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APPENDIX A.1 FUNCTIONS OF TFCC AND BUILDING PLAN CO-ORDINATION AND APPROVAL PROCESS

1. Functions of TFCC

The functions of TFCC are as follows:

a) provide feedback to IDA on their proposals for IDA's consideration regarding changes to Code of Practice for Info-communications Facilities in Buildings (COPIF);

b) set-up pre-consultation meeting for building owners/ developers/ architects/ consultants on building facilities;

c) process building plans and appoint Building Plan Project Co-ordinator for specific building projects;

d) put up recommendations to IDA on waiver of COPIF requirements;

e) ensure that both operators' requirements are incorporated into the building plan; and

f) ensure the timely hand over of MDF room and in-building telecommunication facilities.

2. Building Plan Co-ordination & Approval Process

2.1 For large development projects, building owners/ developers/ architects/ consultants may require pre-consultation meeting with the TFCC on the provision of telecommunication facilities. They may contact and arrange an appointment with the *Secretariat of the Telecommunication Facility Co-ordination Committee (TFCC).* The contact tel. no. for the secretariat is 848 4338.

2.2 For small development projects or pre-consultation is not required, building owners / developers/ architects/ consultants are to submit 3 sets of building plans and 3 sets of site plans to TFCC. All plans are to be addressed to:

Telecommunication Facility Co-ordination Committee
c/o 8 Temasek Boulevard
#14-00 Suntec Tower Three
Singapore 038988.

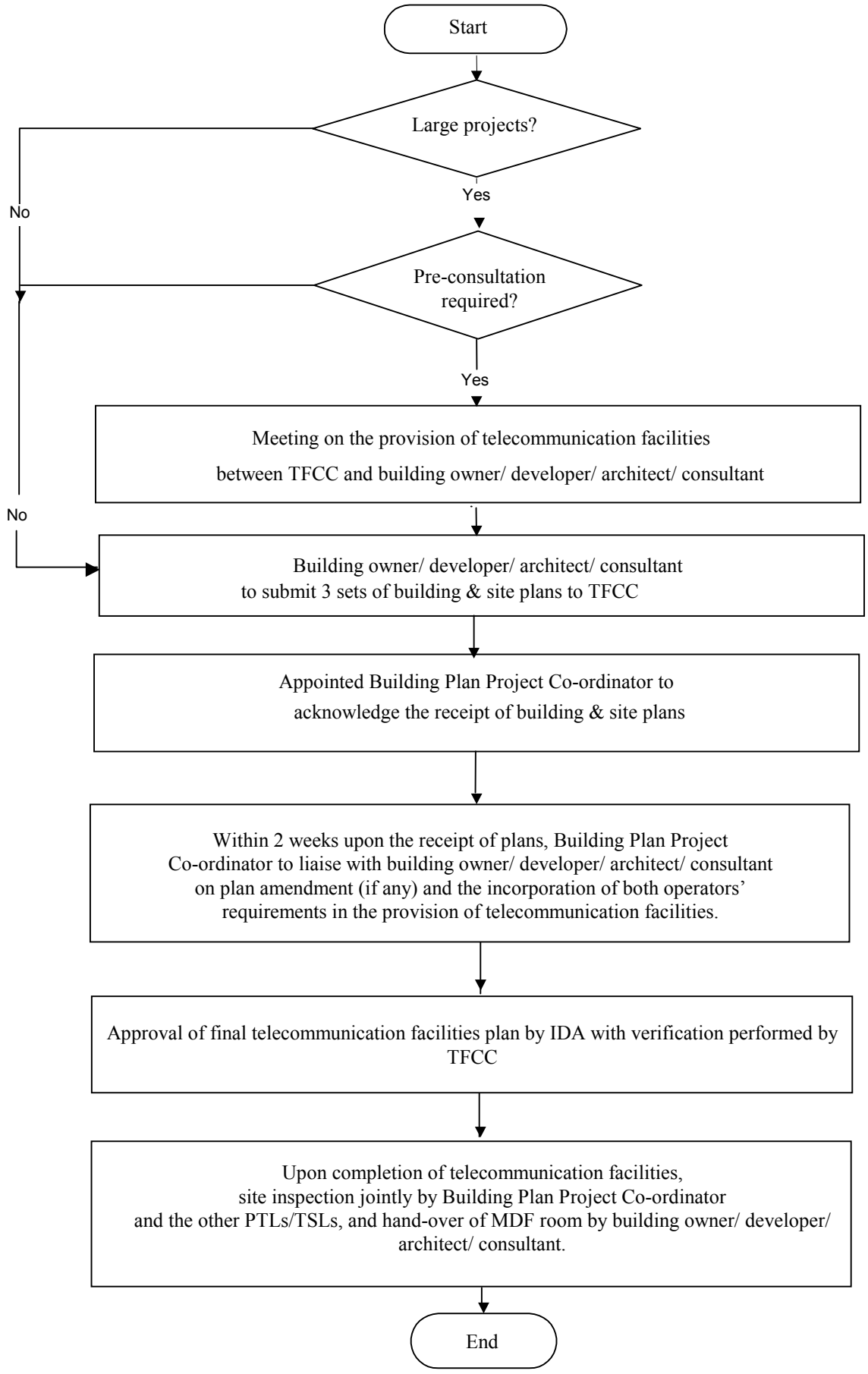
2.3 For plans delivered by hand, they are to be deposited into a Building Plans Submission Box at the above address.

2.4 The Building Plan Project Co-ordinator (appointed by the TFCC) will acknowledge the receipt of building plans. The co-ordinator will co-ordinate site meetings (with presence of representatives from PTLs/TSLs) to discuss in details on the provision of building telecommunication facilities. He/she will collate and forward final telecommunication service plan to building owners/ developers/ architects/

consultants and the other PTLs/TSLs. He/she will arrange for site inspection and MDF room hand-over when facilities are ready.

2.5 The flow chart for building plan co-ordination and approval process is attached.

APPENDIX A.1 FLOW CHART FOR BUILDING PLAN CO-ORDINATION AND APPROVAL PROCESS (AN OVERVIEW)



APPENDIX A.2 DO'S & DON'TS FOR EARTHWORKS

DO'S

1 Do contact telecommunication system licensees during planning stage and before commencement of work for the development project to:

1.1 Obtain service layout plans and subsequent updates after a lapse of 6 months;

1.2 Arrange site meeting for briefing by telecommunication system licensees; and

1.3 Discuss with telecommunication system licensees on whether to divert or support those telecommunication system licensees' plants that are affected by the development.

2 Do carry out the following procedures prior to commencing excavation, piling, soil investigation or earthworks:

2.1 Refer to telecommunication system licensees' service layout plans;

2.2 Engage an IDA licensed cable detection worker to carry out cable detection and notify telecommunication system licensee(s) 7 days before the commencement of earthworks which are within the vicinity of any telecommunication cables in accordance with section 29(1) of the Telecommunications Act 1999;

2.3 Do wait for telecommunication system licensees' replies within 7 days of notification before commencement of earthworks;

2.4 Must carry out trial holes by manual digging to expose telecommunication system licensees' plants at sites; and seek assistance from telecommunication system licensees to ascertain the location of telecommunication system licensees' plants if plants cannot be located;

2.5 Provide and maintain visible markings (such as poles, tapes, painting and etc.) indicating the actual position of telecommunication system licensees' plants within the construction site and inform telecommunication system licensees for site inspection;

2.6 Update telecommunication system licensees' plant location information on the developer's construction plans.

3 Do note that the time required to carry out plant diversion ranging from 6 to 18 months. Such requirement shall be taken into consideration during the planning stage of the project.

4 Do submit to telecommunication system licensees the method of support and protection to those exposed telecommunication system licensees' plants for approval in the case that telecommunication system licensees' plants are to be supported during the construction work at site.

5 Do sever tree roots before grubbing the tree stump.

6 Do inform telecommunication system licensees on the dismantling of supports.

7 Do inform telecommunication system licensees on the backfilling procedure over telecommunication system licensees' plants.

8 Do disseminate information regarding telecommunication system licensees' service layout to all relevant parties involved in earthworks such as main contractor, subcontractors, machine operators, licensed cable detection worker, etc. as it has been found that poor or lack of communication is one of the main causes of damage to telecommunication system licensees' plants.

9 Do note that the depth of telecommunication system licensees' plants varies due to the site conditions.

10 Do report immediately on any damage done at the following telephone nos. as early report could reduce the cost of the damage:

a) For Singapore Telecom Ltd's pipeline system and cables: 1800-2884099 during office hours and 1608 after office hours; or

b) For StarHub Pte Ltd's pipeline system and cables: 8256000 during office hours and 1800-7827482 after office hours; or

c) For Singapore Cable Vision Ltd's pipeline system and cables: 8701570 during and after office hours.

11 On request, telecommunication system licensees can arrange to give a presentation to the developer, project consultant and main contractors to provide detail information of all the telecommunication system licensees' plants within the work site and the precautions to be taken by the contractors while working at the site.

12 Do note the legal liability for failure to notify telecommunication system licensees of earthworks (see Note (a)) and for damaging telecommunication system licensees' plants (see Note (b)).

13 For further enquiry, please contact:

Telecommunication Facility Co-ordination Committee
c/o 8 Temasek Boulevard
#14-00 Suntec Tower Three
Singapore 038988
Tel : 8484338, Fax : 8256868

Notes: (a) Under Section 29 of the Telecommunications Act 1999, any person who fails to give a 7-day notification to telecommunication system licensees prior to commencement of earthworks is liable on conviction to a fine not exceeding $100,000 or to imprisonment for a term not exceeding 3 years or to both.

(b) Under Section 49 of the same Act, any person, who in the course of carrying out earthworks, damages any cable of a telecommunication system licensee is liable on conviction to a fine not exceeding $1 million or to imprisonment for a term not exceeding 5 years or to both.

DON'Ts

1 Must not dig trial holes with JCB or excavator.

2 Must not carry out any excavation, soil investigation, piling or earthworks in the vicinity of telecommunication system licensees' cables without confirming the actual positions of telecommunication system licensees' plants.

3 Don't open any telecommunication system licensee's manhole and equipment box without prior approval by the licensee.

4 Don't cover up any telecommunication system licensee's manhole and equipment box with earth or building materials.

5 Don't fence up any telecommunication system licensee's manhole and equipment box inside your work area.

6 Don't grub up tree stumps without first severing the roots.

7 Don't take for granted that telecommunication system licensee's lines are in a straight run.

8 Don't cover up damages but report them immediately.

9 Don't dismantle any support for telecommunication system licensees' plants without informing them.

10 Don't remove any concrete encasement around a telecommunication system licensee' pipelines after exposing it unless approval from the telecommunication system licensee is given.

