FABRICATED ACCESS COVERS TRADE ASSOCIATION (FACTA)
SPECIFICATION FOR FABRICATED ACCESS COVERS

FOREWORD

This specification has been prepared by the Fabricated Access Covers Trade Association (FACTA) which represents manufacturers of fabricated access covers and frames.

The purpose of this specification is to establish definitions, classes, materials and performance of fabricated access covers.

It is intended to enable users to specify their requirements for fabricated access covers in terms of the required performance, particularly relating to wheel loads. The test loads and calculations contained in this specification are based upon the European standards for structural steelwork.

1. SCOPE

This specification applies to fabricated access covers of the following types:-

1.1 Solid top covers

1.2 Recessed covers which allow for non-structural infill

1.3 Composite covers

1.4 Surface drainage products

1.1-1.4 Include single, multiple and linear units within areas subjected to pedestrian and/or vehicular loadings.

2. NORMATIVE REFERENCES

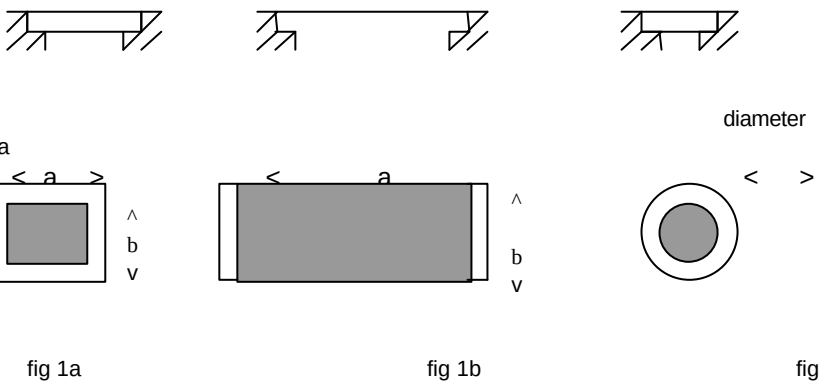
This guide incorporates provisions from other publications:

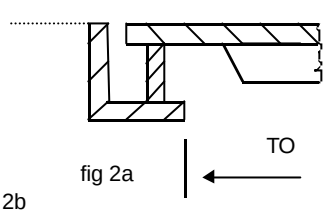
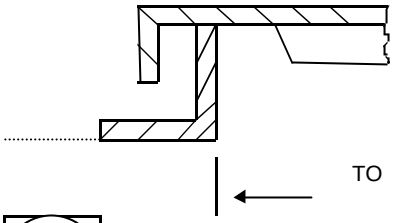
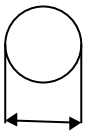
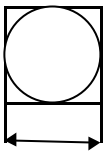
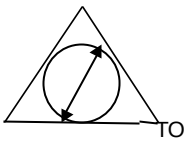
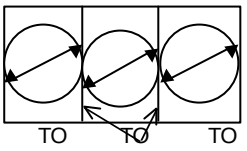
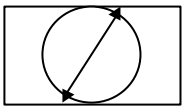
BS 729	Specification for hot dip galvanised coatings on Iron & Steel articles
BS 1449 : Part 2 : 1983	Specification for stainless and heat-resisting steel plate, sheet & strip
BS 1881	Testing concrete
BS 4872	Specification for approval testing of welders when welding procedure approval is not required.

INFORMATIVE REFERENCES

ISO 630 : 1980 structural steels	Fabricated rolled structural steel (carbon steel)
BS 1449 : part 1: section 1.1 1991	Steel plate, sheet and strip/general specification
EN 124 : 1994	Gully tops and manhole tops for vehicular and pedestrian areas - Design requirements, type testing, marking, quality control
Euronorm 80 : 1985	Reinforcing bars (not for prestressing); technical delivery conditions
Euronorm 81 : 1969.03	Hot rolled flat round reinforcing steel; dimensions; mass; tolerances
Euronorm 82 : 1979.02	Steel for the reinforcement of concrete with an improved bonding action; dimensions; mass; tolerances; general requirements
ISO 1459 : 1973	Metallic coatings : protection against corrosion by hot dip galvanising. Guiding principles
ISO 1460 : 1992	Metallic coatings : hot dip galvanised coatings on ferrous metals; gravimetric determination of the mass per unit area
ISO 1461 : 1973	Metallic coatings : hot dip galvanised coatings on fabricated ferrous products. Requirements
BS 8110 : Part 1 : 1985	Code of practice for design and construction
BS 5328 : 1991	Concrete
ISO 9000	Quality management and quality assurance standards
ISO 9002	Quality systems. Model for quality assurance in production, installation and servicing
EN 29002 : 1987	Quality systems : Model for quality assurance in production and installation
DD ENV 1993-1-1: 1992 Eurocode 3	design of steel structures/Part 1.1: General rules and rules for buildings

