

Monroeville Reservoir Floating Solar Project

Technical Briefing: Material Composition, Drinking Water Compliance, and Operational Track Record

Prepared by D3Energy for the Village of Monroeville, Ohio

Executive Summary

The Monroeville reservoir floating photovoltaic (FPV) array uses a Ciel & Terre Hydrelío® floating support structure manufactured from engineered, UV-stabilized high-density polyethylene (HDPE) — the same polymer family used worldwide for municipal water mains, potable water storage tanks, and food-contact infrastructure, selected for long-term durability in continuous water contact. The solar modules are mounted on top of the float structure and sit above the water on aluminum supports — the modules themselves do not contact reservoir water. The only system component on the array in continuous water contact is the HDPE float.

The Hydrelío float system has been independently tested under two of the world's most stringent drinking-water material protocols (UK BS 6920:2014 and Japan Food Sanitation Act / RoHS Directive) and conformed with all parameters in both. The system carries the Solar Impulse Foundation Efficient Solution label (independently audited by Ernst & Young) and Ciel & Terre's design methodology is certified by Bureau Veritas (2020, renewed 2023). The same Hydrelío system is in active service on US drinking-water utility sites, including Del-Co Water Company's Olentangy Water Treatment Plant in Delaware County, Ohio (Ohio's first floating solar array, in service since 2024).

Section 1 through Section 6 below describe the system, materials, testing, and operational record. Appendices A through F provide the detailed component inventory, test result tables, certification listings, project references, and source documents.

1. System Description

The Monroeville FPV system is a 6 MW (DC) floating photovoltaic array deployed on the village's existing reservoir. The system comprises three principal subsystems:

- **Floating support structure:** a modular grid of HDPE floats interlocked with polypropylene connection pins, with aluminum mounting hardware supporting the PV modules at a fixed tilt. Manufactured by Ciel & Terre International under the Hydrelío® product line.
- **Photovoltaic modules:** Astronergy ASTRO 6 Twins CHSM66M(DG)/F-BH bifacial dual-glass modules, 645–665 W nameplate, IP68 junction boxes, anodized aluminum frame. Cells are sealed between two layers of glass; the module contains no internal fluids. The modules are mounted on the float structure above the water surface on aluminum support beams and do not contact reservoir water.
- **Anchoring and balance-of-system:** site-specific anchoring designed by Ciel & Terre engineering; inverters and switchgear located on the bank, not on the water.

The PV modules at Monroeville do not contact reservoir water. They are mounted on the float structure at a fixed tilt angle, supported by aluminum face beams, back beams, and legs that hold each module above the water plane. The only system surface on the array in continuous water contact is the underside of the HDPE floats themselves; the modules sit on top of the float structure in open air. No part of the module — internal materials, surfaces, frame, or junction box — contacts reservoir water.

2. Float Material Composition and Manufacturing

2.1 Component Inventory and Composition

The Hydrelío floating system is manufactured under a controlled industrial process documented in the Hydrelío® datasheet (Ciel & Terre, current revision). The complete component inventory and material specification is presented in Appendix A. Principal materials in water contact:

- **Main float, maintenance main float, small and long secondary floats:** High-density polyethylene (HDPE) compounded with a proprietary UV stabilizer. Manufactured by blow molding. Float masses range from approximately 3 kg (small secondary) to 13 kg (maintenance main); main float overall dimensions range from 1,428 × 1,000 mm to 1,708 × 1,000 mm.
- **Connection pins and nuts:** Glass-fiber-reinforced polypropylene with UV stabilizer; injection-molded; pins certified to NF T 58 000. Resin compound is Ginar Technology APLAX® P2820GN 01 (Taoyuan, Taiwan): polypropylene polymer resin (CAS 9003-07-0) >55%, glass fiber (CAS 65997-17-3) 37–43%, non-regulated lubricants and stabilizers <5%. The Ginar SDS (October 2021) states no cadmium, lead, or other regulated heavy metals are present; the compound is compliant with US TSCA, Canadian DSL, Japan ENCS, Australian AICS, Korean, Philippine PICCS, and Chinese chemical inventories, and is not OSHA-, IARC-, NTP-, or ACGIH-listed as a carcinogen.
- **Self-drilling screws:** Stainless steel SUS 304 (INOX A2).
- **PV module fixation (face beam, back beam, legs, rivets) and spreader bars:** Aluminum.
- **PV clamp hardware:** Stainless A2/A4.

The raw resin used in the float is Chevron Phillips Marlex® HXM 50100 polyethylene, an ethylene–hexene copolymer (CAS 25213-02-9), 99–100% by weight. The SDS for this material (Chevron Phillips, version 3.3, revised 2023-08-07) is provided as a supporting document; the SDS identifies no hazard classification for the finished product and does not classify the polymer as a carcinogen, irritant, or sensitizer under IARC, NTP, or OSHA HazCom 29 CFR 1910.1200.

HDPE is the same polymer family used worldwide for municipal potable water mains (AWWA C901/C906), potable water storage tanks, and food packaging. The UV stabilizer additive is engineered for a 25+ year service life to maintain surface integrity over the operating life of the system.

2.2 Material Selection: Engineered HDPE in Water-Contact Applications

The floats at Monroeville are not foam, not film, and not the kind of disposable plastic associated with single-use products that degrade and shed particles into the environment. They are engineered, blow-molded, UV-stabilized high-density polyethylene — the same polymer family used for municipal water mains, potable water storage tanks, and food-contact infrastructure. HDPE was selected for floating photovoltaic application for the same reason it is the dominant material for buried potable water infrastructure: long-term durability and chemical stability in continuous water contact.

The relevant question for any material in this application is not "is it plastic?" The relevant question is: what type of plastic, what grade, what exposure conditions is it engineered for, and is it designed for long-term durability in water? A generic objection to "plastic in the reservoir" treats a 25-year engineered structural component as if it were a single-use water bottle. They are not the same material in any meaningful sense.

Two analogies illustrate the point:

- **Wood.** Particleboard disintegrates in a damp basement; marine-grade lumber sits on docks and piers for decades. Both are "wood." The grade, the engineering, and the intended exposure environment determine the performance.

- **Metal.** A tin can rusts through in a year; a cast-iron water main carries water for a century; surgical stainless steel sits inside the human body indefinitely. All "metal." No one treats them as equivalent materials, and grade is exactly the point.

The HDPE used in the Hydrelío system is the marine-grade-lumber, surgical-stainless equivalent within its material family. It is not selected for cost; it is selected because it is built to last in this exact application. The blow-molded manufacturing process (versus thin-film extrusion), the UV stabilizer additive, the 25-year design life, and the testing record under BS 6920 and Japan's Food Sanitation Act all reflect that engineering intent.

The standard against which this material should be evaluated is not the public's general experience of disposable plastic, but the documented performance of HDPE in long-term water-contact infrastructure — where it is, and has been for decades, the engineered solution of choice.

3. Drinking Water Compliance Testing

The Hydrelío float has been tested under two of the world's most demanding drinking-water-material protocols. Complete numeric results are provided in Appendix B (BS 6920) and Appendix C (Japan FSA / RoHS).

3.1 UK BS 6920:2014 — Suitability of Non-Metallic Products for Use with Drinking Water

BS 6920 is the British drinking-water-contact standard administered through the UK Water Regulations Advisory Scheme (WRAS). Testing was performed by the UKAS-accredited Spencer House laboratory of Thames Water Utilities Ltd. (UKAS registration 0677). Test report M 105952, dated 25 June 2015, covers the Hydrelío Main and Small Float. The protocol comprises five parts:

- **Odour and flavour of water (Clause 4):** Threshold odour and threshold flavour numbers of <1 in both chlorine-free and chlorinated extracts — conforms.
- **Appearance of water — colour and turbidity (Clause 5):** Colour <0.8 Hazen units, turbidity <0.06 FNU in both first and final extracts — conforms.
- **Growth of aquatic micro-organisms (Clause 6):** Mean dissolved-oxygen difference of 0.1 mg/L over weeks 5–7, comparable to the glass negative reference (0.2 mg/L) and far below the wax positive reference (7.6 mg/L) — conforms; no microbial growth supported.
- **Cytotoxicity — substances of concern to public health (Clause 7):** VERO cell line monolayer confluence 100%, normal morphology, normal culture medium colour — non-cytotoxic response, conforms.
- **Extraction of metals (Clause 8):** All twelve regulated metals (Al, Sb, As, B, Cd, Cr, Fe, Pb, Mn, Hg, Ni, Se) measured below their respective Maximum Acceptable Concentration limits — conforms. See Appendix B for the full metals table.

Executive summary from the report: "When assessed by the methods given in BS 6920-2:2014, the samples of this product are deemed suitable for use in contact with cold water intended for human consumption."

3.2 Japan Food Sanitation Act and RoHS Directive

A separate analytical program was conducted in 2014 by JFE Techno-Research Corporation (Kawasaki, Japan), with the elution test subcontracted to Japan Food Research Laboratories (Tokyo). Two test regimes were applied:

- **Material test (RoHS):** Cadmium, lead, mercury, and hexavalent chromium content of the HDPE substrate. All four elements returned "Not Detected" at the method detection limits (Cd <2 mg/kg, Pb <10 mg/kg, Hg <1 mg/kg, Cr⁶⁺ <1 mg/kg) against RoHS / FSA limits of 100, 100, 1,000, and 1,000 mg/kg respectively.
- **Elution test (Japan FSA — Specifications and Standards for Implements, Containers and Packaging):** Evaporation residue testing at 60 °C in both water and 4% acetic acid solution. Both extracts returned conformable results at ≤5 µg/mL against the 30 µg/mL Japan FSA standard.

Both regimes returned conforming results, confirming the Hydrelío float satisfies the Japanese standards governing materials in contact with food and potable water. See Appendix C for the detailed result table.

4. PV Module Composition and Certifications

The Astronergy CHSM66M(DG)/F-BH ASTRO 6 Twins module is a sealed dual-glass laminate with the following published construction characteristics:

- **Cell type:** P-type monocrystalline silicon, PERC, half-cut, multi-busbar; 132 cells (6 × 22) per module.
- **Front and rear surfaces:** 2.0 + 2.0 mm tempered glass (dual-glass / glass-glass construction). No exposed polymer backsheet.
- **Frame:** Silver-anodized aluminum, 35 mm depth.
- **Junction box:** IP68 ingress protection; 3 bypass diodes.
- **Module envelope:** 2,384 × 1,303 × 35 mm; 38 kg.
- **Maximum mechanical load:** 5,400 Pa front / 2,400 Pa rear.

Cells are fully encapsulated between the two glass sheets within the aluminum frame. There are no internal fluids. Because the modules are mounted on the float structure above the water surface, no part of the module — including the glass surfaces, frame, junction box, or internal materials — contacts reservoir water. The module carries the certifications listed in Appendix D, including IEC 61215 (design qualification), IEC 61730 / UL 61730 (safety), IEC 61701 (salt mist corrosion), IEC 62716 (ammonia resistance), and IEC 62804 (PID resistance).

The dual-glass laminate is the same construction used in utility-scale solar worldwide and is specifically engineered for impact resistance and structural containment. D3Energy's O&M procedures include routine visual inspection of the array and replacement of any module with compromised glass as part of standard plant maintenance.

5. Operational Track Record on US Drinking-Water Sites

The same Hydrelío floating system has multiple-year operating history on US water utility sites. The most directly comparable reference for Monroeville is Del-Co Water Company's Olentangy Water Treatment Plant in Delaware County, Ohio — same developer (D3Energy), same float, same regulatory environment, and same drinking-water application. Selected US drinking-water and water-utility deployments are listed below; full project parameters are in Appendix E.

