GUIDELINE FOR MITIGATING

SUCTION HAZARDS IN POOLS

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HEALTH AUTHORITY
RECREATIONAL WATER COUNCIL

Vancouver CoastalHealth

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Mitigating Suction Hazards in Swimming Pools

Main-drains and other suction points in swimming pools that pose a risk of entrapping swimmers are a critical public health concern. The following provides information on how to assess and mitigate suction hazards and demonstrate compliance with the BC *Pool Regulation* (e.g. Section 10(2)(k)). **Figure 1** outlines a process for addressing potential suction hazards.

Figure 1: Process for assessing and addressing potential suction hazards

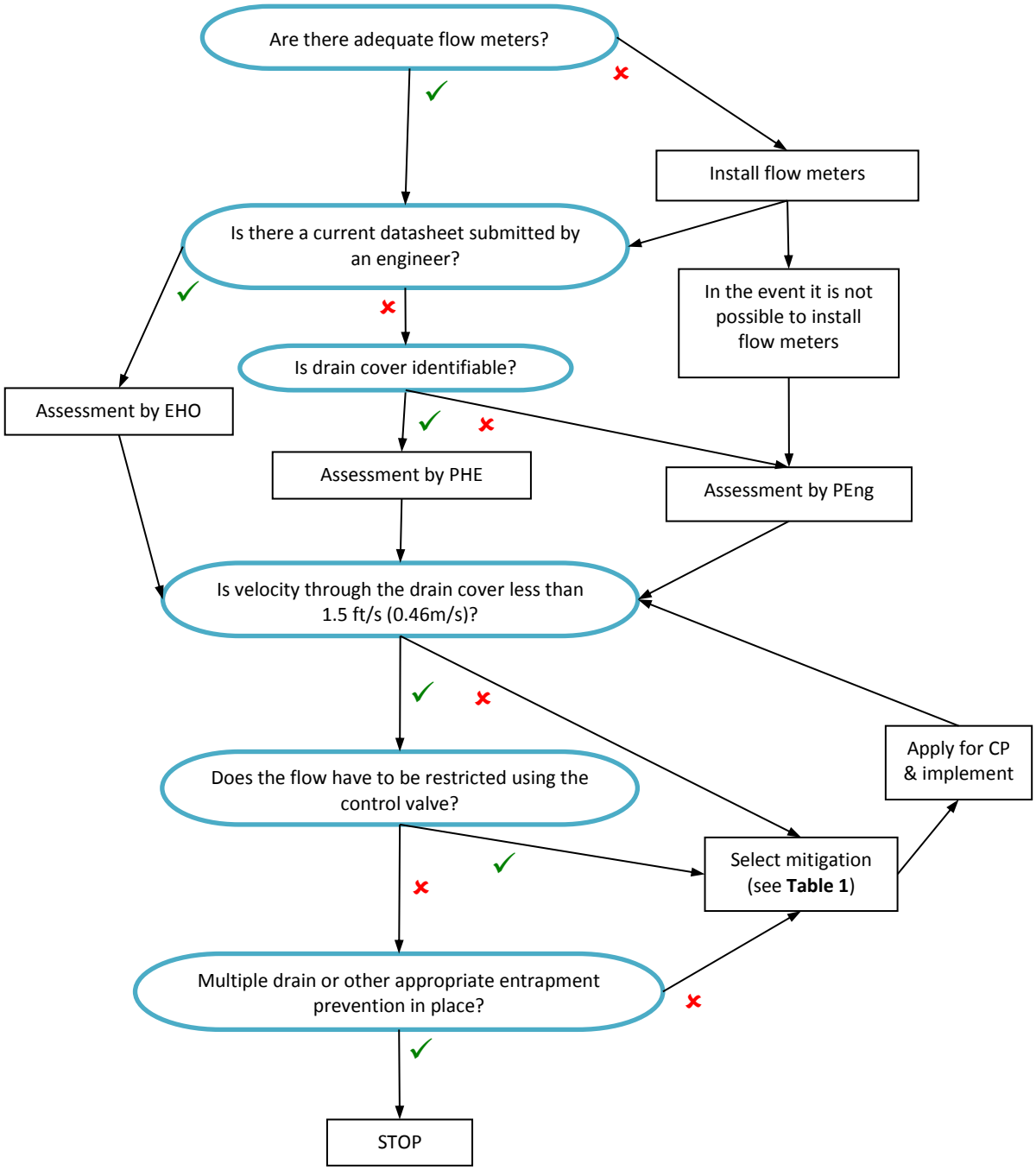

Table 1: Typical issues and mitigation options

<table>
<tr><th colspan="2">Scenarios</th><th>Short-term options</th><th>Long-term options</th></tr>
<tr><td rowspan="2">No main drain</td><td>Single skimmer</td><td>None</td><td rowspan="4">Install proper multiple main drains or
Install a VGB compliant drain cover and sump together with a Safety Vacuum Release System</td></tr>
<tr><td>Multiple skimmers</td><td>Ensure the skimmer covers are vented and the velocity over the skimmer weirs are no more than 5USgpm/inch (7.5L/min/cm)</td></tr>
<tr><td rowspan="2">Single main drain</td><td>Single skimmer</td><td>Install VGB compliant drain cover or enlarge the main drain</td></tr>
<tr><td>Multiple skimmers</td><td>Install VGB compliant drain cover or enlarge the main drain
or
Block the main drain; ensure the skimmer covers are vented and the velocity over the skimmer weirs are no more than 5USgpm/inch (7.5L/min/cm)</td></tr>
</table>

