Introduction

This section brings together performance data for the complete range of Hepworth heating, roofing, ventilating and ancillary products. Most of the products are made from terracotta, and therefore much of the data referring to this material will be common to all.

However, several of the terracotta products also have quite specific performance requirements whilst other products are made from refractory concrete, refractory fireclay, and low alumina fireclay. The performance characteristics of these particular products are indicated by separate references.

Quality assurance

Terracotta products are sampled and tested in accordance with BS 6001: Part 1: 1991 at AQL of 10% and inspection level S.2.

Strength characteristics

When tested to BS EN 1457: 1999 'Clay/ceramic flue liners – Requirements and test methods', Hepworth terracotta products were found to have a compressive strength greater than 65 N/mm^2 (65 MN/m^2), greatly exceeding the minimum requirement of 3.5 MN/m^2.

Fireplace Lintels, Flue Adaptors and Corbel Units, made from reinforced concrete to BS 1251: 1987 'Specification for open-fireplace components', have a minimum compressive strength of 17 N/mm^2 at 28 days after casting using the test method described in BS 1881: Part 116.

The Hepworth precast refractory concrete Gas Flue Block System meets the requirement of Appendix B.1 of BS 6073: Part 1: 1981. Standard Blocks have an average crushing strength of 2.8 N/mm^2. Cover Blocks and Recess Units also have this minimum crushing strength.

Hepworth Firebricks made from low alumina fireclay have a cold crushing strength of 50(±10) N/mm^2 when tested to BS 1902.

Hepworth terracotta Quarry Tiles have a crushing strength exceeding 200 MN/m^2, and a breaking strength ranging from 23 to 27 MN/m^2.

Resistance to corrosion and chemical effects

Resistance to acids

Hepworth terracotta products resist all acids except hydrofluoric acid and satisfy the requirements of BS EN 1457: 1999.

In addition, Hepworth Quarry Tiles are fully resistant to a wide range of industrial and household chemicals, including swimming pool cleaners. Alkalis such as potassium and sodium hydroxide attack these tiles only slowly and although there may be some discoloration, the life of the construction will not be significantly shortened.

Efflorescence

Hepworth terracotta products are treated with chemicals to prevent efflorescence. The products are rated as 'Nil'.

Thermal characteristics

High temperature resistance

Hepworth terracotta products are able to withstand a maximum temperature of 1000ºC for a minimum period of 1 hour, meeting the requirements of BS EN 1457: 1999.

Hepworth precast concrete Gas Flue Blocks are non-combustible and capable of resisting flue gas temperatures up to 350ºC.

Hepworth low alumina fireclay Firebricks withstand high temperatures, and have a Pyrometric Cone Test temperature between 1660 and 1680ºC at which they begin to soften.

Hepworth Firebacks satisfy the heat resistance test given in Appendix A of BS 1251: 1987 in which a specimen is raised to 1280ºC/1320ºC at a rate not exceeding 250 K/hour, held for 1 hour, and cooled at a similar rate.

Thermal conductivity

The thermal conductivity of terracotta is 0.75W/mK when dry.

The good insulating properties of terracotta reduce the risk of low temperature conditions from forming in a flue that contribute to the deposition of soot and tar particles. See also 'Unimpeded flow of combustion gases'.

Hepworth Quarry Tiles have a 'k' value of approximately 1 W/m/K.

Thermal expansion (linear)

Terracotta also has a low coefficient of thermal expansion of 5 x 10^{-6}/K when tested at 20ºC to 50ºC.

Hepworth Firebricks, subjected to a temperature of 1410ºC for 2 hours, show a permanent linear change of ±1.5%.

Moisture resistance

Hepworth terracotta has low moisture penetration and water absorption properties. Buff terracotta absorbs up to 8% moisture, red absorbs up to 5% whilst blue/black takes up a maximum of 2% moisture.

Hepworth firebricks have a porosity of 17±2%.

Weather resistance

Frost and freeze/thaw resistance

Hepworth terracotta products satisfy the requirements of BS 1181: 1999, when subjected to a freeze/thaw multiple-cycle accelerated weathering test.

Hepworth Quarry Tiles meet the requirements of the British Ceramic Research 100-cycle freeze/thaw test, and are classified as fully frost resistant.

Unimpeded flow of combustion gases

The smooth internal surfaces of terracotta Flue Lliners, Flue Liner Terminals and Chimney Pots allow an unimpeded flow of combustion gases and discourage the deposition of soot and tar particles. See also 'thermal characteristics'.

As required by BS 1289: Part 1: 1986, the flow resistance of freestanding terracotta Flue Liner Terminals have a resistance factor not greater than 5, and for terracotta ridge terminals not greater than 15.

As required by BS 1289: Part 1:1986, the flow resistance of Exit Blocks forming part of the Hepworth refractory concrete Gas Flue Block System is not greater than 0.5.

Impervious to combustion gases

The wall thickness of Hepworth terracotta heating products and Hepworth refractory concrete Gas Flue Blocks are virtually impervious to the passage of corrosive combustion gases such as chlorine compounds, sulphur dioxide and oxides of nitrogen.

