

36.2 A temperature-limiting control shall be either a manually resettable type with a defined state (hard lockout) or a thermal link.

36.3 A manually resettable control shall be trip free in accordance with [36.5](#), and the means for resetting shall be readily accessible to the user. Such a control shall comply with the requirements in a, b, c or d below.

a) The Standard for Limit Controls, UL 353.

b) The water heater limit control requirements in the Standard for Limit Controls, UL 353, or the water heater limiting control requirements in the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. Its reset mechanism shall be "Manually Reset 2" or "M2". If part or all of the control is electronic, it shall comply with [37.6](#), [37.7](#) and Appendix [B](#).

c) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls for Household and Similar Use, Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, with the parameters as specified in [Table 36.1](#).

d) The circuit requirements in Supplement [SB](#).

Table 36.1
Temperature-limiting control parameters

| UL 60730-1, Table 7.2DV item number | Information | Control requirement |
|-------------------------------------|--|--|
| 6 | Purpose of control | Manually Reset Thermal Cut-Out |
| 7 | Type of load controlled | AC heater load |
| 27 | Number of Automatic cycles (A) | 6000: 1000 with load 5000 without load |
| 29 | Type of disconnection or interruption | Full-Disconnection |
| 36 | Limits of Activating Quantity | 50°C (122°F) setpoint |
| 39 | Type 1 or Type 2 action | Type 2 |
| 40 | Additional features | Manual Reset, Type 2.D.J Action |
| 41 | Manufacturing Deviation, maximum | ±3°C (±5°C) |
| 42 | Drift | Not vary from the as-received temperature by more than 5 percent of the Fahrenheit setpoint temperature, or by more than 10°F (6°C), whichever is the greater. |
| 49 | Pollution degree | Pollution degree 3 |
| 52 | The minimum parameters of any heat dissipater (heat sink) not provided with an electronic control but essential to its correct operation | Must be specified |
| 53 | Output waveform if other than sinusoidal | Must be specified |
| 58a | Required protection/immunity from mains borne perturbations, magnetic and electromagnetic disturbances | Required ^a |
| 69 | Software Class | B |
| 74 | External load and emission control measures to be used for test purposes | Intended heater |

Table 36.1 Continued on Next Page

Table 36.1 Continued

| UL 60730-1, Table 7.2DV item number | Information | Control requirement |
|---|---------------------------|---|
| 90 | Surge immunity | IEC 61000-4-5 installation Class 3. Overvoltage category II. |
| 92 | Class of Control Function | B |
| ^a For the purpose of the tests specified in Annex H, Section 26 of UL 60730-1, the products covered by this Standard should be considered as: <ul style="list-style-type: none"> a) Installation Class 3 (See Annex R, UL 60730-1); b) Overvoltage Category III c) Test Level 3 | | |

36.4 A thermal cutoff shall comply with the Standard for Thermal-Links – Requirements and Application Guide, UL 60691.

36.5 With reference to [36.3](#), the term "trip free" means that the device is constructed so that the contacts cannot be held in the closed position when the water has attained a temperature hotter than specified, regardless of the position of the actuating handle, button, lever, or the like.

36.6 With reference to [36.1\(c\)](#), either a single-pole device or a multipole device may be used when there is one pole in each ungrounded power supply conductor. The requirement is applicable regardless of the number of power supply circuits used.

36.7 A mechanical temperature-limiting device shall have no operating parts in common with a mechanical temperature-regulating control device, and an electronic temperature-limiting circuit shall have no parts in common with either an electronic temperature-regulating circuit or a mechanical temperature-regulating device; however, a common mounting bracket or enclosure may be used.

Exception: Parts may be employed in common for the temperature-regulating and temperature-limiting control functions when the results of an investigation indicate that the reliability of such parts in common are suitable for the application.

36.8 The relay or contactor that controls the heater circuit shall not be activated by both a temperature-regulating and a temperature-limiting control.

36.9 When opening of the control circuit makes the limit control inoperative, it shall also result in opening the electrical supply to the heater.