3.1 DEFINITIONS

No	Term	Definition
1	Access cover	Assembly consisting of a frame and cover or covers providing access to underground systems
2	Cover	The moveable part(s) of an access cover which cover(s) the chamber or shaft
3	Composite cover	Recessed cover which relies on structural infill material in order to achieve the stated performance
4	Fabricated cover	Cover manufactured by welding or pressing of steel, aluminium or similar components
5	Recessed cover	Fabricated cover the upper surface of which is recessed to allow for the insertion of infill materials whether of a structural or non-structural nature
6	Solid top cover	Fabricated cover the upper surface of which has no provision for the insertion of additional structural or non-structural infill
7	Frame	The fixed part of an access cover which receives and supports a cover
8	Non-structural infill	Material inserted in a recessed cover which does not contribute significantly to the strength of the cover and which is not required in order for the cover to achieve its rated performance
9	Structural infill	A material inserted in a recessed cover whether by the cover manufacturer or others which contributes to structural strength of the cover and upon which the cover relies in order to achieve the rated performance
10	Acceptance test load	Test load comprising the static wheel load and the relevant allowances for overload and dynamic effects.
11	Strength test load	Test load comprising the acceptance test load and the ultimate safety factor
12	Test load (kN)	Load applied to access covers when tested
13	Clear opening (a x b)	The dimension of the area between the internal frame edges, i.e. the shaded area as shown in fig 1 (a-c)  fig 1a fig 1b fig 1c

14	Test opening (TO) (mm)	The diameter of the largest circle that can be inscribed in the clear opening (No 1) of the frame, as shown in fig 2 and fig 3 (a-e)  fig 2a  fig 2b  fig 3a  fig 3b  fig 3c  fig 3d Fixed bars  fig 3e
15	Linear unit	Access cover consisting of an elongated frame containing multiple covers arranged in a row
16	Multiple unit	Access cover consisting of a frame containing multiple covers
17	Single unit	Access cover consisting of a single frame and cover

4. CLASSIFICATION - TABLE 1

Fabricated access covers complying with the requirements of this specification shall be graded as follows:

	Comparisons***		GLW	Wheel Loads		Load Test Data		Typical Applications	
FACTA Class	**EN124 Class**	**BS497 approximate equivalent class**	**Gross Laden Vehicle Weight (slow moving)**	**Wheel Loads ** (slow moving) Pneumatic**	**Wheel Loads ** (slow moving) Solid**	**Acceptance Test** (Static Wheel Load plus overload & dynamic effects)	**Strength Test** (Acceptance Test load plus ultimate safety factor)	**Pneumatic Tyres**	**Solid Tyres**
A 	A15	C	Pedestrian duty	0.6 tonne (5kN)	N/A	5.0 x 1.0 x 1.0 = 5.0kN	5.0 x 1.6 = 8.0kN	Internal and external areas which can only be used by pedestrians or cycles i.e. toilets, changing rooms, footways and cycle tracks.	
AA 	N/A	N/A	5 tonne	1.5 tonne (15kN)	N/A	15.0 x 1.1 x 1.15 = 19.0kN	19.0 x 1.6 = 31.0kN	Very light industrial areas, where small trolleys and private cars/vans can manoeuvre i.e. Domestic driveways, trolley parks, hospital wards.	
AAA 	N/A	N/A	10 tonne	2.5 tonne (25kN)	0.5 tonne	25.0 x 1.1 x 1.15 = 32.0kN	32 .0 x 1.6 = 52.0kN	Delivery/service areas, shopping malls, light industrial areas	Light industrial areas, where trolleys and light pallet trucks operate.
B 	B125	B	Up to 44 tonne *	5.0 tonne (50kN)	0.75 tonne	50.0 x 1.1 x 1.15 = 63.25kN	63.25 x 1.6 = 101.0kN	Pedestrian precincts, forecourts, commercial delivery/parking areas.	Factories, industrial plants, where pick-up trucks and small pallet trucks operate.
C 	C250		Up to 44 tonne but under special conditions *	6.5 tonne (65kN)	1.0 tonne	65.0 x 1.1 x 1.15 or 50.0 x 1.1 x 1.5 = 82.5kN	82.5 x 1.6 = 132.0kN	Factories, industrial plants, special axle loads, kerb side drainage	Industrial areas where pallet and small fork-lift trucks operate
D 	D400	D	Up to 44 tonne but under special conditions *	11.0 tonne (108kN)	3.0 tonne	108.0 x 1.1 x 1.15 or 50.0 x 1.1 x 2.5 = 137.5kN	137.5 x 1.6 = 220.0kN	Heavy duty plant areas carriageways and industrial service roads where fast moving HGVs reach speeds of 20mph max.	Heavy duty industrial areas where medium duty fork-lift trucks operate
E 	E600	N/A	Special application vehicles	16.0 tonne (158kN)	5.0 tonne	158.0 x 1.1 x 1.15 = 200.0kN	200.0 x 1.6 = 320.0kN	Dockside and container storage areas where heavy transporters operate	Very heavy industrial areas where large heavy duty fork-lift trucks operate.
F 	F900	N/A	Special application vehicles	24.0 tonne (237kN)	N/A	237.0 x 1.1 x 1.15 = 300.0kN	300.0 x 1.6 = 480.0kN	Civil and military airfield aprons, where particularly heavy wheel loads are imposed by aircraft and towing vehicles.	

