rename to “Exception Cases”
| 2.1.3 (b) | The following proposals need not comply with the required minimum platform levels:-  
(i) addition & alteration works to an existing building;  
(ii) partial reconstruction works to an existing building involving only the building of additional floors without reconstruction of the first storey;  
(iii) conservation projects;  
(iv) temporary development works intended for use for a temporary period; and  
(v) any other works as may be specified by the Board.  
For these development proposals, the Qualified Person shall advise the developer/owner that the minimum platform levels are still recommended as a protection measure to reduce flood risks. If lower platform levels are adopted, the developer/owner shall be advised that the development site may be subjected to flood risks.  
|  | The following proposals need not comply with the required minimum platform levels:-  
(i) addition & alteration (A&A) works to an existing building where there are no linkages to special underground facilities;  
(ii) partial reconstruction works to an existing building involving only the building of additional floors without reconstruction of the first storey and where there are no linkages to special underground facilities;  
(iii) conservation projects;  
(iv) temporary development works intended for a temporary period, and  
(v) any other works as may be specified by the Board.  
For these development proposals, the Qualified Person shall advise the developer/owner that the minimum platform levels are still recommended as a protection measure to reduce flood risks. If lower platform levels are adopted, the developer/owner shall be advised that the development site may be subject to flood risks and to install flood barriers as stipulated in Section 2.4 where possible. |
2.4 Flood Protection Measures

Flood protection measures as stipulated under Clauses 2.1.2(b) and 2.1.3(b) will be subjected to the following requirements, including those stipulated in Appendix 2:

(a) **General Development**
Flood barriers shall be installed at all points of entry and exit for the building premises (at ground/platform level).

(b) **Commercial/ Multi-Unit Residential Developments with Basements and Special Facilities and Developments with linkages to Special Underground Facilities**
Flood barriers shall be installed at:
(i) all points of entry and exit for the building premises (at ground/platform level); or
(ii) all points of entry and exit for the entire development area.

(c) The developer/owner shall obtain the necessary clearance from relevant authorities to install the flood protection measures during the Development Control (DC) Stage for approval.

(d) Details of the flood protection measures and Standard Operating Procedure (SOP) should be submitted to the Board during Building Plan (BP) Stage for record.

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**CLAUSE 6 - REQUIREMENTS FOR CONSTRUCTION ACTIVITIES**

<table>
<thead>
<tr>
<th>Current Version</th>
<th>Revised Version</th>
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<tbody>
<tr>
<td><strong>6.3.88a</strong> Perimeter Cut-off drain</td>
<td>Perimeter Cut-off drain</td>
</tr>
<tr>
<td>Perimeter cut-off drains shall be concrete-lined and adequate to capture all runoff from the site. For sites located above slope, a solid kerb of at least 600mm high should be provided along the entire perimeter of the site to prevent overflow onto adjacent properties.</td>
<td>Perimeter cut-off drains shall be concrete-lined and adequate to capture all runoff from the site. For sites located above slope, a boundary wall of at least 600mm high shall be provided along the entire perimeter of the site to prevent overflow onto adjacent properties.</td>
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</tbody>
</table>
CLAUSE 7 - DRAINAGE DESIGN AND CONSIDERATIONS

<table>
<thead>
<tr>
<th>Current Version</th>
<th>Revised Version</th>
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</thead>
<tbody>
<tr>
<td>7.1.5</td>
<td>Maximum Allowable Peak Runoff</td>
</tr>
</tbody>
</table>

Industrial, commercial, institutional and residential developments greater than or equal to 0.2 hectares in size are required to control the peak runoff discharged from the development sites. The maximum allowable peak runoff to be discharged to the public drains will be calculated based on a runoff coefficient of 0.55, and for design storms with a return period of 10 years and for various storm durations of up to 4 hours (inclusive). Peak runoff reduction can be achieved through the implementation of ABC Waters design features and structural detention and retention features, such as:

a) Detention tanks;
b) Retention/sedimentation ponds;
c) Wetlands;
d) Green roofs;
e) Planter boxes;
f) Bioretention swales;
g) Porous pavements;
h) Bioretention basins or rain gardens, etc.

