



ASSESSMENT OF FP McCANN'S EASI-BASE MANHOLE BASE

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Authors: J Cant, K Adams and H Williams
Contract Manager: N Tarbet
Contract No.: 15012-0

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Any enquiries relating to this report should be referred to the authors at the following address:

WRc Swindon, Frankland Road, Blagrove, Swindon, Wiltshire, SN5 8YF.
Telephone: + 44 (0) 1793 865000 Fax: + 44 (0) 1793 865001
Website: www.wrcplc.co.uk

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1. INTRODUCTION

1.1 Outline of product range

FP McCann's Easi-Base is a factory cast concrete manhole base that includes benching in a range of connectivity options. The Easi-Base family consist of three variations; unlined concrete benching, benching lined with polypropylene and benching lined with glass reinforced plastic (GRP). Easi-Base is available in four internal diameters of 1200 mm, 1500 mm, 1800 mm and 2100 mm.

For each variation of the Easi-Base a separate Assessment schedule has been drafted and these can be found in Appendix A. The Assessment Schedules are:

- PT/274 /0808: FP McCann Easi-Base precast manhole base with polypropylene lining;
- PT/279/0109: FP McCann Easi-Base precast manhole base with GRP lining;
- PT/280/0109: FP McCann Easi-Base precast manhole unlined.

The precast concrete bases are manufactured by FP McCann at Knockloughrim (Magherafelt) in Northern Ireland and Ellistown (Coalville) in Leicestershire. The polypropylene and GRP linings are manufactured by PREDL GmbH in Germany. The linings are incorporated by FP McCann into the concrete base as part of the casting process.

1.2 Outline of installation procedure

For all the Easi-Base variations the installation process is the same with the base placed on a formation comprising compacted granular material. Conventional methods of constructing the manhole above the base are then followed with pre-cast concrete rings placed onto the Easi-Base. The pre-cast components may or may not be surrounded in concrete depending on the particular specification requirements. The connection of the pipe work to the bases differs for the lined and unlined variations. Full details are given in the installation manual Easi-Base Installation Guide reference FPM/E-BIP REV 1.1 December 2008.

1.3 Claimed system benefits

It is claimed that the Easi-Base products provide a fast and economical method of constructing manhole bases on site compared with traditional methods. The claimed benefits are as follows:

- Cost savings achieved as a result of speed of installation and reduced resource requirements.
- A water tight homogenous base section is achieved once the base is lifted into position. FP McCann chamber rings contain no lifting holes thereby removing a possible point of ground water ingress.

- The base unit requires no further wet-trades once it is fixed into position (no benching or sealing of lifting holes is required).
- Follow up operations can commence immediately.
- Quality of the channel and benches are superior because the unit is precast in a factory.
- Reduced site skill requirement due to factory pre-fabrication.
- Improved construction safety as ground workers spend less time in trenches and inside the manhole.
- It yields environmental advantages as less concrete is used and less excavated material is disposed in landfill.
- Maintenance of the channel and benches are reduced due to the quality of the factory produced product.

1.4 The WRc Approved™ Scheme

The WRc Approved™ Scheme assesses the performance of a product as it relates to the application defined by the manufacturer or supplier. The evaluation of the product is based upon an Assessment Schedule that is prepared by WRc in conjunction with the manufacturer or supplier of the product. Once a product has been approved and the certificate is issued the Assessment Schedule becomes a publicly available document.

The requirements of an Assessment Schedule typically include:

- a description of the product/service and scope of the approval;
- the tests used to assess the performance of the product/service;
- an evaluation of the installation instructions including witnessing the use of the product on-site, and;
- an audit of the quality control procedures used in the manufacture/operation of the product.

1.5 Report

This report describes the assessment of the McCann Easi-Base manhole bases. It is divided into the following sections:

Section 2: Details of compliance with current specifications identified in the Assessment Schedule.

Section 3: Details of the factory production audit.

Section 4: Details of the testing witnessed by WRc.

Section 5: Details the review of the installation manual and the witnessed site installation.

Section 6: Presents the conclusions arising from the assessment.

The Assessment Schedule for each of the Easi-Base variations is included in Appendix A.

2. COMPLIANCE WITH CURRENT SPECIFICATIONS

2.1 Introduction

The three manhole bases were assessed against the requirements of their respective Assessment Schedule. The Assessment Schedules were based upon the requirements of the following specifications:

- Sewers for Adoption 6th Edition, WRc March 2006.
- Sewers for Scotland 1st Edition, WRc July 2001.
- BS EN 752:2008 Drain and sewer systems outside buildings.
- The Building Regulations 2000 Part H Drainage and waste disposal.
- BS EN 1917:2002 Concrete manholes and inspection chambers, un-reinforced, steel fibre and reinforced.
- BS 5911-3:2002 Concrete pipes and ancillary concrete products. Specification for un-reinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002).
- BS EN 13242:2002+A1:2007 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.
- DIN 4060 Pipe joint assemblies with elastomeric seals for use in drains and sewers, Deutsche Norm 1998.
- DIN 1048 Testing concrete; testing of hardened concrete, Deutsche Norm 1991.
- WIS 4-35-01¹ Appendix C – Resistance to Water Jetting 2000.

¹ WIS 4-35-01 Thermoplastics structured wall pipes, joints and couplers with a smooth bore for gravity sewers for the size range 150-900, WRc, July 2000

3. FACTORY PRODUCTION AUDIT

3.1 Background

On the 12th and 13th August 2008 Kevin Adams of WRc audited FP McCann's manufacturing facilities at Knockloughrim Northern Ireland. During that visit trials of the polypropylene and GRP linings were undertaken for CCTV accessibility, impact testing and long term settlement.

The factory audit consisted of a check of all aspects of the production facilities from receipt of order to the completed product ready for shipping. The audit was split into five key stages:

- QA certification;
- Receipt of new order and production planning;
- Receipt of raw materials and storage;
- Manufacture of lining, and;
- Quality checks on factory finished Easi-Bases.

3.2 Quality management certification

FP McCann operates quality management systems in the Ellistown and Magherafelt plants that comply with the requirements of BS EN ISO 9001:2000². They have been registered with BSi Management Systems since August 2005 and the manufacture of the three types of Easi-Base comes within the scope of the registration. WRc was provided with the current Certificate of Registration, FM 97367 issued 07/11/2008, expiry date 03/09/2011.

3.3 Product certification

FP McCann have Kitemark Licences for the manufacture of a variety of concrete pipes, manholes, inspection chambers, fittings and ancillary products. The details of the Licences that are relevant to the manufacture of the Easi-Bases are given below.

3.3.1 Ellistown (Coalville) plant

FP McCann have a Kitemark Licence, number KM 12033 for the manufacture of concrete manholes and inspection chambers that comply with BS EN 1917:2002³ at the Ellistown (Coalville) plant in Leicestershire. The Licence was first issued on April 1991 and the current Licence was issued on 24 April 2008. The scope of the Licence specifically includes the

² BS EN ISO 9001:2000 Quality management systems. Requirements.

³ BS EN 1917:2002 Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced.

manufacture of base units DN 600 to DN 1200 incorporating a polypropylene prefabricated channel.

The Kitemark Licence KM 12033 also covers the manufacture of concrete manholes and soakaways to BS 5911-3: 2002⁴. The scope of the Licence includes DN 1500 base units incorporating a polypropylene prefabricated channel.

3.3.2 Magherafelt Northern Ireland plant

FP McCann have Kitemark Licence number KM 56776 which was first issued on 30 March 2001 and the current Licence was issued on 7 March 2008. The Licence includes the manufacture of DN 1200 concrete base units to BS EN 1917: 2002.

3.4 Receipt of incoming materials

FP McCann operates an “approved suppliers” list. The approved suppliers requirements include:

- Suppliers must operate a quality system to ISO9001, and;
- Suppliers must be able to supply and prove that the goods are to specification for the item with regards to quality and origin traceability.

At the time of the audit FP McCann had no written guidelines for the receipt of the polypropylene and GRP linings. As the lined Easi-Base products are a new development for FP McCann, the checking of received linings is undertaken only by Aidan Scullion and Gavin Peden (Quality Manager).

