

GSHPA

Vertical Borehole Standard

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UK Co-ordinator for



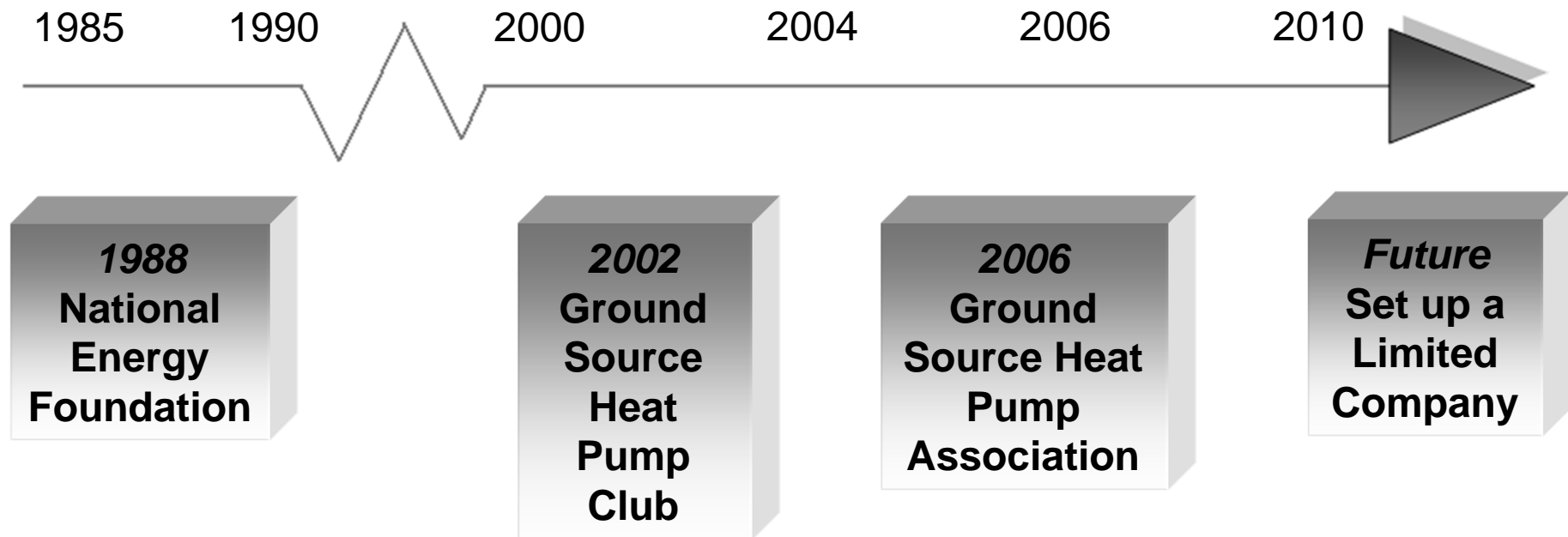
Content

1. GSHPA

2. Vertical Borehole Standard

3. Where Next

History



Principal aims

- promoting efficient and sustainable use of ground source heat pumps
- raising awareness of the benefits of ground source heat pumps
- assisting in the development and practice of sound industry-related standards