The QP shall be required to submit details (calculations and/or hydraulic model results) showing how the proposed system meets the required peak runoff rates. Due consideration shall be given to meeting ABC Waters stormwater quality objectives, which will often require treatment of stormwater runoff using ABC Waters design features. For design guidance on the ABC Waters design features, QPs can refer to the ABC Waters Guidelines and relevant chapters in the Engineering Procedures, available on the PUB website.
<table>
<thead>
<tr>
<th>Current Version</th>
<th>Revised Version</th>
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<tbody>
<tr>
<td><strong>8</strong> Aesthetic Treatment of Watercourses and Integration of Adjacent Watercourses with developments</td>
<td>Integration of Adjacent Watercourses with Developments and ABC Waters Design Features within Developments</td>
</tr>
<tr>
<td><strong>8.1</strong> As part of the ABC Waters Programme, integration of adjacent watercourses with proposed developments is encouraged, whilst satisfying the engineering requirements for drainage functions without posing any public safety, maintenance or environmental problems. These include, but are not limited to:</td>
<td><strong>8.1.1</strong> As part of the Active, Beautiful, Clean Waters (ABC Waters) Programme, integration of adjacent watercourses with proposed developments is encouraged, whilst satisfying the engineering requirements for drainage functions without posing any public safety, maintenance or environmental problems. These include, but are not limited to:</td>
</tr>
</tbody>
</table>
8.2 Qualified Persons together with the owners/developers can significantly enhance the development by incorporating into their designs appropriate ABC Waters Design features as described in the ABC Waters Design Guidelines (2nd Edition) published by the Board on 6 July 2011 (available at http://www.pub.gov.sg/abcwaters/abcwatersdesignguidelines/Documents/ABCWatersDesignGuidelines_2011.pdf). These guidelines were developed based on the following principles:

(a) Protection and enhancement of natural water systems within the development site;
(b) Integration of stormwater treatment into the landscape by incorporating multiple-use corridors that maximise the aesthetics and recreational amenities of developments;
(c) Improvement of quality of water draining from the development into receiving environment. For example, through effective filtration and retention measures, runoff from the site can be treated to remove pollutants and silt, thereby protecting the water quality in waterways downstream;

Reduction of runoff and peak flow from the development site by implementing local detention measures and minimizing impervious areas;

8.2.1 Integration of ABC Waters Design Features within Developments

(a) Qualified Persons together with the developer/owner can significantly enhance the development by incorporating into their designs appropriate ABC Waters design features as described in the latest version of “ABC Waters Design Guidelines” and “Engineering Procedures for ABC Waters design features” published by the Board (available at http://www.pub.gov.sg/abcwaters). These guidelines were developed based on the following principles:

(a) Reduction of runoff and peak flow from the development site by implementing local ABC Waters design features that provide detention measures and minimise impervious areas;
(b) Improvement of quality of water draining from the development into receiving environment. For example, through effective filtration and retention measures via ABC Waters design features, runoff from the site can be treated to remove pollutants and silt, thereby protecting the water quality in waterways downstream;
(c) Integration of stormwater treatment into the landscape by incorporating multiple-use ABC Waters design features that also maximise the aesthetics and recreational amenities of developments; and
(d) Protection and enhancement of natural water systems within the development site.