36.10 Shorting of the limit control circuit to ground shall not make the limit control inoperative.

36.11 Dry-fire protection shall be provided to reduce the risk of damage to the heater or adjacent parts when there is no water flow through the heater. Compliance with this requirement shall be determined by the test described in [58.1.1](#).

36.12 A water-sensing device, when used as the dry-fire protection specified in [36.11](#), shall be installed in such a way as to reduce the risk of contamination due to hair, dirt, calcium deposits, and the like.

37 Reduction of Risk of Injury to Persons

37.1 General

37.1.1 When an automatic-reset type of protective device is employed in a unit, the automatic restarting of the motor shall not result in any risk of injury to persons.

37.1.2 The requirement in [37.1.1](#) necessitates the use of an interlock in the pump when any moving part or the like would be likely to present a risk of injury upon automatic restarting of the motor.

37.1.3 An edge, projection, or corner of an enclosure, opening, frame, guard, handle, or the like shall be smooth and well-rounded and shall not cause a laceration or cut-type injury during use or maintenance.

37.1.4 Any moving part, such as a rotor of a motor, a pulley, a belt, or a gear, shall be enclosed or guarded to reduce the risk of injury to persons.

37.1.5 With reference to the requirement in [37.1.4](#), the degree of protection required of the enclosure depends upon the general design and intended use of the unit. The factors to be taken into consideration in evaluating the acceptability of an exposed moving part are:

- a) The degree of exposure;
- b) The sharpness of the moving part;
- c) The risk of unintentional contact with the moving part;
- d) The speed of movement of the part; and
- e) The risk of fingers, arms, or clothing being drawn into the moving part (such as at points where gears mesh, where a belt travels onto a pulley, or where moving parts close in a pinching or shearing action).

37.1.6 In addition to complying with [37.1.4](#) and [37.1.5](#) and under normal operating conditions, a moving part coming into contact with the occupant shall not exert a force greater than 7 pounds (9.49 J). When the mechanism (moving part) is motorized, it shall reverse its direction of motion when it encounters a resistance greater than 7 pounds.

37.1.7 When the weight of the moving part referenced in [37.1.6](#) (including the weight of the supported component and the supporting structure) exceeds 7 pounds, then it shall additionally comply with the static loading test in the Structural Integrity Tests, Section [62](#).

37.2 Stability

37.2.1 A cord- and plug-connected unit shall be provided with a base of such dimensions that the unit will not tip over while inclined in any direction at 10 degrees to the horizontal, with or without water load.

37.2.2 Ordinarily, the stability of a spa is to be investigated only when the height of the tub exceeds twice the smallest dimension of the base.

37.3 Risk of scald injury

37.3.1 A unit shall not produce excessive temperatures in water discharged into the tub due to residual heat in a heater during temporary loss of power or reduced or interrupted water flow through the heater as determined by the tests described in [58.2.1](#) and [58.3.1](#).

37.4 Heater protection

37.4.1 Water-flow sensing circuitry or devices designed to sense the lack of water when heaters are energized (sometimes called dry-fire protection) shall be investigated for reliability. These devices shall comply with either a, b, c, d or e below:

- a) The Standard for Limit Controls, UL 353.
- b) The water heater control requirements in the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. In addition, the control shall comply with the calibration verification and 100,000-cycle endurance requirements in UL 873. If part or all of the control is electronic, it shall comply with [37.6](#), [37.7](#) and Appendix [B](#).
- c) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements, UL 60730-2-6, with the parameters as specified in [Table 37.1](#).
- d) The Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and the Standard for Automatic Electrical Controls for Household and Similar Use, Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, with the parameters as specified in [Table 37.1](#).
- e) The circuit requirements of Supplement [SB](#).