APPENDIX A.3

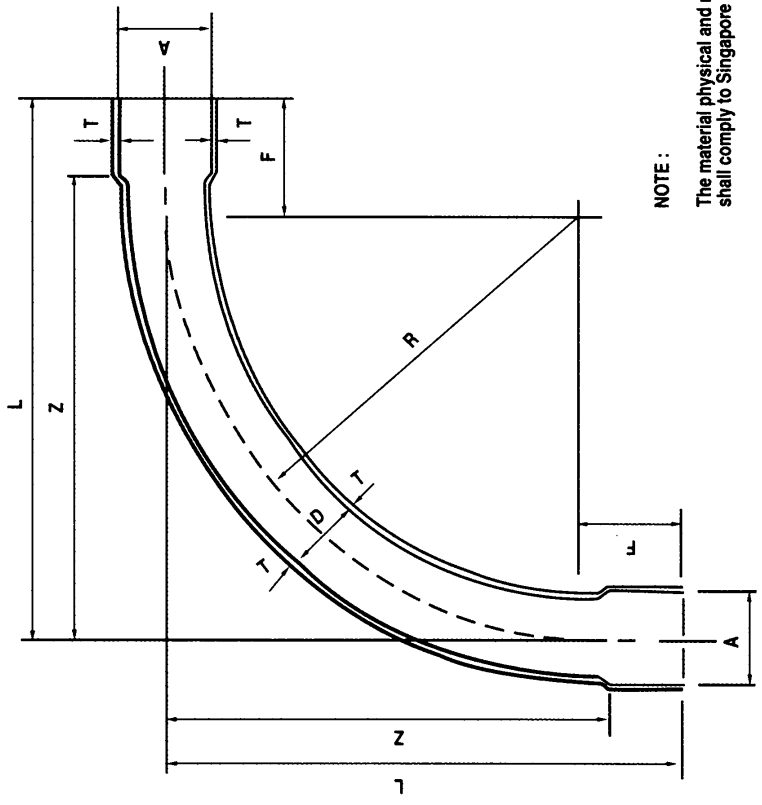
APPENDIX A.3 (A): 110 MM ∅ UPVC BEND PIPE

APPENDIX A.3 (B): 50MM ∅ UPVC BEND PIPE

APPENDIX A.3 (C): REDUCER FOR 110MM TO 50MM ∅ NOMINAL SIZE UPVC PIPE

APPENDIX A.3 (D): REDUCER FOR 50MM TO 25MM ∅ NOMINAL SIZE UPVC PIPE

APPENDIX A.3(A) 110MM DIAMETER UPVC BEND PIPE



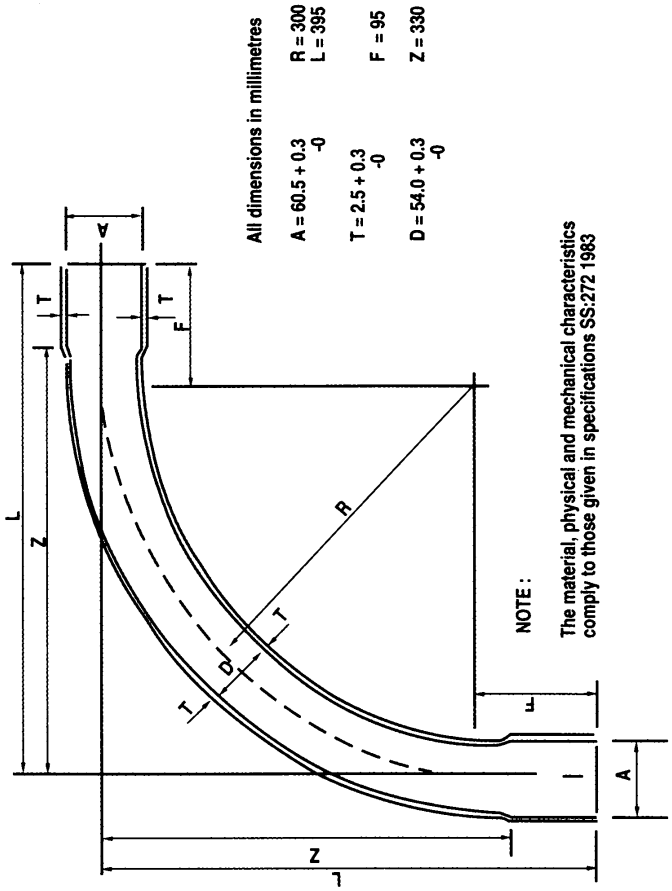
A	110.5 + 0.3 - 0
T	3.2 + 0.4 - 0
D	102.8 + 1.2 - 0
R	500
L	630
F	130
Z	540

All dimension in millimetres

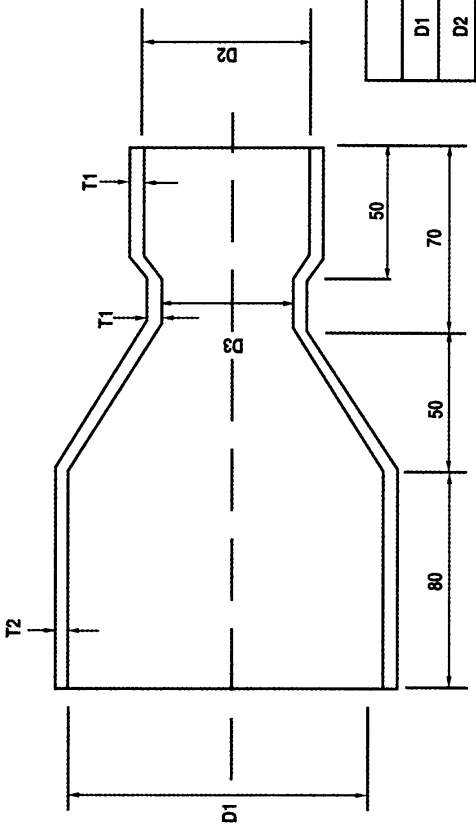
NOTE :

The material physical and mechanical characteristics shall comply to Singapore Standard SS:272

APPENDIX A.3 (B) 50MM DIAMETER UPVC BEND PIPE



Appendix A.3 (C) Reducer for 110mm To 50mm Diameter Nominal Size UPVC Bend Pipe



All dimensions in millimetres

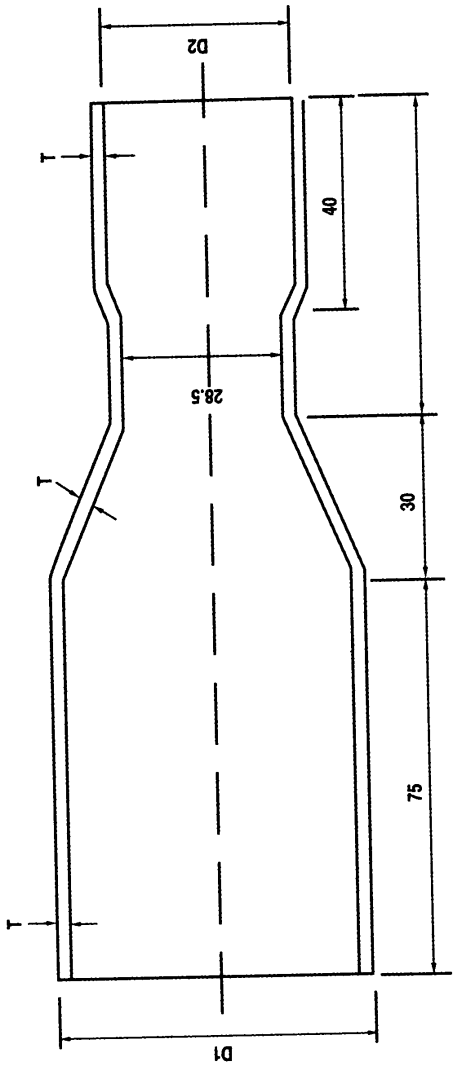
Scale : Full size

	MIN	MAX
D1	110.5	110.8
D2	60.6	60.9
D3	48.0	49.5
T1	5.4	6.1
T2	3.0	3.4

NOTE :

The materials, physical and mechanical characteristics shall comply to those given in specification SS:272 1983.

APPENDIX A.3 (D) REDUCER FOR 50MM TO 25MM DIAMETER NOMINAL SIZE UPVC PIPE (STOCK 134837Z)



	MIN	MAX
D1	60.2	60.5
D2	33.7	34.0
T	2.7	3.0

NOTE :

The materials, physical and mechanical characteristics shall comply to those given for 110mm Ø nominal size uPVC pipe in accordance to Singapore Standard SS:272 1983.

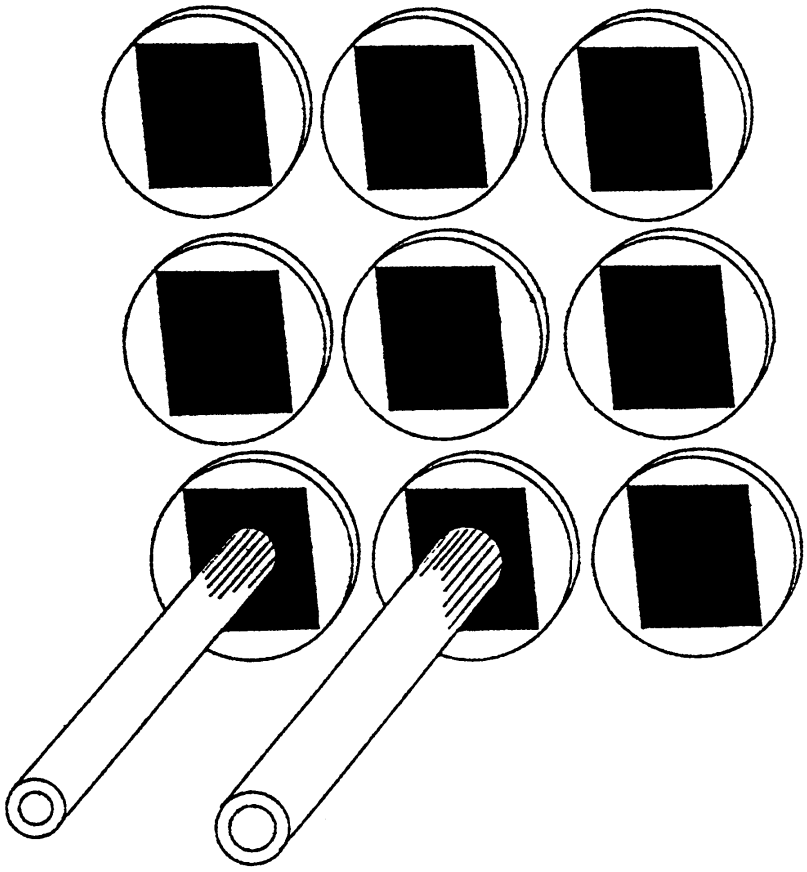
All dimensions in millimetres

APPENDIX A.4

APPENDIX A.4 (A): CABLE DUCT SEALING SYSTEM

APPENDIX A.4 (B): DUCT SEALING SYSTEM FOR HIGH-RISE BUILDINGS- INFORMATION TO BUILDERS

APPENDIX A.4(A) PICTORAL VIEW OF CABLE DUCT SEALING SYTEM



APPENDIX A.4 (B) DUCT SEALING SYSTEM FOR HIGHRISE BUILDINGS- INFORMATION TO BUILDERS

1 SYSTEMS USED

(a) MCT - Transit for round holes/pipes, type RGP-150, split type.

(b) SVT - Pyro-safe round fittings RDS-150, split type.

(c) ROX - Multi-diameter-modules with adaptable cores.

(d) BST – Multi cable transit, modular system.

2 SUPPLIERS

For MCT System: Czeta Pte Ltd, 50 Kian Teck Road, Singapore 628788, Tel: 264 0225.

For ROX System: Finessco Industries Pte Ltd, 75A Joo Koon Circle, Singapore 629095, Tel: 862 3200.

For BST System: Best Technology Pte Ltd, 37 Tannery Lane #03-06, Tannery House, Singapore 347790, Tel: 747 5688.

Note: The above list of companies dealing with duct sealing system is not exhaustive. IDA and PTLs/TSLs do not endorse the qualifications or services of these companies. Also, IDA and PTLs/TSLs are not in any way associated with these companies.

3 BUILDER'S RESPONSIBILITY

Builders shall ensure that no water leaks on the duct seal before handing over to PTLs/TSLs for maintenance. For unused-duct seal blocks, such assurance should extend up to a period of 12 months.