8.2.2 The developer/owner shall engage an ABC Waters (Active, Beautiful, Clean Waters) Professional to design, oversee the construction of, and develop a maintenance plan for the ABC Waters design features. The developer/owner shall submit the concept design and design calculations, endorsed by the ABC Waters Professional, to the Board as
### CLAUSE 9 - DRAINAGE STRUCTURES AND FACILITIES

<table>
<thead>
<tr>
<th>Current Version</th>
<th>Revised Version</th>
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<tbody>
<tr>
<td><strong>9.8</strong> Drop-inlet Chamber and Slot-outlet</td>
<td><strong>Drop-inlet Chamber and Slot-outlet</strong></td>
</tr>
<tr>
<td>9.8.1 Runoff from road carriageways and carparks shall be effectively drained away to prevent water stagnation and to ensure road safety. Drop-inlet chambers (shown in Drawing No. 5) shall be provided at maximum 6 m spacings along all road carriageways and concealed scupper drainage shall be provided in accordance with the Land Transport Authority's standard specifications.</td>
<td>Runoff from road carriageways and carparks shall be effectively drained away to prevent water stagnation and to ensure road safety. Drop-inlet chambers and concealed scupper drainage shall be designed in accordance with the Land Transport Authority's standard specifications and shall be provided at maximum 6 m spacings along all road carriageways. For flood prone areas, hotspots or any other areas as requested by the Board, enhanced drop-inlet chambers (shown in Drawing No. 5) shall be provided.</td>
</tr>
<tr>
<td><strong>9.12</strong> Grating over Closed Drain/ Culvert</td>
<td><strong>Drop-inlet Chamber and Slot Outlets Grating over Closed Drain/ Culvert</strong></td>
</tr>
<tr>
<td>9.12.1 All gratings provided over closed drains/culverts shall be hinged to fixed frames securely embedded into the drain structures. Mild steel heavy duty gratings shall be used for closed drains subjected to vehicular loadings, whereas light duty gratings shall only be used for pedestrian loadings. Chequered plates shall be fixed on the pedestrian gratings for those closed drains narrower than 2 m (internal width). The gratings, frames and chequered plates shall be galvanised. The details of the gratings and chequered plates are shown in Drawing No. 8-12.</td>
<td>All gratings provided over closed drains/culverts shall be hinged to fixed frames securely embedded into the drain structures. Mild steel heavy duty gratings shall be used for closed drains subjected to vehicular loadings, whereas light duty gratings shall only be used for pedestrian loadings. Chequered plates shall be fixed on the pedestrian gratings for those closed drains narrower than 2 m (internal width). The gratings, frames and chequered plates shall be galvanised. The details of the gratings and chequered plates shall be designed in accordance with the Land Transport Authority's standard specifications.</td>
</tr>
</tbody>
</table>
9.12.3 The size and spacing of gratings required shall be based on the internal width of the closed drain, as follows:

<table>
<thead>
<tr>
<th>Internal Width (W)</th>
<th>Grating Size</th>
<th>Grating Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W &gt; 4 \text{ m}$</td>
<td>850 mm x 1000 mm</td>
<td>50 m (staggered)</td>
</tr>
<tr>
<td></td>
<td>in addition 3.5 m x 1.8 m (opening)</td>
<td>500 m</td>
</tr>
<tr>
<td>$2 \text{ m} \leq W \leq 4 \text{ m}$</td>
<td>850 mm x 1000 mm</td>
<td>50 m (staggered)</td>
</tr>
<tr>
<td></td>
<td>in addition 1.5 m x 1.5 m (opening)</td>
<td>500 m</td>
</tr>
<tr>
<td>$750 \text{ mm} &lt; W \leq 2 \text{ m}$</td>
<td>850 mm x 1000 mm</td>
<td>6 m (for drain $\leq 1 \text{ m}$ deep) or 18 m (for drain $&gt; 1 \text{ m}$ deep)</td>
</tr>
<tr>
<td>$600 \text{ mm} \leq W \leq 750 \text{ mm}$</td>
<td>700 mm x 850 mm</td>
<td>6 m</td>
</tr>
</tbody>
</table>

Note: (i) Rungs shall be embedded at the drain wall at every opening/grating for closed drains with internal widths equal to or less than 2m in accordance with Section 9.11.