* Under the "Road Vehicles (Authorised Weight) Regulations 1998", Axle weights for the UK are limited to 11.5 tonnes maximum 'Refer to 'Acceptance Test for maximum design load/load bearing capacity)

** Slow moving wheel loads are deemed to be speeds no greater than 20mph.

*** These comparisons are for guidance only and are not intended to be exact.

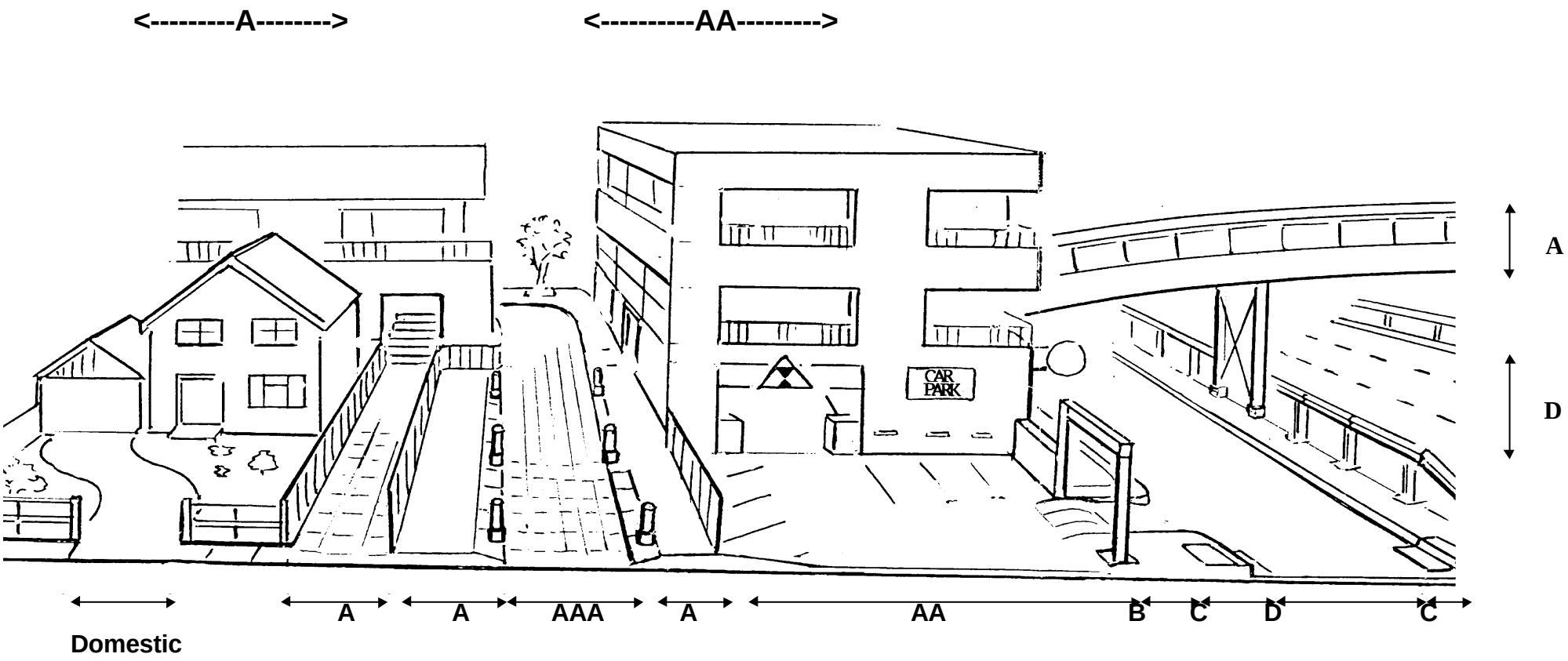


Figure 4. Typical applications of FACTA Performance Classes

5. MATERIALS AND FINISHES

5.1 Fabricated Covers

Fabricated covers complying with this guide shall be made from:

5.1.1 weldable steels and alloys including aluminium or stainless steel
5.1.2 any of the above materials in combination with concrete

5.2 Corrosion Resistance

Where corrosion resistance is required for steel covers, this may be achieved by a hot dip galvanising to BS729 Other coatings may be applied by agreement; these may include black bitumen coating or paint systems.

5.3 Stainless Steel

Austenitic stainless steel of grades 304 and 316 (to BS 1449 part 2) or others of suitable composition, shall require no additional protection. However, all surfaces must be free of debris and contaminants to the approval of the specifier.

5.4 Concrete

When required, the manufacturer shall specify the necessary information to enable filling of the cover by others and for the cover, thus filled, to attain the tested performance.

Minimum crushing strengths shall be by agreement between the supplier and specifier. All testing of strength shall be fully in accordance with BS 1881.

5.5 Welding

Where welding is undertaken, the welder shall be qualified to BS 4872 or BS EN 287.

6. DESIGN REQUIREMENTS

6.1 Clear openings of manhole tops for man entry

The opening of manhole tops designed for man entry shall comply with the safety requirements in force at the place of installation. Generally, this is considered to be at least 600 mm diameter.

6.2 Clearances

Unless otherwise agreed between supplier and customer, the clearance between cover and frame (or cover and cover in multiple units) shall be adequate to allow removal and replacement of covers. Good practice is recognised as being a maximum clearance of 3mm between mating surfaces although this may be dependant on the applications.