Member Benefits



Influence on government policies



Use of the Association logo



“Find a member” enquiry service

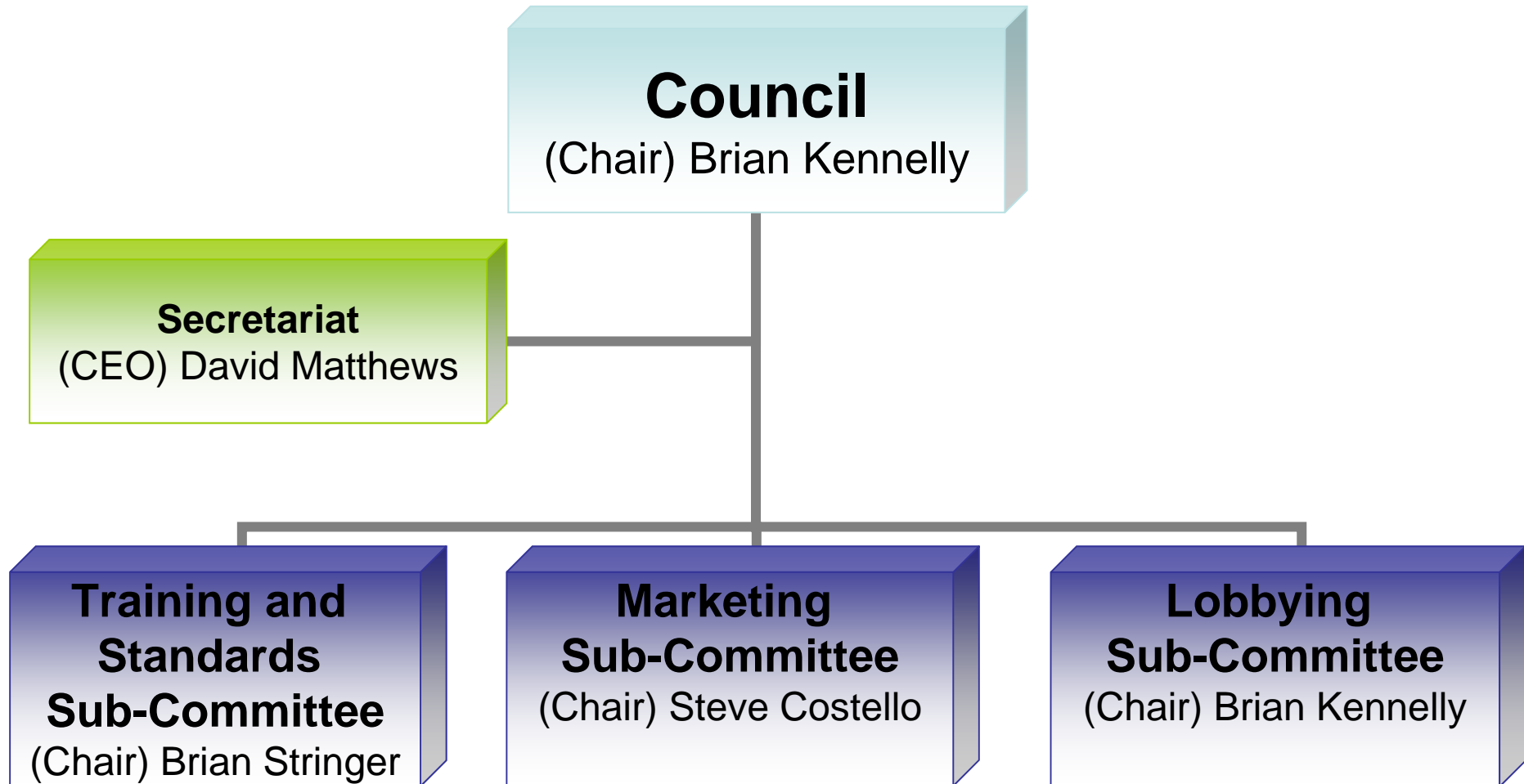


Up to date expert information

Recent achievements

- New website – source of up-to-date relevant industry documents & ‘find a member’ search
- Work with Government & Industry partners including:
 - BDA, HPA, BEAMA, Met Office & BGS
 - EA, DECC, OFGEM
 - Several Universities
- Well respected Code of Ethical Practice
- Industry Standards – first of series of standards to support industry now launched!

Management Structure



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The Scope of the Standards Document #1

