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Building Design Against Flooding Risk

Introduction

Waterwork is an essential and a “must need” provision in most of building design, it is not just related to domestic plumbing systems, but also be involved in HVAC, Fire Services, processing, etc. The existing of pipeline and water devices, of course, can help us on daily operation, but they can also be a kind of risk on water damage / flooding to the premise. Drainage system capability and performance is not just depended on the hydraulic estimation on pipe sizing and gradient fall, it is also related to the external criteria and conditions, geometry and the provisions and actual capacity of the utilities / public sewage network. Hence it is necessary to be coordinated among Project team, architect, client and civil engineers to work for anti-flooding.

Making technical consideration and planning in building design to minimize risk of flooding and lead to any loss / damage will be discussed in the followings.

Flooding by External influence

When the external area suffering different level of flooding at different situations, such as extreme weather, typhoon, storm, etc making rain water caught by the building / roof can’t be disposal and discharge away from the building boundary & may be back-flow to the buildings / basement.

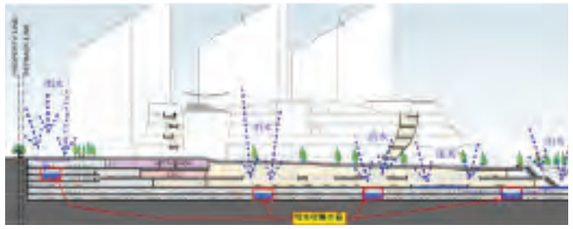
The damage by flooding is not just limited to the loss of property of localized watered area, but also the operation of entire business and even may damage the major building facilities, the goodwill and image of the premise as well. Hence, in the building design and planning, more consideration on the flooding.

Besides, all kind of system installation may suffer failure after continuous operation on individual device / equipment, it is important for a reliability system is allowing predicable failure and maintain system in operation.

Holding Tanks

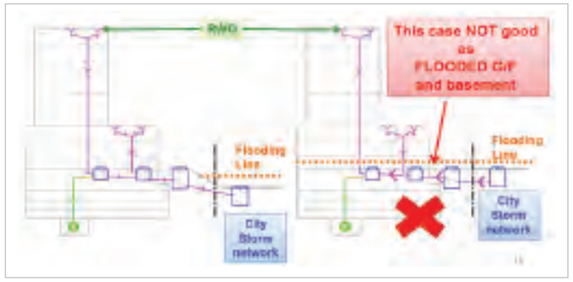
Drainage systems / installations are mainly relying on gravity; rain water caught and discharged to the public drainage network utilities; in case of a project with large footprint and with wide span, induced long horizontal pipe run, or project with sunken plaza where catchment locations are already lower than the utilities, localized rain water collection tank(s) can be arranged to hold and collect rain water, it can be treated as retention and delay the discharge, which can be reduce the instead loading of public drainage network and reduce the flooding risk.

At the same time, it can be utilized as re-cycling water and re-use.

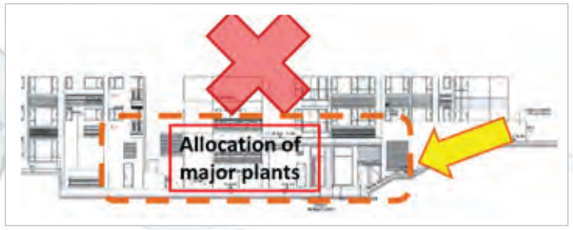


Water ingress path

In case of extreme weather, large intensity and long duration of rainfall, public network may be fail and can't be proper function. No matter how good in building drainage system provision, not able to help to water ingress; hence it is better to focus on the planning of architectural layouts to cater for such situation to prevent water damage due to flooding.