6.3 Edge and contact surfaces protection for access covers of steel reinforced concrete

The edges of reinforced concrete covers shall be protected to resist erosion or wear of the concrete edge in service.

6.4 Surface condition

Where required, slip resistance shall be provided. Methods include the use of chequer plate/pressed patterns or the provision of anti-slip surface finishes (including paints and concrete).

6.5 Opening angle of hinged covers

Hinged covers shall be so designed that when in the fully open position (1) they do not impede access to the clear opening and (2) they are prevented from unintentional closing in a manner likely to cause injury.

6.6 Recessed covers (filled covers)

In the case of recessed covers, the manufacturer shall provide all necessary specifications for filling, unless the filling is carried out at the manufacturer's plant.

The surface texture of such filled covers shall be appropriate to the place of installation.

7. TESTING

Single unit access covers shall be tested as complete units in their condition of service. For multiple units a representative cover shall be tested so as to simulate the condition of service.

Composite covers shall be load tested filled with concrete of the agreed specification.

Covers recessed for non-structural infills and which are delivered unfilled shall be load tested without filling.

A test specimen shall be checked for compliance with the requirements of this clause. Compliance with the loading requirements for the appropriate class of clause 4 shall be determined by a loading test with loads according to the class of fabricated access covers.
(see table 2)

7.1 Test Loads

TABLE 2 - Test Loads for Fabricated Access Covers

Class	Static wheel load x overload factor (OF) x dynamic factor (DF)			Imposed Test Loads	
	kN	OF	DF	Acceptance * kN	Strength ** kN
A	5	1	1	5	8
AA	15	1.1	1.15	19	31
AAA	25	1.1	1.15	32	52
B	50	1.1	1.15	63.25	101
C	50	1.1	1.5	82.5	132
D	50	1.1	2.5	137.5	220
E	-	-	-	200.0	320
F	-	-	-	300.0	480

***see clause 7.4 **see clause 7.5

For fabricated access covers with a Test Opening less than 300mm see table 3 for factor to be applied to test loads.