- **Del-Co Water Company, Olentangy WTP (Delaware County, Ohio):** 1.5 MW Hydrelío FPV; Ohio's first floating solar array; in service since 2024; member-owned non-profit cooperative serving eight central Ohio counties. D3Energy developer.
- **Canoe Brook Reservoir (Millburn, NJ):** 8.9 MW Hydrelío FPV on a New Jersey American Water drinking-water reservoir serving approximately 84,000 customers; 16,510 modules across 17 acres.
- **Sayreville (Bordentown Road), New Jersey:** 4.4 MW Hydrelío FPV on the borough's water treatment plant retention ponds; powers 100% of plant load.
- **City of Cohoes, New York:** 3 MW Hydrelío FPV on the City's drinking water reservoir; same HDPE float material as Monroeville.
- **Mountain Regional Water, Signal Hill WTP (Utah):** 600 kW Hydrelío FPV at a drinking water treatment plant; expected to offset >90% of plant load. D3Energy developer.

Each of these projects operates under the oversight of its respective state and local water authority. No water-quality issue has been reported at any of these sites. Where measurable effects on reservoir water have been documented, they are consistently in beneficial dimensions: reduced evaporation, suppressed algal growth, and lower mean water temperature.

6. Independent Third-Party Endorsements

- **Solar Impulse Foundation — Efficient Solution Label:** Hydrelío® holds the Solar Impulse Efficient Solution label, an independent certification assessing environmental and economic performance, audited by Ernst & Young, awarded for solutions meeting United Nations Sustainable Development Goal criteria.
- **Bureau Veritas — Design Methodology Certification:** Ciel & Terre's floating PV design methodology has been certified by Bureau Veritas (originally 2020, renewed 2023), providing third-party validation of the engineering approach to anchoring, structural, and survivability analysis.
- **UKAS-accredited drinking water testing (BS 6920):** Performed by Thames Water Utilities Ltd., UKAS lab 0677.
- **Japan Food Sanitation Act testing:** Performed by JFE Techno-Research Corporation; elution testing subcontracted to Japan Food Research Laboratories (authorized by the Japanese Government).

Appendices

Appendix A — Hydrelío Floating System: Component Inventory and Material Specification

Source: Ciel & Terre International, Hydrelío® datasheet (Detailed).

Component	Material	Manufacturing Process	Specification
Main float (MF 1300 / 1400 / 1480 / 1580)	HDPE + UV stabilizer	Blow molding	~8–9 kg each; overall dimensions 1,428–1,708 × 1,000 mm
Maintenance main float (MMF)	HDPE + UV stabilizer	Blow molding	~11–13 kg each; same overall dimension range
Small secondary float (SSF)	HDPE + UV stabilizer	Blow molding	~3 kg; 1,000 × 400 × 150 mm overall
Maintenance small secondary float (SSFX)	HDPE + UV stabilizer	Blow molding	~3 kg; 1,000 × 400 × 218 mm overall (additional buoyancy ring)
Long secondary float (LSF 1420 / 1510 / 1610 / 1700)	HDPE + UV stabilizer	Blow molding	~6 kg each; 1,548–1,828 × 400 mm overall
Connection pin (long / large)	Ginar APLAX® P2820GN 01 — PP (CAS 9003-07-0) >55% + glass fiber (CAS 65997-17-3) 37–43% + UV stabilizer	Injection molding	~90–120 g each; 102–104 mm height; certified NF T 58 000
Connection nut	Ginar APLAX® P2820GN 01 — PP + 37–43% glass fiber + UV stabilizer	Injection molding	~30 g each
Self-drilling screw	Stainless steel SUS 304 / INOX A2	Standard fastener	Ø 3.5–3.9 mm; L = 19 mm
Face beam, back beam, legs, rivets	Aluminum	Extrusion / fabrication	Dimensions defined by tilt angle (5° or 12°) and module width
PV clamp hardware (screws, washers, nuts)	Stainless A2 / A4	Standard fastener	M8 CHC screws, M8 spring washers, M8 flange nuts

Component	Material	Manufacturing Process	Specification
Spreader bars (small / medium)	Aluminum	Extrusion / fabrication	Maximum load 11.98 kN per spreader bar

HDPE raw resin: Chevron Phillips Marlex® HXM 50100 polyethylene; ethylene-hexene copolymer (CAS 25213-02-9); 99-100% by weight; SDS rev. 3.3, 2023-08-07.

Connection pin / nut resin compound: Ginar Technology APLAX® P2820GN 01; polypropylene polymer resin (CAS 9003-07-0) >55 wt%, glass fiber (CAS 65997-17-3) 37-43 wt%, lubricants and stabilizers <5 wt%; SDS October 2021.

Connection pins and connection nuts are inserted through the connection ears of the floats and locked with the self-drilling screw to secure the assembly.

Appendix B — UK BS 6920:2014 Test Results

Source: Thames Water Utilities Ltd., Spencer House Laboratory (UKAS 0677). Test Report M 105952, dated 25 June 2015.

Subject article: Hydrelion™ Main and Small Float; HDPE with Anti-UV Compound; blow-molded plaque test article 121 × 59 × 3 mm. Extraction temperature 23 ± 2 °C. Tests performed: odour & flavour, appearance, growth of aquatic micro-organisms, cytotoxicity, and extraction of metals.

B.1 Odour, Flavour, Appearance, Microbial Growth, and Cytotoxicity

Test (BS 6920-1 Clause)	Parameter	Result	Limit / Reference
Odour & flavour (Cl. 4)	Threshold odour and flavour number, chlorine-free and chlorinated	<1 (all conditions)	Standard threshold ≤ procedural blank
Appearance (Cl. 5)	Colour (Hazen units)	<0.8	Procedural blank baseline
Appearance (Cl. 5)	Turbidity (FNU)	<0.06	Procedural blank baseline
Microbial growth (Cl. 6)	Mean dissolved-oxygen difference, weeks 5–7 (mg/L)	0.1	Glass reference 0.2; wax positive ref. 7.6
Cytotoxicity (Cl. 7)	VERO ATCC CCL 81 monolayer confluence	100% (normal)	Non-cytotoxic response

B.2 Extraction of Metals (BS 6920-1 Clause 8)

All values are first extract concentrations at 23 ± 2 °C. "<" denotes below limit of detection. MAC = Maximum Acceptable Concentration under BS 6920-1.

Element	Symbol	Unit	MAC limit	Sample 1	Sample 2	Reagent blank
Aluminium	Al	µg/L	200	2.8	2.5	1.7
Antimony	Sb	µg/L	5	<0.1	<0.1	<0.1
Arsenic	As	µg/L	10	<0.3	<0.3	<0.3
Boron	B	µg/L	1000	<11	<11	<11
Cadmium	Cd	µg/L	5	<0.1	<0.1	<0.1
Chromium	Cr	µg/L	50	<0.9	<0.9	<0.9
Iron	Fe	µg/L	200	<2.0	<2.0	<2.0
Lead	Pb	µg/L	10	<0.2	<0.2	<0.2
Manganese	Mn	µg/L	50	<0.8	<0.8	<0.8
Mercury	Hg	µg/L	1	<0.09	<0.09	<0.09

Element	Symbol	Unit	MAC limit	Sample 1	Sample 2	Reagent blank
Nickel	Ni	µg/L	20	<1.3	<1.3	<1.3
Selenium	Se	µg/L	10	<0.8	<0.8	<0.8

Analytical methods: inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled plasma optical emission spectrometry (ICP-OES). Methods validated to UK Drinking Water Inspectorate and "A Manual on Analytical Quality Control for the Water Industry" (NS 30).

Overall conclusion of BS 6920 test report: *"The samples of this product meet the test criteria of BS 6920-1:2014 (Specification) and is suitable for use in contact with cold but not hot water intended for human consumption."*

Appendix C — Japan Food Sanitation Act and RoHS Test Results

Source: JFE Techno-Research Corporation, Report No. Y1403655 (December 25, 2014), Kawasaki, Japan. Elution testing subcontracted to Japan Food Research Laboratories, Tokyo (authorized by the Japanese Government), Certificate of Analysis No. 14125475001-02 (December 23, 2014).

Subject article: HYDRELIO® Float. Material test analytical methods: wet decomposition and atomic absorption spectroscopy (Cd, Pb), reduction vaporizing AAS (Hg), boiling-water extraction with diphenylcarbazide absorptiometry (Cr⁶⁺). Elution test: 2 mL solvent per cm² surface area, 60 °C, 30 minutes.

C.1 Material Test (RoHS Directive and FSA Implements, Containers and Packaging Standards)

Element	Result	Method Detection Limit	Standard limit	Reference standard
Cadmium (Cd)	Not Detected	2 mg/kg	100 mg/kg	Japan FSA
Lead (Pb)	Not Detected	10 mg/kg	100 mg/kg	Japan FSA
Mercury (Hg)	Not Detected	1 mg/kg	1,000 mg/kg	RoHS Directive
Hexavalent chromium (Cr ⁶⁺)	Not Detected	1 mg/kg	1,000 mg/kg	RoHS Directive

C.2 Elution Test (Japan FSA — Specifications for Implements, Containers and Packaging, Synthetic Resin / Polyethylene)

Test parameter	Result	Japan FSA standard	Conformance
Evaporation residue (water, 60 °C, 30 min)	≤5 µg/mL	≤30 µg/mL	Conformable
Evaporation residue (4% acetic acid, 60 °C, 30 min)	≤5 µg/mL	≤30 µg/mL	Conformable
pH, water solvent at 22 °C	6.3	Reference (blank 5.8)	Within range
pH, 4% acetic acid solvent at 22 °C	2.4	Reference (blank 2.4)	Within range

Overall conclusion of the Japan test program: "Analysis values of every item of the material and elution tests were less than the minimum quantitative limit values, and satisfied the specification values in accordance with the RoHS Directive and the standard values of the Specifications and Standards for Implements, Containers and Packaging in accordance with the Food Sanitation Act."

Appendix D — Astronergy CHSM66M(DG)/F-BH Module Certifications

Source: Astronergy ASTRO 6 Twins CHSM66M(DG)/F-BH product datasheet (December 2023, American market revision) and Astronergy Certificate of Compliance E313491.