Table 37.1
Water-flow control parameters
(Dry-fire protection)

| UL 60730-1, Table 7.2DV item number | Information | Control requirement |
|-------------------------------------|---------------------------------------|--|
| 6 | Purpose of control | Protective control (temperature) |
| 7 | Type of load controlled | AC heater load |
| 27 | Number of Automatic cycles (A) | 100,000 |
| 29 | Type of disconnection or interruption | Micro-Disconnection |
| 36 | Limits of Activating Quantity | Factory pressure, vacuum or temperature setting |
| 39 | Type 1 or Type 2 action | Type 2 |
| 40 | Additional features | Automatic reset |
| 41 | Manufacturing Deviation, maximum | The operating pressure of a pressure control shall be within ± 5 percent of its set point pressure $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$) for temperature sensitive controls. |
| 42 | Drift | The operating pressure shall not vary from the operating pressure initially determined by more than 5 percent of the maximum set point pressure. Not vary from the as-received temperature by more than 5 percent of the Fahrenheit setpoint temperature, or by more than 10°F (6°C), whichever is the greater. |
| 49 | Pollution degree | Pollution degree 3 |

Table 37.1 Continued on Next Page

Table 37.1 Continued

| UL 60730-1, Table 7.2DV item number | Information | Control requirement |
|---|--|--|
| 52 | The minimum parameters of any heat dissipater (heat sink) not provided with an electronic control but essential to its correct operation | Must be specified |
| 53 | Output waveform if other than sinusoidal | Must be specified |
| 58a | Required protection/immunity from mains borne perturbations, magnetic and electromagnetic disturbances | Required ^a |
| 69 | Software Class | B |
| 74 | External load and emission control measures to be used for test purposes | Intended heater |
| 90 | Surge immunity | IEC 61000-4-5 installation Class 3. Overvoltage category II. |
| 92 | Class of Control Function | B |
| ^a For the purpose of the tests specified in Annex H, Section 26 of UL 60730-1, the products covered by this Standard should be considered as: <ul style="list-style-type: none"> a) Installation Class 3 (See Annex R, UL 60730-1); b) Overvoltage Category III c) Test Level 3 | | |

37.5 Water backflow

37.5.1 A spa shall be provided with two separate and independent means to prevent water backflow into electrical equipment (such as a backflow loop and a check valve).

Exception No. 1: A spa may be provided with a single component to prevent water backflow into electrical equipment when the results of an investigation indicate that the reliability of the single component is suitable for the application.

Exception No. 2: Water-sanitizing equipment, such as an ozone generator, need only be provided with one backflow check valve.

37.5.2 When a spa or an equipment assembly is tested in accordance with [58.4.1](#), there shall be no wetting of live parts or electrical insulation.

37.5.3 A check valve provided to reduce the risk of water backflow shall close when the air pressure falls below that pressure represented by the maximum head of water that the valve can be subjected to under any condition of filling. The valve shall not leak when subjected to twice the maximum water pressure, as described in [58.5.1](#).

37.5.4 When an equipment assembly is provided with a check valve that is necessary to reduce the risk of backflow of water from a hot tub or spa furnished in the field, it shall close when the air pressure falls below the maximum pressure that the blower can develop and shall not leak at any water pressure from zero to 5 pounds-force per square inch (0 to 34.5 kPa), as described in [58.5.1](#).

37.5.5 A blower or an equipment assembly with a blower shall be provided with the marking specified in [72.4.1](#) and the instructions specified in [74.5.1](#).

Exception: A blower or an equipment assembly with a blower that complies with the requirement specified in [37.5.1](#) is not required to be provided with the marking specified in [72.4.1](#) and the instructions specified in [74.5.1](#).

37.6 Safety controls and safety circuits

37.6.1 A temperature-limiting control, a temperature-regulating control, and a dry-fire control are considered to perform a safety function. A component, such as a switch or relay, or an electronic circuit that is used to perform a safety function shall not be used to perform any other function.

Exception: Except as specified in [36.8](#), an individual component or an electronic circuit may be used to perform functions (including additional safety functions) in addition to the primary safety function if the results of an investigation indicate that the reliability of components in such multiple functions is suitable for the application.

37.7 Reliability

37.7.1 A component investigation (see [58.8.1](#)) shall be necessary when evaluating:

- a) Safety controls,
- b) Safety circuits,
- c) Circuits that are accessible to the occupant or in contact with circulating water, and
- d) Other circuits where component faults result in a risk of fire, electric shock, or injury to persons.