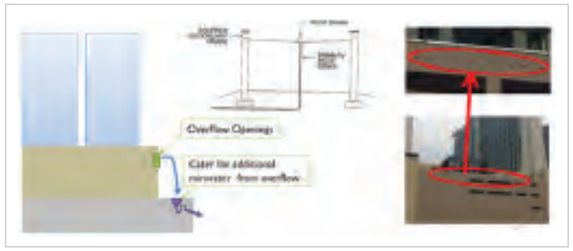
For services running in / out of the building structural, it is necessary to consider the level to prevent the entry / ingress through those manholes and cable draw pits, where water may ingress to the basement.



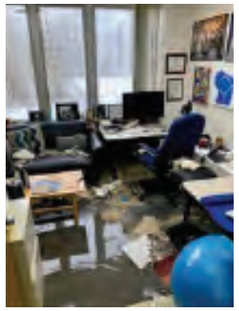
The main entrance level / or allocation of major plant / rooms higher than the expected flood line to prevent water ingress. Besides, it is required to plan for the allocation of car ramp or passage to basement levels to have necessary water gate at critical entry and water detection line to alert the operation.

Standby rain drainage provision

or overflow opening to be allocation on roof or other podium flat roof, so that in case of primary rain water system in failure, rain water will not be accumulated on roof and lead to water ingress to building or acting as additional loading to roof structure, worst case may lead to collapse.



Flooding by In-house services

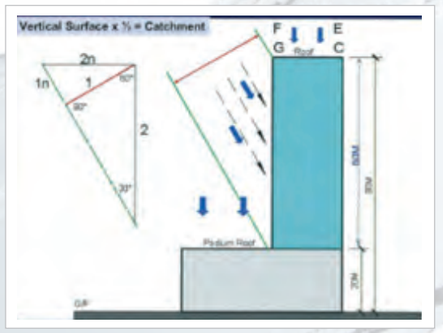


Water services / tanks must be existing in any premise, it is necessary to design for failure to these related installations; pro-active planning listed below in order to prevent / minimize influence on it:

Rain water catchment area design should consider the building geometry, large building elevation, or special shape or feature, special consideration on rainfall intensity should be incorporated to building drainage design.

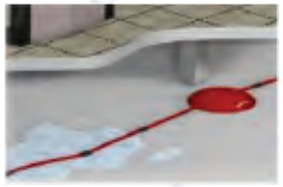
Rain water stack planning –
different levels of flat roof with different downstack can prevent water back-flow to building at lower rain water outlets especially when little blockage inside the stack after years of operation.

Multiple down stacks planning for rain disposal on roof area rather than just single, even though it's sufficient; it can prevent any single point of failure / blockage lead to entire roof in flooding risk.



Control & accessories to increase awareness on building management against leakage / flooding situations -

- Tank overflow pipe inside building can be discharged through external rather than a floor drain in plant room
- Major plant rooms protected with Water leakage detector, A/V alarm, remote control on shut-off in-fill, and notify management office
- Utilize more on wireless sensor on water leakage to essential / critical locations, such lift shafts, machine rooms, ELV rooms.



- Door kerb / equip plinth against external louvre passage leading external
- Suitable Floor drain provision to water plant room and at the same time, need to prevent the risk of loss of water seal / single point of failure.
- Rigid pipe joint and support at the base of all stacks, no matter waste or storm disposal
- Sump pump station at basement with back-up power, and in >1 duty + >1 standby combination.
- Water hammer resistance provisions required for high static sump drainage pump as well
- Application of fittings with less clog / failure rate, such as ball check valve.
- Normally, efficiency of sump pumps are NOT as good as booster pumps, capacities sizing should be checked against availability, it should aim for having small-flow + small-head or Large-flow + Large-head models, less mixture unless with pump manufacturer support.
- Major plant room should be avoided to be on the lowest basement floor
- Secure the water Level sensor able to control the ON/OFF of transfer pump in lower floor, especially avoid failure of control lead to transfer pump still be running but roof tank had been in water high level situation already. Besides, ensure same power source including the control; duplicate the sensor can further increase the reliability of control.