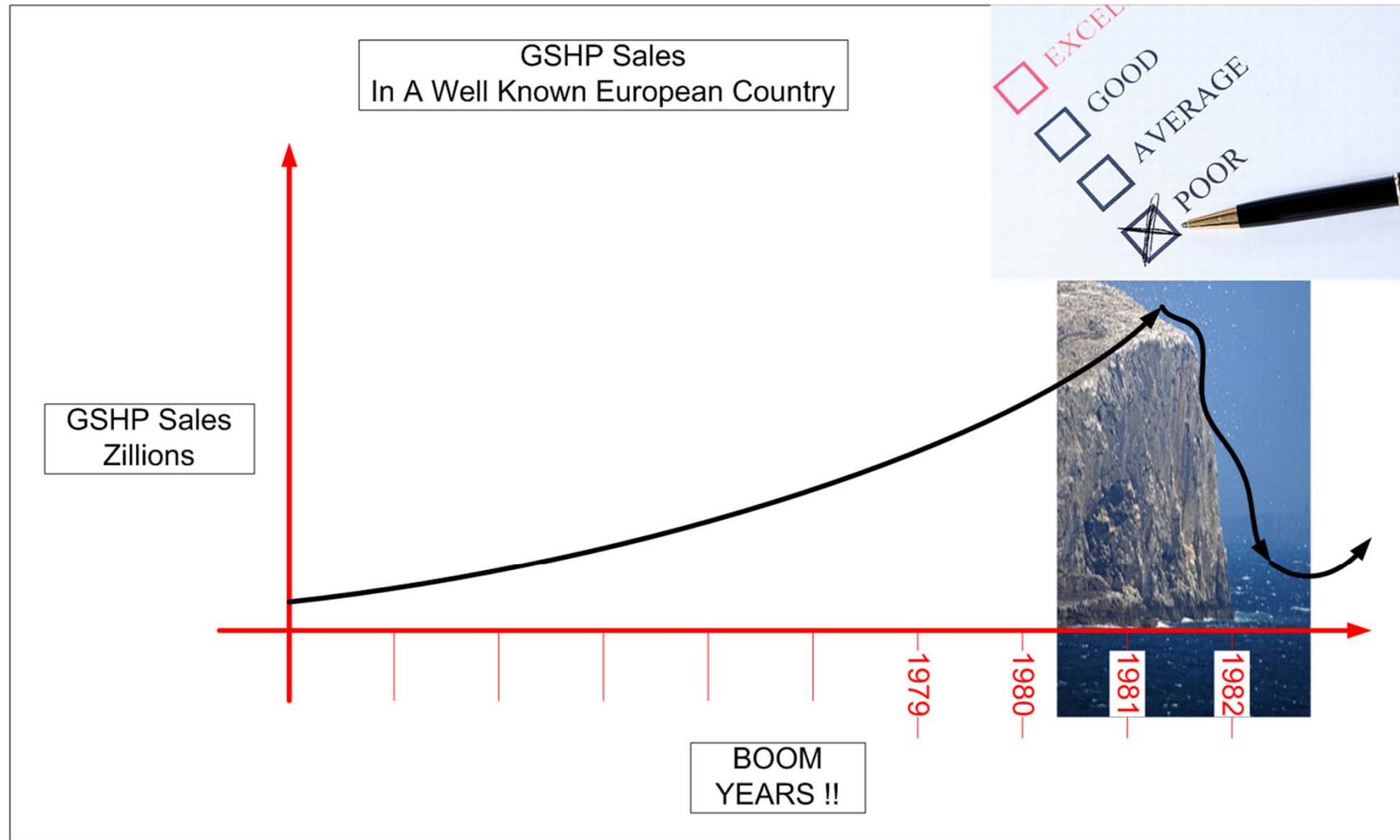
- The GSHPA Vertical Borehole Standard is a concise document providing information for the materials and general specification of a closed-loop vertical borehole system.
- The Standard also covers internal pipe works up to and including manifolds and / or flushing valves / arrangements. The Standard does not include the building entry detail as these will be defined elsewhere.
- The Standard is not designed to be an installation or training manual and must be referred to in conjunction with recognised design qualifications and training programmes.

The Scope of the Standards Document #2

- The Standards are designed to enable anybody reading them to quickly reference minimum materials specification, techniques and qualification requirements to be met and ensure that they either comply with the standards (or higher) or are employing companies and personnel who do comply with the standards (or higher).



We like to work on even ground...