APPENDIX A.5

APPENDIX A.5 (A) TESTING AND ACCEPTANCE PROCEDURE FOR FACILITIES PROVIDED BY DEVELOPMENT/OWNER

APPENDIX A.5 (B) WOODEN MANDREL

APPENDIX A.5(A) TESTING AND ACCEPTANCE PROCEDURE FOR FACILITIES PROVIDED BY DEVELOPMENT/OWNER

Upon completion of pipelaying works, the developer/owner or its representatives shall make arrangements with PTLs/TSLs through the TFCC to have the pipe tested in accordance with the following procedures:

For 110mm diameter nominal size uPVC Pipe:

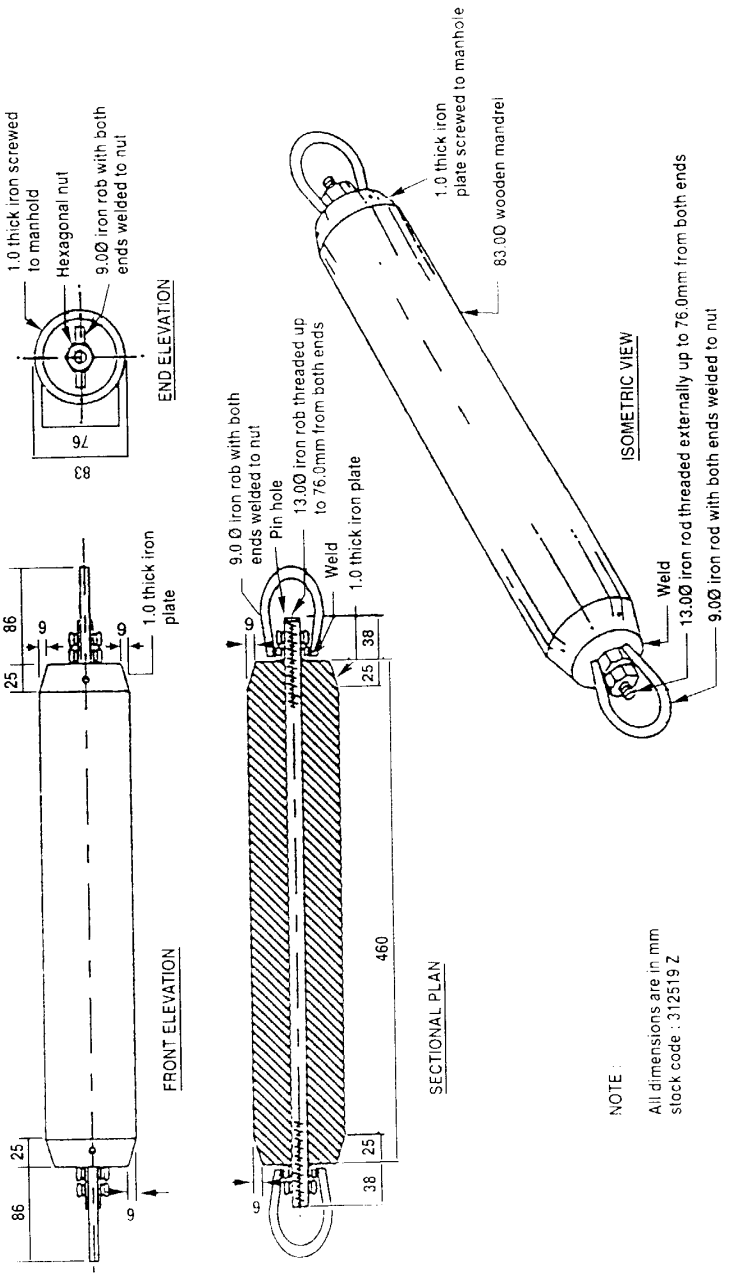
A brush of appropriate size shall be drawn through each pipe to remove any dirt which may have entered. A standard wooden test mandrel as shown in Appendix A.4(b) shall then be drawn through each pipe from both ends of the pipe.

For 25mm and 50mm diameter nominal size uPVC Pipes:

A two metre length of cable with diameter l5mm smaller than the internal diameter of the pipe shall be drawn through each pipe from both ends.

PTLs/TSLs will accept the pipes on the condition that the developer/owner maintains the pipes for a period of 1 year commencing from the date of acceptance.

APPENDIX A.5(B) WOODEN MANDREL



NOTE :

All dimensions are in mm
stock code : 312519 Z

APPENDIX A.6 PTL/TSL'S SPECIFICATIONS FOR 110 MM DIAMETER NOMINAL SIZE UNPLASTICISED PVC PIPE IN ACCORDANCE TO SINGAPORE STANDARD, SS:272 1983

1 SCOPE

1.1 This specification applies to unplasticised polyvinyl chloride (uPVC) pipe of 110mm nominal size for use as underground conduit for containing telecommunication cables.

1.2 Pipes shall comply with all requirements as specified in SS:272 unless otherwise specified.

2 MATERIAL

2.1 The material from which the pipes and couplings are produced shall comply with Clause 3 of SS:272.

3 COLOUR

3.1 Pipes and couplings shall be no darker than the grey colour 10/A07 as per British Standard 4800.

4 MANUFACTURING REQUIREMENTS

4.1 Pipe

4.1.1 General

The pipes shall be supplied in straight length of 6.0m within the tolerance of +50mm and -0mm as specified in Clause 7 of SS:272.

The pipe shall be supplied complete with one pipe one coupling.

4.1.2 Dimensions

Pipes shall conform to dimension given in Table 1 of SS:272 for nominal size 110mm.

4.2 Coupling

4.2.1 General

The coupling shall be manufactured by injection moulding method. Details for coupling are shown on Figure 1.

APPENDIX A.6 (Cont'd)

4.2.2 Dimensions

The dimensions of the coupling shall conform to the tolerance as follows:

Coupling Length	:	1 80.0mm ±2.0mm
Internal Diameter	:	At the edges : 110.5mm + 0.2mm - 0.0mm At the centre : 110.0mm + 0.0mm - 0.2mm
Wall Thickness	:	Average Value : 3.2mm + 0.4mm -0.0mm Individual Value : 3.0mm (min)

The wall thickness for a length of 15 mm from both ends of the coupling shall increase to:

Average Value	:	4.7mm + 0.3mm
Individual Value	:	4.2mm (min)

5 PROPERTIES

5.1 Pipes and couplings shall comply with all tests as specified in Clause 8.1 and 8.2 of SS:272.

6 SAMPLING

6.1 The manufacturer shall participate in the Certificate Marking Scheme operated by the Singapore Productivity & Standards Board (PSB). For manufacturers awarded a licence to use the PSB Mark on the product the frequency of product testing and factory inspection shall be governed by the terms and conditions as stipulated by PSB. For manufacturers who have not been awarded a PSB licence the frequency of sampling and testing by PSB shall be in accordance with Table 7 & 8 of SS:272. Satisfactory test reports issued by PSB shall form the basis of acceptance of the pipes and couplings by the /TSL. All fees for testing shall be borne by the manufacturer.

6.2 The PTL/TSL may, at any time, revise the frequency of tests and basis of acceptance as stated in 6.1 if there is evidence of deterioration of quality or unsatisfactory performance of the manufacturing quality control system. The manufacturer shall bear the cost of this additional testing.

6.3 Notwithstanding the requirements of 6.1 and 6.2, the PTL/TSL reserves the right to sample pipes and couplings delivered to PTL/TSL sites and stores and to reject the pipes and couplings if the quality is found to be not satisfactory.

7 MARKING

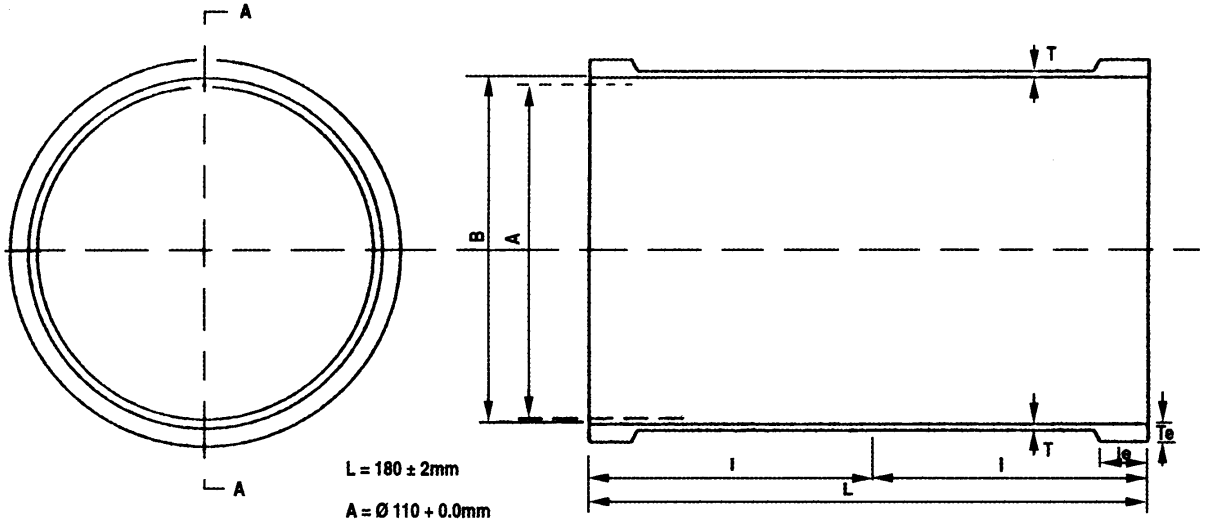
7.1 Each length of pipe shall be clearly, indelibly and continuously marked at intervals of not more that 1.0m using a distinctive colour. The marking shall read as follows:

Manufacturer's identification/PTL/TSL/110mm uPVC pipe/Day/Month/Year/SS272.

8 PACKING

8.1 The manufacturer shall ensure that the items shall be adequately packed and secured in such a manner as to withstand rough handling during transportation and to reach their destination in good condition. Any item found below standard or damaged owing to inadequate or improper packing shall be replaced by the manufacturer without any charge to the PTL/TSL immediately upon receipt of PTL/TSL's advice.

APPENDIX A.6 INJECTION MOULDED UPVC COUPLING FOR 110MM NOMINAL SIZE UPVC PIPE



ELEVATION

SECTION A-A
(Scale : not to scale)

L = 180 ± 2mm

A = Ø 110 + 0.0mm
- 0.2mm

B = Ø 110.5 + 0.2mm
- 0.0 mm

T = 3.2 + 0.4mm
- 0.0mm

Te = 4.7mm ± 0.3mm

I = 0.5L

Le = 15mm ± 2mm

NOTE :

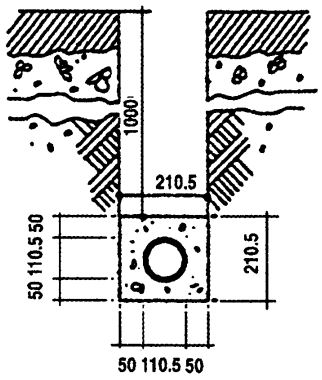
(1) The material, physical and mechanical characteristics shall comply to SS272:1983

(2) The uPVC coupling for 110mm uPVC pipe shall be gradually tapered from the centre towards the edges with dimensions shown in the drawing.