The first step for all pools is to determine if the velocity flowing through the main drains are less than 1.5 ft/s (0.46 m/s). In order to assess this, the pool must be fitted with the appropriate number and type of flow meters, allowing for an accurate measurement of the flow rate. There should be one flow meter for the main recirculation system after flow from main drain and skimmer lines have been combined (or one on each line) and a flow meter for any additional features that draws water through the main drains (i.e. jet pumps for hydrotherapy pools, pumps for, waterslides or play features etc.). The overall flow is then calculated by adding the flow as read from the flow meters and using the assumption that all of the flow is through the main drain (accounts for possibility of no flow through skimmers). The main drain open area will be ascertained either from the pool datasheets or by the EHO/PHE if the drain cover is known. The velocity of water flowing through the main drain can be calculated after these two numbers have been obtained. In cases where neither is available, an assessment by a Professional Engineer will be required.

The next step is to mitigate risks posed by potential suction entrapment hazards. **Table 1** summarizes the options for dealing with the common suction entrapment issues in existing swimming pools. Further details on these options are provided in the following pages.

Skimmers

It should be remembered that skimmers should NOT be considered as an effective suction relief. This is because skimmers might be clogged with debris or they are probably not sized to provide enough relief. No skimmer equalizer lines should terminate in the pool basin and skimmer lids should be vented.

Main Drains

Main drains certified to ASTM/ANSI 112.19 are acceptable. (This is the VGBA Compliant standard, http://www.poolsafely.gov/parents-families/residential-pool-spa-owners/vgb-compliant-drain-covers/).

For pools less than 5ft (1.5m) deep, flat or low profile drain covers are typically preferred.

If there is difficulty installing two main drains on the pool basin floor, installing a side/vertical mounted suction fitting (e.g. the Paramount SDX) would be acceptable as long as the main drain and the suction fitting are interconnected. This is required to prevent having a single suction point.

If there is more than one pump connected to the main drain than the recirculation pump (water feature, hydro air pump etc.), then the flows from each pump must all be added together and they become the Design Flow Rate for that particular drain.

Options for Existing Pools

The following are potential options that an operator could take to mitigate existing suction hazards. In all cases, the operator should be directed to contact an engineer or architect to design an appropriate solution and submit sealed plans for a construction permit.

Short-term

In all cases, flow rates should be controlled such that the velocity through the drain covers is less than 1.5 ft/s (0.46 m/s), or the flow through the weirs is within the range of 3 to 5 USgpm per lineal inch (7.5L/min/cm) of weir. The valve position should be locked and the operator should be advised to closely monitor the flow rates. Extra measures to maintain good water quality may also be required as circulation in the pool would be restricted. The following are potential options:

Main Drain Disablement

A number of the older pools have had the main drains disabled for unknown reasons and are operating with skimmers only. If there are two or more operational skimmers, then there are multiple suction points, reducing the potential for a suction hazard. In some cases, where there are multiple operational skimmers, it might be safer to make use of the skimmers and disable the single main drain (for example, where the single main drain is very small and the pool is less than 5ft (1.5m) deep. This option should be first considered by an engineer or architect to ensure proper pool function will be maintained.

Main Drain Modification

Small channels may be created on either side of the single main drain and extended for 1-2 feet (30- 60 cm) and covered with grate covers, such that the drain and channels cannot be fully covered by a person's body. The arrangement looks similar to the Aquastar channel drain, but with the existing main drain in the middle. Note that the effective open area would still be based on the original drain design as it is governed by the dimension of the original sump. Alternatively, a VGB drain cover may be installed. In any case, the velocity through the drain should be maintained at less than 1.5 ft/s (0.46 m/s).

Long-term

The most reliable solution is to install properly designed multiple main drains. Instead of replacing the single main drain with a proper multiple main drain system, the following six options are considered reasonable management solutions for public facilities with single main drains when coupled with manual shut-off switches (easily accessible from the pool deck) and alarms:

- Safety Vacuum Release Systems (SVRS)
- Suction Limiting Vent Systems
- Gravity Drainage Systems (similar to surge tanks)
- Unblockable Drains (including the cover, sump, frame and fasteners)

Details of the various options can be found from the following web site:

www.doh.wa.gov/Portals/1/Documents/Pubs/333-119.pdf

Modifications, *With Lifeguards*

- Alter the single main drain to an unblockable drain type, meeting the ASME A112.19.8-2007 standard. An unblockable drain consists of an entire drain outlet, including the cover, sump, frame and fasteners. Placing an unblockable drain cover over a blockable drain sump does not constituent an unblockable drain, and
- Install on-deck pump shut off switch and audible alarm.

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- Install an appropriately certified Safety Vacuum Release Systems (SVRS), and provide clear operating instructions in the Pool Safety Plan. Commercial pools should consider installing an alarm with the SVRS. Activation of the SVRS will stop operation of the pump and recirculation system thereby affecting water quality.

Timelines

Environmental Health Officers (EHO) and Public Health Engineers can support owners and operators in assessing their pools for suction entrapment hazards and identifying management solutions. In all cases it is expected that pool operators and owners will take progressive action to address any potential entrapment hazards in a timely manner. In cases where operators are unwilling or unable to take appropriate steps to comply, the responsible EHO may need to take progressive enforcement action under the *Pool Regulation* and *Public Health Act* to address potential threats to public health. The progressive compliance and enforcement steps taken should reflect the likelihood that a swimmer will become entrapped (e.g. the number of persons using the facility; the location of the suction hazard) and consequence (e.g. if lifeguards are present to respond).