7.2 Testing Apparatus

7.2.1 Testing machine

The testing machine, preferably a hydraulic test press, shall be capable of applying a load at least 25% greater than the respective test load for classes A to D and at least 10% greater than the respective test load for classes E and F.

A tolerance of +/- 3% of the test load shall be maintained.

Except for multiple units, the dimensions of the bed of the testing machine shall be greater than the bearing area of the unit to be tested.

7.2.2 Test blocks

TABLE 3 - The dimensions and shapes of test blocks are shown in the table below

Shape and Test Opening of Fabricated Access Cover	**Dimension of Test Block**	**Factor to be applied to test loads**
Fabricated access covers of any shape over 300mm test opening	Circular test block 250mm diameter	1.0
The test opening between 200mm and 300mm - rectangular cover with 1 side greater than 300mm	Rectangular test block* 250mm x 150mm	0.7
Test opening between 200mm and 300mm - all other shapes	Circular test block 150mm diameter	
Test opening less than 200mm - rectangular cover with one side greater than 300mm	Rectangular test block* 250mm x 75mm	0.4
Test opening less than 200mm - all other shapes	Circular test block 75mm diameter	

*****The long axis of the test block shall be orientated parallel to the long axis of the cover.

7.2.3 Preparation for the test

The test block shall be placed on the unit with its vertical axis perpendicular to the surface and coincidental with the geometric centre of the cover (examples, see figure 5). In the case of multiple units the test blocks shall be placed on an individual unit in the geometric centre as shown in figure 5 and a second test shall be carried out with the edge of the test block 75mm from an unsupported edge of the cover as shown in figure 5. The cover shall be supported and levelled to simulate service conditions.

The test load shall be uniformly distributed over the whole surface of the test block and any irregularities compensated for by means of an appropriate intermediate layer, e.g. softwood, fibre board, felt or similar material positioned between the cover and the test block. The dimensions of this intermediate layer shall not be larger than those of the test block.

When testing fabricated access covers with a non-flat surface, the contact face of the test block shall be shaped to match the cover. Patterns as defined in sub-clause 6.4 and small deviations from a flat surface do not require a shaped contact face of the test block.

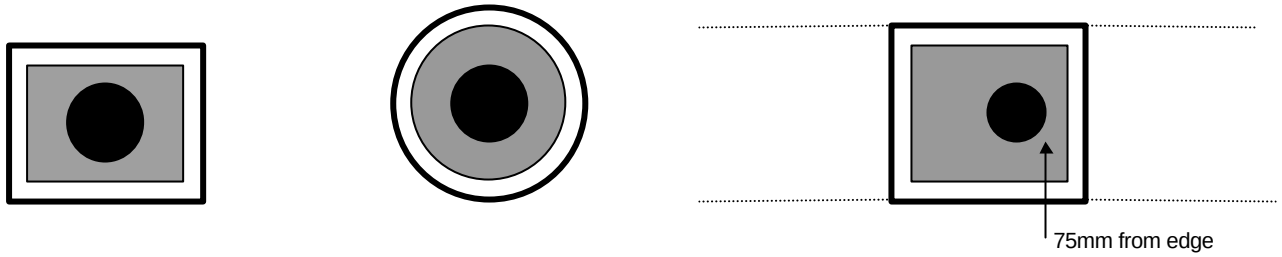


Figure 5 - test blocks and geometric centres

7.3 Testing Procedures

7.3.1 Performance of fabricated access covers may be demonstrated by the following tests:

a) Acceptance tests

b) Strength tests

7.3.2 For bespoke covers, a strength test shall not be required provided that either

(a) a strength test has been performed on a cover of similar configuration

or

(b) a suitable analysis has been carried out to demonstrate that the cover complies with the required loading subject to agreement by the client.

7.3.3 Prior to testing, the manufacturer may elect to apply a settlement load of 100% of the acceptance load for the relevant class of cover. The load shall then be released.

The cover shall be observed for any signs of intial weakness/cracking and a record made of the settlement to the underside of the cover.

The settlement figure in millimeters shall not exceed test opening multiplied by 0.5%.

The deflection guage shall then be reset to zero, or the residual figure shown from the settlement load shall be treated as zero.

7.4 Acceptance Test

7.4.1 The test is intended to be non-destructive test for confirming structural performance and demonstrating the essentially elastic characteristics of the Cover. For compliance, Fabricated Access Covers shall prove capable of sustaining the test loading given in Table 2 whilst satisfying the residual deflection figure as stated in clause 7.4.3.