FIG. 1

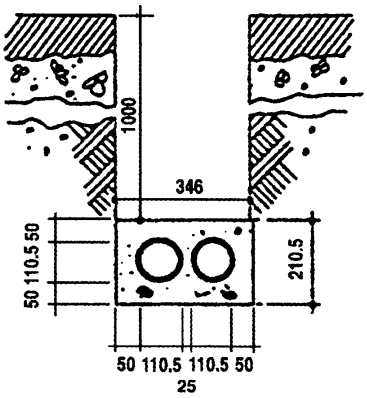
APPENDIX A.7 DRAWINGS OF MULTIWAY PIPELINES

APPENDIX A.7



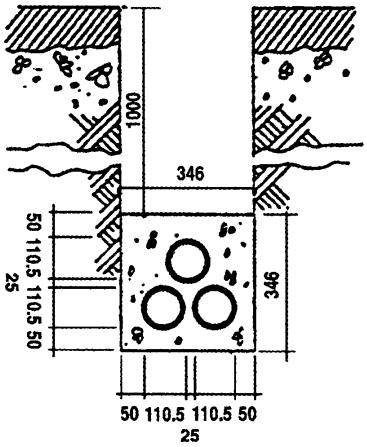
SECTION

1 way pipe formation
DRAWING NO 1



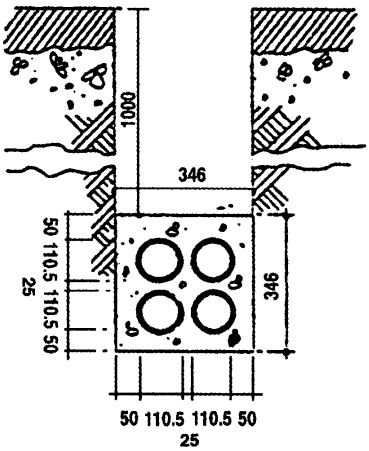
SECTION

2 way pipe formation
DRAWING NO 1a



SECTION

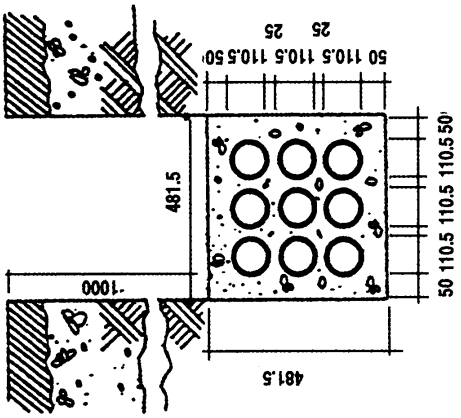
3 way pipe formation
DRAWING NO 1b



SECTION

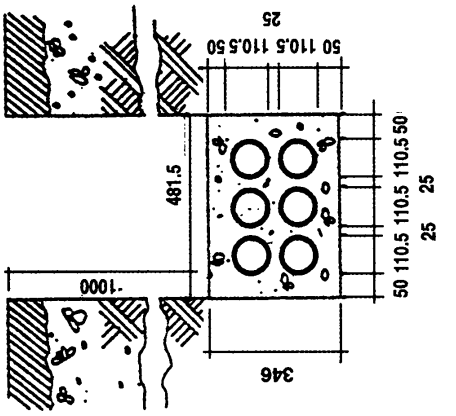
4 way pipe formation
DRAWING NO 1c

Appendix A.7 (Cont'd)



SECTION
9 way pipe formation

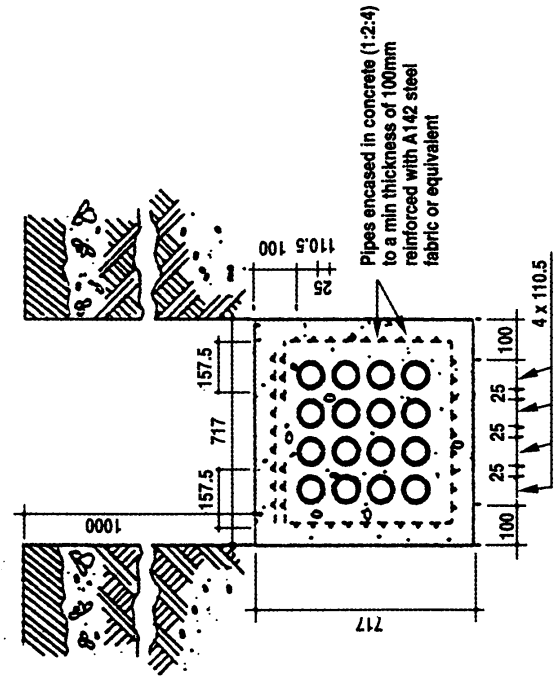
DRAWING NO 1e

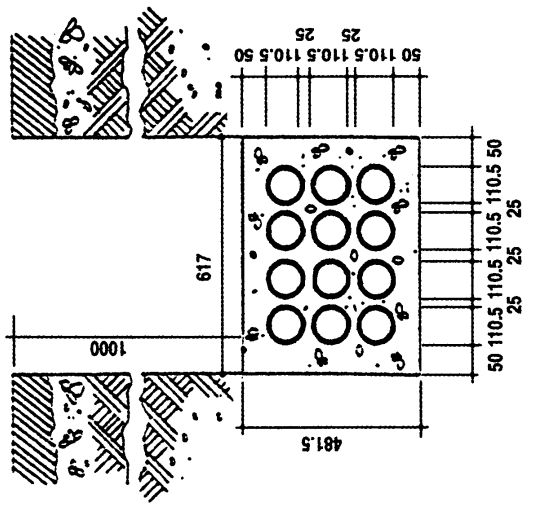


SECTION
6 way pipe formation

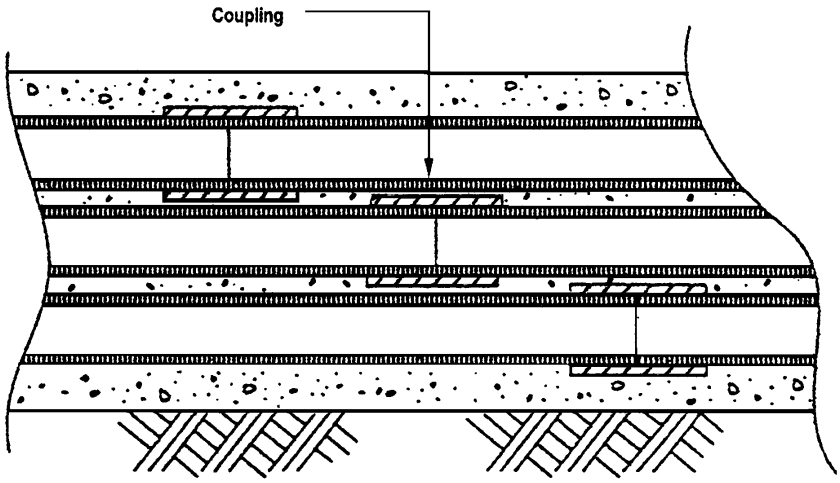
DRAWING NO 1d

Appendix A.7 (Cont'd)





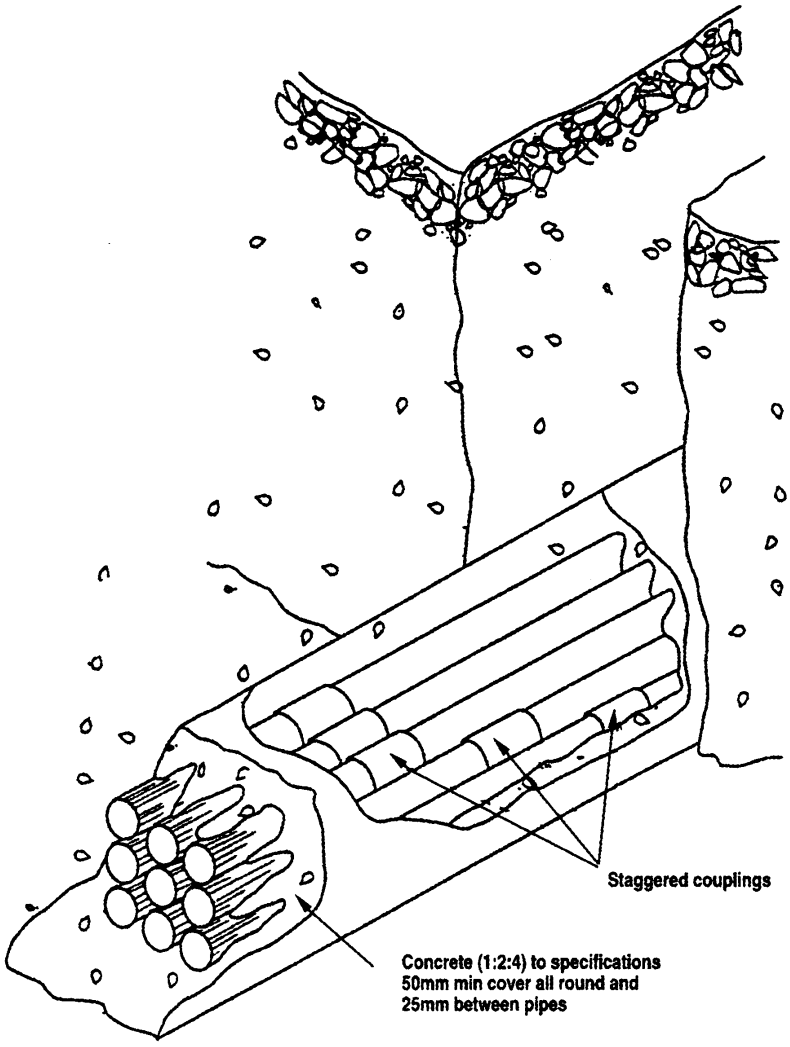
Appendix A.7 (Cont'd)



Detail showing staggered joints of
PVC applicable to all multiple ways

DRAWING NO 2

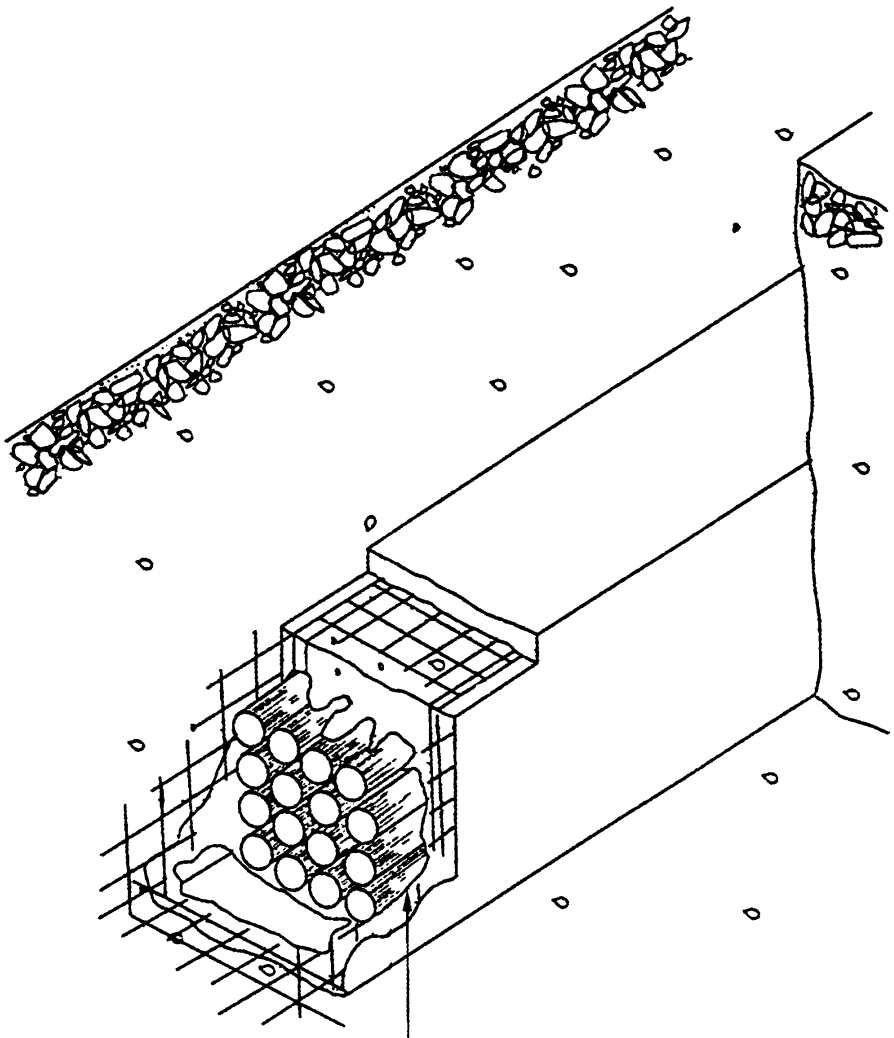
Appendix A.7 (Cont'd)



9 way pipe formation

DRAWING NO 3

Appendix A.7 (Cont'd)



NOTES :

1) 16 Way pipe formation

2) All pipe formation exceeding 16 ways

DRAWING NO 4

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APPENDIXA.8 SPECIFICATIONS OF CABLES AND SOCKETS

1 TELECOMMUNICATION CABLES AND ANCILLARY ACCESSORIES

Telecommunication cables and other wiring equipment to be used for telecommunication wiring work shall comply with the following specifications for telecommunication cables and ancillary accessories and other associated specifications to be designated by IDA from time to time.