37.7.2 Except for controls evaluated in accordance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, the Standard for Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements, UL 60730-2-6, and the Standard for Automatic Electrical Controls for Household and Similar Use, Part 2: Particular Requirements for Temperature Sensing Controls, UL 60730-2-9, with the parameters as specified in [Table 35.1](#), [Table 36.1](#), and [Table 37.1](#), an electronic or solid-state circuit that performs a backup, limiting, or other function intended to reduce the risk of fire, electric shock, and/or injury to persons, including temperature-regulating, temperature-limiting and dry-fire protection, shall comply with the requirements in Appendix [B](#).

37.7.3 For the purposes of determining circuit reliability required by [37.7.2](#), the Critical Failure Modes for each type of control are as follows:

- a) Temperature-Regulating Control –
 - 1) Normal use set point higher than 40°C (104°F)
 - 2) Special Use Set Point higher than 41°C (106°F)
 - 3) Maximum water temperature exceeding 43°C (109°F)
- b) Temperature – Limiting Control – Water temperature at the inlet to the spa greater than 50°C (122°F)
- c) Heater Protection – Heater allowed to activate without water flow.

37.8 Ozone generators

37.8.1 An ozone generator provided as an integral spa component shall inject ozone into the water circulating system without ozone passing through the pump, heater, or current collectors, and without ozone contacting any safety circuit component or sensing device, or any check valve that is not an integral part of the ozone system.

37.8.2 A spa with an integral ozone generator shall not offgas more than 0.1 parts ozone per million parts air (PPM) averaged over 8 hours when tested as specified in the Ozone Offgas Test, Section [57](#).

37.8.3 The maximum transitory ozone concentration shall not exceed 0.3 parts ozone per million parts air (PPM) when averaged over any 13 consecutive readings and shall not exceed 0.8 PPM when averaged over any two consecutive readings.

37.8.4 Factors to be taken into consideration when evaluating the acceptability of water disinfection components such as ozone generators include but are not limited to:

- a) Type of injection method, including injection depth;
- b) Type of injector used, such as an ozone jet or a negative pressure venturi;
- c) Contact distance (with water) from the point of generation to the point of injection; and
- d) Other factors that may contribute to reduce the off-gassing effects, such as plumbing diameter, type of tubing used, etc.

37.9 Button or coin cell batteries of lithium technologies

37.9.1 The battery compartment of an appliance or any accessory, such as a wireless control, incorporating one or more coin cell batteries of lithium technologies shall comply with the Standard for Products Incorporating Button or Coin Cell Batteries of Lithium Technologies, UL 4200A, if the appliance or any accessory:

- a) Is intended for use with one or more single cell batteries having a diameter of 32 mm (1.25 in) maximum with a diameter greater than its height; and
- b) The appliance is intended for household use.

Exception: UL 4200A is not applicable to appliances and accessories under the scope of UL 1563 that meet the following:

- a) The battery is not intended to be replaced.*
- b) The battery is not referenced in the instructions or markings.*
- c) A battery access door or cover is not provided.*
- d) The appliance or accessory is not intended to be handheld during normal operation.*

38 Suction Openings

38.1 Each spa shall be provided with a minimum of two suction openings, or one suction opening and a skimmer equipped with a vacuum break. The suction openings may be shared by more than one pump, provided each pump can draw water from two or more openings. Each suction opening shall be provided with a means to reduce the risk of entrapment. Each suction opening provided for this purpose shall:

- a) Have a flow rate in gallons-per-minute (GPM) which equals or exceeds the water flow rating of the specific opening when tested as described in [59.1](#);
- b) Comply with the applicable requirements specified in the Standard Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs, APSP-16; and
- c) Not be installed on seating or lounge areas or on the backrest(s) of such areas.

Exception: A fitting with no marked flow rating need not comply with [38.1 \(a\)](#) if it complies with all the provisions of APSP-16 when installed in the spa. Controls shall be adjusted for the maximum water flow through the fitting.

38.2 A suction opening that presents a risk of injury due to its shape, location or intended use under normal or abnormal use, or when it can be used as a seat, step, or support structure facilitating entry or exit from the spa, shall comply with the applicable tests in Structural Integrity Tests, Section [62](#).