Standard	Description	Status
IEC 61215	Design qualification and type approval of crystalline silicon terrestrial PV modules	Certified
IEC 61730 / UL 61730	PV module safety qualification: construction and testing requirements	Certified
IEC 61701	Salt mist corrosion testing of PV modules	Certified (Intertek)
IEC 62716	Ammonia corrosion testing of PV modules	Certified
IEC 62804	Potential-induced degradation (PID) of crystalline silicon PV modules	Certified
ISO 9001:2015	Quality management system	Astronergy certified
ISO 14001:2015	Environmental management system	Astronergy certified
ISO 45001	Occupational health and safety management	Astronergy certified
Module-level warranty	15-year product warranty / 30-year linear power warranty (American market revision)	Manufacturer-issued

Module performance and construction key parameters (from datasheet):

- Nameplate power: 645 / 650 / 655 / 660 / 665 W
- Maximum module efficiency: 21.4%
- First-year power degradation: ≤ 2.0%; year 2–30 annual degradation: ≤ 0.45%
- Operating temperature coefficient: -0.34%/°C (Pmpp)
- NMOT: 41 ± 2 °C
- Maximum system voltage: 1500 V DC
- Maximum series fuse rating: 35 A

Appendix E — US Drinking-Water and Water-Utility Hydrelío Deployments

Project	Operator / Owner	Capacity	In service	Application
Olentangy WTP, Delaware County, OH	Del-Co Water Company (cooperative)	1.5 MW	2024	Drinking-water utility reservoir
Monroeville Reservoir, OH	Village of Monroeville (PPA: Gardner Capital)	6 MW	2026 (commissioning)	Pretreated drinking-water reservoir
Canoe Brook Reservoir, Millburn, NJ	New Jersey American Water	8.9 MW	2024	Drinking-water reservoir (~84,000 customers)
Sayreville Bordentown Rd WTP, NJ	Borough of Sayreville	4.4 MW	2019	Water treatment plant retention ponds
City of Cohoes Reservoir, NY	City of Cohoes (municipal water utility)	3 MW	Operating	Drinking-water reservoir
Signal Hill WTP, Park City area, UT	Mountain Regional Water	600 kW	2021	Drinking-water treatment plant

Developer: D3Energy is the development partner for the Olentangy (Del-Co), Monroeville, and Signal Hill (Mountain Regional) projects. All projects listed use the Ciel & Terre Hydrelío® floating system. None of these projects has reported a water-quality issue attributable to the floating system.

Appendix F — Source Documents, Standards, and References

F.1 Supplied with this briefing

- Ciel & Terre, Hydrelío® aiR Optim Datasheet (Detailed) — complete component inventory and material specification.
- Ciel & Terre, Hydrelío® aiR Optim Datasheet (1-page summary).
- Chevron Phillips Chemical Company, Marlex® HXM 50100 Polyethylene Safety Data Sheet, SDS Number 100000000792, Version 3.3, Revision Date 2023-08-07.
- Ginar Technology Co., Ltd. (Taoyuan, Taiwan), APLAX® P2820GN 01 Safety Data Sheet, October 2021 — connection pin and nut resin compound.
- Thames Water Utilities Ltd., Spencer House Laboratory, BS 6920:2014 Test Report M 105952 (Hydrelío Main and Small Float), 25 June 2015.
- JFE Techno-Research Corporation, Report No. Y1403655, Material and Elution Tests of Floating Unit, 25 December 2014; with Japan Food Research Laboratories Certificate of Analysis No. 14125475001-02, 23 December 2014.
- Astronergy (Chint New Energy Technology Co., Ltd.), ASTRO 6 Twins CHSM66M(DG)/F-BH product datasheet, American market revision, December 2023, including 15-year product / 30-year linear power warranty.

F.2 Standards and Protocols Referenced

- BS 6920-1:2014, BS 6920-2:2014 — Suitability of non-metallic products for use in contact with water intended for human consumption.
- Japan Food Sanitation Act — Specifications and Standards for Implements, Containers and Packaging (Synthetic Resin / Polyethylene).
- EU RoHS Directive — Restriction of Hazardous Substances.
- NF T 58 000 — French standard governing the connection pin tested designation.
- IEC 61215, IEC 61730, UL 61730, IEC 61701, IEC 62716, IEC 62804 — PV module qualification and safety standards.
- AWWA C901 / C906 — referenced as the U.S. standard family governing HDPE potable water pipe.

F.3 Third-Party Verifications

- Solar Impulse Foundation — Hydrelío® awarded the Efficient Solution label (independently audited by Ernst & Young).
- Bureau Veritas — Ciel & Terre design methodology certification (originally 2020, renewed 2023).
- UKAS — Spencer House laboratory accreditation reference 0677 (BS 6920 testing).
- Japan Food Research Laboratories — government-authorized laboratory (elution testing).

Prepared by D3Energy — The Floating Solar Developer | d3energy.com | (954) 536-8770



Hydrelío aiR Optim

Main float

Range from 1300 up to 1580mm

Module fixation

Available in 5° and 12°



Waves up to 1m*

Our floating solutions are perfectly adapted to inshore and nearshore conditions. **depending on wave length*



Wind up to 210 km/h

Equivalent to a dynamic pressure of 1625 pascal

Compatible with large-frame

PV modules up to 700Wp
(M6 to M12)

Secondary floats

Up to 1700mm long
Non slipping surface

Connection pin

Certified NFT 58 000

Maintenance float

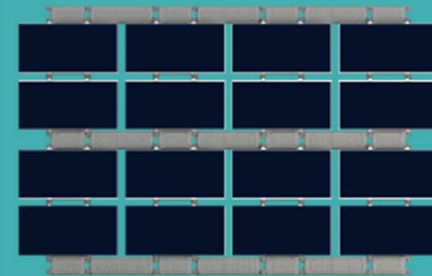
Optimised comfort with stability and buoyancy

Configurations

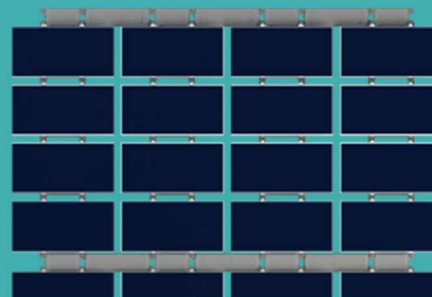
North/South orientation



Single row



2-in-a-row



4-in-a-row

[See more](#)



-10°C to 50°C

and **made to resist heavy snow loads.**



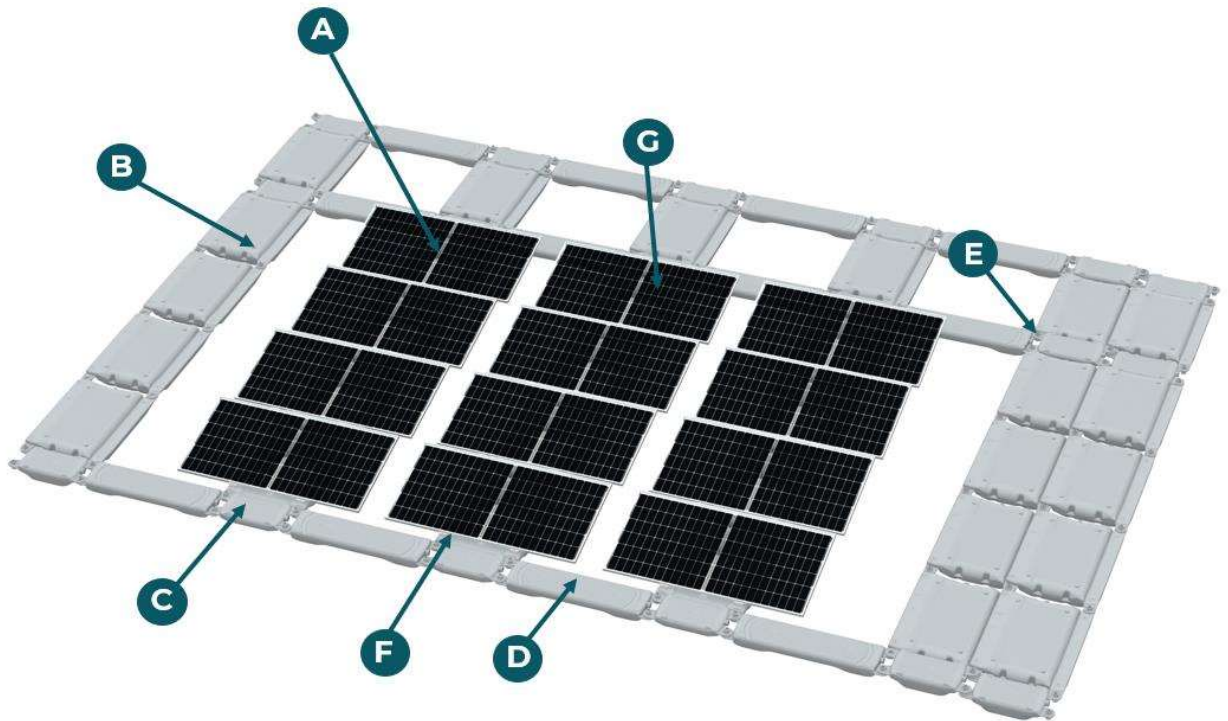
Our solutions can be installed in corrosive environments.

Contact our teams to define if and how it is applicable to your projects.

Durable products

- Floats made with HDPE
- PP connection pins reinforced with fiberglass
- Coated metallic parts

1 | Hydrelío® datasheet



- A** Main float (OMF)
- B** Maintenance Main float (OMMF)
- C** Small secondary float (OSSF and OSSFX)
- D** Long secondary float (OLSF)
- E** Connection pin (CP)
- F** Fixation system
- G** PV panel

1.1 Main floats (OMF)

Type of MF	MF 1300	MF 1400	MF1 480	MF 1580
Weight	~ 8 kg	~ 8 kg	~ 8 kg	~ 9 kg
Dimensions	<i>Ear to ear:</i> 1300x872 mm <i>Overall:</i> 1428x1000 mm	<i>Ear to ear:</i> 1400x872 mm <i>Overall:</i> 1528x1000mm	<i>Ear to ear:</i> 1480x872 mm <i>Overall:</i> 1608x1000	<i>Ear to ear:</i> 1580x872 mm <i>Overall:</i> 1708x1000 mm



Raw material	High Density Polyethylene (HDPE) and containing UV stabilizer
Manufacturing process	Blow molding
Function	Support the PV module

Additional information:

The size of the main float might be different according to the size of the PV panel and the site characteristics.

The main floats are linked with the other floats thanks to the connection ears where connection pins are inserted.

1.2 Maintenance Main Float (OMMF)

Type of FF	OMMF 1300	OMMF 1400	OMMF 1480	OMMF 1580
Weight	~ 11 kg	~ 12 kg	~ 12 kg	~ 13 kg
Dimensions	<i>Ear to ear:</i> 1300x872 mm <i>Overall:</i> 1428x1000 mm	<i>Ear to ear:</i> 1400x872 mm <i>Overall:</i> 1528x1000mm	<i>Ear to ear:</i> 1480x872 mm <i>Overall:</i> 1608x1000	<i>Ear to ear:</i> 1580x872 mm <i>Overall:</i> 1708x1000 mm



Raw material	High Density Polyethylene (HDPE) and containing UV stabilizer
Manufacturing process	Blow molding
Function	<ul style="list-style-type: none"> • Support electrical equipments • Ensure a maintenance walkway on columns

Additional information:

The size of the maintenance main float might be different according to the site characteristics.

The maintenance main floats are linked with the other floats thanks to the connection ears where connection pins are inserted.

1.3 Small secondary floats (OSSF)



Raw material	High Density Polyethylene (HDPE) and containing UV stabilizer.
Weight	~ 3 kg
Dimensions	Ear to ear: 872x272 mm Overall: 1000x400x150 mm
Manufacturing process	Blow molding
Function	<ul style="list-style-type: none"> • Ensure connection between other floats • Ensure a maintenance walkway

Additional information:

The small secondary floats are linked with the other floats thanks to the connection ears where connection pins are inserted.

1.4 Maintenance Small secondary floats (OSSFX)




Raw material	High Density Polyethylene (HDPE) and containing UV stabilizer.
Weight	~ 3 kg
Dimensions	Ear to ear: 872x272 mm Overall: 1000x400x218mm
Manufacturing process	Blow molding
Function	<ul style="list-style-type: none"> • Ensure connection between main floats • Ensure a maintenance walkway • Ensure more buoyancy on the extra ring

Additional information:

The small secondary floats X are linked with the main floats thanks to the connection ears where connection pins are inserted.