(a)	IDA TS L1-1 : 1996	Specification for High Count PVC Cable
(b)	IDA TS L1-2 : 1996	Specification for Low Count PVC Cable
(c)	IDA TS L2-1 : 1994	Specification for 4-Way Modular On Wall Socket
(d)	IDA TS L3-1 : 1994	Specification for 2-Pair Block Terminal
(e)	IDA TS L3-2 : 1994	Specification for 4-Pair Block Terminal
(f)	IDA TS L3-3 : 1994	Specification for 5-Pair Block Terminal

2 CABLE SPECIFICATIONS

Types of cables	Outside Diameter of Cable (mm)	Cross Sectional Area of Cable (mm^2)	Specifications
4-wire	3.5	9.63	IDA TS L1-2 : 1996
6-wire	5.3	22.07	
8-wire	5.8	26.43	
10-wire	6.5	33.20	
10-pair	8.3	54.13	IDA TS L1-1 : 1996
20-pair	10.7	90.00	
40-pair	14.2	158.43	
80-pair	21.8	373.40	
100-pair	22.6	401.31	

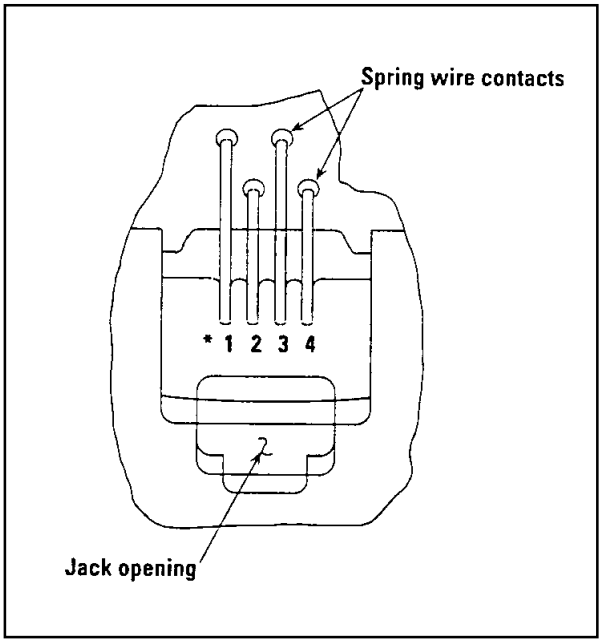
Wire Gauge = 24 AWG (or 0.5 mm diameter)
Conductor = Solid tinned copper
Wire insulation = PVC Compound Type 2 of BS6746
Cable Sheath = PVC Compound Type TM1 of BS6746

3 SPECIFICATION OF SOCKETS

Type	Dimension	Specifications
On-Wall Socket	65 mm x 65 mm	IDA TS L2-1 :1994
In-Wall Socket	86 mm x 86 mm	IDA TS L2-1:1994

Modular jack of socket : RJ type in accordance with FCC (Federal Communication Commission) specifications Part 68 Sub-part F.

Colour Designation for Contacts and Terminals :



* Contact No.	Colour	Designation
1	Black (BK)	Earth
2	Red (RD)	L2
3	Green (GN)	L1
4	Yellow (YL)	Spare

Colour Designation For Contacts & Terminals of Socket

APPENDIX A.9 GUIDELINES TO BUILDING DEVELOPERS OR OWNERS ON INSTALLATION OF BROADBAND ENABLING OPTICAL FIBRE CABLES IN BUILDINGS

1. Building developers or owners (as the case may be), who would like to provide their own broadband enabling optical fibre cables, are required to comply with the prevailing regulatory requirements which have been implemented by IDA for the info-communications industry.

2. Building developers or owners (as the case may be) may engage wiring contractors, who are licensed by IDA, to install broadband enabling cables in their buildings. They may also make commercial arrangement with a telecommunication licensee to install broadband enabling cabling in their buildings.

3. However, in multi-tenanted buildings, occupiers have the choices of getting any telecommunication licensee to provide broadband services. An occupier may lease the broadband enabling cables provided by the building developer or owner (as the case may be) based on commercial arrangements, or may use the cables provided by a telecommunication licensee. IDA will allow a telecommunication licensee to provide cables to the building to serve the occupier should the latter require the use of such cables.

4. Building developers or owners (as the case may be) are required to follow the IDA's Code of Practice for Info-communications Facilities in Buildings (COPIF) when planning or installing their own broadband enabling optical fibre cables. They may install their cables in a separate communication riser duct. In the absence of any communication riser duct, approval from IDA is to be sought for using the telecom riser ducts which are designated for the public telecommunication licensees' use. IDA will accede to the requests from building developers or owners (as the case may be) to use telecom riser ducts where there is enough space for all users to share.

5. Where telecom riser ducts are congested with cables, building developers or owners (as the case may be) may arrange for their contractors to remove those unused cables which are left over by their former tenants so that there will be enough space for new cables to be laid.

APPENDIX A.10 TERMINOLOGY USED IN TELECOMMUNICATION FACILITIES

1 BLOCK TERMINAL (BT)

An object consisting of a series of electrically separated metallic points on which cables and wires are terminated, the capacity and shape of which vary.

2 CABLE TRAY/CABLE LADDER

A flat metallic surface for horizontal or vertical anchoring of cables.

3 CONDUIT

uPVC pipe used for accommodation of telecommunication cables and wires to protect against physical damage.

4 DISTRIBUTION CASE (DISCASE)

A rectangular wooden, PVC or metallic box or case which a series of termination strips are fixed for cable termination and cross-connection purposes.

5 DISTRIBUTION PLAN

A drawing showing the distribution cable network and routing within a building or between a related group of buildings.

6 DISTRIBUTION POINT

The point where local cables from the MDF are terminated.

7 DUCT/TRUNKING

An enclosed space of metallic or non-metallic construction provided for the installation and concealment of telecommunication cables and wires. This expression includes the space provided in the wall and in the skirting of walls and partitions.

8 FINAL DISTRIBUTION POINT

The final point where the local cable terminates.

9 INTERMEDIATE DISTRIBUTION FRAME (IDF)

A metallic frame used for the termination of local cables within the building.

10 INTERNAL WIRES

Wiring which is run from interface point to the actual terminal equipment e.g. telephone.

11 JUNCTION BOX/OUTLET

An opening with a removable cover to provide access to the concealed ducts/conduits.

12 KTS

Key Telephone System.

13 LEAD-IN PIPE

Ducts linking PTLS/TSLS existing/proposed underground pipes to the building.

14 LOCAL CABLES

Cabling run between the MDF and distribution point (DP), IDF or FDP.

15 MAIN CABLES

Cables provided by PTLs/TSLs which link the building to a telephone exchange and terminate onto the MDF.

16 MAIN DISTRIBUTION FRAME (MDF)

The metallic frame on which the incoming main cables and the local cables are terminated. It is the main distribution point for all cables within the building or related group of buildings.

17 MDF ROOM

The room housing the MDF.

18 MANHOLE

An underground chamber for facilitating cable pulling and jointing purposes.

19 MLS

Multi-Line System.

20 PABX

Private Automatic Branch Exchange.

21 RISER DUCT

Compartment for running local cables vertically to individual floor of the building.

22 TER

Telecommunication Equipment room for housing multiplexing equipment.

APPENDICES B.1 TO B.8: APPENDIXES RELATED TO BROADBAND COAXIAL CABLE SYSTEM

APPENDIX B.1: DEFINITIONS OF TERMS

APPENDIX B.2: EQUIPMENT SPECIFICATIONS

APPENDIX B.3: COMMISSIONING OF TEST PROCEDURES

APPENDIX B.4: METHODS OF MEASUREMENTS

APPENDIX B.5: TYPICAL BCS RISER SCHEMATIC FOR A HIGH-RISE BUILDING

APPENDIX B.6: DESCRIPTION OF SOME STANDARDS DEVELOPED BY THE SCTE

APPENDIX B.7: ANTENNA AND INSTALLATION (NON-MANDATORY FOR BCS SYSTEM)

APPENDIX B.8 FLOW CHART FOR BCS COMPLIANCE PROCEDURES (AN OVERVIEW)

APPENDIX B.1 DEFINITION OF TERMS

Reference may be made to Figure 1.

Broadband Coaxial Cable System (BCS)

A wide-area, wired (cabled) system of coaxial, interconnecting a large number of outlets installed in the buildings. The system include upstream bandwidth for broadband interactive services such as cable-modem high-speed Internet access service, in addition to conventional CATV network for subscriber CATV services.

Head End

Facility with equipment that are connected between receiving antennae or other signal sources and the remainder of the cabled distribution system to process the signals to be distributed.

Note: The head end may, example, comprise antennae amplifiers, frequency converters, combiners, separators and generators.

Local Head End

The transmission facility that is directly connected to the trunk feeders or to a short haul "trunk feeder replacement" link.

Hub Head End

A subsidiary head end usually located at the center of its service area, with inputs from a local head end, and possibly other sources.

Remote Head End

A head end from which signals are delivered to a local head end via a long-distance terrestrial or satellite link.

Distribution Point

The point where signal from the trunk feeder that energises the branches and/or spur feeders.

Note: In some cases a distribution point may be directly connected to the head end.

Feeder
A transmission path forming part of a cabled distribution system. Such a path may consist of a metallic cable, optic fibre, wave-guide, or any combination of them. By extension, the term is also applied to paths containing one or more radio links.

Supertrunk feeder

A feeder which only connects between head ends or between a head end and the first distribution point.