Exception: Small parts unlikely to be subjected to the loading effects anticipated by the tests in Section [62](#) may be subjected to the Test for Resistance to Impact, Section [56](#).

38.3 All parts removable without the use of tools shall be removed while the system is evaluated for risk of body and hair entrapment if doing so results in the worst case.

38.4 Additional factors to be taken into consideration when evaluating the acceptability of suction openings not completely submerged (or unlikely to be completely submerged) at all times when installed as intended include but are not limited to:

- a) Resistance to impact;
- b) Mechanical strength;
- c) Normal and abnormal loading effects (such as an occupant using it as a step or seat);
- d) Risk of injury (such as a laceration, or the risk of tub occupant inadvertently hitting the device); and
- e) The impact of the occupant not replacing some or all removable parts.

38.5 Suction openings shall be installed in such a manner that it is unlikely both suction openings or a suction opening and skimmer on the same pump can be simultaneously blocked. The installed fitting(s) and skimmer shall comply with the body entrapment requirements specified in the Standard for Standard Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs, APSP-16.

Exception No. 1: Constructions where the spa is provided with features, electrical, mechanical, or both that release the pump vacuum in the event both fittings on a single pump are blocked. The functionality of these features shall be evaluated by the Body Entrapment Test in APSP-16. Mechanical or electrical construction features necessary for the function of the system shall be evaluated for reliability.

Exception No. 2: Suction outlets protected by either (1) a suction-limiting vent system with a tamper-resistant atmospheric opening or (2) or gravity drainage system.

38.6 Installations specified below are considered unlikely to be simultaneously blocked:

- a) One fitting in a footwell and a skimmer.
- b) Fittings installed on the same plane and separated by a minimum of 3 feet (0.9 m).

c) Fittings on the same pump that are installed in a footwell where the footwell cannot be completely covered by the 18 inch by 23 inch (457 mm by 584 mm) blocking element specified in APSP-16. In constructions where this cannot be readily determined, the footwell shall be subjected to the Body Entrapment Test specified in APSP-16.

38.7 Suction openings that draw water from a gravity-fed water reservoir are not required to comply with the requirements in [38.3](#) – [38.6](#) when they are inaccessible to the occupant, and do not present a risk of hair or body entrapment.

38.8 Skimmers represented by the general descriptions in (a) – (c) and conforming to the overall general shapes and designs (or the equivalent) illustrated in [Figure 38.1](#) – [Figure 38.3](#) are not required to comply with the requirements in [38.3](#) – [38.6](#).

a) Weir Door Style Skimmer – A vertically-mounted, square-shaped skimmer installed in the side wall of the spa shell provided with a square-shaped face opening measuring approximately 5 x 5 inches (12.7 x 12.7 cm) or having an opening measuring 25 inches² (63.5 cm²) minimum, installed close to the tub rim. Provided with a weir door for skimming floating debris from the water surface. Provided with a skim basket with mesh openings covering the entire basket. May be provided with a filter cartridge. See [Figure 38.1](#) for the general shape and design of a weir door style skimmer.