WRc requested that a procedure is written for checking the delivered polypropylene and GRP linings. The procedures must be a controlled document and should include checking for damage in transportation, key dimensions, connectivity configuration and quantity. WRc was shown proof that FP McCann has rejected delivered linings for quality reasons.

In response to the above request, WRc received new documentation in September 2008 for the receipt of the lining component of the Easi-Base; document reference “Easi-Base Goods Inwards Procedure (Draft 1) September 2008”.

FP McCann has established procedures for the receipt of cements and aggregates used for the manufacture of pre-cast concrete products. Each component has a secure individual silo controlled by the Quality Assurance Department.

3.5 Storage of raw materials

WRc inspected the storage facilities and the following observations were made for the liners both pre and post fitting of connectors:

⁴ BS 5911-3: 2002 Concrete pipes and ancillary concrete products – Part 3: Specification for unreinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002).

- the storage area was tidy, laid out in an orderly manner with allotted storage space for each component, based on diameter and connectivity configurations;
- all goods were clearly labelled, and;
- there was evidence of Quality Checks using a coloured sticker system.



Figure 3.1 Storage of Linings

The cement and aggregates used for FP McCann precast products are stored in individual secure silos.

3.6 Fitting of connectors to polypropylene linings

The connectors for the lining outlets are factory welded using Polypropylene sticks. For bespoke installation it is possible to offset the connector by 22° from the exit point of the channel by cutting the connector to the required angle. Such linings are clearly labelled as “specials”.

The welded joints are visually inspected for defects.

3.7 Production process

There were no Easi-Bases being produced at the time of the factory audit. WRc witnessed the production of manhole rings on the casting machine used for the manufacture of Easi-Bases. WRc understands that the procedure for the manufacture of the bases both, lined and unlined, and the associated quality inspection are the same for all of FP McCann’s production cast products. The manufacturing procedure is outlined below.

- The lining is placed on a core with the bonding bridges facing upwards.
- The mould is placed over the core with outlets fitted dependent upon the configuration of the lining.

- A batch of concrete, whose volume and mix are automatically controlled, is poured into the annulus between the core and the mould. The automated system sounds an alarm if an incorrect mix ratio is selected.
- The concrete is vibrated within the machine.
- The cast base is removed from the machine and labelled with the cast date and permitted logos.
- The dimensions of the base (depth of concrete below channel, height and wall thickness) are fixed by the dimensions of the core and mould.

WRc was supplied with the concrete mix ratio for the DN1200 Easi-Base (Design mix) manufactured at Knockloughrim (Magherafelt), shown in Table 3.1.

Table 3.1 Concrete design mix ratio for the DN1200 Easi-Base

Component	Item abbreviation	By weight
Concrete sand	C/S	650
Fine sand	F/S	218
14 mm (stone)	LH14	200
Loughside Dust	L/SIDE	150
10mm gravel	GRA	710
Quinn cement	Q/C	270
Pulverised fuel ash	PFA	90
SIKA PREMIER	ADMIX	2.75

3.8 Quality checks on finished bases

3.8.1 Inspection

The Easi-Bases are cast upside down, therefore inspection is limited to external casting defects. The casting operator identifies the bases with either a red mark, for those with casting defects, or a green mark for those which are acceptable. All the castings go for further inspection by the QA department. After 24 hours the bases are turned up the correct way for inspection of the lining interface with the concrete. Any bases that are rejected are removed from stock.

3.8.2 QA Testing

Routine QA testing of manufactured units is undertaken in accordance with the sampling procedures for finished products detailed in Annex G of BS EN 1917: 2002, shown in Table 3.2.

Table 3.2 Test requirements for DN 1200 Easi- Base Units in Annex G of BS EN 1917: 2002

Type of Test	No. of Units	Frequency
Water Absorption	1	Per month or at the start of each run of production
Crushing Strength	1	Per 500 units produced, but not less than 4 per year
Water tightness	1	Per 1000 units produced, but not less than 1 per year
Joint Assemblies	1	Per 1000 units produced, but not less than 1 per year

The water absorption test of the finished Easi-Base is undertaken in house in accordance with BS EN 1917 Clause 6 of Annex D Section D.1

The crush testing of the finished Easi-Base is done in-house in accordance with clauses 5.2.6 and 5.23 of BS EN1917: 2002.

The water leak tightness and joint assembly testing of the finished Easi-Base is also done in-house in accordance with clause 4.3.8 and Annex C.7.3 of BS EN1917: 2002. Testing is undertaken with the connections under shear load and angular deflection.

All the results from the quality assurance testing are recorded on a central database.

3.9 Finished goods storage

The Easi-Bases were stored on site in an orderly manner. At the time of the audit, FP McCann were developing an external labelling system so that the base can be identified from the outside without the need to view the internal PREDL label on the lining.

In September 2008 WRc received a copy of the external label which will be used on Easi-Bases manufactured from that date.

4. TESTING

4.1 Introduction

Independent test data were supplied to WRc by FP McCann for those tests where there were no independent data, WRc witnessed the testing. The testing has been split into two categories; performance and operational, these included:

Performance:

- Impact testing of the liner
- Settlement trials
- Water tightness testing
- Resistance of bond between liner and the concrete base

Operational:

- Man entry
- Jetting resistance of the liners
- CCTV accessibility

4.2 Impact testing

Impact tests were witnessed for the polypropylene and GRP lined units. The unlined Easi-Base was not impact tested as there is no requirement for the impact testing of benching that is cast on-site.

4.2.1 Test method

The impact test consisted of dropping a 2 lb hammer from a height of 6 m onto a base. For the test this process was repeated three times to account for the variation of the impact angle. For the polypropylene lining a 1200 mm diameter Easi-Base with a 150 mm channel was used and for the GRP lining a 1500 mm diameter Easi-Base with a 600 mm channel was tested.

4.2.2 Polypropylene lining results

Drop 1	Minor scratching at impact point; no puncturing or cracking of lining
Drop 2	Minor scratching at impact point; no puncturing or cracking of lining
Drop 3	Minor scratching at impact point; no puncturing or cracking of lining

4.2.3 GRP lining results

Drop 1	Minor scratching at impact point; no puncturing or cracking of lining
Drop 2	Minor scratching at impact point; no puncturing or cracking of lining
Drop 3	Minor scratching at impact point; no puncturing or cracking of lining

4.2.4 Impact test conclusion

For both linings the hammer bounced from the point of impact and there was no evidence of damage to lining that would affect the linings' performance or bond to the concrete.



Figure 4.1 Impact test and typical damage to polypropylene and GRP linings

4.3 Settlement trials

4.3.1 Background

The trials were undertaken to determine whether there is any initial settlement of Easi-Bases that are not installed on concrete pads. Eight newly installed bases were surveyed and their levels recorded. WRc did not witness the installation of the Easi-Bases. The manholes were then surveyed in November 2008, after they had been subjected to traffic loading for 3 months, to check for any settlement.

A total of eight Easi-Base manholes were surveyed at the Chapel View Development in Annacoy, Downpatrick and at the Bann Meadow development in Ballymoney on the 13th August 2008. The Easi-Bases installed at Downpatrick were used for the CCTV accessibility site trials.

At the time of the initial survey in August 2008, the roads were not finished at either development so the manholes were not at the finished levels. Hence the initial level was taken from the ID tag on the base to a determined Temporary Bench Mark (TBM) that will still be present when the development has been completed.

It should be noted that the extent of the site settlement is affected by the workmanship of the installers. Therefore settlement trials at the FP McCann plant were undertaken by FP McCann and witnessed by WRc on 21st August 2008, see section 4.3.4.

4.3.2 Chapel View, Downpatrick

The Chapel View Development was nearing completion with show homes in place and a number of properties nearing completion. Four Easi-Base units were installed in a cul-de-sac, each containing 6 properties. None of the manholes had been made to finish level, nor had the finished road surface been applied. Each manhole was surveyed from 2 TBMs on 13th August 2008.

The site was revisited on 11th December 2008 and the manholes were re-surveyed. It was noted that manholes 1 and 2 had not been subjected to site traffic whereas manholes 3 and 4 had been. For manholes 1 and 2 there was a differential of level greater than 50 mm. Inspection of the site showed the contractor had altered the level of the chosen TBM. Inspection of manhole 3 and 4 showed no evidence of this degree of settlement. There was no damage to the manhole rings or to the interface of the lining to the base and there was no pooling of water which would have occurred had the base sunk below the outlet pipe. It was also noted that kerb line and ground works had been altered since the August site visit.