Ultra-violet light and colour fastness

Hepworth terracotta is made from specially selected clays that are blended for colour stability and durability. Their colour is an intrinsic, through-body, fired-in property of the material and is stable against fading and deterioration.

Dimensional tolerances

Flue Liners, Flue Liner Terminals and Chimney Pots

These components comply with BS 1181: 1989. Refer to Table 1 and Table 2 on page 3. In Table 1, the decorative parts of Type B terminals above the functional connection to the flue are in accordance with Hepworth technical drawings.

BS 1181: 1989 lays down tolerance limits for the nominal height of straight flue linings of –2% to +5% subject to a minimum value of ±10mm. Tolerances for flue liner bends are ±55mm on radius and ±5° on curvature. See Figure 1 on page 3.

Hepworth Flue Liners comply with BS 1181: 1989 for straightness and the squareness of ends. See Table 3 and Table 4 on page 3.

Vent openings in terminals pass the 16mm sphere test of BS 1289: Part 2: 1989.

Fireplace components

Hepworth Firebacks comply with the dimensional requirements of BS 1251: 1987 Section 2.

Hepworth Firebricks are manufactured to a ±2% tolerance on length, and a minimum of ±2mm on width and thickness.

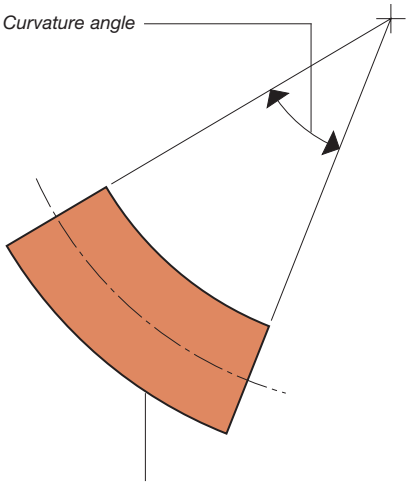
Gas Flue Block System

Hepworth Gas Flue Block System complies with the dimensional tolerance requirements of BS 1289: Part 1: 1986. See Table 5 on page 4.

Technical Advisory Service Tel: 0870 4435551 Fax: 0870 4435552 E-mail: info@hepworthterracotta.co.uk

Table 1: Flue liner terminal and chimney pot dimensional tolerances

Nominal size (mm)	Type A (BS 1181) Limits of bore/internal width (mm)		Maximum external diameter/width (mm)	Type B (BS 1181) Limits of bore/internal width (mm)	
	minimum	maximum		minimum	maximum
Circular					
125	119	135	175	116	137
150	145	160	200	143	163
175	169	186	230	167	189
185	179	198	242	177	202
210	200	220	268	200	229
225	219	239	287	216	245
250	242	266	314	239	270
300	292	317	385	288	323
Square					
175 x 175	169	186	240	167	189
185 x 185	179	198	250	177	202
200 x 200	193	213	260	191	218
225 x 225	219	239	295	216	245
250 x 250	242	266	320	240	270
300 x 300	292	317	400	288	323



Definition of curvature

Figure 1

Table 2: Flue liner dimensional tolerances

Nominal size (mm)	Limits of bore or internal width (mm)		Maximum external diameter/width (mm)
	minimum	maximum	
Type 1			
125	119	135	175
150	145	160	200
175	169	186	230
185	179	198	242
210	200	220	268
225	219	239	287
250	242	266	314
300	292	317	385
350	342	366	424
Type 2			
175 x 175	169	186	240
185 x 185	179	198	250
200 x 200	193	213	260
225 x 225	219	239	295
250 x 250	242	266	320
300 x 300	292	317	400

Table 3: Flue liner straightness

Nominal height (mm)	Maximum permissible deviation (mm)
450	5
600	7

Table 4: Flue liner squareness

Nominal size (mm)	Maximum permissible deviation (mm)
175 x 175	7
185 x 185	7
200 x 200	8
225 x 225	9
250 x 250	10
300 x 300	11

Table 5: Gas flue block dimensional tolerances

Coordinating height	Bonded flue block Starter and cover (transfer) blocks	225mm *Stated by manufacturer
Wall thickness		≥ 25mm
Flue size	Horizontal cross-section of flue for bondedand unbonded flue blocks Cross-sectional area	≥ 90mm ≥ 16,500mm^2
Bonding extension	Plain bonded flue blocks	≥ 75mm
Angles	Angle of offset in lateral or rear offset blocks Angle of offset between sections of flue in transfer blocks	≥ 30º ≥ 45º
Size of opening	Starter blocks	≥ 305mm wide x 115mm deep
Terminal openings	Will not allow 16mm diameter sphere to pass through when subjected to a force of 5 N	
Bonded flue block	Shall be designed so that when jointed together the flues in adjacent blocks are aligned to within 3mm	
Unbonded flue block	Shall be designed so that when jointed together the sides of the flues, including any locating devices such as metal connectors, are aligned to within 3mm	

**Note: The maximum dimensional deviations from the manufacturer's stated work size shall be ± 3mm*

Technical Advisory Service Tel: 0870 4435551 Fax: 0870 4435552 E-mail: info@hepworthterracotta.co.uk