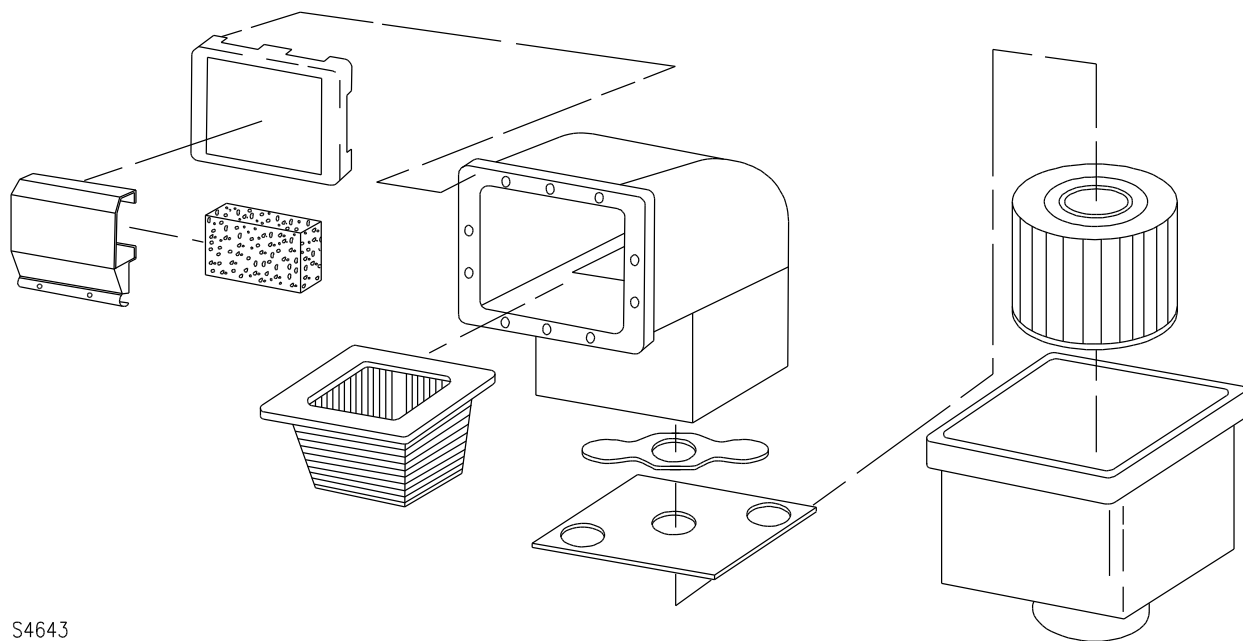
b) Floating Weir Style Skimmer – A horizontally-mounted, circular-shaped skimmer measuring approximately 15 inches (38 cm) tall with an 8-inch (20.3 cm) diameter. Installed so that the telescoping floating weir comes within a couple of inches of the tub rim when fully extended. Installed in a recessed area. Provided with an adjustable, telescoping floating weir (extendable to approximately 5 inches) for skimming floating debris from the water surface. Provided with a vacuum break ring. The vacuum break ring is part of the skimmer body, and is provided with the following openings around the diameter of the skimmer allowing water to flow into the skimmer from the sides in addition to the top.

- 1) Six openings measuring 2 inches (5 cm) wide by 0.25 inches (51 mm) high; or
- 2) Eight openings measuring 1.15 inches (2.9 mm) wide by 0.2 inches (5 mm) high, and two openings measuring 2.15 inches (5.4 cm) long by 0.2 inches high; or
- 3) Four openings measuring 2 inches wide by 0.3 inches (8 mm) high, and two openings measuring 1.6 inches (40 mm) wide by 0.3 inches high; or
- 4) A minimum of six openings evenly distributed along the diameter of the skimmer body having a total area of minimum 2.7 inches² (6.8 cm²).

Provided with a circular-shaped skim basket with mesh openings covering the entire basket. Skim basket and floating weir are held inside the skimmer using friction fit. Provided with a filter cartridge measuring approximately 12 inches (30.5 cm) long. See [Figure 38.2](#) for the general shape and design of a floating weir style skimmer.

c) Strip Style Skimmer – A vertically-mounted, rectangular-shaped skimmer installed in the side wall of the spa shell. Two-piece construction (faceplate and threaded back plate). Overall dimensions approximately 9 inches (23 cm) tall by 4 inches (10 cm) wide by 1 inch (25.4 mm) deep. Installed as close to the tub rim as practical (within a couple of inches). Provided with a half-inch plumbing connection attached to the threaded back plate. Faceplate is screwed to the threaded back plate and is provided with multiple openings having a total area of approximately 7 inches² (17.7 cm²) for skimming floating debris from the water surface. Additional openings are provided either on the tapered sides of the faceplate, or on the threaded back plate having a total area of approximately 3 inches² (7.6 cm²). See [Figure 38.3](#) for the general shape and design of strip style skimmer.

Figure 38.1
Weir door style skimmer



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