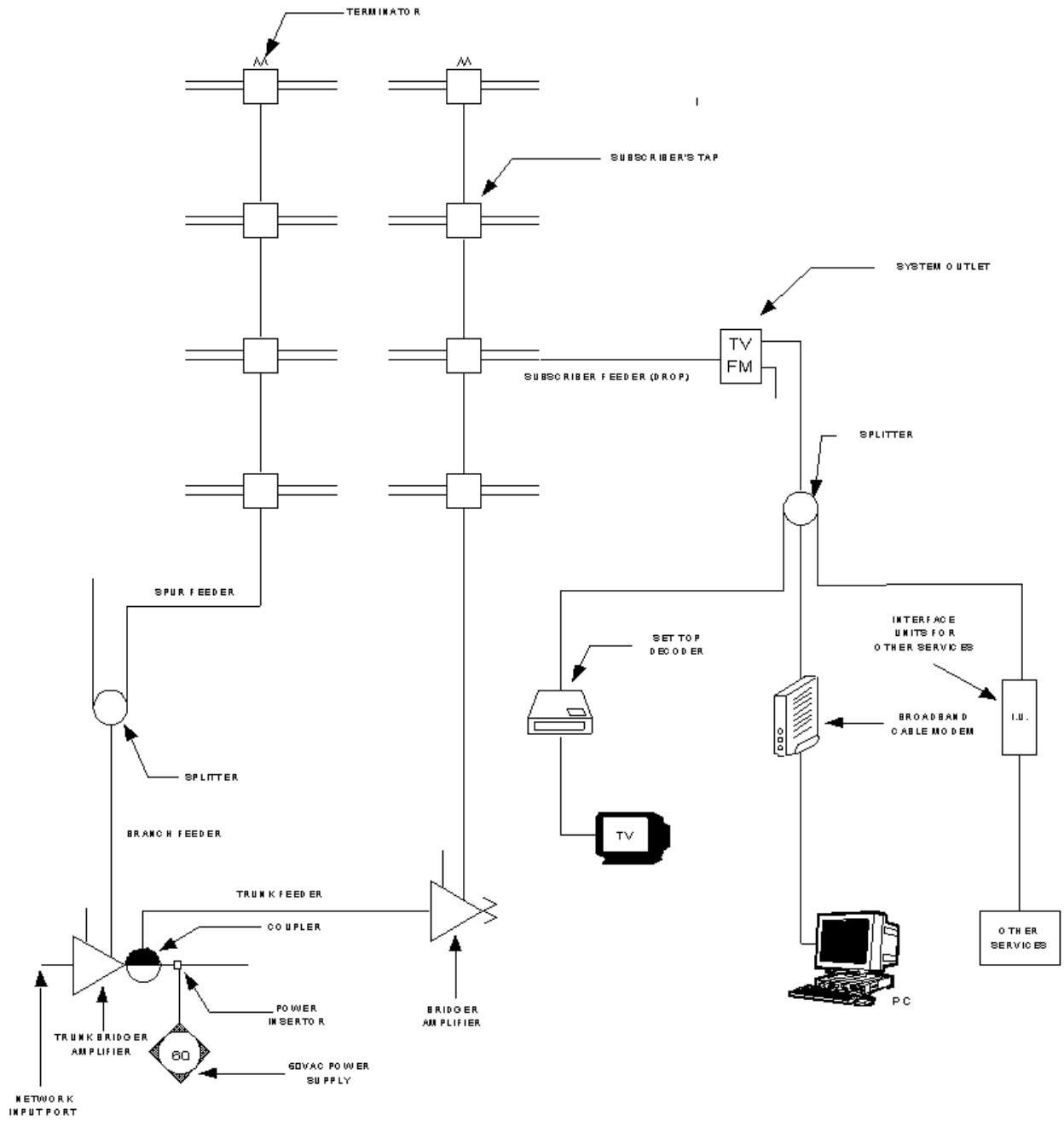


Figure 1: Principal items of equipment employed in a BCS system

Trunk feeder

A feeder used for the transmission of signals between a head end and a distribution point or between distribution points.

Branch feeder

A feeder used for connecting a distribution point to spur feeders.

Spur feeder

A feeder to which subscribers' taps are connected.

Subscriber's feeder

A feeder connecting a subscriber's tap to a system outlet or where the latter is not used, directly to the subscriber's apparatus, in which case it may include filters and transformers.

Distribution System Equipment

Antenna Amplifier

An amplifier (often a low noise type) associated with an antenna.

Trunk Amplifier

An amplifier to compensate for attenuation in a trunk feeder.

Bridger Amplifier

An amplifier for connection in a trunk feeder to provide a distribution point.
An amplifier for connection in a branch feeder, to energise one or more branch or spur feeders.

Trunk Bridger Amplifier

An amplifier to compensate for attenuation in a trunk feeder and also to provide a distribution point.

Distribution Amplifier

An amplifier designed to feed one or more branch or a spur feeders.

Branch Amplifier

An amplifier to compensate for attenuation in a branch feeder.

Automatic Level Controlled Amplifier

An amplifier that includes means to control automatically the level of the signal(s) at its output.

Note: This may be achieved using variation of gain or slope or both by means of:
one or more pilot carriers; a temperature sensing device; remote control.

Frequency Converter

A device for changing the carrier frequency of one or more signals prior to transmission on a feeder.

Combiner

A device in which the signals arriving at two or more input ports are fed to a single output port.

Note: Some forms of this device may be used in the reverse direction as a splitter.

Separator (multiplexer)

A device in which the signal energy at one (input) port which covers a frequency band is divided between two or more (output) ports each of which covers a part of that frequency band.

Note 1: For example, a diplexer is a two-output separator.

Note 2: Some forms of this device may be used in the reverse direction for combining signal energy.

Splitter (Spur Unit)

A device in which the signal energy at the (input) port is divided equally or unequally between two or more (output) ports.

Note: Some forms of this device may be used in the reverse direction for combining signal energy.

Directional Coupler

A splitter in which the attenuation between any two output ports exceeds the sum of all the attenuation between the input port and each of these output ports.

Equaliser

A device designed to compensate over a certain frequency range the amplitude/frequency distortion or the phase/frequency distortion introduced by feeders or equipment.

Note: This device is for the compensation of linear distortions only.

Subscriber's Tap

A device for connecting a subscriber's feeder to a spur feeder.

Subscriber-Related Equipment

Channel Selector

A device incorporated in the system for selecting the desired channel, often at the subscriber's premises.

System Outlet

A device for interconnecting a subscriber's feeder and a receiver lead.

Distribution Panel

A device through which the spur feeder passes and which contains one or more passive electrical devices (taps/tee or splitters) used to distribute MATV or CATV signals to system outlets.

Receiver Lead

A lead which connects the system outlet to the subscriber's apparatus.

Note: It may include filters and balun transformers in addition to the cable.

Signal Adaptor

In a cabled distribution system which distributes television signals not conforming to any CCIR system (only in respect of r.f. structure) a device which modifies the signal to achieve conformity with the appropriate CCIR system, without changing the baseband characteristics.

Cabled System Receiver

A television or sound receiver specifically designed to operate from a cabled distribution system.

Set Top Converter

A device connected in a receiver lead, to change the system carrier frequencies to those for which the receiver was designed.

Characteristics of the Signal

Decibel Ratio

The decibel ratio of two quantities of power P_1 and P_2 is defined by :

$$10\log_{10}\frac{P_1}{P_2}(dB)$$

Standard Reference Power (P_0).

In cabled systems the standard reference power is 1/75 pW.

Note: This is the power dissipated in a 75 ohm resistor with a voltage drop of 1uV r.m.s across it.

Level

The level of any power (P_1) is the decibels ratio of that power to the standard reference power (P_0) i.e.

$$10\log_{10}\frac{P_1}{P_0}(dB)$$

This may be expressed in decibels (relative to 1uV in 75 ohm) or more simply in dB (μV) if there is no risk of ambiguity.

Note: By "power" in relation to a vision-modulated carrier is meant power at the peak of the modulation envelope (i.e. the maximum r.m.s. voltage squared and divided by the resistance).

Attenuation

The attenuation of any system is the decibel ratio of the input power of the output power.

Gain

Gain of any system is the decibel ratio of the output power to the input power.

Automatic Gain Control

The automatic control of a device to maintain constant the level of the signal at its output, without using the amplitude of the sync pulse of the signal to be controlled as the control stimulus.

Automatic Level Controlled Amplifier

An amplifier which includes means to control automatically the level of the signal(s) at its output but excludes the use of the amplitude of the synchronising pulses of the received television signals for such control purpose.

Frequency Response

The gain or loss of a system plotted against frequency.

Slope

Between any two points in a system, the difference in gain or attenuation at two specified frequencies.

Signal Tilt

The difference in level deliberately established between specified signals or groups of signals at any point in a system.

Performance Characteristics

Crossview

In a multi-pair system, the effect on a wanted television signal of the undesired transfer of one or more television signal(s) from other circuit(s).

Cross-modulation

The undesired modulation of the carrier of a desired signal by the modulation of another signal as a result of system non-linearities.

Inter-modulation

The process whereby non-linearity in equipment in a system produced spurious output signals (called inter-modulation products) at frequencies which are linear combinations of those of the input signals.

Carrier to inter-modulation ratio

The difference in decibels between the carrier level at a specified point in a system and the level of a specified inter-modulation product or combination of products.

Carrier to noise ratio

The difference in decibels between the vision or sound carrier level at a given point in the system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use).

Mutual Isolation

The attenuation between one system outlet to that of another at any frequency within the range of the system under investigation. It is always specified, for any particular installation, as the minimum value obtained within specified frequency limits.

Reflections or echoes

These are visible as multiple images to the right of the displayed picture. They become more visible the more they are separated from the picture and no single
figure can be given for the admissible maximum level of the unwanted reflected signal. (Please refer to CP39:1994 Appendix C)

Echo rating

The "echo rating", E, is defined as the result of a system test with a 2T sine-squared pulse (as determined in CCIR Recommendations 473 and 567) by the boundary line on a specified graticule (e.g. Figure 4) within which all parts of the received pulse fall. (Please refer to CP39:1994 Appendix D)

Note: The object of the gratitude design is to ensure that the subjective effect of an echo of rating E% is the same as that of a single echo, with displacement greater than 12T, of E/2 %, relative to the peak amplitude of the test pulse.

VSWR

Voltage Standing Wave Ratio is the ratio of the maximum voltage along the transmission line to the minimum voltage along the transmission line. It is also the ratio of the impedance of the load to the characteristic impedance of the transmission line. It is a measure of mismatch between the transmission line and the load and is equal to one when perfectly matched.

Front-to-back ratio

The ratio of the original strength received by the antenna when it is pointing to the signal source against that received when the antenna is reversed (rotated) by 180^{o}.

Miscellaneous

Well-matched

A test set up is said to be "well-matched" when the port or ports facing the equipment under test have a return loss ratio of at least 20dB relative to the system impedance.

Bonding

Bonding is the safety connection of circuits to the main supply earth (ground) or to other electrically grounded metallic installations, or in the case of outdoor equipment, the connection to the surrounding earth (ground).

APPENDIX B.2 EQUIPMENT SPECIFICATIONS

The detailed performance specification of each component part to be installed in a CATV system shall be selected to attain the overall system performance specification and requirements.

1. Minimum Requirement of Amplifiers

The amplifiers shall meet the minimum specifications set out hereunder:

1.1 The amplifier designs shall be based on parallel hybrid device (PHD) integrated circuits.

1.2 The distribution amplifiers that are to be cascaded, shall be operated with moderated trunk output levels in order to reduce the effects of accumulated distortions.

1.3 Carrier-to-composite triple beat at operating output levels of 50dBmV and 39dBmV output at 824 and 54 MHz respectively, 60 channel loading, shall be greater than 62 dB.

1.4 The carrier-to-composite (second order) at operating output levels of 50dBmV and 39dBmV at 824 and 54 MHz respectively, 60 channel loading, shall be greater than 60 dB.

1.5 The minimum performance characteristics of the high gain amplifier shall be as follows :
(a) Noise figure with equaliser; less or equal to 10 dB
(b) Flatness in unity gain configuration : ± 1 dB
(c) Forward bandwidth (downstream) : 54-824 MHz

1.6 Amplifier housings, shall be equipped with suitable means to prevent RF ingress and egress. When the cover is securely fastened, the housing shall have RF shielding effectiveness in excess of 80 dB when measured using the Dipole Antennae procedure, or in excess of 70 dB when measured using the Absorbing Clamp Method. The housing shall be of water tight construction, sealed with moisture blocking gaskets.

1.7 Amplifiers shall provide for the use of appropriate equalisers (input and/or interstage), and shall contain diplex filters providing sufficient isolation to avoid interaction between forward and reverse transmission.

1.8 Initial system configuration will accommodate broadband 54–824 transmission for the MATV operations and 5 – 42 MHz upstream transmissions for CATV operations.

1.9 Amplifiers shall not require AGC, however, it is desirable to have the option of installing an AGC circuit on the initial amplifier in any network leg. This would compensate for any level variation that may be introduced from the future CATV system.

2. Minimum Requirements Of Passive Devices : Taps/Tees, Splitters And Wall Outlets

2.1 Splitters and bi-directional couplers may be either separately installed or combined in convenient groups to form multi-taps for use as distribution panels.

2.2 In order to minimise signal leakage (egress) from the installation, the screening effectiveness of splitters, bi-directional couplers and multi-tap combinations shall be either

greater than 80 dB when measured using the Dipole Antennae Procedure, or greater than 70 dB when measured using the Absorbing Clamp Method.

2.3 The frequency response of all passive devices, including taps/tees, splitters, couplers and power inserters will be minimally 5 – 824 MHz.

2.4 To minimise signal reflections, devices that do not present a constant impedance match to the distribution cables should not be used. The return loss over the total frequency band shall be better than 12 dB.