1.5 Long secondary floats (OLSF)

Type of LSF	OLSF 1420	OLSF 1510	OLSF 1610	OLSF 1700
Weight	~ 6 kg	~ 6 kg	~ 6 kg	~ 6 kg
Dimensions	<i>Ear to ear:</i> 1420x272 mm <i>Overall:</i> 1548x400mm	<i>Ear to ear:</i> 1510x272 mm <i>Overall:</i> 1638x400mm	<i>Ear to ear:</i> 1610x272 mm <i>Overall:</i> 1738x400mm	<i>Ear to ear:</i> 1700x272 mm <i>Overall:</i> 1828x400mm
				
Raw material	High Density Polyethylene (HDPE) and containing UV stabilizer			
Manufacturing process	Blow molding			
Function	<ul style="list-style-type: none"> • Ensure connection between main floats • Ensure a maintenance walkway 			

Additional information:

The size of the long secondary float might be different according to the size of the PV panel and the site characteristics.

The long secondary floats are linked with the main floats thanks to the connection ears where connection pins are inserted.

1.6 Long and Large connection pins



Type of Connection Pin	Long	Large
Weight (Pin)	~ 90 g	~ 120 g
Dimensions	102 mm height	104 mm height
Manufacturing process	Injection	
Raw material	Polypropylene reinforced with 40% fiberglass + UV stabilizer	
Function	Ensure the connection between the main floats through the connection ears.	

Additional information:

The connection pins are inserted in the connection ears then the nuts are screwed tightly to secure the connection between the floats. A self-drilling screw locks the nut on the pin.

1.7 Connection nuts



Raw material	Polypropylene reinforced with 40% fiberglass + UV stabilizer
Weight	~ 30 g
Manufacturing process	Injection
Function	Ensure the connection between the main and secondary floats through the connection ears.

Additional information:

On other C&T documents, to ease the communication, the pin and nut is only one part considered as Connection pin.

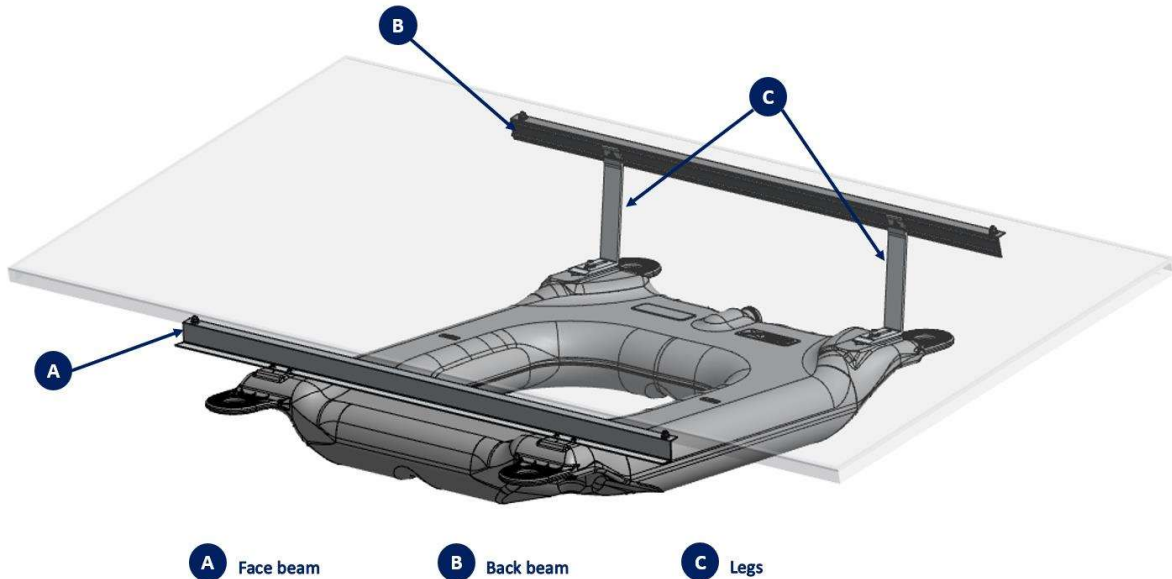
1.8 Self-drilling screws



Raw material	INOX A2/ SUS 304
Dimensions	Ø = 3.5 mm to 3.9 mm L = 19 mm
Function	Block the connection nut in rotation

1.9 Fixation system

The raw material of all fixation system parts might be different according to the water quality of the project.

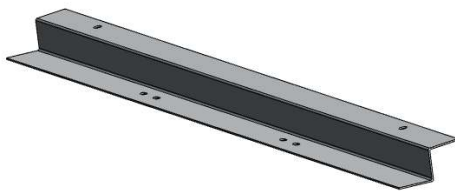


A Face beam

B Back beam

C Legs

1.9.1 Face beam



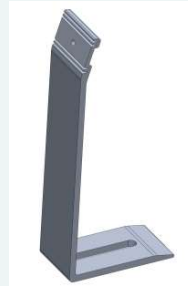
Raw material	Aluminium
Shape	Dimensions are defined by tilt (5° or 12°)
Quantity (per panel)	1
Function	Ensure the connection between the bottom of the PV module and the main float.

1.9.2 Back beam



Raw material	Aluminium
Shape	Same dimensions at 5° or 12°
Quantity (per panel)	1
Function	Ensure the connection between the bottom of the PV module and the main float.

1.9.3 Legs



Raw material	Aluminium
Shape	Dimensions are defined by tilt (5° or 12°) and PV panels width.
Quantity (per panel)	2
Function	Ensure the connection between the top side of the PV panel and the float.

1.9.4 Rivets



Raw material	Aluminium
Quantity (per panel)	6
Function	Ensure the fixation between the front legs and the float.

1.9.5 Hardware to attach the clamp on the PV panels

	Screw CHC M8x30 Stainless A2/A4
	Spring washer M8 Stainless A2/A4
	Flange nut M8 Stainless A2/A4

1.9.6 Hardware to attach the legs on the floats

	Screw CHC M8x30 Stainless A2/A4
	Spring washer M8 Stainless A2/A4
	Large flat washer M8 Stainless A2/A4
	Aluminium brace
	Flange nut M8 Stainless A2/A4

1.10 Spreader bars

The raw material of the spreader bars might be different according to the water quality of the project.

Small spreader bar



Medium spreader bar



Raw material	Aluminum
Resistance	The maximum load acceptable per spreader bar is 11.98 kN.
Function	Ensure connection points for mooring lines and the floats

Additional information:

Two different sizes of spreaders bars are used, according to their location on the solar island. Each spreader bar is fixed on the 2 ears of a float by using connection pins.

**Marlex® HXM 50100 Polyethylene**

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SECTION 1: Identification of the substance/mixture and of the company/undertaking**Product information**

Product Name : Marlex® HXM 50100 Polyethylene
Material : 1118576, 1018745, 1018747, 1070714, 1093199, 1080384,
1086319, 1018013, 1018017, 1017207, 1025207, 1018746,
1018748, 1019312, 1019315, 1019314, 1019313, 1019310,
1019311, 1018749

Company : Chevron Phillips Chemical Company LP
10001 Six Pines Drive
The Woodlands, TX 77380

Emergency telephone:**Health:**

866.442.9628 (North America)

1.832.813.4984 (International)

Transport:

CHEMTREC 800.424.9300 or 703.527.3887(int'l)

Asia: CHEMWATCH (+612 9186 1132) China: 0532 8388 9090

Mexico CHEMTREC 01-800-681-9531 (24 hours)

South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600

Argentina: +(54)-1159839431

EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Austria: VIZ +43 1 406 43 43 (24 hours/day, 7 days/week)

Belgium: 070 245 245 (24 hours/day, 7 days/week)

Bulgaria: +359 2 9154 233

Croatia: +3851 2348 342 (24 hours/day, 7 days/week)

Cyprus: 1401

Czech Republic: Toxicological Information Center +420 224 919 293, +420 224 915 402

Denmark: Danish Poison Center (Gifflinjen): +45 8212 1212

Estonia: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Finland: 0800 147 111 09 471 977 (24 hours/day)

France: ORFILA number (INRS): + 33 (0) 1 45 42 59 59 (24 hours/day, 7 days/week)

Germany: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Greece: (0030) 2107793777 (24 hours/day, 7 days/week)

Hungary: +36-80-201-199 (24 hours/day, 7 days/week)

Iceland: 543 2222 (24 hours/day, 7 days/week)

Ireland: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Italy: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

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Latvia: State Fire and Rescue Service, phone number: 112; Toxicology and Sepsis Clinic Poisoning and Drug Information Center, Hipokrāta 2, Riga, Latvia, LV-1038, phone number +371 67042473. (24 hours.)

Liechtenstein: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Lithuania: +370 (85) 2362052

Luxembourg: (+352) 8002 5500 (24 hours/day, 7 days/week)

Malta: +356 2395 2000

The Netherlands: NVIC: +31 (0)88 755 8000

Norway: 22 59 13 00 (24 hours/day, 7 days/week)

Poland: BIG +32.14.584545 (phone) or +32.14583516 (telefax)

Portugal: CIAV phone number: +351 800 250 250

Romania: +40213183606

Slovakia: +421 2 5477 4166

Slovenia: Phone number: 112

Spain: National Emergency Telephone Number of Spanish Poison Centre: +34 91 562 04 20 (24 hours/day, 7 days/week)

Sweden: 112 – ask for Poisons Information

Responsible Department : Product Safety and Toxicology Group
E-mail address : SDS@CPChem.com
Website : www.CPChem.com

MEDICAL APPLICATION CAUTION: Do not use this material in medical applications involving permanent implantation in the human body or permanent contact with internal body fluids or tissues fluids or tissues.

Do not use this material in medical applications involving brief or temporary implantation in the human body or contact with internal body fluids or tissues unless the material has been provided directly from Chevron Phillips Chemical Company LP or its legal affiliates under an agreement which expressly acknowledges the contemplated use.

Chevron Phillips Chemical Company LP and its legal affiliates makes no representation, promise, express warranty or implied warranty concerning the suitability of this material for use in implantation in the human body or in contact with internal body fluids or tissues.

SECTION 2: Hazards identification**Classification of the substance or mixture**

This product has been classified in accordance with the hazard communication standard 29 CFR 1910.1200; the SDS and labels contain all the information as required by the standard.

Classification

: Combustible dust

Labeling

Signal Word : Warning

Hazard Statements : May form combustible dust concentrations in air.
While this product may not be a combustible dust as sold, further processing or handling may form combustible dust concentration in air.

Potential Health Effects

Physical Hazards : Pellets may cause a slip hazard on hard surfaces.

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- Mechanical processing may form combustible dust concentrations in air and thermal processing at elevated temperatures may generate formaldehyde.
- Inhalation** : Repeated exposure to dust from this material may cause respiratory irritation.
Fumes generated during thermal processing may cause irritation of the upper respiratory tract.
- Skin** : Contact with the skin is not expected to cause prolonged or significant irritation.
Contact with the skin is not expected to cause an allergic response.
If this material is heated, thermal burns may result from contact. Thermal burns may include pain or feeling of heat, discolorations, swelling, and blistering.
- Eyes** : Contact with the eyes may cause irritation due to the abrasive action.
Not expected to cause prolonged or significant eye irritation. Thermal burns may result if heated material contacts eye.
- Ingestion** : Ingestion of this product is not a likely route of exposure.