(ii) Chequered plates shall be fixed on the pedestrian gratings for closed drains with internal widths less than 2m.

9.12.4 Where a closed drain exceeds 3 m deep, access shaft (2 m by 1.5 m) may be required by the Board. If the access shaft is deeper than 4 m, intermediate platform shall be provided as shown in Drawing No. 11.

Where a closed drain exceeds 3 m deep, access shaft (2 m by 1.5 m) may be required by the Board. If the access shaft is deeper than 4 m, intermediate platform shall be provided as shown in Drawing No. 9.
9.13 Entrance Culvert/Crossing

Where an entrance culvert/crossing is proposed at a stretch of closed drain, a heavy duty grating shall be provided if there are no nearby gratings/openings at the upstream and downstream sections. (Alternatively, a cast-iron heavy duty manhole cover may be used.) The grating/cover shall be provided at the entrance culvert/crossing so that the spacing between the gratings/openings is not more than 6m.

Under the exceptional circumstance where the entrance culvert/crossing is shallower than 600mm, hinged open gratings shall be installed throughout the whole length of the entrance culvert/crossing.

Entrance Culvert/Crossing

Where an entrance culvert/crossing is proposed at a stretch of closed drain, gratings/openings shall be provided at the closed drain sections immediately upstream and downstream of the proposed entrance culvert/crossing.

Under the exceptional circumstance where the entrance culvert/crossing is shallower than 600mm, hinged open gratings shall be installed throughout the whole length of the entrance culvert/crossing.

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CLAUSE 11 - TEMPORARY OCCUPATION PERMIT (TOP)

<table>
<thead>
<tr>
<th>Current Version</th>
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<tbody>
<tr>
<td>11.1 Compliance during Temporary Occupation Permit (TOP)</td>
<td>Compliance during Temporary Occupation Permit (TOP)</td>
</tr>
</tbody>
</table>

QPs are required to declare that their platform and crest protection levels are in compliance with our Code of Practice on Surface Water Drainage and approved plans when applying for Temporary Occupation Permit (TOP) clearance.

This declaration shall be supported by submitting their application for TOP clearance and supported by as-built survey plans prepared by a registered surveyor. The Board will only issue TOP clearance through CBPU to the developer/owner when the declaration and all necessary supporting documents are submitted and assessed to be in compliance with the requirements of approved plans and our Code of Practice on Surface Water Drainage.

QPs are required to declare that their platform and crest levels are in compliance with the Code of Practice on Surface Water Drainage and constructed according to approved plans when applying for Temporary Occupation Permit (TOP) clearance.

The declaration shall consist of the application for TOP clearance and be supported by as-built survey plans indicating the crest levels, platform levels and flood protection levels (based on the approved flood protection measures), where applicable, and any other relevant information as required by the Board, prepared and endorsed by a Registered Surveyor. The Board will only issue TOP clearance through CBPD to the developer/owner when the declaration and all necessary supporting documents are submitted and assessed to be in compliance with the requirements of approved plans and the Code of Practice on Surface Water Drainage.
CLAUSE 13 - MAINTAINING THE INTEGRITY OF THE STORM WATER DRAINAGE SYSTEM INCLUDING FLOOD PROTECTION MEASURES

13.2 Flood Protection Measures (i.e. Crest/Flood barriers/Pumped drainage system)
The Developer/Owner shall submit the certificate of inspection and survey plan endorsed by the Architect (i.e. QP of the development) or Professional Engineer to confirm that the approved flood protection measures, including crest protection measures, flood barriers and pumped drainage systems are in place. This certificate of inspection and survey plan shall be submitted annually upon obtaining the Temporary Occupation Permit (TOP), for all developments.