For manholes 3 and 4 it was also noted that the area of one of the bench marks had been altered since the previous visit. From the second bench mark a settlement difference of 50 mm was measured.

The final road surface had not been applied at either site and the properties were not occupied. Hence the sites had not been trafficked as required by the Assessment Schedules.

While there was no visual evidence of any significant settlement at any of the four manholes at Downpatrick, WRc has requested that the following are undertaken.

- The levels at Downpatrick are checked three months after occupation of the properties.
- A CCTV inspection is undertaken to determine any inclination of the inlet and outlet rocker pipes. The survey should include the first pipe joint to determine whether the pipe has been pulled or whether there is any incline on the downstream pipe.
- A flow test should be undertaken by pouring water (50l) into the manhole and determining whether the water flows to the immediate downstream manhole. If there has been no significant settlement, there should be no more than 25-30 mm of standing water remaining in the upstream manhole.

4.3.3 Bann Meadows, Ballymoney

The Bann Meadows Development was at an earlier stage than the Chapel View Development, with groundworks still being undertaken. The four Easi-Base units were located parallel to the main road. It is estimated that these sites are unlikely to be subjected to road loads within three months of the installation of the Easi-Base units. There were no permanent fixtures on site that could be used for a TBM therefore the manholes were surveyed from a lamp post (marked 11) located on the main road. It was also noted that two of the manholes were

flooded and there was visible evidence of ground water entering the structures via the seals of the manhole rings.

To date, the site has not been revisited as work on the site has not progressed significantly.

The installations at Barn Meadows, Ballymoney could be surveyed in the future depending upon the progress at the site.

4.3.4 Factory settlement trials

Bedding tests were carried out in the Knockloughrim (Magherafelt) factory to verify the adequacy of the specified bedding layers when subjected to loading. Two bedding materials were tested; a 14 mm to 5 mm graded aggregate, and a 10mm nominal single size aggregate. A test load up to a maximum of 500 kN was applied to the Easi-Base. The settlement of the Easi-Base was recorded for each bedding test to verify there was no excessive settlement due to the loading. A settlement of 10 mm was deemed a reasonable maximum for acceptable settlement.

The tests were undertaken in accordance with the Test Arrangement and Test Procedure produced by FP McCann (Doc ref: FPM/EB/AT/BT/P-001, date of issue: 21/08/08). The test arrangement and procedure for both bedding materials was the same. For each of the bedding materials three cycles of loading and unloading were carried out.

The bedding material is kept in dedicated bins at the rear of the factory. Grading of the material is carried out in an on-site laboratory. The 14 mm to 5 mm graded aggregate consisted of an equal mix of 14 mm, 10 mm and 6 mm graded aggregate.

The bedding material was laid in three layers, each approximately 50mm deep (as measured by ruler) and each layer was compacted using a standard "Wacker" type compaction plate. Another layer of material was then put in around the edge of the test pit to fill in any gaps and to achieve the correct level. A compacted bedding material depth of approximately 150 mm was measured using a spirit level and tape measure.

The Easi-Base was placed into position by forklift. Four points were marked on the Easi-Base so levels could be taken and a reference point was marked on the floor near the test rig. All levels were taken from the same optical level which was set-up at a suitable distance from the test rig. The reference level was checked before, during and after each test cycle to ensure accuracy.

The laying and compaction of the 14 mm to 5 mm bedding material and the positioning of the Easi-Base was not observed by WRc. These procedures were observed for the 10 mm nominal single size aggregate.

The loading was applied to the Easi-Base via the test rig spreader beam which was positioned in the middle of the Easi-Base with a suitable packing material between the beam and the base. For each cycle the load was applied in increments of 20% of the maximum test load of 500kN. The test load was applied and removed, at a slow and steady rate, Each load was maintained for a period of two minutes prior to recording the level readings at each of the four points on the Easi-Base.

After the maximum test load of 500 kN had been applied for the two minute period and the initial level reading had been taken, it was originally planned to maintain that load for a further

five minutes. However, the test rig was not capable of holding the 500 kN load for the additional five minutes as this load was close to its operational limit. Therefore, after the application of the 500 kN load for the two minute period, the loading was reduced to zero and the 500 kN reapplied for a further two minutes before the level reading was taken.

The maximum settlement recorded at any point on the Easi-Base for both bedding materials was 3 mm, well below the suggested limit of 10 mm. This settlement was observed when the maximum load of 500 kN was applied in the first loading cycle for each bedding material. As the load was removed in increments the deflection recorded for each test reduced or even returned to the original value of zero. The overall settlement of the Easi-Base was less for cycle 3 of each test than it had been for cycle 2 and cycle 1. This appears to be due to the bedding material being further compacted during testing.



Figure 4.2 Factory settlement trial, base preparation and loading of base

4.3.5 Settlement trials conclusions

The factory trial showed that when the Easi-Base is installed in accordance with the installation manual, there is likely to be minimal settlement as a result of traffic loading.

It is not possible to draw any conclusions from the settlement trials at Downpatrick and Ball money.

Observations at the Downpatrick site indicate that the surface levels of the site had changed since the original level survey of the installed bases so that it was not possible to take any meaningful measurements. There was no visual evidence of any significant settlement having occurred.

WRc has requested that additional, confirmatory checks are undertaken of the installed bases at the Downpatrick site.

If necessary, the installations at Barn Meadows Ball money could also be surveyed at some time in the future, dependent upon the progress at the site.

4.4 Water tightness testing

In December 2008 WRc witnessed the making of a test piece of the unlined Easi-Base consisting of the base, inlet and outlet rocker pipes. The test piece was inspected and

deemed to be typical of an actual installation. The process was witnessed in full and used as a basis to update the installation manual.

The water tight joint between the base and rocker pipes was achieved by using Webber Solution Epoxy Plus structural adhesive. The use of the adhesive is stated as a requirement in the installation manual. WRc was supplied with a full data sheet for the product, which is typical of that used in the drainage industry.

The water tightness test was carried out in accordance with the requirements of clause 4.3.8 and the test procedure BS EN 1917: 2002. Clause 6.6 Annex C, C.4 Throughout the test the pressure was maintained at 0.5m head for 15 minutes. The test piece was inspected for evidence of leakage, sweating or cracking, none of which was observed.

FP McCann provided records of water tightness tests undertaken in November 2008 on the polypropylene lined Easi-Base. The tests were in accordance with clause 4.3.8 and the test procedure in Annex C4 of BS EN 1917 and witnessed by BSi.



Figure 4.3 Water tightness testing of unlined Easi-Base

4.5 Resistance of bond between liner and the concrete base

For both types of liner, the liner is anchored into the concrete by a combination of anchor bars on the lining and the rough outer surface of the lining, see Figure 4.4. The anchor bars extend 50 mm from the surface of the lining into the concrete base. The number of bars is determined by the base pipe work configuration. The outer wall of the liner is 'pebble dashed' with 5 mm irregular off-cuts of the liner to give a roughened surface, thereby providing a physical key at the interface of liner and concrete. The liners are received with the anchor bars attached and the rough surface applied.



Figure 4.4 Detail of bridging anchors and pebble dash of outer wall

WRc were supplied with test results from PREDL for bond testing undertaken by MFPA Leipzig e. V., test report PZ V1/00-671 (Part A) on a polypropylene liner. The tests were conducted to DIN 1048 Part 1⁵ and were a requirement of the DIBt⁶ approval of the linings. The testing was undertaken on 23 August 2000. The results showed that the pulling resistance to separate the polypropylene liner from the concrete base exceeded the DIBt requirement of 0.05 N/mm². As the anchoring mechanism is the same for both lining types DIBt accepted that the results are applicable to the GRP lining as it is the bond mechanism that is being tested and not the lining material properties.

4.6 Assessment of jetting resistance of liner

As a requirement of the Assessment Schedule for WRc Approval of the Easi-Base pre-cast manhole base it is necessary to determine the maximum pressure at which the Easi-Base liners could be jetted without compromising the product's performance.