Low Consumer Confidence Burst this Bubble

Pipe Materials

PE100+

- Slow crack growth resistance
- Verifiable, virgin grade raw material
- Manufactured to outside diameters, wall thickness and respective tolerance as specified in BS EN 12201 (part 2)



Pipe-work Jointing Techniques



Electro-Fusion



Socket-Fusion



Butt-Fusion

Jointing Quality Control



Image courtesy of G-Source

- Factory manufactured under controlled & quality assured conditions
- Purpose manufactured u-bend fusion-welded to each leg of pipe
- Maximum number of welds = 2 welds to form u-bend

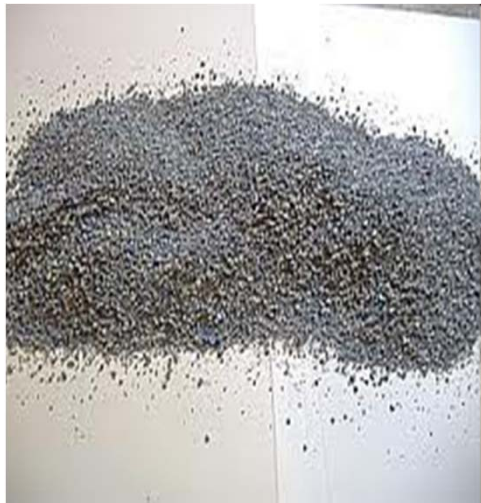
Oops, even the loop manufacturer doesn't bother with clamps.. Good job the driller pressure tested it.



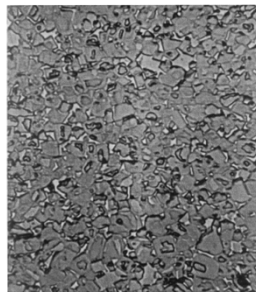
..It failed the test quite convincingly.

Types of Grout

Pliable materials



Bentonite based



Rigid materials



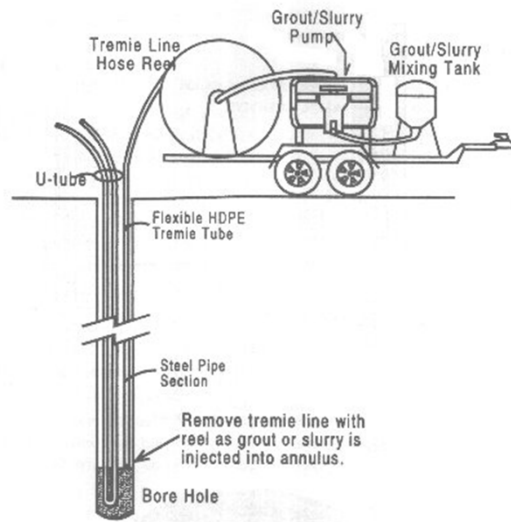
Cement based

Properties of Grout

- Known Thermal Conductivity
- Maximum allowable Hydraulic Conductivity (hc) $\leq 1 \times 10^{-9}$ m/sec
- If cementitious grouts: combined max. allowable permeability no higher than surrounding ground
- Consider operational temps of grouts – hydraulic conductivity not to be impaired by shrinkage or freeze thaw cycles



Grouting QA



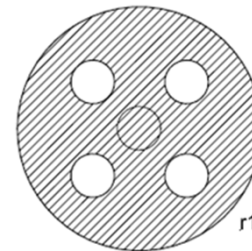
Pipe Placement

- Pipe positioning & quality of backfilling materials.



Pipe Transport, Storage & Installation

- Keep capped to avoid dirt etc. entering pipes
- Take Care to avoid damage & kinks
- Pipe separation can be crucial



Pipe-work Quality Issues



Images courtesy of LoopMaster Europe

QA - Post Installation Testing

Purge Points



Pressure Testing



Flow test cart

Thermal Transfer Fluid

Hazardous substances

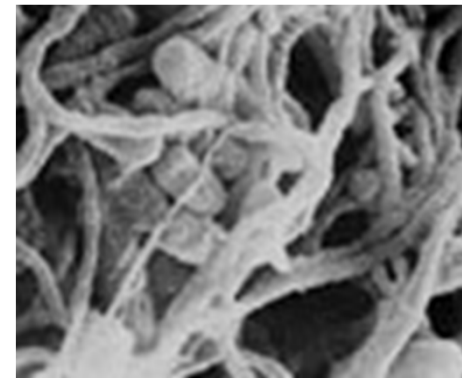
“Substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern”.