2.5 System outlets located at spare TV points or in areas shall have all ports terminated when not in use. This may be accomplished by use of self-terminating wall plates. These devices activate an internal termination when the receiver lead is removed. However, the use of self-terminating wall plates may not be necessary if the taps used in a terminated branch feeder have good tap-to-tap or tap-to-output protection and the performance of the network is not affected even if a TV wall outlet is not connected.

2.6 Wall outlet boxes and plates shall be fabricated from non-corrosive material or from metallic material treated to resist corrosion.

3. Minimum Requirements Of Connectors And Splices

3.1 Connectors for subscriber feeder cables shall be F type, with long (12-19mm) attached ferrule. The connectors will utilise a compression sealed plastic ferrule bushing within the ferrule and a neoprene rubber gasket within the rotational joint in order to keep out moisture. In addition, it is recommended to seal the front end of the F type connectors with neoprene rubber boots which fit over the female F port and are compressed by the front face of the F type connector. Other connectors with similar characteristics and in every respect not less effective than that of the F type connectors may also be used.

3.2 Bulkhead fittings, cable connectors and splice barrels shall be compatible with each other and the coaxial cable used. This is particularly critical with respect to the diameter of the centre conductor and the clutch in the female fitting.

3.3 Suitable connectors and splices for solid sheath cables shall be used. Connectors will utilise a fixed sleeve with two separate ferrules to seize the other conductor and jacket of the cable independently. Connectors must be specifically designed for use with the coaxial cables types to be used.

3.4 Main distribution cables require the use of pin type connectors. Feed-through types are unacceptable. Connector return loss specifications shall equal or exceed 30 dB from 47 – 824 MHz. F type connectors are not allowed on the main distribution cables.

3.5 Adapters between F connectors and housings or other devices shall be designed for use with each other and the coaxial cables used.

3.6 All connectors shall be installed and protected with properly applied shrink tubing in order to minimise corrosion or oxidation of cables and connectors.

3.7 All types of RF connectors, regardless of application, shall be mechanically, electrically and metallurgical suitable for use with the types of conductors used on various cables.

APPENDIX B.3 COMMISIONING OF TEST PROCEDURES

1. Upon the completion of the installation work, a thorough physical inspection should be carried out to determine that all necessary equipment is in place, and property installed. Each device, connector and cable of poor workmanship should be replaced as it would lead to signal ingress or egress if it is left unattended.

2. For a multi-storey building, a sample test shall be conducted for every storey and riser in the building. Tests shall be completed by making measurements on all vertical cable risers on all storeys. Signals shall be measured at the distribution panels. Test will be for continuity and proper levels. Not less than three visual carriers, spread across the band, should be tested. For a multi-storey building, a sample test shall be conducted for every storey in the building. This test shall involve outlets in at least two units in the same storey. Tests shall be completed by making measurements on all vertical cable risers on all storeys. Signals shall be measured at the distribution panels. On each storey, signal levels shall be measured at two system outlet locations, one representing the longest subscriber feeder and another representing the shortest subscriber feeder. Test will be for continuity and proper levels. Not less than four visual carriers, spread across the band, should be tested with CW signals at the input port at proper levels.

3. For a private residential house, a sample test shall be conducted by making measurements at the distribution panel in the pedestal box outside the house. Test will be for continuity and proper levels. Not less than three visual carriers, spread across the band, should be tested. Another physical inspection may be carried out after all the tests are completed. In order to minimise disturbance to residents, power levels may be measured at the distribution panel and interpolated for signal level within the residence.

APPENDIX B.4 METHODS OF MEASUREMENTS

General

The basic methods of measurements shall be conducted in accordance with the recommendations both IEC 728-1 and National Cable Television Association (NCTA). Any equivalent method that ensures the same accuracy may by used for assessing performance.

The following measurements are considered:

(a) Measurement of mutual isolation between system outlets;

(b) Measurement of Hum;

(c) Measurement of amplitude/frequency response within a channel;

(d) Measurement of Visual, Aural Carrier Centre Frequency;

(e) Measurement of inter-modulation;

(f) Measurement of Visual Carrier to Noise Ratio;

(g) Measurement of Chrominance – Luminance delay Inequality

(h) Measurement of differential gain and phase;

(i) Measurement of Signal Leakage.

1. Measurement of Mutual Isolation between System Outlets

1.1 References to system outlets shall also apply to the far ends of subscribers' feeders when no system outlets are used.

Isolation shall be measured between:

(a) system outlets connected to adjacent subscriber's taps;

(b) System outlets connected to the same multiple subscriber's taps.

1.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of IEC 728-1.

2. Measurement of Hum

2.1 Modulation distortion at power frequencies ("Hum") is the amplitude distortion of the desired signals caused by the modulation of these signals with components of the power source.

2.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(10) and NTCA Recommended Practices – Second Edition 1993.

3. Measurement of Frequency Response within A Channel

3.1 Frequency response is a measure of the overall gain variation of a cable system as a function of frequency. It is normally measured in dB peak to peak (sometimes called peak-to-valley) or as ± dB (half the peak-to-peak value).

3.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(6) and NTCA Recommended Practices – Second Edition 1993.

4 Measurement of Visual, Aural Carrier Centre Frequency

4.1 Vision carrier level in a cable television system is the rms voltage of a channel's visual (picture) carrier measured across a termination impedance which match the internal impedance of the cable system. Aural carrier level in a cable television system is the rms voltage of a channel's aural (sound) carrier measured across a termination impedance which match the internal impedance of the cable system, generally expressed with reference to the channel's associated visual carrier level.

4.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(4) and NTCA Recommended Practices – Second Edition 1993.

5 Measurement of Inter-modulation

5.1 The method is applicable to measurements of single inter-modulation products, second-order inter-modulation products and third-order inter-modulation products.

5.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of IEC 728-1 Clause 9 and NTCA Recommended Practices – Second Edition 1993.

6 Measurement of Visual Carrier To Noise Ratio

6.1 Vision carrier to noise ratio is the power in a sinusoidal signal, whose peak is equal to the peak of a visual carrier during the transmission of synchronising pulse, divided by the associated system noise power in the 5 megahertz bandwidth. This ratio is expressed in dB.

6.3 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(7) and NTCA Recommended Practices – Second Edition 1993.

7. Measurement of Chrominance – Luminance Delay Inequality

7.1 The Chrominance – Luminance delay inequality caused by a headend system or component is defined as the change in delay time of the chrominance component of the signal relative to the luminance component after passing through the system. The parameter is also called Chroma Delay.

7.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(11)(i) and NTCA Recommended Practices – Second Edition 1993.

8. Measurement of Differential Gain and Phase

8.1 The methods are applicable to the measurement of differential gain and differential phase for complete systems and items of equipment thereof.

8.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(11)(ii)(iii) and NTCA Recommended Practices – Second Edition 1993.

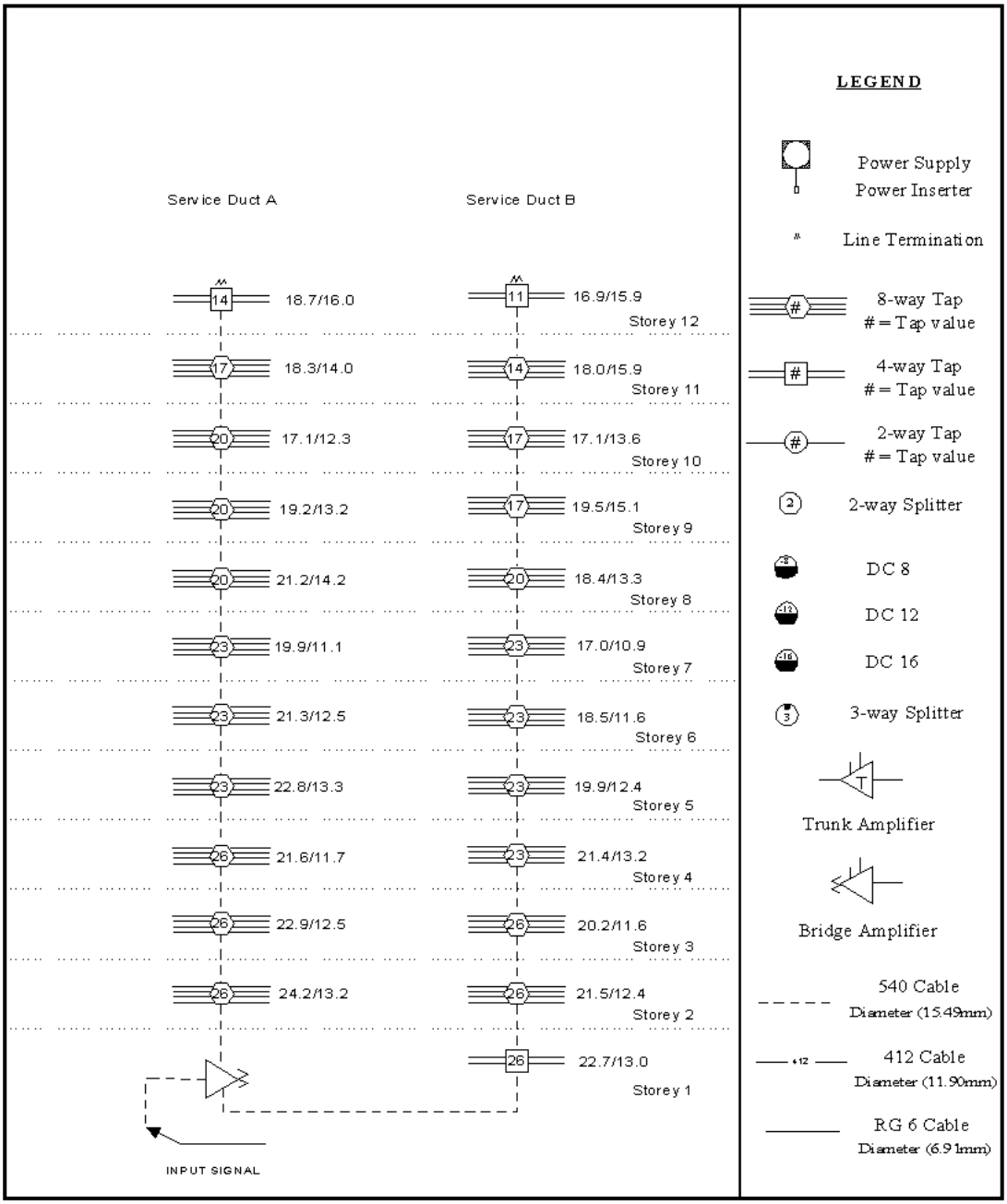
9. Measurement of Signal Leakage

9.1 The term “leakage” refers to the undesired emanation of electromagnetic energy from the cable television system.

9.2 Equipment required for the test set-up shall be provided and the measurement shall be conducted in accordance with the recommendations of FCC 76.605(a)(12) and NTCA Recommended Practices – Second Edition 1993.

APPENDIX B.5

TYPICAL BCS RISER SCHEMATIC FOR A HIGH-RISE BUILDING



APPENDIX B.6 DESCRIPTION OF SOME STANDARDS DEVELOPMENT BY THE SCTE

The Society of Cable Telecommunications Engineers Inc (SCTE) is an accredited Standards Developing Organization of the American National Standards Institute (ANSI) in the specialized area of broadband cable engineering. The following are the outline of the some related standards available at the point of developing this document. For further details, please refer to the official publications from SCTE.

Interface Practices & In-Home Cabling Drop Specifications

IPS-SP-001 Flexible RF Coaxial Drop Cable–This specification is intended to apply to general purpose flexible RF coaxial drop cable and not specialty cables. There are numerous reasons to standardize drop cable, but the primary reason is for proper cable to "F" fitting interface.

IPS-SP-200 On Premises Bonding and Safety Specification–Electrical bonding refers to the methods and devices used to control or reduce voltages and currents imposed on the cable plant from foreign sources such as lightning and commercial AC power faults. The primary purpose of electrical bonding is to prevent damage to subscriber equipment and to prevent shock and injury to those involved in its construction, operation, and maintenance. The purpose of this practice is to stress the importance of providing a low resistance path to ground for both lightning and power protection.

