

### PRODUCT DESCRIPTION

#### PENATECH HS GROUT

Aftek Penatech HS Grout is a high strength, precision Class C grout. Non shrink dual expansion compensates for shrinkage in both the plastic and hardened state.

Penatech HS complies with US Corp of Engineers Specification of non-shrink grout, CRDC 621-82A and ATSM C1107-91 (Type C).

#### PENATECH HES GROUT

Penatech HES Grout is a high early strength gain, flowable, shrinkage compensated, Class C grout for use where rapid strength gain is required.

Penatech HES Grout complies with US Corps of Engineers specification CRDC 621-82A and ASTM C1107-91 for Class C Grout.

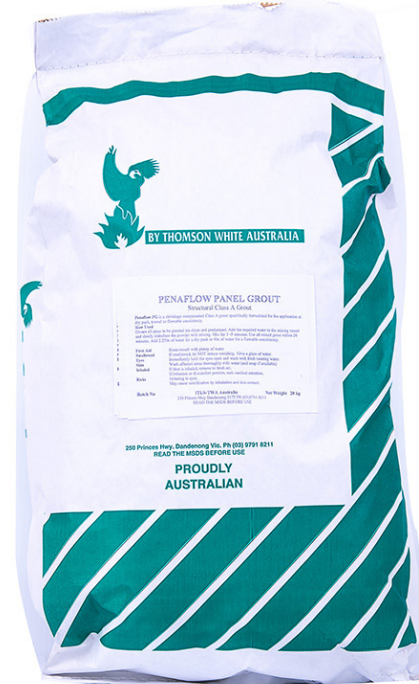
Penatech HES Grout comprises a blend of Portland cements, graded fillers and chemical additives which impart controlled expansion in the plastic and hardened states whilst minimising water demand and maximising early compressive strength gain.

Penatech HES Grout is supplied as a ready to use powder, requiring only the addition of clean water to produce a flowable consistency non-shrink grout.

### BENEFITS

#### PENATECH HS GROUT

- High early and ultimate strength
- Exceptional flow characteristics, good flow retention
- High ultimate (28 days) strength
- Shrinkage compensated in both plastic and hardened state
- Non-metallic wires content eliminates staining
- Complies with ASTM C1107-91 and CRDC-621-82
- Good impact and thermal resistance
- Can be dry packed



#### PENATECH HES GROUT

- High early strength, even at low temperatures.
- Dual stage expansion compensates for shrinkage in both the plastic and hardened states.
- High ultimate strength (28 days)
- Exceptional flow characteristics
- Rapid strength gain and set times
- Variable consistency obtainable
- Equipment and machinery can be reinstated after 24 hours.
- Non metallic iron eliminates staining
- Good impact and thermal resistance
- Complies with US Corps of Engineers specification CRD-C-621-82A and ASTM C1107-91 for expansion. Prepackaged material requires only the addition of clean water on site
- Grouting from 10mm to 120mm in a single application

### AREAS OF APPLICATION

#### PENATECH HS GROUT

- Machine base plates where critical grouting application is required
- Applications subject to dynamic loads and where continuous vibrations are present
- Bridge bearing pads

- Crane rail sole plates
- Pre-cast concrete sections/panels
- Anchor bolt fillings
- Filling in core holes, cavities, gaps and base infill's
- High performance structural grouting

## **PENATECH HES GROUT**

- Cementitious grouting where high early strength is required
- Heavy duty support grout high load machine base plates
- Precast grouting applications
- Anchoring bolt holes
- Bridge bearing pads
- Crane rail plates
- Cavities, gaps and recesses
- Rapid reinstatement of equipment (minimise downtime)
- Grouting requiring dynamic load bearing and applications subject to continuous vibration.

## **APPLICATION INSTRUCTIONS**

### **PENATECH HS GROUT**

Surface and Substrate Preparation -  
The substrate to be grouted must be clean, sound and free from dust, oil, grease, curing compounds or any foreign matter that will affect the grout adhesion bond. Bolt holes and anchor points must be clean and free of water.