Water Framework Directive 2000/60/EC

Thermal Transfer Fluid

➤ Requirements

- shall not be harmful by ingestion
- shall not have an acute oral toxicity of less than 2000 mg/kg
- shall not be harmful to the environment
- shall have suitable and appropriate levels of biocide, corrosion and scale inhibitors
- shall be compatible with all materials and components within the ground source system
- shall be non-flammable



O & M Manuals & Commissioning

PC Form: Commissioning Sheet of Heat Pump for Heating/Cooling

Return by fax 00 44 (0) 870 727 0114 or mail to:

Glen Dimplex UK Ltd
Millbrook House, Grange Drive,
Hedge End, Southampton, SO30 2DF

Installation Site:
Name: _____
Street: _____
Postal code, town: _____

Heating System Installation: (Heat Distribution)
Name: _____
Street: _____
Postal code, town: _____

Energy Supply Company:
Name: _____
Address: _____
Off-periods: no yes; max. duration _____h

Heat Source: (e.g. well drilling contractor)
Name: _____
Address: _____

Air (visual inspection of air ducts)	No. of 90° elbows	_____	_____
	Straight length	_____ m	_____ m
	Minimum duct length (inlets)	_____ m	_____ m
	Rain guard	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no

Geothermal system	Antifreeze	<input type="checkbox"/> Monoethylene glycol <input type="checkbox"/> Propylene glycol	Brine pressure _____ bar
	Mean heat exchanger capacity	_____ kW	Frost protection down to _____ °C
	Number of loops	_____	Length per loop _____ m
	Strainer checked and cleaned	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no

Ground Water / Other
Ground water compatibility with regard to the water-to-water heat pump was determined by means of water analysis. Certificate is available. yes no
Intermediate heat exchanger yes no
Strainer checked and cleaned yes no
 Other heat source: _____

Heat Pump Heating Heating/Cooling
HP type: _____ Serial no.: _____ Manufacturing date: _____
Passive cooling system PFC Serial no.: _____ Manufacturing date: _____
Date of purchase: _____ Delivery date: _____

Water Heating: using heat pump: yes no
Hot water tank Make/type: _____
One warranty for the proper functioning will be assumed if tanks of different makes are used or tanks which are not authorized for use with the specific heat pump type. (Improvements of the heat pump operation are possible.)
Heat exchanger sun-face area: _____ m² Rated capacity: _____ l Electric storage heater _____ kW

Electrical Installation:
Name: _____
Street: _____
Postal code/town: _____

Heating / Cooling System:
Hydraulic connection of heat pump as per schematics of the project planning and installation manual.
Project planning and installation manual, edition: _____ Page/ Fig.: _____
Variations: _____ (drawing to be supplied for special connections)
Buffer tank in: flow circ. return circ. capacity _____ l
Electric supplemental heater in heating circuit _____ kW
Compact manifold no yes
Type of fuel heating system: oil gas solid fuel _____
The heating contractor was informed that the heating installation needs to be properly adjusted (overflow valve and hydraulic adjustment): no yes
Heating circulating pump: regulated unregulated Stage _____
Make/type: _____
Hot water circulating pump Stage _____
Make/type: _____
Swimming pool circulating pump Stage _____
Make/type: _____
Auxiliary circulating pump: Stage _____
Make/type: _____
Borewell circulating pump Stage _____
Make/type: _____
Blow-off mixer: no yes; Mixer running time: _____ min
Make/type: _____
Heating system mixer: no yes; Mixer running time: _____ min
Make/type: _____
Solar water heating: no yes
Solar system controller Make/type: _____
Solar heating back-up: no yes
Solar regulator, make/type: _____

Basically...

To allow anybody such as drillers, ground workers architects, designer, specification writers, installers, end users, building operators etc etc etc to be able to assess and ensure that the minimum materials standards are being asked for, provided or being adhered to...

But, They Must Be Adopted !

They are not to outline how to design a system, they are not for Mrs Jones to vet or verify that the thermal transfer fluid is correct...

They are **not** to prove how many holes are needed, how to drill a hole or how to install a heat pump system.

Circulator Sizing and System Components



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Where Next?

- **Future Modules to GSHP Standards**
 - Thermal Piles
 - Horizontal Ground Heat Exchangers
 - Open Loop Applications

- 300,000+ GSHP installations by 2020

And now you may go...

Thank you for listening...

<http://www.gshp.org.uk/Standards.html>

...Any questions?



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