Carcinogenicity:**IARC**

No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP

No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 3: Composition/information on ingredients

Component	CAS-No.	Weight %
Polyethylene Hexene Copolymer	25213-02-9	99 - 100

SECTION 4: First aid measures

- If inhaled** : Move to fresh air in case of accidental inhalation of dust or fumes from overheating or combustion. If symptoms persist, call a physician.
- In case of skin contact** : If the molten material gets on skin, quickly cool in water. Seek immediate medical attention. Do not try to peel the solidified material from the skin or use solvents or thinners to dissolve it.
- In case of eye contact** : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- If swallowed** : Do not induce vomiting without medical advice.

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SECTION 5: Firefighting measures

Flash point	:	No data available
Autoignition temperature	:	No data available
Suitable extinguishing media	:	Water. Water mist. Dry chemical. Carbon dioxide (CO ₂). Foam. If possible, water should be applied as a spray from a fogging nozzle since this is a surface burning material. The application of high velocity water will spread the burning surface layer. Avoid the use of straight streams that may create a dust cloud and the risk of a dust explosion. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific hazards during fire fighting	:	Risks of ignition followed by flame propagation or secondary explosions can be caused by the accumulation of dust, e.g. on floors and ledges.
Special protective equipment for fire-fighters	:	Use personal protective equipment. Wear self-contained breathing apparatus for firefighting if necessary.
Further information	:	This material will burn although it is not easily ignited.
Fire and explosion protection	:	Treat as a solid that can burn. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Hazardous decomposition products	:	Normal combustion forms carbon dioxide, water vapor and may produce carbon monoxide, other hydrocarbons and hydrocarbon oxidation products (ketones, aldehydes, organic acids) depending on temperature and air availability. Incomplete combustion can also produce formaldehyde.

SECTION 6: Accidental release measures

Personal precautions	:	Sweep up to prevent slipping hazard. Avoid breathing dust. Avoid dust formation.
Environmental precautions	:	Do not contaminate surface water. Prevent product from entering drains.
Methods for cleaning up	:	Clean up promptly by sweeping or vacuum.
Additional advice	:	Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air).

SECTION 7: Handling and storage**Handling**

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Advice on safe handling : Use good housekeeping for safe handling of the product. Keep out of water sources and sewers. Spilled pellets may create a slipping hazard.

Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary, but may not by themselves be sufficient. At elevated temperatures (>350°F, >177°C), polyethylene can release vapors and gases, which are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. These substances may include acetaldehyde, acetone, acetic acid, formic acid, formaldehyde and acrolein. Based on animal data and limited epidemiological evidence, formaldehyde has been listed as a carcinogen. Following all recommendations within this SDS should minimize exposure to thermal processing emissions.

Advice on protection against fire and explosion : Treat as a solid that can burn. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Storage

Requirements for storage areas and containers : Keep in a dry place. Keep in a well-ventilated place.

Advice on common storage : Do not store together with oxidizing and self-igniting products.

SECTION 8: Exposure controls/personal protection**Ingredients with workplace control parameters****US**

Components	Basis	Value	Control parameters	Note
Nuisance Dust	OSHA Z-3	TWA	15 mg/m3	Total dust
	OSHA Z-3	TWA	5 mg/m3	(respirable dust)

Control as Particulate Not Otherwise Classified (PNOC). The ACGIH Guideline* for respirable dust is 3.0 mg/m3 and 10.0 mg/m3 for total dust. The OSHA PEL for respirable dust is 5.0 mg/m3 and 15.0 mg/m3 for total dust.

* This value is for inhalable (total) particulate matter containing no asbestos and < 1.0% crystalline silica.

Engineering measures

Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection : No respiratory protection is normally required. If heated material generates vapor or fumes that are not adequately controlled by ventilation, wear an appropriate respirator. Use the following elements for air-purifying respirators: Organic Vapor and Formaldehyde. A positive pressure, air-supplying

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respirator may be appropriate if there is potential for uncontrolled release, aerosolization, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

Dust safety masks are recommended when the dust concentration is excessive.

Eye protection : Use of safety glasses with side shields for solid handling is good industrial practice. If this material is heated, wear chemical goggles or safety glasses with side shields or a face shield. If there is potential for dust, use chemical goggles.

Skin and body protection : At ambient temperatures use of clean and protective clothing is good industrial practice. If the material is heated or molten, wear thermally insulated, heat-resistant gloves that are able to withstand the temperature of the molten product. If this material is heated, wear insulated clothing to prevent skin contact if engineering controls or work practices are not adequate.

SECTION 9: Physical and chemical properties**Information on basic physical and chemical properties****Appearance**

Form : Pellets
 Physical state : solid
 Color : Opaque
 Odor : Mild to no odor
 Odor Threshold : No data available

Safety data

Flash point : No data available

Lower explosion limit : Not applicable

Upper explosion limit : Not applicable

Autoignition temperature : No data available

Thermal decomposition : Low molecular weight hydrocarbons, alcohols, aldehydes, acids and ketones can be formed during thermal processing.

pH : Not applicable

Melting point/range : 90-140°C (194-284°F)

Melting point/freezing point : Not applicable

Initial boiling point and boiling range : Not applicable

Vapor pressure : Not applicable

Relative density : Not applicable

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Density	: 0.91 - 0.97 g/cm ³ Please refer to the Technical Data Sheet (TDS) for more detailed information relating to the nominal physical properties, including density, of this polyethylene resin grade.
Water solubility	: negligible
Partition coefficient: n-octanol/water	: No data available
Solubility in other solvents	: No data available
Viscosity, dynamic	: Not applicable
Viscosity, kinematic	: Not applicable
Relative vapor density	: Not applicable
Evaporation rate	: Not applicable

SECTION 10: Stability and reactivity

Reactivity	: This material is considered non-reactive under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Chemical stability	: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions	
Conditions to avoid	: Avoid prolonged storage at elevated temperature.
Materials to avoid	: Avoid contact with strong oxidizing agents.
Thermal decomposition	: Low molecular weight hydrocarbons, alcohols, aldehydes, acids and ketones can be formed during thermal processing.
Hazardous decomposition products	: Normal combustion forms carbon dioxide, water vapor and may produce carbon monoxide, other hydrocarbons and hydrocarbon oxidation products (ketones, aldehydes, organic acids) depending on temperature and air availability. Incomplete combustion can also produce formaldehyde.
Other data	: No decomposition if stored and applied as directed.

SECTION 11: Toxicological information**Marlex® HXM 50100 Polyethylene**

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Acute oral toxicity : Presumed Not Toxic

Marlex® HXM 50100 Polyethylene
Acute inhalation toxicity : Presumed Not Toxic

Marlex® HXM 50100 Polyethylene
Acute dermal toxicity : Presumed Not Toxic

Marlex® HXM 50100 Polyethylene
Skin irritation : No skin irritation

Marlex® HXM 50100 Polyethylene
Eye irritation : No eye irritation

Marlex® HXM 50100 Polyethylene
Sensitization : Did not cause sensitization on laboratory animals.

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Further information : This product contains POLYMERIZED OLEFINS. During thermal processing (>350°F, >177°C) polyolefins can release vapors and gases (aldehydes, ketones and organic acids) which are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. Generally these irritant effects are all transitory. However, prolonged exposure to irritating off-gases can lead to pulmonary edema. Formaldehyde (an aldehyde) has been classified as a carcinogen based on animal data and limited epidemiological evidence.

SECTION 12: Ecological information**Ecotoxicity effects**

Biodegradability : This material is not expected to be readily biodegradable.

Elimination information (persistence and degradability)

Bioaccumulation : Does not bioaccumulate.

Mobility : The product is insoluble and floats on water.

Additional ecological information : This material is not expected to be harmful to aquatic organisms., Fish or birds may eat pellets which may obstruct their digestive tracts.

Ecotoxicology Assessment

Short-term (acute) aquatic hazard : This product has no known ecotoxicological effects.

Long-term (chronic) aquatic : This product has no known ecotoxicological effects.

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hazard

SECTION 13: Disposal considerations

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

SECTION 14: Transport information

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION BY THIS AGENCY.

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Maritime transport in bulk according to IMO instruments**SECTION 15: Regulatory information****National legislation****SARA 311/312 Hazards** : Combustible dust

CERCLA Reportable Quantity : This material does not contain any components with a CERCLA RQ.

SARA 302 Reportable Quantity : This material does not contain any components with a SARA 302 RQ.

SARA 302 Threshold Planning Quantity : No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 304 Reportable Quantity : This material does not contain any components with a section 304 EHS RQ.

SARA 313 Components : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

Ozone-Depletion Potential : This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCM I Intermediate or Final VOC's (40 CFR 60.489).

US State Regulations

Pennsylvania Right To Know

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: No components are subject to the Pennsylvania Right to Know Act.

California Prop. 65
Components

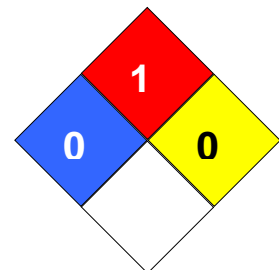
: This product, as shipped, does not contain any carcinogens or reproductive toxins presently known by the State of California to cause cancer or reproductive toxicity at a level of exposure subject to the requirements of California Proposition 65.

Notification status

Europe REACH	:	On the inventory, or in compliance with the inventory
Switzerland CH INV	:	On the inventory, or in compliance with the inventory
United States of America (USA) TSCA	:	On or in compliance with the active portion of the TSCA inventory
Canada DSL	:	All components of this product are on the Canadian DSL
Australia AIC	:	On the inventory, or in compliance with the inventory
New Zealand NZIoC	:	On the inventory, or in compliance with the inventory
Japan ENCS	:	On the inventory, or in compliance with the inventory
Philippines PICCS	:	On the inventory, or in compliance with the inventory
Korea KECI	:	A substance(s) in this product was not registered, notified to be registered, or exempted from registration by CPChem according to K-REACH regulations. Importation or manufacture of this product is still permitted provided the Korean Importer of Record has themselves notified the substance or the exported amount does not exceed the minimum threshold quantity of the non-registered substance(s).
Taiwan TCSI	:	On the inventory, or in compliance with the inventory
China IECSC	:	On the inventory, or in compliance with the inventory

SECTION 16: Other information

NFPA Classification : Health Hazard: 0
Fire Hazard: 1
Reactivity Hazard: 0

**Further information**

Legacy SDS Number : 240370

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is

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not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Key or legend to abbreviations and acronyms used in the safety data sheet

ACGIH	American Conference of Government Industrial Hygienists	LD50	Lethal Dose 50%
AIIC	Australian Inventory of Industrial Chemicals	LOAEL	Lowest Observed Adverse Effect Level
DSL	Canada, Domestic Substances List	NFPA	National Fire Protection Agency
NDSL	Canada, Non-Domestic Substances List	NIOSH	National Institute for Occupational Safety & Health
CNS	Central Nervous System	NTP	National Toxicology Program
CAS	Chemical Abstract Service	NZIoC	New Zealand Inventory of Chemicals
EC50	Effective Concentration	NOAEL	No Observable Adverse Effect Level
EC50	Effective Concentration 50%	NOEC	No Observed Effect Concentration
EGEST	EOSCA Generic Exposure Scenario Tool	OSHA	Occupational Safety & Health Administration
EOSCA	European Oilfield Specialty Chemicals Association	PEL	Permissible Exposure Limit
EINECS	European Inventory of Existing Chemical Substances	PICCS	Philippines Inventory of Commercial Chemical Substances
MAK	Germany Maximum Concentration Values	PRNT	Presumed Not Toxic
GHS	Globally Harmonized System	RCRA	Resource Conservation Recovery Act
>=	Greater Than or Equal To	STEL	Short-term Exposure Limit
IC50	Inhibition Concentration 50%	SARA	Superfund Amendments and Reauthorization Act.
IARC	International Agency for Research on Cancer	TLV	Threshold Limit Value
IECSC	Inventory of Existing Chemical Substances in China	TWA	Time Weighted Average
ENCS	Japan, Inventory of Existing and New Chemical Substances	TSCA	Toxic Substance Control Act
KECI	Korea, Existing Chemical Inventory	UVCB	Unknown or Variable Composition, Complex Reaction Products, and Biological Materials
<=	Less Than or Equal To	WHMIS	Workplace Hazardous Materials Information System
LC50	Lethal Concentration 50%	ATE	Acute toxicity estimate

SDS

SAFETY DATA SHEET



APLAX
P2820GN 01

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Tel +886-3-3868820
Fax +886-3-3863587

1. PRODUCT AND COMPANY IDENTIFICATION

- A. Product Name :** APLAX : P2820GN 01
- B. Chemical Name and Synonyms :** Polypropylene
- C. Suggested Uses :** Plastic
- D. Manufacturer / importer:** GINAR TRCHNOLOGY CO., LTD.
No. 250, Changfa Rd., Nangang Vil., Dayuan Dist., Taoyuan City, Taiwan
- E.Phone / Fax :** +886-3-386-8820(REP) / +886-3-386-3587

2. HAZARD IDENTIFICATION

- A. Chemical Hazard Classification :** Health : -
- B. Labeling information :** -
- C. Potential Health Effects :**

Inhalation: As a solid these nylon resins are not likely to be hazardous by inhalation. Dizziness and nausea may occur if fumes from molten or burning polymer are inhaled.