### **Pre-Soaking**

All prepared areas must be saturated with water for a minimum of 4 hours prior to grouting. This will reduce the porosity of the substrate. Prior to grouting, ensure all excess water is removed all holes must be free from water and no puddles of water are present. If grouting under base plates, it is imperative that bleed holes or venting holes are provided (this will eliminate pressure build up in a confined area).

### **Formwork**

It is essential that the formwork to be constructed is leak proof and water tight. In order to achieve this it is recommended that foam rubber strips or a suitable sealant such as polyurethane or silicone be used underneath the formwork. The formwork should be constructed, which will allow and ensure a grout head is maintained on the side above the level of the underside at the base plate. The formwork should allow for gravity flow of grout with a suitable grout head allowing for continuous flow between the base plate and the concrete substrate.

To ensure ease of formwork removal, the formwork should be coated with form oil or release oil prior to grouting (consult ITLS-Aftek Technical Department for additional information).

### **Large Volume Grouting**

For grouting requiring thicknesses greater than 200mm, special procedures are necessary, such as the addition of Epilox Fillers or 10mm Silt Free aggregate can be used. Consult your AFTEK/ITLS representative for advice and additional information.

### **Temperature**

Low Temperature Application:

At low temperatures below 10°C, the grout setting time is extended and some bleeding may occur. The early strength gain will be dramatically reduced. However, ultimate strength will be maintained. It is recommended that the Penatech HS Grout and the water be conditioned to 20-25°C overnight or several hours before application. This will assist in strength development.

High Temperature Application:

At high temperatures greater than 30°C, the grout setting time is reduced and grouting application becomes problematic due to very early setting times and reduced placement times. It is recommended that Penatech HS Grout be kept in a cool environment and the use of cold water be used for mixing. It is recommended that in instances where the temperature is greater than 30°C, the grouting be conducted early in the day or late in the evening and sheltered from sunlight and direct heat.

### **Mixing**

Penatech HS Grout is ready to use, simply requiring the addition of water. Penatech HS Grout must be mixed with a mechanical mixer with a high shear mixer or a suitable drum mixer that creates a forced action mixing. For smaller quantity mixing an electric drill with a spiral mixing paddle is suitable. The speed drill should be approx. 500-600rpm.

**DO NOT MIX BY HAND.**

<b>Dry Pack / Stiff Grout:</b>	Add 2.2-2.6 litres per 20kg bag
<b>Plastic / Trowellable Grout:</b>	Add 2.8-3.2 litres per 20kg bag
<b>Flowable / Pourable Grout:</b>	Add 3.5-4.0 litres per 20kg bag

Always add the grout powder to the pre-measured water. DO NOT ADD ADDITIONAL WATER AS GROUT WILL SEGREGATE AND BLEED AFFECTING PERFORMANCE.

The selected water level should be accurately measured and added to a suitable mixing container.

Add the powder (grout) to the water and mix for 3-5 minutes until a homogeneous consistent mix is obtained.

DO NOT ADD ADDITIONAL WATER OTHER THAN SPECIFIED. DISCARD ANY GROUT THAT HAS STIFFENED OR IS UNWORKABLE.

## **PENATECH HES GROUT**

### **Foundation surface**

The substrate surface must be free from oil, grease or any loosely adherent material. If the concrete surface is defective or has laitance, it must be cut back to a sound base. Scabbling or water blasting can be used to remove laitance and provide a mechanical key.

Bolt holes or fixing pockets must be blown clean of any dirt or debris. Any cracked or weakened concrete should be removed to provide a solid foundation.

### **Presoaking**

Several hours prior to grouting, the area of cleaned foundation should be flooded with fresh water. Immediately before grouting takes place, any free water should be removed with particular care being taken to blow out all bolt holes and pockets.

### **Base plate**

It is essential that this is clean and free from grease, oil or scale. Air relief holes should be provided to allow venting of any isolated high spots.

### **Levelling Shims**

If these are to be removed after the grout has hardened, they should be treated with a suitable release agent.