Four samples, in sheet form, of the polypropylene and GRP liners as well as a pre cast channel were supplied for testing. Each was tested in accordance with the requirement of Clause 6.10 in WIS 4-35-01: Issue 1: July 2000⁷ for the resistance to a jetting pressure of 180 bar.

The maximum jetting pressures at which each of the samples passed the jetting test were:

- Polypropylene sheet: 250 bar / 3630 psi;
- GRP sheet ref 1030: 330 bar / 4790 psi;
- GRP sheet ref 780: 290 bar / 4260 psi;
- Composite GRP sheet and concrete block: 350 bar / 5000 psi;
- Composite of polypropylene and concrete block: 350 bar / 5000 psi.

⁵ DIN 1048-1: 1991 Testing concrete; testing of fresh concrete

⁶ DIBt Deutsches Institut Für Bautechnik (German Institute for Building Techniques)

⁷ WIS 4-35-01 Thermoplastics structured wall pipes, joints and couplers with a smooth bore for gravity sewers for the size range 150-900, WRc, July 2000.

All the lining sample sheets supplied by FP McCann exceeded the requirements of the Jetting Code of Practice of 180 bar.

It was noted that while the GRP sheets passed at a higher jetting pressure than the polypropylene material, the surfaces of the GRP samples were cracked and had delaminated. This created a roughened surface that could cause snagging in the channel of an installed Easi-Base. The polypropylene sheet had very localised damage in the form of pitting, approximately 1.5 mm in diameter.

The unlined Easi-Base was not subjected to the jetting test as it is known that concrete will meet and exceed the 180 bar requirement. Also traditional cast insitu benching is not subject to any high pressure jetting resistance testing.

4.7 Man entry

4.7.1 Benching dimensions

The dimensions of the polypropylene and the GRP-lined bases were checked for compliance with the requirements of Sewers for Adoption (6th edition)⁸ and as far as practicable BS EN 752:2008⁹. There is a difference in the typical manhole configuration between SfA Figure 2.4 and BS EN 752:2008 Figure NA.16. The minimum width of benching required in SfA6 is 225 mm compared with the minimum of 325 mm for BS EN 752: 2008 for pipe sizes greater than DN 450.

In Figure NA.16 of BS EN 752: 2008, the position of the ladder is turned, so that any person entering would have the channel at their side rather than at their back. WRc considers that the position of the ladder does not affect the fitness for purpose or inhibit any maintenance action that could be undertaken inside or via the manhole. The diagrams are described as being typical configurations in both documents.

WRc tried a number of bases both at the factory and installed on-site and found no issues with regard to access, working space upon the benching and grip. Table 4.1 show the degree of compliance of polypropylene lining manhole size benching with SfA figure 2.4 and BS EN 752 figures NA15 and NA16.

⁸ •Sewers for Adoption 6th Edition, WRc March 2006


⁹ BS EN 752:2008 Drain and sewer systems outside buildings.

Table 4.1 Polypropylene lined Easi-Base compliance with Sewers for Adoption and BS EN 752: 2008

FP McCann Easi-Base		Bench widths (mm)				
		as per SfA6, Fig 2.4		as per BSEN 752, Figs NA.15, NA.16		
Manhole Internal Diameter (mm)	Pipe Nominal Size	Working side (mm)	Non-working side (mm)	Ladder depth (mm)	Working side - required bench between ladder face and channel (mm)	Non-working side (mm)
1500	450	500	525	240	450	335
	525		450			260
	600		375			185
	675		300			110
	750		225			35
1800	450	500	825	237	450	638
	525		750			563
	600		675			488
	675		600			413
	750		525			338
	825		450			263
	900		375			188
2100	450	500	1125	234	450	941
	525		1050			866
	600		975			791
	675		900			716
	750		825			641
	825		750			566
	900		675			491
	1050		525			341
	1200		375			191
	1350		225			41

 Compliant 

 non-compliant 

 pipe size excluded by SfA6, table 2.2

4.7.2 Surface grip

The Polypropylene and GRP linings have rough surfaces to provide an acceptable level of grip for an operative wearing suitable footwear. The finish of the unlined Easi-Base benching appears to be polished but nevertheless provides an adequate level of grip. WRc staff stood on a number of bases, both at the factory and insitu and found the grip equivalent or better than cast insitu benching.



Figure 4.5 Grip on Polypropylene base

4.8 CCTV accessibility assessment

4.8.1 Objective

The objective of the exercise was to determine whether the Easi-Base would allow access for CCTV equipment. Trials were undertaken at the Knockloughrim (Magherafelt) factory and on site at Downpatrick. The same CCTV contractor undertook all the trials using equipment typical of that used for sewer inspection.

The trials were undertaken using polypropylene lined bases as these provide a more challenging environment for CCTV inspection than the unlined base because of the acute pipe connection angle that these can provide. The lining material has no effect on the outcome of these trials so the results are applicable to all types of Easi-Base including the unlined version.

4.8.2 Knockloughrim (Magherafelt) Factory yard trial

Three polypropylene lined, 1200 mm diameter Easi-Bases, with 150 mm channels, were connected in series by 150 mm PVC pipe work. The configuration included a 90° change of direction at the intermediate manhole and the manhole downstream of the intermediate manhole. There was a 22° bend at the connector of the third Easi-Base where the pipe entered the manhole, see Figures 4.6 and 4.7. The 150 mm diameter channel was chosen as this provided the tightest angle in the Easi-Base range.

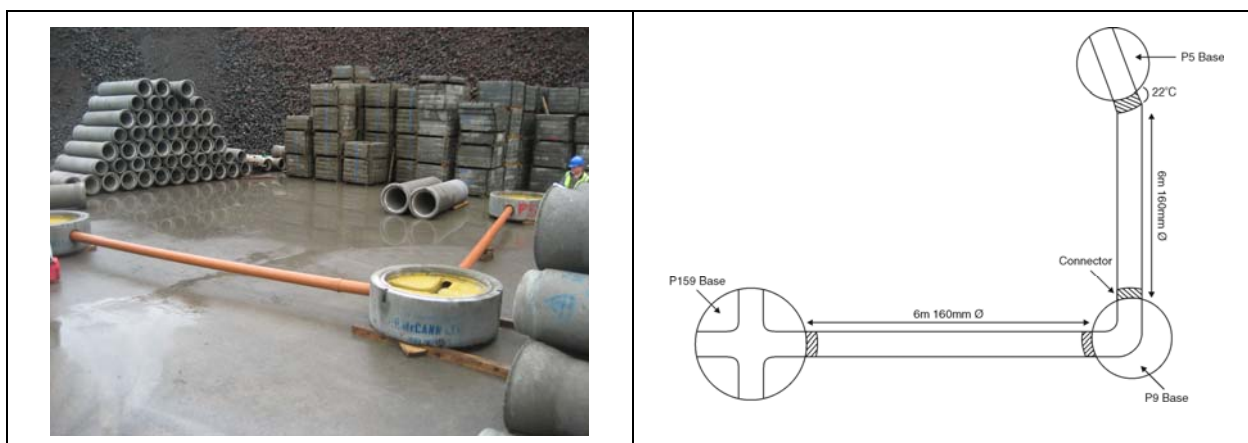


Figure 4.6 CCTV yard trial configuration photograph and schematic of manholes and pipe work



Figure 4.7 CCTV yard trial configuration of manholes and pipe work

4.8.3 Test 1

A Rico EAB camera was used, which is typical of those used to inspect 150 mm pipe work. The camera consisted of a drive unit and an optic unit connected by a flexible coupler. The dimensions of the CCTV camera are shown in Figure 4.8.