Skin : As a solid no effect, nylon resins are normally not irritating to the skin. Contact with the viscous melt (>280°C) will cause severe skin and body burns.

Eye : As a solid the same as other nuisance dusts and powders. Contact with viscous melt >280°C will cause severe burns; exposure to decomposition fumes may cause eye irritation.

Ingestion : Solid nylon polymer presents no problem since it is insoluble in body fluids and biologically inert.

Carcinogenicity : None of the components in these materials are listed by IARC, NTP, OSHA or ACGIH as carcinogens.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture:

Hazardous ingredients Name:

Concentration:

A.Polypropylene polymer resin	CAS#9003-07-0	>55 %
B.Glass Fiber	CAS#65997-17-3	37-43 %
C.Non regulated lubricants and stabilizers		<5 %

None of ingredients contain environmentally prohibited elements such as cadmium, lead and other heavy metals. The possibilities of naturally existing portion of such substances are controlled by Ginar's internal tolerance limits to maintain high level of environmental safety.

4. FIRST AID

First aid methods for different exposure pathways of:

- A. Inhalation :** Remove to fresh air and get medical attention if dizziness or nausea occurs.
- B. Skin :** The compound is not likely to be hazardous by skin contact. For contact with viscous molten get immediate medical attention.
- C. Eye :** No specific treatment for exposure under normal conditions. Get medical attention if irritation persists. For contact with viscous molten get immediate medical attention.
- D. Ingestion :** No specific intervention is indicated as compound is not likely to be hazardous by ingestion. Seek medical attentions and treat as symptomatic.

Major symptoms and effects :

For protection of emergency personnel :

5. FIRE FIGHTING MEASURES

- A. Extinguishing Media :** Water Spray, Foam, Dry Chemical, CO₂
- B. Fire & Explosion Hazards :** Accumulation of dust from grinding or machining operations could present a fire hazard
- C. Fire Fighting Instructions :** Keep personnel removed and upwind of fire. Wear self-contained breathing apparatus.
- D. Fire Fighting Equipment :** Wear self-contained breathing apparatus, MSHA/NIOSH approved (or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

- A. Protect People :** No protective measure required unless the polymer is involved in a fire situation. See section 5 above.
- B. Protect the Environment :** Keep out of drains and water courses. Pellets may present a physical ingestion hazard to wildlife due to resemblance to grains. Clean up spills immediately.
- C. Cleanup :** In case of spill, sweep, scoop or vacuum and remove. Flush spill area with water.

7. HANDLING AND STORAGE

- A. Handling Procedures :** Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of material from eyes, skin and clothing.
- B. Storage :** Stable under normal conditions of handling and storage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls :

- A. Control parameters :** Good general ventilation should be sufficient to control normal airborne levels. Add local exhaust ventilation as needed.
- B. Biological indicators :** NA

Personal Protective Equipment :

- A. Respiratory Protection :** None should be needed for normal working operations.
- B. Hand Protection :** For solid materials normal good industrial hygiene practice to minimize skin contact. For working with potential contact with molten material use heat resistant gloves with sleeve protection for arms and facemasks are recommended for eye and face protection.
- C. Skin Protection :** Clean body-covering clothing should be needed.

D. Eye Protection : Wear safety glasses or goggles for all operations. When working with molten material ensure protection from splashes.

Health Measures: -

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance : Solid & Cylindrical Pellets	Odor : Slight
Olfactory threshold : Not applicable	Melting Point : 155 -165°C
PH : Not applicable	Boiling Point : Not applicable
Flammability (solid, gas) : Not applicable	Flash Point : Not applicable
Decomposition temperature : Not applicable	Test methods (open or closed cup) : Not applicable
Self-ignition temperature : Not applicable	Explosion limits : Not applicable
Vapor Pressure : Not applicable	Vapor Density : Not applicable
Specific Gravity or Density : >0.9	Solubility : Not Insoluble
Octanol / water partition coefficient (log Kow) : Not applicable	Evaporation Rate : Not applicable

10. STABILITY AND REACTIVITY

A. Chemical Reactivity : Stable. Temperatures above 340°C will cause decomposition in the presence of oxygen.

B. Conditions to avoid

Avoid heat, flame, spark and other ignition sources.

Avoid contact with incompatible materials.

C. Incompatibility with Other Materials : Incompatible or attacked by concentrated acids, phenols, calcium chloride, zinc chloride and oxidizing agents.

D. Hazardous Decomposition Products : Organic decomposition products such as acid fumes, toxic oxides of nitrogen, amine type fumes, ammonia, carbon monoxide, carbon dioxide.

E. Hazardous Polymerization : Will not occur.

11. TOXICOLOGICAL INFORMATION

Components

Data from Ginar studies and/or the available scientific literature on the components of this material which have been identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200) or the Canadian Hazardous Products Act are discussed below.

Polypropylene	No animal test reports are available to define carcinogenic, developmental, reproductive, or mutagenic hazards
Glass Fiber	Irritating to eyes, skin and respiratory tract. No genetic effects were noted in standard bacterial tests.

12. ECOLOGICAL INFORMATION

Eco toxicity:

LC50(Fish) : -

EC50(Aquatic invertebrates) : -

Bio concentration Factor(BCF) : -

Persistence and degradability : -

Bio accumulative : -

Soil Mobility: -

Other adverse effects : -

13. DISPOSAL CONSIDERATIONS

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State / Provincial and local regulations

14. TRANSPORTATION INFORMATION

UN number : -

UN shipping name : -

Transportation hazard classification : -

Packaging Category : -

Marine pollutant(Yes/No) : -

Special delivery methods and precautions : -

15. REGULATORY INFORMATION

All components are in compliance with the following inventories: U.S. TSCA, Canadian DSL, Japanese ENCS, Australian AICS, Korean, Philippine PICCS, Chinese

Canadian WHMIS classification: Not Controlled

SARA Hazard Notification:

Hazard Categories Under Title III Rules (40 CFR 370): Not applicable

Section 302 Extremely Hazardous Substances: Not applicable

Section 313 Toxic Chemical(s): Not Applicable

TSCA = Toxic Substance Control Act

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

SARA = Superfund Amendments and Reauthorization Act

16. OTHER INFORMATION

Although the information contained in this document is presented in good faith, based on available information believed to be reliable at the time of preparation of this document, Ginar Technology Co., Ltd. makes no warranties or representations with respect to the information or the products described herein, and expressly disclaims all implied warranties and conditions (including all warranties and conditions of merchantability or fitness for a particular purpose). This information is subject to change without notice.

Responsibility for use, storage, handling and disposal of the products described herein, whether alone or in combination with any other substance, is that of the purchaser and/or end user.

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Environmental Declaration Disclaimer:

Ginar believes this environmental information to be correct but cannot guarantee its accuracy or completeness. Ginar subcontracts manufacturing and information is based on data received from vendors and suppliers. This information has not been validated by Ginar.

Revision History

The following table shows the revision history for this document.

Date	Version	Revision
2021/10		

BRITISH STANDARD TESTING

NON-METALLIC MATERIALS FOR USE WITH DRINKING WATER (BS 6920: 2014)

TEST REPORT

Product: Hydrelion™ Main and Small Float
Report Reference: M 105952
Page 1 of 6 Pages

Ciel et Terre International
3, rue du Docteur Huart
59260 Hellemmes
FRANCE

Report Date: 25th June 2015

Executive Summary - when assessed by the methods given in BS 6920-2:2014 the samples of this product are deemed suitable for use in contact with cold water intended for human consumption.

NOTES.

1. The results given in this report relate only to the items tested, and not necessarily to the bulk from which they were taken.
2. This test work was undertaken in the UKAS accredited Spencer House laboratory of Thames Water Utilities Ltd., UKAS registration number 0677, unless otherwise stated.
3. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
4. This test report shall not be reproduced, except in full, without our prior written approval.

BRITISH STANDARD TESTING (BS 6920:2014)

SUITABILITY OF NON-METALLIC PRODUCTS FOR USE IN CONTACT WITH WATER INTENDED FOR HUMAN CONSUMPTION WITH REGARD TO THEIR EFFECT ON THE QUALITY OF THE WATER.

0. INTRODUCTION.

The samples of the product referred to in this report have been tested in accordance with the methods of BS 6920-2:2014 "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water : Methods of Test".

1. TEST SAMPLES.

General composition of product	HDPE with Anti-UV Compound	
Material trade name/ designation	Polyethylene HDPE [REDACTED]	
Material manufacturer / site	HDPE: [REDACTED] / [REDACTED], France Masterbatch: [REDACTED] / [REDACTED] France	
Component trade name / designation	Hydrelion™ Main Float and Small Float	
Component manufacturer / site	[REDACTED] / [REDACTED], France	
Date of manufacture/ production	2 nd July 2014	
Method of manufacture	Blow moulding	
Production batch numbers	14/183.3 – 121	
Submitting organisation	Ciel et Terre International	
Date of application	24 th February 2015	
Date of receipt of test samples	3 rd March 2015	
Method of packaging	In plastic bag	
Condition on receipt	Satisfactory	
Laboratory storage before test	Ambient temperature (21±4) °C	
Description	test article shape dimensions	Plaque Rectangular 121mm x 59mm x 3mm
Appearance of article	colour surface finish opacity	Grey Textured Opaque
Surface area of one article (mm ²)	15358	
Number of articles to give a surface area to volume ratio of 15000mm ² to 1L of test water	1	
Calibration mark of the test vessel/container in litres	1	
Extraction temperature used for tests 2, 3, 5 & 6	(23±2) °C	

2. ODOUR & FLAVOUR OF WATER TEST.

Temperature of extraction: (23±2) °C

Date test started: 24.03.15

The extracts detailed below were compared with the procedural blank test waters by a panel of 3 testers. The following results were obtained for the test extracts.