### **Formwork**

The formwork should be constructed to be leak proof. This can be achieved by using foam rubber strip or mastic sealant beneath the constructed formwork and between joints.

In some cases it is practical to use sacrificial semidry sand and cement formwork. The formwork should contain outlets for presoaking.

### **Unrestrained surface area**

This must be kept to a minimum. Generally the gap width between the formwork and the plate edge should not exceed 150mm on the pouring side and 50mm on the opposite side. It is advisable to have no gap at the flank sides.

### **Mixing and placing**

#### **Mixing**

For best results a mechanically powered grout mixer should be used when quantities up to 40kg are used, a slow speed drill fitted with a high shear mixer is suitable. Larger quantities will require a high shear vane mixer. Do not use a colloidal impeller mixer.

To enable the grouting operation to be carried out continuously, it is essential that sufficient mixing capacity and labour are available. The use of a grout holding tank with provision to gently agitate the grout may be required.

#### **Consistency of mixed grout**

The quantity of clean water required to be added to a 20kg bag to achieve the desired consistency is given below.

Consistency:	Trowelable	Flowable
Water required:	2.5 – 2.8 litres	3.2 – 3.5 litres

The water content should be accurately measured into the mixer.

The total contents of the Penatech HES Grout bag should be slowly added and continuous mixing should take place for 5 minutes. This will ensure that the grout has a smooth even consistency.

#### **Placing**

At 20°C, place the grout within 10 minutes of mixing to gain the full benefit of the expansion process.

Penatech HES Grout can be placed in thickness up to 120mm in a single pour when used as an under-plate grout. For thicker sections it is necessary to fill out Penatech HES Grout with well graded silt free aggregate to minimise heat buildup.

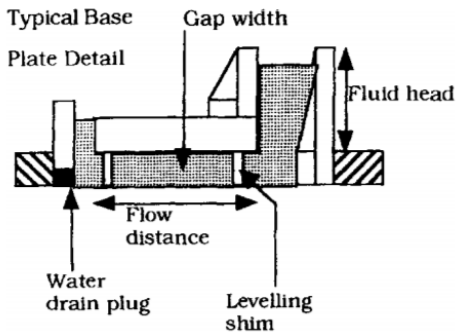
Typically Epilox Fillers F4 is suitable for this, added at the rate of 10kg per 20kg bag of Penatech HES Grout.

Do not add excess aggregate as this will affect the water requirement and ultimate strength gain of the grout.

NOTE: Adding aggregate may create a heat sink effect which will retard the set of the grout. This will slow strength development slightly in the first few hours after placement of the filled grout.

Any bolt pockets must be grouted prior to grouting between the substrate and the base plate.

Continuous grout flow is essential. Sufficient grout must be prepared before starting. The time taken to pour a batch of grout must be regulated to the time to prepare the next one.



Pouring should be from one side of the void to eliminate any air or presoaking water from being trapped under the baseplate.

It is advisable to pour the grout across the shortest distance of travel. The grout head must be maintained at all times so that a continuous grout front is achieved.

Where large volumes have to be placed, Penatech HES Grout may be pumped. A heavy duty diaphragm pump is recommended for this purpose. Screw feed and piston pumps may also be suitable.

### Curing

On completion of the grouting operation, exposed areas should be thoroughly cured. This should be done by the use of an Aftek liquid curing membrane, continuous application of water and/or wet hessian.

### PROPERTIES

#### PENATECH HS GROUT

Mixed 4 litres of water per 20kg bag at 20°C

FLOW PROPERTIES			
Grout Consistency	Gap Depth (mm)	100mm head of grout Flow distance (metres)	250mm head of grout Flow distance (metres)
Fluid/Flowable	10	0.950	2.80
	20	2.00	3.30
	30	3.10	3.50
	40	3.40	>3.50
	50	>3.80	>3.80
	100	>4.00	>4.00

Grout head refers to headbox required for a continuous pour as to avoid air pockets under the base plate as well improve flow.