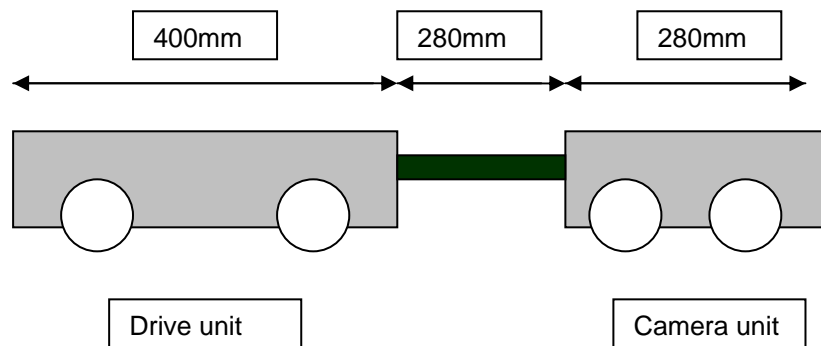


Figure 4.8 CCTV dimensions

The CCTV Camera was placed in the P159 manhole base and it successfully negotiated the 90° bend at the P9 manhole and the 22° offset joint at the P5 manhole. The process was successfully repeated in reverse. Figure 4.9 shows the camera negotiating the P9 and P5 Easi-Bases.

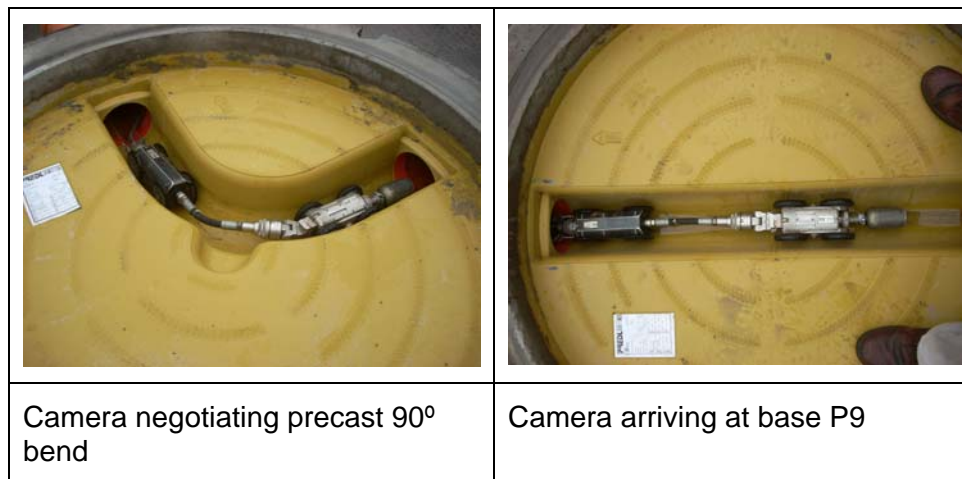


Figure 4.9 CCTV camera test 1

4.8.4 Test 2

Using the same test configuration the process was repeated using a single body camera which was 820 mm in length. The length of the camera body meant that it would not be able to negotiate the 90° bend at base P9 and complete the survey in a single run. Therefore it was investigated whether the survey could be completed in stages.

The camera was installed in base configuration P159 and successfully travelled to base P9, but could not travel around the curve of the channel

The camera was installed at base P9 and travelled to base P5, but could not fully enter the base due to the offset joint. The camera head did enter the base as shown in Figure 4.10, hence the complete line could be surveyed in two runs.

The camera was next installed at base P5 that contained the offset joint. The camera could not negotiate the offset and so could not progress along the pipe. It was concluded that a single bodied camera of these dimension, could not be used to survey a 150 mm diameter sewer that contained an offset joint at either end.

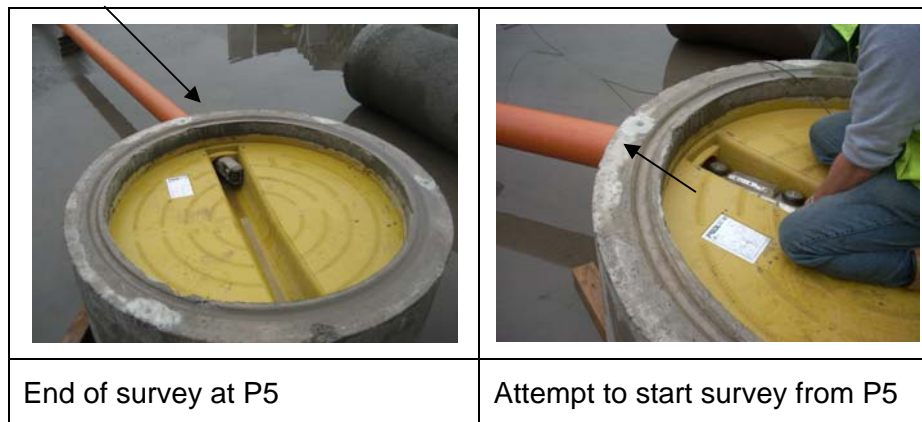


Figure 4.10 Single body camera at offset joint

No further investigation was undertaken to determine the angle of the offset that a single body camera could negotiate.

4.8.5 Site trials

CCTV inspections were undertaken at the Chapel View Development at Annacloy, Downpatrick on 13th August 2008. Four surveys were undertaken from four different Easi-Base manhole installations and for all surveys the following observations apply:

- All the Easi-Bases were type P5 (straight through configuration).
- All the surveys were undertaken using the flexible twin bodied camera that was used for the yard trial. It was installed in the channel without the need for man entry into the manhole (see Figure 4.11).
- All the connecting pipe work was 150 mm diameter PVC-U pipe.
- All channels and pipes contained site debris.
- For each it was not possible to survey upstream of the manhole as the pipe work had not been installed.
- Each survey was 25-30 m in length.
- A 360° inspection of the seal between the connector of the Easi-Base and pipe was made and seen to be satisfactory.

A second development was visited at Bann Meadow, Ballymoney for CCTV trials. However the development was at the ground works stage and the manholes were flooded due to a

combination of site conditions, ground water level and adverse weather conditions. Therefore the Bann Meadow development was not used for CCTV site trials.



Figure 4.11 CCTV van and manhole

4.8.6 CCTV access conclusions

None of the variations of the Easi Base would prohibit the ability to undertake CCTV Inspection of pipe work, particularly if a flexible camera is used.

Potentially a system which includes an upstream and a downstream lined Easi-Base, with the inlet and outlet pipe connections at 22° at both the manholes, could not be surveyed using a single bodied camera. However, such a configuration is unlikely and is considered to be unacceptable design.

5. INSTALLATION

5.1 Introduction

The installation instructions provided by FP McCann were audited to determine whether they enable the Easi-Base manhole system to be successfully installed. The audit is in two parts, firstly a desk based audit of the instruction manual followed by a site visit to witness the installation of the Easi-Base.

5.2 Installation manual

5.2.1 Lined Easi-Base

The Easi-Base installation manual referenced FPM/E-BIP rev 1.1; issue date June 2008 was reviewed by WRc. The review made a number of recommendations most notably with regard to:

- Document control;
- Ensuring the wording was clear and concise and was not open to interpretation;
- Further details on receipt and handling of bases on site;
- Material requirements and minimum level of compaction required of the foundation layer;
- Use of photographs and schematics to support the text.

Subsequently, WRc received an updated installation manual which addressed the issues raised above. It was noted that its reference has not been updated i.e. FPM/E-BIP rev 1.1; issue date June 2008.

5.2.2 Lined and unlined Easi-Base

When the WRc Approval was expanded to include the unlined variation of the Easi-Base, it was agreed that the installation process was the same as that for lined Easi-Base with the exception of the connectivity between the pipes and the base. The section in the manual relating to pipe connectivity was split into two sections; connectivity to lined Easi-Bases and connectivity to unlined Easi-Bases.

The final version of the installation manual is:

Easi-Base Installation Procedure Version 1.0, Issue date: Dec 2008. Next review date: Dec 2013.

5.3 Site audit

5.3.1 Peterborough installation

WRc audited the installation of two lined Easi-Base manholes at the Hampton Haygate development at Peterborough on 28th July 2008. The installation was on a brown field site which had previously been used for brick manufacturing. The site had no defined layout at time of the audit. Both installations were at 2.75 to 3 m in depth.

Two bases were installed by the contractor in accordance with the installation manual.

5.3.2 Knockloughhrim (Magherafelt) Factory

On 11th December 2008, WRc witnessed the fitting of a rocker pipe to an unlined Easi Base at FP McCann's plant at Knockloughhrim (Magherafelt).

5.4 Conclusions

The December 2008 issue of the Installation Manual enables the Easi-Base to be successfully installed.