Extract	Test water	Test	Descriptors	Threshold dilutions
First	Chlorine free	Odour	None	█
		Flavour	None	<1
	Chlorinated	Odour	None	█
		Flavour	None	<1
Final	Chlorine free	Odour	---	█
		Flavour	---	---
	Chlorinated	Odour	---	█
		Flavour	---	---

[method code LP/R/MT02]

COMMENT. On the basis of these results the samples of this product have been found **to conform** with the requirements of BS 6920-1 : Clause 4 when extracted at 23°C.

3. APPEARANCE OF WATER.

Temperature of extraction: (23±2) °C

Date test started : 10.03.15

	Colour (Hazen Units)		Turbidity (Formazine Nephelometric Units)	
	First Extract	Final Extract	First Extract	Final Extract
	Test sample extract	<0.8	--	<0.06
Reagent blank	<0.8	--	<0.06	--
Test sample effect	<0.8	--	<0.06	--

[method code LP/R/MT03 & LP/R/526 & LP/R/14 & LP/R/15]

COMMENT. On the basis of these results the sample of this product has been found **to conform** with the requirements of BS 6920-1 : Clause 5 when extracted at 23°C.

4. GROWTH OF AQUATIC MICROORGANISMS.

Temperature of test : (30±2)°C

Date test started : 10.03.15.

Container	Mean Dissolved Oxygen Difference (MDOD) in mg/L
Test product (weeks 5 to 7)	0.1
Negative reference (glass) (weeks 5 to 7)	0.2
Positive reference (wax) (weeks 5 to 7)	7.6
Special positive reference Bacteriocidal/Bacteriostatic effect	n/a n/a
Negative control - Mean dissolved oxygen concentration (weeks 5 to 7)	8.5

[method code LP/R/MT04]

COMMENT. On the basis of these results the sample of this product has been found **to conform** with the requirements of BS 6920-1 : Clause 6.

At the end of this test the test pieces showed no changes in colour and appearance.

5. THE EXTRACTION OF SUBSTANCES THAT MAY BE OF CONCERN TO PUBLIC HEALTH.

Temperature of extraction: (23±2)°C

Date test started : 10.03.15.

The extracts from the product and the blank were used to prepare culture media for use with a monkey kidney cell line (VERO ATCC CCL 81)

Attribute	Test sample extract	Reagent blank	Zinc sulfate solution
Cell morphology (Microscopy)	Satisfactory	Satisfactory	Cell death
Culture medium (colour)	Normal	Normal	Abnormal (alkaline)
Monolayer confluence (approx %)	100%	100%	0%

[method code LP/R/MT05 & LP/R/256]

COMMENT. On the basis of these test results the extract of this product has been found to give a non-cytotoxic response, and therefore it has been found **to conform** with the requirements of BS 6920-1: Clause 7 when extracted at 23°C.

6. EXTRACTION OF METALS.

Temperature of extraction : (23±2) °C

Date test started : 24.03.15.

The results obtained for the first extract are given below -

Element	Unit	MAC	Reporting limit	Sample 1	Sample 2	Reagent blank
Aluminium	Al	µg/L	200	1.4	2.8	1.7
Antimony ^{1,2}	Sb	µg/L	5	0.1	<0.1	<0.1
Arsenic	As	µg/L	10	0.3	<0.3	<0.3
Boron	B	µg/L	1000	11	<11	<11
Cadmium	Cd	µg/L	5	0.1	<0.1	<0.1
Chromium	Cr	µg/L	50	0.9	<0.9	<0.9
Iron	Fe	µg/L	200	2.0	<2.0	<2.0
Lead	Pb	µg/L	10	0.2	<0.2	<0.2
Manganese	Mn	µg/L	50	0.8	<0.8	<0.8
Mercury	Hg	µg/L	1	0.09	<0.09	<0.09
Nickel	Ni	µg/L	20	1.3	<1.3	<1.3
Selenium	Se	µg/L	10	0.8	<0.8	<0.8

[* method code LP/R/MT06 & LP/R/563]

[Analysis subcontracted to UKAS accredited laboratory ref: 1111 (method code M_ICPMS)]

²Deviating sample – the validity of the test result may be affected.

Extract Analytical.

Aluminium, antimony, arsenic, boron, cadmium, chromium, iron, lead, manganese, mercury, nickel, and selenium - inductively coupled plasma mass spectrometry* or inductively coupled plasma optical emission spectrometry*.

Analytical Control Data - this technique is in continuous use for analysis of drinking water metals; this technique is fully validated to the requirements of "A Manual on Analytical Quality Control for the Water Industry" (NS 30) and the requirements laid down by the Drinking Water Inspectorate. The technique has a comprehensive AQC protocol including control solutions and spike recovery testing with each batch of samples for analysis; full details available upon request.

COMMENT. On the basis of these results the samples of this product have been found **to conform** with the requirements of BS 6920-1: Clause 8 when extracted at 23 °C.

NOTE. In the Extraction of Metals Test the concentration of Aluminium found in the reagent blank exceeded the limit of detection for this element. After investigation it was concluded, however, that the test was valid and that the results obtained for the product do conform with the requirements for this test.


CONCLUSIONS.

The samples of this product meet the test criteria of BS 6920-1:2014 ("Specification") and is suitable for use in contact with cold but not hot water intended for human consumption.

NOTE : materials and products intended for use by a public water supply company in the preparation or conveyance of water may need to satisfy more comprehensive toxicological requirements as specified by the Drinking Water Inspectorate. These additional requirements are necessary to ensure water company usage complies with Regulation 31 of the Water Supply (Water Quality) Regulations 2000.

NOTES -

1. The results specified in this report relate only to the sample(s) submitted for testing. Any changes in the nature or source of ingredients and the process of manufacture or application could affect the suitability of this product for use in contact with drinking water.
2. We would draw to your attention that reports issued by the accredited test laboratories do not of themselves constitute approval by the Water Regulations Advisory Scheme (WRAS) or the test laboratory. Only a letter from the Scheme, citing a Directory Reference Number, can be regarded as indicating approval.



Helen Bala
Materials Testing Manager

Messrs. Ciel Terre Japan Co., Ltd.

Report No.	Y1403655
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(Total pages including cover sheet: 7)

“Material and Elution Tests of Floating Unit” Report

December 25, 2014



JFE

JFE Techno-Research Corporation

Eco Analysis Technology Department, Solution Division (Kawasaki)

Yasushi Tanaka, Division Director

1-1, Minamiwataridacho, Kawasaki-ku, Kawasaki-shi, Kanagawa 210-0855, JAPAN

Phone: +81-44-322-6398

Fax: +81-44-322-6526

Approved by	Prepared by
<i>T. Modizaki</i>	<i>M. Kojima</i>

1. Title of the Report

Material and Elution Tests of Floating Unit

2. Purpose

In order to confirm that pollution due to the elution of the environmentally hazardous substances from the floating unit used for the solar power generation facility on water, material and elution tests are performed in accordance with the RoHS Directive and the Specifications and Standards for Implements, Containers and Packaging in accordance with the Food Sanitation Act.

3. Analysis item

Material test: Cd, Pb, Hg and Cr⁶⁺

Elution test: Evaporation residues

4. Sample

HYDRELIO[®] Float: 1 sample

Figure 1 shows the photograph of the analysis sample of the material test, and Fig. 2 shows the photograph of the analysis sample of the elution test.

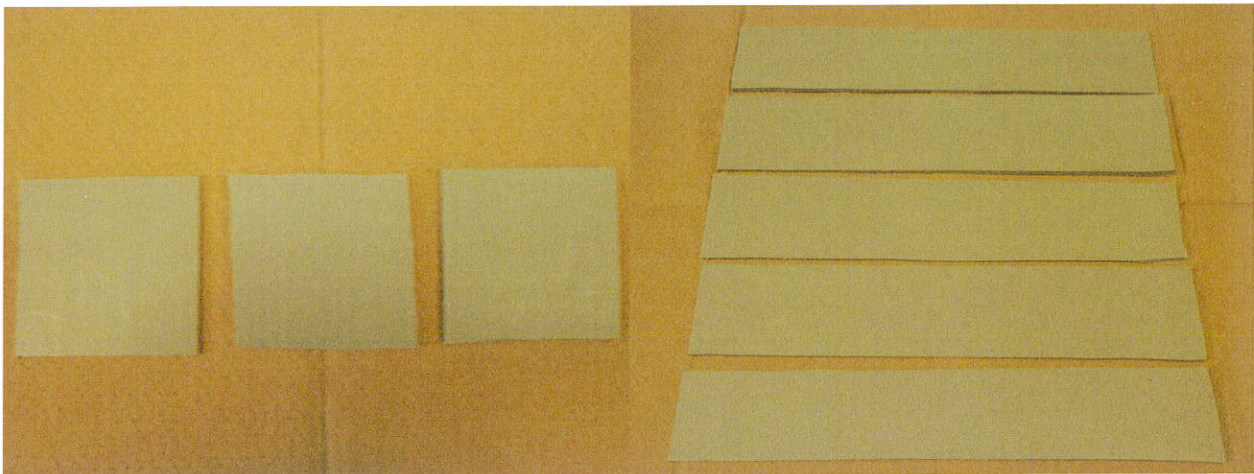


Fig. 1: Analysis sample of the material test

Fig. 2: Analysis sample of the elution test

5. Analytical method

5.1 Material test (Cd, Pb, Hg)

Sample was dissolved by acid, and quantitative analysis was performed for Cd and Pb with atomic absorption spectroscopy and for Hg with reduction vaporizing atomic absorption spectroscopy.

5.2 Material test (Cr⁶⁺)

Sample was extracted with boiling water and quantitatively analyzed with diphenylcarbazide absorptiometry.

5.3 Elution test

Sample was thoroughly rinsed with water and solvent (water and 4% acetic acid solution) at a ratio of 2 ml per 1 cm² of the surface area of the sample was heated to 60°C. Test solution was prepared by soaking the sample into this heated solvent for 30 minutes under the condition of being kept at 60°C.

200 ml of the test solution was measured, taken into the evaporating dish which was preliminary dried

at 105°C, and evaporated to dryness on the water bath. After that, it was dried at 105°C for 2 hours and then allowed to cool in the desiccator. Weight of the evaporation dish was measured after cooling, and evaporation residues were determined by dividing the difference of weight of the test solution before and after the evaporation by the weight of the sampled test solution.

6. Analysis result

Analysis values of every item of the material and elution tests were less than the minimum quantitative limit values, and satisfied the specification values in accordance with the RoHS Directive and the standard values of the Specifications and Standards for Implements, Containers and Packaging in accordance with the Food Sanitation Act.

Analysis results are shown in Table 1.

Table 1: Analysis result

Analytical test item	Result	Standard value
Cd	Less than 2 µg/g	100 µg/g or less ^{*1}
Pb	Less than 10 µg/g	100 µg/g or less ^{*1}
Hg	Less than 1 µg/g	1,000 µg/g or less ^{*2}
Cr ⁶⁺	Less than 1 µg/g	1,000 µg/g or less ^{*2}
Evaporation residues (water)	5µg/ml or less	30 µg/ml or less ^{*1}
Evaporation residues (4% acetic acid)	5µg/ml or less	30 µg/ml or less ^{*1}

*1: Referred from the Specifications and Standards for Implements, Containers and Packaging in accordance with the Food Sanitation Act

*2: Referred from the specification values in accordance with the RoHS Directive

Analysis of the evaporation residues were consigned to Japan Food Research Laboratories.