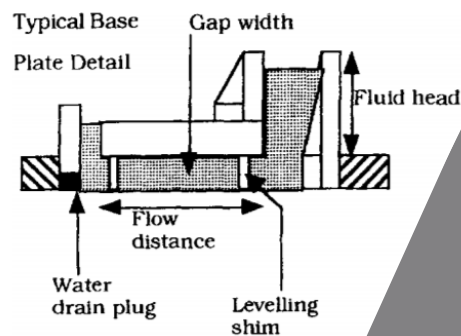
Care must be taken during grouting to ensure the headbox and grout head is maintained at all times.

The grout head nominated (100mm or 250mm) will ensure that a continuous and consistent flow is achieved.

### Placement

Penatech HS Grout can be placed in two different ways:

1. Gravity flow using header box-  
Mix the grout to a flowable consistency and pour grout from one side to avoid air entrapment. Ensure a grout head box is used and the grout head is maintained at all times. This will ensure continuous flow of grout without the possibility of air entrapment.
2. Large volume pumping-  
Mix the grout using a forced action mixer. A positive displacement pump is the recommended pump for large placement application. For large grout pours ensure the grout is pumped from the bottom upwards as this will minimize any air entrapment and ensure complete void filling. For base plates pump from one side ensuring an air bleeder hole is available in the formwork or base plate to ensure any build-up of pressure is released from the bleeder hole.



### Curing

On completion of grout application, all exposed grout should be cured in accordance to 'good practices' in concrete curing. The exposed grout should be covered with plastic sheeting, wet hessian or wet liquid curing compounds such as the Curecon range at Aftek Curing Compounds. Consult your Aftek representative for advice on the most suitable product.

Curing plays a vital role in ultimate grout performance and strength development.

## TYPICAL PROPERTIES

Appearance	Light grey powder (grey when mixed)
Application Temp	Minimum 5°C Maximum 30°C
Expansion characteristics	Expansion 1-2% in plastic state
Time for Expansion	Start 5 min Finish 25 min
Bleed	0%

## SETTING TIMES

Water requirement (litres per bag)	Trowellable 2.8-3.2	Flowable 3.2-3.5
Initial set (hours)	20	25
Final set (hours)	35	40

Tested at 20°C 50% RH Tested to AS 1012.18 for setting times

## COMPRESSIVE STRENGTH

Age	Compressive strength MPa		Flexural strength MPa	
	Trowellable	Flowable	Trowellable	Flowable
2 hrs	>35	>25		
4hrs	>45	>30		
8 hrs	>50	>36		
24 hrs	>60	>44	>5.3	>3.6
3 days	>65	>48		
7 days	>85	>65	>8.82	>7.0
28 days	>85	>65	>9.8	>9.5

## BOND STRENGTH

Age (days)	Trowellable MPa	Flowable MPa
28	>9.5	>10

Tested to ASTM C882-1987, slant shear method

## YIELDS

Consistency	Trowellable	Flowable
Litres of water – per 20kg bag	2.8-3.2	3.5-4.0
Yield – per bag litres	10.2 approx.	11 approx.
Fresh wet density kg/m <sup>3</sup>	2220	2200
Bags required – per cubic metre (m <sup>3</sup> )	98	91

## PENATECH HES GROUT

### TYPICAL PERFORMANCE PROPERTIES

Appearance	Light grey powder (grey when mixed)	
Application temp	Min	5°C
	Max	30°C
Expansion characteristics	Expands 1-2% in plastic state	
Time for expansion	Start	5 mins
	Finish	25 mins
Bleed	0%	
Young's Modulus	28 GPa	

### Strength gain

Compressive strength tested to AS1012.9, AS2350.11

Flexural strength tested to C348-86 (20°C)

### COMPRESSIVE STRENGTH

Age	Compressive strength MPa		Flexural strength MPa	
	Trowellable	Flowable	Trowellable	Flowable
2 hrs	>35	>25		
4hrs	>45	>30		
8 hrs	>50	>36		
24 hrs	>60	>44	>5.3	>3.6
3 days	>65	>48		
7 days	>75	>50	>8.8	>7.0
28 days	>85	>65	>9.8	>10.0

### Setting Times (@ 20°C)

	Trowellable	Flowable
<b>Initial</b>	20 minutes	25 minutes
<b>Final</b>	35 minutes	40 minutes

**Bond Strength** (ASTM 882-1989 slant shear method)

## **CLEAN UP**

### **PENATECH HS GROUT**

Wash all tools and equipment with fresh, clean water immediately after use. Penaflo Panel Grout can only be removed mechanically.