6. CONCLUSIONS

The three types of the FP McCann Easi-Base manhole system have successfully undertaken all aspects specified within the Assessment Schedule and each has been awarded WRc Approved TM certification detailed below.

- PT/274/0808: FP McCann Easi-Base precast concrete manhole base with polypropylene lining; Assessment schedule AS/274/0808
- PT/279/0109: FP McCann Easi-Base precast concrete manhole base with GRP lining; Assessment schedule AS/279/0808
- PT/280/0109: FP McCann Easi-Base precast concrete manhole unlined. Assessment schedule AS/280/0808

All certificates are valid for 5 years from the issue date.

APPENDIX A ASSESSMENT SCHEDULES

ASSESSMENT SCHEDULE PT/274/0808

PT/274/0808 – AS (August 2008)

**FP McCann's Easi-Base Precast Concrete
Manhole Bases with Polypropylene lining:
1200mm Ø Assessment Schedule –**



independent certification of your products & services

1. Scope

1.1 This schedule covers the manufacture and installation of FP McCann's Easi-Base precast manhole bases with GRP liners. They are available for manholes with nominal internal diameter of 1200mm,

1.2 Details of these products, including the available range of connecting pipe sizes, are provided in the following publication: DN 1200 Polypropylene Easi-Base Brochure⁽¹⁾. They provide a fast and economical method of constructing manhole bases on site compared with traditional methods, and the benching has a consistent quality factory finish.

1.3 Easi-Bases are manufactured from concrete with a Polypropylene liner over the benching. They are used to construct manholes in drainage and sewer systems and meet the general requirements of the UK water industry as detailed in Sewers for Adoption 6th Edition⁽²⁾ and Sewers for Scotland 2nd Edition⁽³⁾.

1.4 The Easi-Base units are placed on a formation comprising granular material. Conventional methods of constructing the manhole above the base are then followed with pre-cast concrete rings placed onto the Easi-Bases. The pre-cast components may or may not be surrounded in concrete depending on the particular specification requirements.

1.5 Loading limitations are the same as for conventional manhole bases.

1.6 This schedule covers the following assessment areas in order to prove

the "fitness for purpose" of this product:

- general requirements;
- product type testing;
- audit of the production quality control systems;
- review of documentation and guidance for designers, installers and operatives;
- operational practices.

2. General Requirements

2.1 The National Annex to European standard EN 752⁽⁴⁾ provides information on the design of manholes. Further information is provided in the documents Sewers for Adoption 6th Edition⁽¹⁾ and Sewers for Scotland⁽²⁾. In Sewers for Adoption the manhole design guidance is covered by Clause 2.9 Design of Manholes and typical manhole detail drawings A, B, E and F and a Specification is covered by Part 5. Manhole requirements for drainage systems are in The Building Regulations Part H ⁽⁵⁾ Clause 2.48.

2.2 This product may depart from the requirements of EN 752 with respect to the following aspects of the benching design:

- minimum width of benching between ladder rungs and channel may be less than 450mm;
- manholes greater than 1.5m deep may not allow 325mm and 450mm of benching each side.

In these cases the product shall be demonstrated to meet general fitness for purpose requirements for operations staff working in the manholes.

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2.3 This product shall meet the requirements of EN 752 with respect to the following:

- the flows should combine in preformed swept channels;
- the first pipe joints should be within 150mm of manhole;
- in-situ concrete surround is not normally required;
- the general requirements for channels and benching do not apply to preformed thermoplastics;

2.4 Significant requirements of Sewers for Adoption are summarised below. Clause 2.9 Design of Manholes:

- minimum manhole diameter - 1200 mm;
- largest pipe shall be less than 375 mm diameter in 1200 mm diameter manhole;
- largest pipe shall be 700 mm diameter in 1500 mm diameter manhole;
- largest pipe shall be 900 mm diameter in 1800 mm diameter manhole;
- rocker pipes should be provided at entry to and exits from manholes.

Materials specification Clause 5.2.29:

- manholes and chambers shall comply with the relevant provisions of EN 1917⁽⁶⁾ and BS 5911-3⁽⁷⁾.

3. Type testing

3.1 The test requirements for base units of EN 1917 and BS 5911 are summarised in Table 1 and 2 for sizes DN 1200 and DN 1500 / DN 1800 respectively.

Test	EN 1917 Clause	BS 5911
Drilled core strength	4.2.2.1	-
water absorption	4.2.7.1	-
surface finish	4.3.2	4.3.1
geometrical characteristics	4.3.3	5.4
installed steps	4.3.7	-
watertightness*	6.6	-

*Note: An alternative watertightness test to show that the base meets the requirements of DIN 4060⁽⁸⁾ may be undertaken.

Table 1 Type test requirements applicable to DN 1200

Test	EN 1917 Clause	BS 5911
Drilled core strength	4.2.2.1	-
water absorption	4.2.7.1	-
surface finish	4.3.2	4.3.1
geometrical characteristics	4.3.3	5.4
installed steps	4.3.7	-

Table 2 Type test requirements applicable to DN 1500 and DN 1800

3.2 The bedding beneath shall be proof loaded and settlement shall not exceed 10mm. The following bedding materials meeting the requirements of BS EN 13242⁽⁸⁾ shall be used: 1. 14mm to 5mm graded aggregate, 2. 10mm nominal single size aggregate. A manhole base placed on the bedding shall be loaded to 50 tonnes vertically. A DN 1200 base can be considered to be representative of the size range

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3.3 The degree of friction provided by the surface grip, when wet, shall be tested by a sewerage operative standing on the benching in typical work boots. The degree of friction provided by the GRP shall not be less than that provided by concrete with a steel trowel finish.

3.4 Watertightness tests on the joints between the lining and pipes shall be carried out in accordance with the requirements of DIN 4060⁽⁹⁾. The sizes of joints that are tested shall include the smallest and largest diameters that are available in the bases.

3.5 The following additional tests shall be carried out on the GRP liner benching on a concrete base of minimum thickness to prove the robustness of the bases:

1. Load test to mimic operative working in chamber – 100 kg person standing in various positions in chamber without unsafe flexing of plastic benching;
2. an impact load test – lump hammer (>0.5 kg) dropped from 6 metres onto plastic benching without causing damage.

3.6 The resistance of the bond between the polypropylene lining and the mass concrete base shall be tested on 3No. 50mm diameter cores in accordance with DIN 1048⁽¹⁰⁾. The pulling resistance shall be greater than 0.05 N/mm².

4. Production quality audit

4.1 An audit of the production quality control systems procedures of the Manufacturer shall be undertaken and a visit to the manufacturing premises made to witness the production process.

4.2 Quality control certification for the materials suppliers shall be available.

5. Documentation

5.1 The information provided to designers and installers shall be reviewed to check for completeness, accuracy and agreement with UK water industry requirements and general "fitness for purpose" requirements.

5.2 Documentation shall include:

- product details for designers;
- installation details for contractors;

6. Installation

6.1 WRc shall witness the installation of two Easi-Base units in order to check the installation instructions contain the necessary information for site staff.

6.2 The installed products shall be inspected to check the general quality and "fitness for purpose" of the system. The pre-fabricated channels in the bases shall be correctly aligned with incoming and outgoing sewers.

6.3 The potential for settlement of the manhole base shall be assessed by inspecting manholes that have been in service for a minimum of three months. A minimum of three manholes located

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Manhole Bases with Polypropylene lining:
1200mm Ø Assessment Schedule –**



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in trafficked roads shall be inspected. CCTV shall be used to identify if there has been any significant settlement of the manhole relative to the incoming sewers. A visual inspection of the manhole cover and surround shall be made to identify if significant settlement has occurred at ground level. Note: this check may be carried out within six months of a WRc Approved certificate being issued, if settlement is shown to be significant then the certificate shall be withdrawn.

7. Operational practices

7.1 Test a sample of each type of plastic lining product with a minimum wall thickness in accordance with the high pressure water jetting requirement detailed in WIS 4-35-01 Appendix C – Resistance to Water Jetting⁽¹¹⁾.

7.2 The access into the sewers for sewer operations activities shall be checked. A CCTV tractor unit shall be shown to be able to successfully enter a sewer where the rotation at the sewer/manhole joint is the maximum that may be required in practice. The sewer diameter shall be the minimum that can be connected to the manhole.