7.4.2 The test load for an 'Acceptance Test' shall be as listed in Table 2.

7.4.3 The full test load shall be applied through the test block as described in 7.2.3 (directly after the settlement load, if elected) at a rate of between 1kN/sec and 5kN/sec. The deflection to the underside of the cover directly below the test block shall be noted. (incremental deflection readings at Key Stages may prove useful for analysis purposes). The load on the test specimen shall then be released and the deflection reading again noted.

On removal of the test load, the test specimen shall demonstrate elastic behaviour with a reduction in the deflection registered under full load, the residual deflection shall then be recorded. A further 4 Test loads shall be applied as before on release of the load on each occasion the residual deflection shall be equal or less than that recorded from the first test load. The sum of the settlement and residual deflection shall NOT exceed test opening multiplied by 0.8%.

7.4.4 (a) For composite concrete filled covers with reinforcing bars, no visible cracks wider than 0.3mm shall appear in the concrete after this test.

(b) For composite concrete filled covers without reinforcing bars, no visible cracks shall appear in the concrete after this test.

7.4.5 For covers complying with Load Classes 'C', 'D', 'E' and 'F' of this specification, fatigue needs to be considered. Covers shall comply with either of the following criteria:

a) when tested in accordance with clause 7.4.3 above the maximum deflection observed during the test shall not exceed test opening divided by 200;

or

b) the elastic range of the specimen shall be determined by calculation or test and when tested in accordance with clause 7.4.3 above maximum deflection observed shall not exceed 50% of the full elastic range.

7.5 Strength Test

7.5.1 The strength test is designed to confirm the compliance of the fabricated access cover to the ultimate safety load factor in table 2.

7.5.2 Before carrying out the strength test, the specimen should first be submitted to and satisfy the acceptance test described in section 7.4 above.

7.5.3 Where prototype testing is established in order to develop high volume production runs, a minimum of three covers of similar design shall be subjected to the strength test.

7.5.4 The full test load shall be applied at rate of between 1kN/sec and 5kN/Sec and shall be held for 30 seconds. The deflection on the cover shall be noted. The load on the test specimen shall then be released and the deflection reading again noted.

7.5.5 At this load the cover shall support the load without signs of failure by buckling or rupture of any part of the specimen.

7.5.6 On removal of the test load, the deflection shall reduce by at least 20%.

This recovery for fabricated rolled structural steelwork ensures adequate capacity over the strength test load to provide a satisfactory margin before failure.

8. IDENTIFICATION & LABELLING

All fabricated access covers shall bear:

(a) FACTA as the marking of this specification
(b) The appropriate load class
(c) The name and/or identification mark of the manufacturer

and may in addition bear:

(d) Additional markings relating to the application or the owner
(e) Product identification

9. QUALITY ASSURANCE

Products complying with this guide shall be manufactured under a quality management system which complies with the requirements of BS EN ISO 9002.

APPENDIX A

GLOSSARY OF TERMS

Automatic Opening

Hinged cover will open freely without any further force/assistance by operative/operatives form above/below after disengagement of holding down mechanism.

Double Seal

A specifically designed mechanical device/support within the frame/cover enabling the placing of two suitable materials thus allowing the cover and frame to be classed as being a double seal system. If installed as recommended by the manufacturer, can be classed as being generally resistant to the egress of odorous gases and ingress of water, dust and debris, with twice the protection of a single seal.

NOTE: This does not imply that the unit will be Pressure-tight or Waterproof.

Duct Cover

A multiple access cover and frame system, designed for use over a continuous trench.

Fishtail Lug

A lug, generally fitted to the access cover frame to provide a positive key when casting into concrete.

Fixing Lug

A lug, generally fitted to the manhole frame, pierced/drilled to receive an anchor screw/bolt fixing.

Flush Fitting

When the access cover frame/lid is designed to be level with the finished floor/structure level.

Gas Tight

The access cover top designed to prevent the egress of gases to an agreed pressure.

Hinged

When the access cover is hinged to the access cover frame.

Integral Safety Barrier

Integral assembly within cover/frame to provide facility against accidental access to chamber when cover in open condition resulting in possible personal injury.

Locking Device

A means of securing the access cover to the access cover frame by use of an engineered device.

Locking Screws/Bolts

A means of securing the access cover to the access cover frame by use of screws/bolts.