### **PENATECH HES GROUT**

Penatech HES Grout should be removed from tools and equipment immediately after use. Cured material can only be removed mechanically.

## **LIMITATIONS**

### **Low temperature working**

When the air or contact surface temperatures are 5°C or below on a falling thermometer, warm water (30-40°C) is recommended to accelerate strength development. For ambient temperatures below 10°C the formwork should be kept in place for at least 36 hours. Normal precautions for winter working with cementitious materials should then be adopted.

### **High temperature working**

At ambient temperatures above 35°C cool water (below 20°C) should be used for mixing the grout prior to placement. Store bags of Penatech HES Grout under cover and keep as cool as possible.

## **ESTIMATING**

### **Packaging**

Penatech HES Grout is supplied in 20 kg polylined bags.

### **Estimating Data**

Consistency:	Trowelable	Flowable
Yield per bag	10.3 litres (approx.)	11 litres (approx.)
Fresh Wet Density	2220 kg/m <sup>3</sup>	2220 kg/m <sup>3</sup>
No. Bags to cast one cubic metre	97	91

NOTE: These figures are intended to be used as a guide only. Variations in water content and wastage on site may cause yields to fluctuate.

## **STORAGE**

**Penatech HS** has shelf life of 9 months if stored in the original sealed packaging in dry, low humid environments.

**Penatech HES Grout** is a cement based product which must be stored in a dry area off the ground. Penacrete should be used within 12 months of date of manufacture.

## **HEALTH AND SAFETY**

### **PENATECH HS GROUT**

Avoid contact with skin. Protective gloves and clothing are recommended when mixing or using this product. Please refer to full MSDS (material safety data sheet) for this product

## **PENATECH HES GROUT**

Penatech HES Grout is non-toxic, but it is alkaline in nature. Any contact with eyes or skin should be washed off with clean water. Protective gloves and clothing should be worn.

For more detailed information, please read the MSDS for this product.

## **ALLIED PRODUCTS**

ITLS manufactures a broad range of products under the Aftek brand, which are used in the construction industry and in manufacturing, including:

Grouts, Coatings, Admixtures, Adhesives, Sealants, Floor Toppings, Floor Levelling Compounds, Concrete Repair, Concrete Curing

## **SPECIFICATION CLAUSES**

### **PENATECH HS GROUT**

#### **Performance specification**

All grouting shown on the drawing 1.1 must be carried out with a pre-packaged cement based grout which is chloride free.

It shall be mixed with clean water to the required consistency. The plastic grout must not bleed or segregate.

A positive volumetric expansion shall occur while the grout is plastic by means of a gaseous system.

The compressive strength of the grout must exceed 50 MPa at 7 days and 65 MPa at 28 days.

The storage and placement of the grout must be in strict accordance with the manufacturer's instructions.

#### **Supplier's specification**

All grouting where shown on the drawing must be carried out using as manufactured by Aftek and used in accordance with the manufacturer's data sheet.

## **PRECAUTIONS**

### **PENATECH HS GROUT**

- Unrestrained area must be kept to a minimum
- Do not add additional water other than what is specified
- Never apply mixed grout to a dry porous substance
- Refer to MSDS (material safety data sheet) prior to mixing
- Always apply grout in a continuous operation ensure grout head is maintained
- At low temperatures, grout setting time and strength gain will be extended
- At very high temperatures, grout will set and cure faster potentially causing cracking and delamination