7. Attachment

- Report on material test, No. Y1403655-01E
- Report on elution test, No. 14125475001-02

RESULTS OF ANALYTICAL TEST*Customer Name***Ciel Terre Japan Co., LTD.***Kind of article***Results of Hazardous Substances <RoHS Directive>****1. Sample**

HYDRELIO®Float

2. Sample receiving date

December 8, 2014

3. Testing period

December 11 to December 22, 2014

4. Analytical method

Element	Preparation	Method
Cd	Wet decomposition method	AAS
Pb	Wet decomposition method	AAS
Hg	Wet decomposition method	Reduction vaporizing AAS
Cr ⁶⁺	In boiling water to extraction	Diphenylcarbazide Absorptiometry



Date of issue : Dec. 24, 2014

Approved Signatory

General Manager

JFE Techno-research Corporation
Solution Division(West Japan)

1-chome Kawasaki-dori, Mizushima, Kurashiki-city Okayama 712-8074 Japan
 TEL 086-447-4621 FAX 086-447-4618

5. Results

Table 1 RESULTS OF ANALYTICAL TEST

Element	Results (mg/kg)	MDL (mg/kg)	Operator	Section Chief
Cd	N.D.	2	TAKASUGI	KOHMOTO
Pb	N.D.	10	TAKASUGI	KOHMOTO
Hg	N.D.	1	NANAMURA	SAKAMOTO
Cr ⁶⁺	N.D.	1	NANAMURA	SAKAMOTO

MDL : Method Detection Limit

N.D. : Not Detected

6. Analysis flow

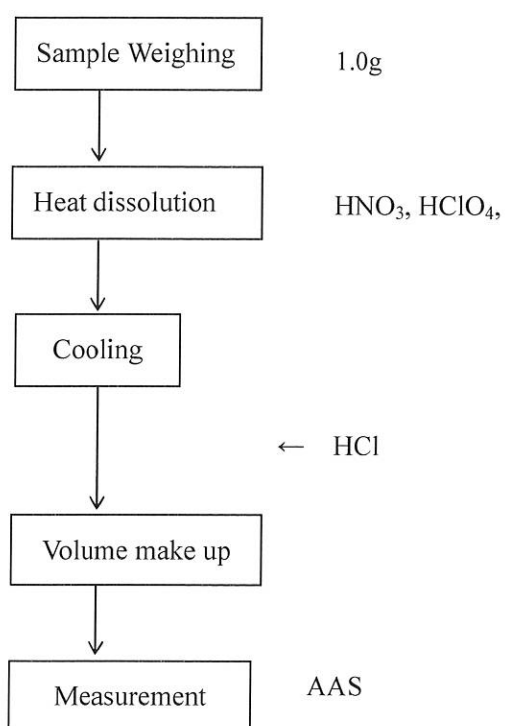


Fig 1 Analytical method (Cd,Pb)

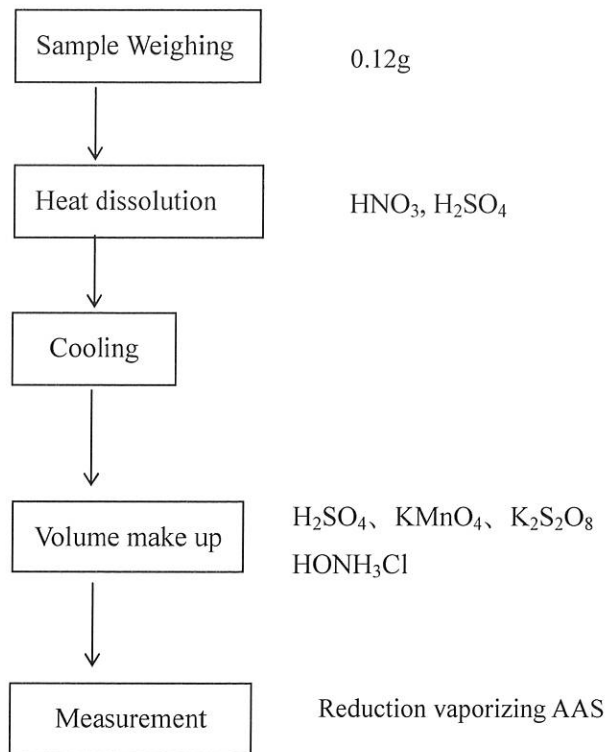
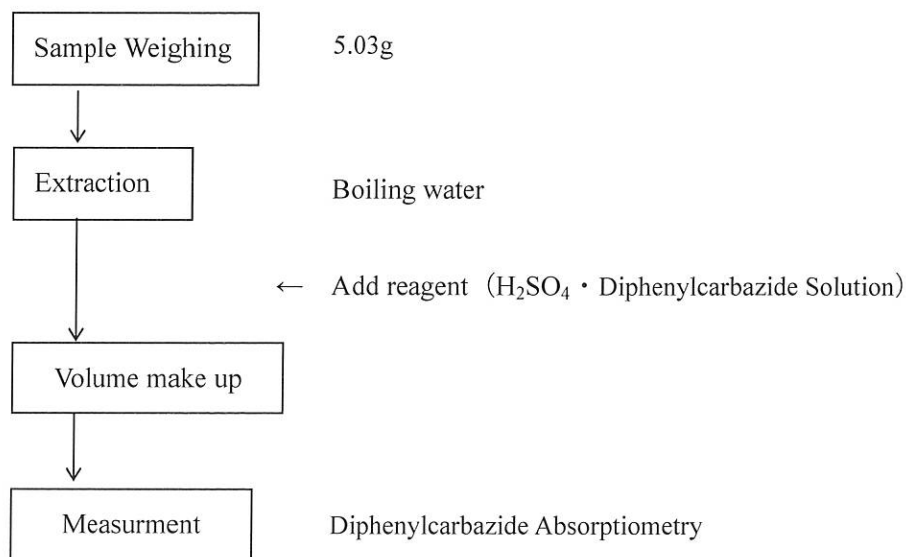


Fig 2 Analytical method (Hg)

Fig 3 Analytical method (Cr⁶⁺)

CERTIFICATE OF ANALYSIS

Client: JFE Techno-research Corporation
1-1 Minamiwatarida-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa 210-0855, Japan

Sample name: HYDRELIO Float

Received date: December 11, 2014

This is to certify that the following result(s) have been obtained from our analysis on the above-mentioned sample(s) submitted by the client.

Test Result(s)

Test Item	Result	QL	N	M
Specifications for Implements, Containers and Packaging <Synthetic Resin>	.....	.....	1	
Specific standards <Polyethylene (PE)>	.....	.....
Elution test	.....	.....
Evaporation residue (water)	Conformable (Not more than 5 µg/ml)	.....	
Evaporation residue (4 % acetic acid)	Conformable (Not more than 5 µg/ml)	.....	
Elution test(s)	.....	.....	2	
pH (solvent: water)	6.3 (22°C)	.....	3	1
pH (solvent: 4 V/V% acetic acid)	2.4 (22°C)	.....	4	1

QL: Quantitation limit N: Notes M: Method

Notes

1: Notification No. 370 (1959) "Specifications and Standards for Foods, Food Additives, etc.", issued by the Ministry of Health and Welfare. Type: used at the temperature not exceeding 100 °C.

2: Conditions for elution: soaking extraction at a ratio of 2 ml of solvent per cm² of surface area at 60 °C for 30 minutes.

3: Result of the blank test: 5.8 (22°C)

4: Result of the blank test: 2.4 (22°C)

Method

1: Glass electrode method



T. Arai
Takeko Arai
Principal Investigator

Dec. 23, 2014
Date



ASTRONERGY

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Create Sustainable and Efficient Green Energy

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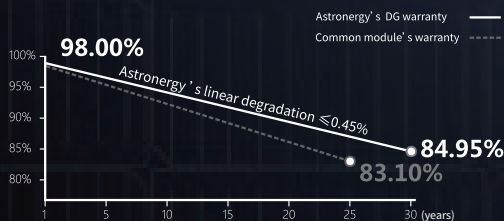
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15-year Product Warranty
30-year Linear Power Warranty



ISO 9001:2015:ISO Quality Management System
ISO 14001:2015:ISO Environment Management System
ISO 45001:Occupational Health and Safety
The first solar company which passed the Nord IEC/TS 62941 certification audit.



Tier 1
BloombergNEF



645~665W

POWER RANGE

0~+5W

POWER SORTING

21.4%MAX MODULE
EFFICIENCY**≤ 2.0%**FIRST YEAR
POWER DEGRADATION**≤ 0.45%**YEAR 2-30
POWER DEGRADATION

Electrical Specifications

STC: Irradiance 1000W/m², Cell Temperature 25° C, AM=1.5

	645	650	655	660	665
Rated output (P _{mpp} / Wp)	645	650	655	660	665
Rated voltage (V _{mpp} / V)	37.48	37.68	37.88	38.08	38.28
Rated current (I _{mpp} / A)	17.21	17.26	17.30	17.34	17.38
Open circuit voltage (V _{oc} / V)	45.29	45.49	45.69	45.89	46.09
Short circuit current (I _{sc} / A)	18.27	18.32	18.37	18.42	18.47
Module efficiency	20.8%	20.9%	21.1%	21.2%	21.4%

NMOT: Irradiance 800W/m², Ambient Temperature 20° C, AM=1.5, Wind Speed 1m/s

	485.8	489.5	493.3	497.1	500.8
Rated output (P _{mpp} / Wp)	485.8	489.5	493.3	497.1	500.8
Rated voltage (V _{mpp} / V)	35.03	35.19	35.34	35.47	35.60
Rated current (I _{mpp} / A)	13.87	13.92	13.97	14.02	14.07
Open circuit voltage (V _{oc} / V)	42.43	42.63	42.83	43.03	43.23
Short circuit current (I _{sc} / A)	14.72	14.77	14.82	14.87	14.92

Electrical Specifications (Integrated power)

P _{mpp} gain	P _{mpp} / Wp	V _{mpp} / V	I _{mpp} / A	V _{oc} / V	I _{sc} / A
5%	687	37.88	18.17	45.69	19.29
10%	720	37.88	19.03	45.69	20.21
15%	753	37.89	19.90	45.70	21.13
20%	786	37.89	20.76	45.70	22.04
25%	818	37.89	21.63	45.70	22.96

Electrical characteristics with different rear power gain (reference to 655W)

Temperature Ratings (STC)

Temperature coefficient (P _{mpp})	-0.34%/°C	No. of diodes	3
Temperature coefficient (I _{sc})	+0.04%/°C	Junction box IP rating	IP 68
Temperature coefficient (V _{oc})	-0.25%/°C	Max. series fuse rating	35 A
Nominal module operating temperature (NMOT)	41±2°C	Max. system voltage (IEC/UL)	1500V _{DC}

Operating Parameters

Mechanical Specifications

Outer dimensions (L x W x H)	2384 x 1303 x 35 mm
Cell type	P type mono-crystalline
No. of cells	132 (6*22)
Frame technology	Aluminum, silver anodized
Front / Back glass	2.0+2.0 mm
Cable length (Including connector)	Portrait: (+)410 mm, (-)250 mm; Customized length
Cable diameter (IEC/UL)	4 mm ² / 12 AWG
^① Maximum mechanical test load	5400 Pa (front) / 2400 Pa (back)
Connector type (IEC/UL)	HCB40 (Standard) / MC4-EVO2A (Optional)
Module weight	38 kg
Packing unit	31 pcs / box (Subject to sales contract)
Weight of packing unit (for 40'HQ container)	1227 kg
Modules per 40' HQ container	496 pcs

^① Refer to Astronergy crystalline installation manual or contact technical department.
Maximum Mechanical Test Load=1.5×Maximum Mechanical Design Load.

Curve