7.3 The configuration of the chambers' channels and width of benching with respect to operational requirements shall be checked by undertaking man access into the chambers.

8. References

1. DN 1500 – DN 2100 GRP Easi-Base Brochure, Version 1, 2009. FP McCann
2. Sewers for Adoption 6th Edition, WRc March 2006.
3. Sewers for Scotland 1st Edition, WRc July 2001.
4. BS EN 752:2008 Drain and sewer systems outside buildings.
5. The Building Regulations 2000 Part H Drainage and waste disposal.
6. BS EN 1917:2002 Concrete manholes and inspection chambers, un-reinforced, steel fibre and reinforced.
7. BS 5911-3:2002 Concrete pipes and ancillary concrete products. Specification for un-reinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002).
8. BS EN 13242:2002+A1:2007 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.
9. DIN 4060 Pipe joint assemblies with elastomeric seals for use in drains and sewers, Deutsche Norm 1998.
10. DIN 1048 Testing concrete; testing of hardened concrete, Deutsche Norm 1991.
11. WIS 4-35-01 Appendix C – Resistance to Water Jetting 2000

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Tel: 01793 865000 Web: www.wrcapproved.com E-Mail: wrcapproved@wrcplc.co.uk

ASSESSMENT SCHEDULE PT/279/0109

PT/279/0109 – AS (January 2009)
FP McCann's Easi-Base Precast Concrete
Manhole Bases with GRP lining: 1200mm Ø
to 2100mm Ø Assessment Schedule -



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1. Scope

1.1 This schedule covers the manufacture and installation of FP McCann's Easi-Base precast manhole bases with GRP liners. They are available for manholes with nominal internal diameters 1500mm, 1800mm and 2100mm.

1.2 Details of these products, including the available range of connecting pipe sizes, are provided in the following publication: DN 1500 – DN 2100 GRP Easi-Base Brochure⁽¹⁾. They provide a fast and economical method of constructing manhole bases on site compared with traditional methods, and the benching has a consistent quality factory finish.

1.3 Easi-Bases are manufactured from concrete with a GRP (glass reinforced plastic) liner over the benching. They are used to construct manholes in drainage and sewer systems and meet the general requirements of the UK water industry as detailed in Sewers for Adoption 6th Edition⁽²⁾ and Sewers for Scotland 2nd Edition⁽³⁾.

1.4 The Easi-Base units are placed on a formation comprising granular material. Conventional methods of constructing the manhole above the base are then followed with pre-cast concrete rings placed onto the Easi-Bases. The pre-cast components may or may not be surrounded in concrete depending on the particular specification requirements.

1.5 Manhole loading limitations are the same as those that apply to conventional manhole bases.

1.6 This schedule covers the following assessment areas in order to prove the "fitness for purpose" of this product:

- general requirements;
- product type testing;
- audit of the production quality control systems;
- review of documentation and guidance for designers, installers and operatives;
- operational practices.

2. General Requirements

2.1 The National Annex to European standard EN 752⁽⁴⁾ provides information on the design of manholes. Further information is provided in the documents Sewers for Adoption 6th Edition⁽¹⁾ and Sewers for Scotland⁽²⁾. In Sewers for Adoption the manhole design guidance is covered by Clause 2.9 Design of Manholes and typical manhole detail drawings A, B, E and F and a Specification is covered by Part 5. Manhole requirements for drainage systems are in The Building Regulations Part H ⁽⁵⁾ Clause 2.48.

2.2 This product may depart from one of the requirements of EN 752 with the following alternative requirement for the benching design (conforms with Sewers for Adoption 6th Edition):

- the benching width in manholes greater than 1.5m deep may not be less than 225mm on one side.

The product shall be demonstrated to meet general fitness for purpose requirements for operations staff working in the manholes.

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2.3 This product shall meet the requirements of EN 752 with respect to the following:

- the flows should combine in preformed swept channels;
- the first pipe joints should be within 150mm of manhole;
- in-situ concrete surround is not normally required;
- the general requirements for channels and benching do not apply to preformed thermoplastics.

2.4 Significant requirements of Sewers for Adoption are summarised below. Clause 2.9 Design of Manholes:

- largest pipe shall be 700 mm diameter in 1500 mm diameter manhole;
- largest pipe shall be 900 mm diameter in 1800 mm diameter manhole;
- rocker pipes should be provided at entry to and exits from manholes.

Materials specification Clause 5.2.29:

- manholes and chambers shall comply with the relevant provisions of EN 1917⁽⁶⁾ and BS 5911-3⁽⁷⁾.

3. Type testing

3.1 The test requirements for base units in EN 1917 and BS 5911 are summarised in Table 1.

Test	EN 1917 Clause	BS 5911
drilled core strength	4.2.2.1	-
water absorption	4.2.7.1	-
surface finish	4.3.2	4.3.1
geometrical characteristics	4.3.3	5.4
installed steps	4.3.7	-

Table 1 Type test requirements applicable to DN 1500 and DN 1800

3.2 The bedding beneath a base shall be proof loaded and any settlement shall not exceed 10mm. The following bedding materials meeting the requirements of BS EN 13242⁽⁸⁾ shall be used: 1. 14mm to 5mm graded aggregate, 2. 10mm nominal single size aggregate. A manhole base placed on the bedding shall be loaded to 50 tonnes vertically. A DN 1200 base can be considered to be representative of the size range.

3.3 The degree of friction provided by the surface grip, when wet, shall be tested by a sewerage operative standing on the benching in typical work boots. The degree of friction provided by the GRP shall not be less than that provided by concrete with a steel trowel finish.

3.4 Watertightness tests on the joints between the lining and pipes shall be carried out in accordance with the requirements of DIN 4060⁽⁹⁾. The sizes of joints that are tested shall include the smallest and largest diameters that are available in the bases.

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3.5 The following additional tests shall be carried out on the GRP liner benching on a concrete base of minimum thickness to prove the robustness of the bases:

1. Load test to mimic operative working in chamber – 100 kg person standing in various positions in chamber without unsafe flexing of plastic benching;
2. an impact load test – lump hammer (>0.5 kg) dropped from 6 metres onto plastic benching without causing damage.

3.6 The resistance of the bond between the GRP lining and the mass concrete base shall be tested on 3No. 50mm diameter cores in accordance with DIN 1048⁽¹⁰⁾. The pulling resistance shall be greater than 0.05 N/mm².

4. Production quality audit

4.1 An audit of the production quality control systems procedures of the Manufacturer shall be undertaken and a visit to the manufacturing premises made to witness the production process.

4.2 Quality control certification for the materials suppliers shall be available.

5. Documentation

5.1 The information provided to designers and installers shall be reviewed to check for completeness, accuracy and agreement with UK water industry requirements and general "fitness for purpose" requirements.

5.2 Documentation shall include:

- product details for designers;
- installation details for contractors;

6. Installation

6.1 WRc shall witness the installation of two Easi-Base units in order to check the installation instructions contain the necessary information for site staff. A DN 1200 base or other nominal diameter base can be considered to be representative of the size range.

6.2 The installed products shall be inspected to check the general quality and "fitness for purpose" of the system. The pre-fabricated channels in the bases shall be correctly aligned with incoming and outgoing sewers.

6.3 The potential for settlement of the manhole base shall be assessed by inspecting manholes that have been in service for a minimum of three months. A minimum of three manholes located in trafficked roads shall be inspected. CCTV shall be used to identify if there has been any significant settlement of the manhole relative to the incoming sewers. A visual inspection of the manhole cover and surround shall be made to identify if significant settlement has occurred at ground level. Note: this check may be carried out within six months of a WRc Approved certificate being issued, if settlement is shown to be significant then the certificate shall be withdrawn. A DN 1200 base or other nominal diameter base can be considered to be representative of the size range.

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7. Operational practices

7.1 Test a sample of each type of plastic lining product with a minimum wall thickness in accordance with the high pressure water jetting requirement detailed in WIS 4-35-01 Appendix C – Resistance to Water Jetting ⁽¹¹⁾.

7.2 The access into the sewers for sewer operations activities shall be checked. A CCTV tractor unit shall be shown to be able to successfully enter a sewer where the rotation at the sewer/manhole joint is the maximum that may be required in practice. The sewer diameter shall be the minimum that can be connected to the manhole.