Multiple Leaf

An access cover top consisting of two or more access covers within a frame.

One Man Operation

All manner of operations to cover can be carried out to assembly, e.g. opening, lift-off closing by one person to agreed limits or recognised legislation as regards forces applied, length of reach etc.

Peephole

A secondary access cover within the main access cover (usually required for inspection purposes).

Pressure Tight

The access cover top designed to prevent the egress of gases or fluids to an agreed pressure.

Safety Grid

A grating fitted within an access cover frame below the cover to prevent the objects cover from falling into the chamber, once the cover is removed or hinged open.

Single Seal

A specifically designed mechanical device/support within the frame/cover enabling the placing of a suitable sealing material thus allowing the cover and frame to be classed as being generally resistant to the egress of odorous gases and ingress of dust and debris.

NOTE: This does not imply that the unit will be Pressure-tight or Waterproof.

Staybar/Safety Stay

A mechanical arm fitted to a hinged access cover top to provide support to the access cover in the open position.

Support Beam

A member used to support the adjacent unsupported edges of a twin/multiple/linear access cover.

Support Beam Pockets/Bracket

An assembly designed to support and fix the support beam to the chamber wall/supporting face.

Twin Leaf

An access cover top consisting of two access covers within the one access cover frame.

Unsealed

An unsealed cover or ducting unit, is one that has no mechanical device to form or support a seal.

Unsealed systems are primarily used where water, dust, debris and air movement through the cover system is unimportant or non-existent.

Unsealed systems are the simplest and most cost effective and by their very nature, give inherent limited ventilation.

Upstanding

When the access cover frame/lid is designed to stand proud of the finished floor/structure level.

Watertight

The access cover top design prevents the ingress of water to the chamber (to an agreed waterhead).

APPENDIX B

FACTA GUIDE TO INSTALLATION OF FABRICATED ACCESS COVERS

The performance of Fabricated Access Covers depends firstly on selection of the proper cover for the load and, secondly, on correct measurement and installation on site. Guidance on selection can be obtained from the FACTA Guide Performance Classes for Fabricated Steel Access Covers (available from the address below) while FACTA's installation recommendations are set out below.

The manufacturers' detailed instructions should always be followed carefully. The operations to be performed and sequence in which they are to be carried out will vary depending upon the type of cover. The following recommendations are given in good faith, as answers to questions which experience shows can from time to time arise in a variety of installations. It should not be regarded as a substitute for the manufacturers' instructions.

PREPARATION

Structural Opening

In service, the entire load on the cover is transferred through the frame to the structural opening. It is vital that the structure of the opening itself is adequate and that the grouting material to be applied beneath the frame is sufficiently strong. A frame which is not properly supported may distort in service, leading to failure of the seals and perhaps to the cover becoming unstable. A twisted frame is incapable of giving proper support to the cover which will therefore be subjected to force for which it was not designed.

Dimensions

The dimensions of the frame must be properly co-ordinated with the size of the clear opening. The frame selected must be large enough to allow for any tolerance in the construction of the structural opening. Otherwise, a slightly oversized structural opening could result in the frame not being properly supported.

Handling & Storage

Care must be taken in handling and storage of covers and frames to prevent damage and distortion prior to installation. Units must not be modified without prior reference to the manufacturer. Prior to starting work, ensure that all components are present in the correct sequence for installation.

Rebate

The rebate in which the frame is to lie must be sufficiently wide to allow for the frame member plus any grouting lugs or holding down bolts around the periphery of the frame. The depth of the rebate must be sufficient to allow for the frame to be packed and levelled without causing the top of the frame to project above the finished floor level.

INSTALLATION

Packing	Packing should always be a hard durable material.
Anchor Bolts	Holding down bolts or grouting lugs, where provided, are important to the structural stability of the frame and cover - they should always be installed in accordance with the manufacturers' instructions.
Bedding	The grouting must be applied so as to ensure that no voids are left beneath the frame.
Levelling	It is vital that the cover and frame should be level and free of any twist or other distortion.
Spillage	Care should be taken to protect key ways, bolt housing, seals etc. from spillage during filling or grouting operations.
Seals	Before a cover is put into service, sealing and seating areas should be cleaned and, where specified, seals should be filled with manhole grease.
Support Beams	Where removable support beams are supplied with a multiple cover, it is vital to ensure that they are correctly replaced and the covers secured before the cover is trafficked.