Revised Version

Submissions on Storm Water Drainage System (including Crest/Flood barriers/Pumped drainage system/ABC Waters design features)

13.2.1 Crest Level(s)

(i) For Commercial/ Multi-Unit Residential Developments with Basements (e.g. shopping malls, large office buildings and condominiums), the developer/owner shall, every three years upon obtaining the Temporary Occupation Permit (TOP), declare that the crest levels are in compliance with the Code of Practice on Surface Water Drainage and constructed according to approved plans. When there is deviation from approved plans, the declaration shall be supported by as-built survey plans indicating the crest levels, platform levels, adjacent road levels, and any other relevant information as required by the Board, prepared and endorsed by a Registered Surveyor.

When requested by the Board, this declaration shall be submitted annually upon obtaining the Temporary Occupation Permit (TOP).

(ii) For Special Underground Facilities and Developments with Linkages to Special Underground Facilities, the developer/owner shall declare that the crest levels are in compliance with the Code of Practice on Surface Water Drainage and constructed according to approved plans annually upon obtaining the Temporary Occupation Permit (TOP). When there is deviation from approved plans, the declaration shall be supported by as-built survey plans indicating the crest levels, platform levels, adjacent road levels, and any other relevant information as required by the Board, prepared and endorsed by a Registered Surveyor.
13.2.2 Flood Barriers/Detention Tanks/ABC Waters Design Features/Pumped Drainage System

The developer/owner, when requested by the Board, shall submit the following documents (where applicable) annually upon obtaining the Temporary Occupation Permit (TOP):

(i) Certificate of inspection on flood barriers on-site including leak test complying with relevant international standards or any requirements specified by the Board and endorsed by a Civil/Mechanical Qualified Person (where applicable);

(ii) Amendments to the standard operating procedure (SOP) of the flood barrier endorsed by a Civil and/or Mechanical Qualified Person;

(iii) Certificate of inspection on the pumped drainage system (for the basement and/or detention tank) endorsed by a Mechanical or Electrical Qualified Person;

(iv) Records on the Operational Performance of Flood Protection Measures/Pumped Drainage Systems prior to the onset of the North East Monsoon season (Nov - Jan), and

(v) Certificate of inspection on ABC Waters design features endorsed by an ABC Waters Professional. The certificate of inspection shall contain a declaration that the features have been inspected, and are maintained satisfactorily and functioning well.
2) **DURING DEVELOPMENT CONTROL (DC) STAGE**  
For all developments with flood protection measures, the following documents, endorsed by a Qualified Person, shall be submitted:

(i) Proposed plans indicating the crest levels and/or platform levels with and without flood barrier at various entrance and exit points;

2) **DURING BUILDING PLAN (BP) STAGE**  
For developments where flood barriers are automated and/or with more than 2 points of entry/exit, or when requested by the Board, the following shall be submitted:

(i) Details on the size, type and design of the flood barrier.

(ii) Details on the standard operating procedure (SOP) including the proposed maintenance plan of the flood barrier to be endorsed by a Civil and/or Mechanical Qualified Person, and the developer/owner.

3) **DURING TEMPORARY OCCUPATION PERIOD (TOP) STAGE**  
For all developments with flood protection measures, the following documents, endorsed by a Registered Surveyor, shall be submitted together with the declaration that their platform and crest levels are in compliance with the Code of Practice on Surface Water Drainage and constructed according to approved plans:

(i) As-built survey plans indicating the crest levels, platform levels and the flood protection levels (based on the approved flood protection measures).
4) **CERTIFICATE OF STATUTORY COMPLETION (CSC) STAGE**
For developments where automated flood barriers are implemented, the following documents, endorsed by a Qualified Person (Civil and/or Mechanical), shall be submitted:

(i) Leak Test Certification on the installed flood barrier, in compliance with relevant international standards or any requirements specified by the Board.

5) **MAINTAINING THE INTEGRITY OF THE STORM WATER DRAINAGE SYSTEM INCLUDING FLOOD PROTECTION MEASURES**
The developer/owner of premises with flood protection measures, when requested by the Board, shall comply with the submission of documents upon obtaining the Temporary Occupation Permit (TOP) as stipulated in Section 13.2.