7.3 The configuration of the chambers' channels and width of benching with respect to operational requirements shall be checked.

7. BS 5911-3:2002 Concrete pipes and ancillary concrete products. Specification for un-reinforced and reinforced concrete manholes and soakaways (complementary to BS EN 1917:2002).
8. BS EN 13242:2002+A1:2007 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.
9. DIN 4060 Pipe joint assemblies with elastomeric seals for use in drains and sewers, Deutsche Norm 1998.
10. . DIN 1048 Testing concrete; testing of hardened concrete, Deutsche Norm 1991.
11. WIS 4-35-01 Appendix C – Resistance to Water Jetting 2000

8. References

1. DN 1500 – DN 2100 GRP Easi-Base Brochure, Version 1, 2009. FP McCann
2. Sewers for Adoption 6th Edition, WRc March 2006.
3. Sewers for Scotland 1st Edition, WRc July 2001.
4. BS EN 752:2008 Drain and sewer systems outside buildings.
5. The Building Regulations 2000 Part H Drainage and waste disposal.
6. BS EN 1917:2002 Concrete manholes and inspection chambers, un-reinforced, steel fibre and reinforced.

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Tel: 01793 865000 Web: www.wrcapproved.com E-Mail: wrcapproved@wrcplc.co.uk

ASSESSMENT SCHEDULE PT/280/0109

PT/280/0109 – AS (January 2009)
FP McCann's Easi-Base Precast Concrete
Manhole Bases unlined :1200mm Ø to
2100mm Ø Assessment Schedule



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1. Scope

1.1 This schedule covers the manufacture and installation of FP McCann's Easi-Base precast manhole bases with concrete surface to benching. They are available for manholes with nominal internal diameters 1200mm, 1500mm, 1800mm and 2100mm.

1.2 Details of these products, including the available range of connecting pipe sizes, are provided in the following publication: DN 1500 – DN 2100 Concrete Easi-Base Brochure⁽¹⁾. They provide a fast and economical method of constructing manhole bases on site compared with traditional methods, and the benching has a consistent quality factory finish.

1.3 Easi-Bases are manufactured from concrete. They are used to construct manholes in drainage and sewer systems and meet the general requirements of the UK water industry as detailed in Sewers for Adoption 6th Edition⁽²⁾ and Sewers for Scotland 2nd Edition⁽³⁾.

1.4 The Easi-Base units are placed on a formation comprising granular material. Conventional methods of constructing the manhole above the base are then followed with pre-cast concrete rings placed onto the Easi-Bases. The pre-cast components may or may not be surrounded in concrete depending on the particular specification requirements.

1.5 Manhole loading limitations are the same as those that apply to conventional manhole bases.

1.6 This schedule covers the following assessment areas in order to prove the "fitness for purpose" of this product:

- general requirements;
- product type testing;
- audit of the production quality control systems;
- review of documentation and guidance for designers, installers and operatives;
- operational practices.

2. General Requirements

2.1 The National Annex to European standard EN 752⁽⁴⁾ provides information on the design of manholes. Further information is provided in the documents Sewers for Adoption 6th Edition⁽¹⁾ and Sewers for Scotland⁽²⁾. In Sewers for Adoption the manhole design guidance is covered by Clause 2.9 Design of Manholes and typical manhole detail drawings A, B, E and F and a Specification is covered by Part 5. Manhole requirements for drainage systems are in The Building Regulations Part H ⁽⁵⁾ Clause 2.48.

2.2 This product may depart from one of the requirements of EN 752 with the following alternative requirement for the benching design (conforms with Sewers for Adoption 6th Edition):

- the benching width in manholes greater than 1.5m deep may not be less than 225mm on one side.

The product shall be demonstrated to meet general fitness for purpose requirements for operations staff working in the manholes.

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2.3 This product shall meet the requirements of EN 752 with respect to the following:

- the flows should combine in preformed swept channels;
- the first pipe joints should be within 150mm of manhole;
- in-situ concrete surround is not normally required;

2.4 Significant requirements of Sewers for Adoption are summarised below. Clause 2.9 Design of Manholes:

- largest pipe shall be 700 mm diameter in 1500 mm diameter manhole;
 - largest pipe shall be 900 mm diameter in 1800 mm diameter manhole;
 - rocker pipes should be provided at entry to and exits from manholes.
- Materials specification Clause 5.2.29:
- manholes and chambers shall comply with the relevant provisions of EN 1917⁽⁶⁾ and BS 5911-3⁽⁷⁾.

3. Type testing

3.1 The test requirements for base units in EN 1917 and BS 5911 are summarised in Table 1.

3.2 The bedding beneath a base shall be proof loaded and any settlement shall not exceed 10mm. The following bedding materials meeting the requirements of BS EN 13242⁽⁸⁾ shall be used: 1. 14mm to 5mm graded aggregate, 2. 10mm nominal single size aggregate. A manhole base placed on the bedding shall be loaded to 50 tonnes vertically. A DN 1200 base can be considered to be representative of the size range.

Test	EN 1917 Clause	BS 5911
drilled core strength	4.2.2.1	-
water absorption	4.2.7.1	-
surface finish	4.3.2	4.3.1
geometrical characteristics	4.3.3	5.4
installed steps	4.3.7	-

Table 1 Type test requirements applicable to DN 1500 and DN 1800

3.3 The degree of friction provided by the surface grip, when wet, shall be tested by a sewerage operative standing on the benching in typical work boots. The degree of friction provided by the precast concrete shall not be less than that provided by concrete with a steel trowel finish.

3.4 Watertightness tests on the joints between the lining and pipes shall be carried out in accordance with the requirements of DIN 4060⁽⁹⁾. The sizes of joints that are tested shall include the smallest and largest diameters that are available in the bases.

4. Production quality audit

4.1 An audit of the production quality control systems procedures of the Manufacturer shall be undertaken and a visit to the manufacturing premises made to witness the production process.

4.2 Quality control certification for the materials suppliers shall be available.

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5. Documentation

5.1 The information provided to designers and installers shall be reviewed to check for completeness, accuracy and agreement with UK water industry requirements and general "fitness for purpose" requirements.

5.2 Documentation shall include:

- product details for designers;
- installation details for contractors.

6. Installation

6.1 WRc shall witness the installation of two Easi-Base units on site in order to check the installation instructions contain the necessary information for site staff. A DN 1200 base or other nominal diameter base can be considered to be representative of the size range.

6.2 WRc shall witness the connecting sewers being installed into the bases to create leaktight joints. This does not have to be undertaken on site.

6.3 The installed products shall be inspected to check the general quality and "fitness for purpose" of the system. The pre-fabricated channels in the bases shall be correctly aligned with incoming and outgoing sewers.

6.4 The potential for settlement of the manhole base shall be assessed by inspecting manholes that have been in service for a minimum of three months. A minimum of three manholes located in trafficked roads shall be inspected. CCTV shall be used to identify if there has been any significant settlement of the manhole

relative to the incoming sewers. A visual inspection of the manhole cover and surround shall be made to identify if significant settlement has occurred at ground level. Note: this check may be carried out within six months of a WRc Approved certificate being issued, if settlement is shown to be significant then the certificate shall be withdrawn. A DN 1200 base or other nominal diameter base can be considered to be representative of the size range.

7. Operational practices

7.1 The access into the sewers for sewer operations activities shall be checked. A CCTV tractor unit shall be shown to be able to successfully enter a sewer where the rotation at the sewer/manhole joint is the maximum that may be required in practice. The sewer diameter shall be the minimum that can be connected to the manhole.

7.2 The configuration of the chambers' channels and width of benching with respect to operational requirements shall be checked.

8. References

1. DN 1500 – DN 2100 Concrete Easi-Base Brochure, Version 1, 2009. FP McCann.
2. Sewers for Adoption 6th Edition, WRc March 2006.
3. Sewers for Scotland 1st Edition, WRc July 2001.
4. BS EN 752:2008 Drain and sewer systems outside buildings.

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5. The Building Regulations 2000 Part H Drainage and waste disposal.
6. BS EN 1917:2002 Concrete manholes and inspection chambers, un-reinforced, steel fibre and reinforced.
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