IPS-SP-202 Drop Amplifiers–The purpose of this specification is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to amplify signals presented to an input port and deliver the amplified signals to one or more output ports. The devices are also required to pass signals in a different range of frequencies in the reverse direction and, optionally, may provide amplifications of such reverse signals. The specification's scope is limited to 75 ohm devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Devices covered by this specification include products commonly known as the Drop Amplifiers. They may be mounted with NID housing on dwellings or independently within dwellings.

IPS-SP-206 Drop Passives: Splitters and Couplers–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to split signals presented to an input port among two or more output ports with a splitting ratio that is nominally independent of frequency. Alternatively, such devices can be used to combine signals from several input ports into a common output port. Its scope is limited to 75 ohm devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Products covered by this specification include signal splitters (2,3,4 and 8-way) and directional couplers.

IPS-SP-207 Drop Passives: Antenna Selector Switches–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to allow signals presented to an input port to be routed selectively to one of two or more output ports. Alternatively, such devices can be used to select which among multiple input sources are routed to the common output port. Its scope is limited to 75 ohm devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Products covered by this specification include switches commonly known as "A/B Switches" and "A/B/C Switches." These devices are regulated by the Federal Communications Commission as "Cable Input Selector Switches" under C.F.R. 47 ss 15 which is incorporated by reference into this standard.

IPS-SP-208 Drop Passives: Bonding Blocks (Without Surge Protection)–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio

frequency (RF) devices whose primary purpose is to provide a transition point between the network operator's service cable (the "drop") and the distribution wiring within premises. An important function of the device is to provide a connection point for a bonding conductor in accordance with requirement of the National Electrical Code or local building requirements. The scope of this specification is limited to 75 ohm devices whose ports are provided with female type "F" connectors.

IPS-SP-209 Drop Passives: Female F to Female F In-Line Adapters (F Splices)– The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose purpose is to provide a transition between two type "F" Male connectors. The scope of this specification is limited to 75 ohm devices whose ports are provided with female type "F" connectors.

IPS-SP-210 Drop Passives: FM Splitters–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to split signals presented to an input port such that signals in the FM broadband (88 MHz through 108 MHz) exit through one port and the remainder of the spectrum exits through other ports. Alternately, such devices can be used to combine signals in the FM band with signals in the remainder of the spectrum into a common output port. Its scope is limited to 75 ohm devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting electrical and mechanical but not environmental requirements may be designated as "indoor use" and the products must be marked as specified herein to guide users in their appropriate applications.

IPS-SP-211 Drop Passives: Matching Transformers 75 ohm to 300 ohm–The purpose of this test is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to provide an impedance and connector match between 75 ohm coaxial type "F" and 300 ohm twin-lead open screw connectorised devices. The most common use for such devices is matching coaxial cables from distribution system to screw antenna terminals on receivers. The alternative configuration provides a match between 300 ohm twin lead (typically from off-air antennas) and type "F" receiver input ports.

IPS-SP-212 Drop Passives: Power Inserters–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to multiplex AC power with RF signals carried over flexible drop cables. Alternatively, such devices can be used to extract power from cables which carry both RF and power voltages. The device also acts to block the power voltage from traveling both directions along the coaxial cable. The specification's scope is limited to 75 ohm devices whose ports are provided with "F" connectors for at least the RF ports. The most common application for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting the electrical and mechanical but not environmental requirements may be designated with "indoor use" and the products must be marked as specified herein to guide users in their appropriate application.

IPS-SP-213 Drop Passives: In-Line Attenuators–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to provide a fixed attenuation of RF signals by an amount that is nominally independent of frequency. Its scope is limited to 75 ohm devices whose ports are provided with "F" connectors. The most common use for such devices is on-premises RF signal distribution. Two levels of compliance are specified. Those meeting electrical and mechanical but not environmental requirements may be designated with "indoor use" and the products must be marked as specified herein to guide users in their appropriate application.

IPS-SP-214 MDU Amplifiers–The purpose of this specification is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to amplify signals presented to an input port and deliver the amplified signals to one or more output ports. The devices are also required to pass signals in a different range of frequencies in

the reverse direction and, optionally, may provide amplification of such reverse signals. The specification's scope is limited to 75 ohm devices whose RF connectors may be "F" connectors or 5/8-24 mainline cable ports. The most common use of such devices is RF signal distribution in multi-dwelling units (MDUs). Devices covered by this specification include products commonly known as MDU Amplifiers.

IPS-SP-215 Drop Passives: F Male Terminators–The purpose of this document is to specify recommended mechanical and electrical standards for broadband radio frequency (RF) devices whose primary purpose is to provide a low-reflection RF termination for 75 ohm devices which are equipped with the "F" female ports which meet the requirements of SCTE IPS-SP-407.

On Premises Specifications

IPS-SP-002 On Premise Cable Installation and Performance–The purpose of this document is to improve and standardize new dwelling pre-wiring and existing dwelling cable installation. This document is intended primarily for the cable industry to use as a standard to supplement procedures already in use. This document can be used by the local operator to distribute to home building industry crafts-people, home automation, electrical contractors and others that install coax cable for use with CATV signals. This will allow the local cable operator to provide CATV and future services to the home without having to rerun the coax in the house.

IPS-SP-203 Passive Network Interface Devices (NID) Enclosure Specification–This specification is for NIDs intended to house internally, coax and telephony drop components. The primary purpose is to recommend a standard set of design requirements for mounting and enclosing drop components in outdoor applications.

IPS-SP-204 Coaxial Cable System Customer Premise Interface–The intent of this specification is to provide necessary information on minimum requirements that may be used by interested parties for the protection of coaxial cable interface circuits. This specification is written for surge protection at customer entrance interface/demarcation points.

IPS-SP-205 Active Network Interface Devices (NID)– This specification is for Network Interface Devices (NID) enclosures intended to house internally, broadband active drop components. The primary purpose is to recommend a standard set of design requirements for mounting and enclosing active drop components for outdoor applications. The functions of NID include physical connection point between drop loop and subscriber's wiring, bonding point, test point, and weatherable housing.

"F" Connector Specifications

IPS-SP-400 "F" Port (Female Outdoor) Physical Dimensions–,Mechanical dimensions for the female "F" connector, outdoor. ANSI/SCTE.

IPS-SP-401 "F" Port (Male Outdoor) Physical Dimensions–Mechanical dimensions for the male "F" connector. This document does not cover the connector to cable interface.

IPS-SP-402 Recommended "F" Push-On (Feed Thru, Male)–Mechanical dimensions for the male push-on "F" connector. This document does not cover the connector to cable interface.

IPS-SP-404 Indoor F-Male Connector Installation & Performance–This document is the preliminary specification for the male and female connections used in In-Home cabling applications. The primary purpose is to recommend "F" connector practices pertaining to indoor usage. To this end, the document references existing practices and specifications from organisations such as NEC, SCTE, and UL. This specification is meant to recommend a connection system that is compatible with

general purpose indoor flexible RF coaxial drop cable and with other components specified by SCTE Interface Practices/In-Home Cabling Subcommittee.

IPS-SP-405 Outdoor F-Male Connector Installation and Performance–The intent of this specification is to provide installation guidelines pertaining to the outdoor use of "F" Connectors and their attachment to both female "F" ports and 75 ohm coaxial cables ranging from 59-Series standard braid through 11-Series quad braid. This specification is meant to recommend a connection system that is compatible with general purpose flexible R.F. coaxial drop cable and with other passive and active components used in the coaxial outdoor distribution network.

IPS-SP-406 "F" Port (Female, Indoor) Physical Dimensions–Mechanical dimensions for the female "F" connector, indoor. ANSI/SCTE.

IPS-SP-407 "F" Port Female Specifications–The purpose of this document is to specify torque, cantilever, axial strength and signal performance requirements for female "F" ports for both indoor and outdoor applications.

IPS-SP-408 Male F Ports–The purpose of this document is to specify requirements for male "F" equipment ports for both indoor and outdoor applications. This specification does not cover connectors intended for installation on cables, whether of the "pin" type or the "feed-through" type.

IPS-SP-600 Trap "F" Male Connector–Mechanical dimensions for the male "F" Connector portion of in-line traps.

Mainline Specifications

IPS-SP-100 Specification for Trunk, Feeder and Distribution Coaxial Cable–This specification is intended to apply to general purpose semi-rigid RF coaxial cable, not specialty cables.

IPS-SP-500 Recommended 5/8 – 24 Port (Female)–Mechanical dimensions for the female 5/8 – 24 entry port.

IPS-SP-501 Recommended 5/8 – 24 Port (Male)–Mechanical dimensions for the male 5/8 – 24 port plug.

IPS-SP-502 Recommended Mainline Plug (Male) to Cable Interface–The primary purpose of this specification is to assure an acceptable electrical and mechanical performance integrity between cable and connector interfaces. The scope of this standard will be directed to the key performance of impedance, low galvanic action, low loop resistance, maximum cable retention, minimum intermodulation distortion and AC hum, signal response, RF shielding, and water tight seals.

Test Procedure Documents

IPS-TP-001 Cold Bend–The purpose of this procedure is to provide instructions to measure the cold bend properties of flexible RF coaxial drop cable.

IPS-TP-002 Flexible Coaxial Cable Impact Test–This test is to establish that specified flexible RF coaxial drop cables are capable of withstanding an impact at low temperatures.

IPS-TP-003 Polyethylene Jacket Longitudinal Shrinkage–The purpose of this test is to determine the amount of shrinkage of the jacketing material used on flexible RF coaxial drop cables.

IPS-TP-004 Insertion Force–This test procedure is designed to measure the amount of linear force required to install a drop ("F") connector onto a drop cable of the proper size.

IPS-TP-005 Center Conductor Bond to Dielectric Bond–This test is to determine the amount of bond between the center conductor and dielectric for specified flexible RF coaxial drop cables. Adopted.
IPS-TP-006 Coaxial Cable Impedance–The purpose of this procedure is to provide a test procedure for measuring the impedance of CATV coaxial cable using the Hewlett-Packard HP 8444A Tracking Generator, HP 8568B Spectrum Analyser, Wide Band Engineering (WBE) A56 Return Loss Bridge, and WBE A65 low loss impedance transformers.

IPS-TP-007 Coaxial Cable Structural Return Loss–The purpose of this procedure is to provide instructions to measure the Structural Return Loss (SRL) characteristics of flexible RF coaxial drop cable from 5 MHz to 1,000 MHz. SRL is a ratio between the reflected and the reference signals or the reflection coefficient (Þ). ANSI/SCTE.

IPS-TP-008 DC Loop Resistance–This method is intended for use in determining the DC Loop Resistance of coaxial cables using the Wheatstone Bridge Method.

IPS-TP-009 Coaxial Cable Attenuation–Measurement technique for determining attenuation of coaxial cable at various frequencies.

IPS-TP-010 Ampacity–This method is intended for use in determining the current carrying capacity (ampere capacity) of coaxial drop cables.

IPS-TP-011 Transfer Impedance–This procedure is for the measurement of transfer impedance of coaxial drop cables from 5 MHz to 1,000 MHz.

IPS-TP-012 Dielectric Withstand–This test procedure describes a method to determine if the dielectric used in flexible RF coaxial drop cables will withstand an alternating voltage for a preset time limit.

IPS-TP-013 Interface Moisture Migration–This test method can be used for comparing the various methods used in sealing the interface by an artificial environment which cannot be correlated to field service, and for detecting moisture leakage of the "F" connector Interface. Liquid penetrate examination can be used to indicate the presence, location, and to an extent, the nature and magnitude of the detected moisture paths. This test method is intended primarily for localised areas of examination utilising minimal equipment. This method can also be used to determine the liquid tightness of integral or external seals, encapsulations or other environmental protection devices of the interface.

IPS-TP-014 Aerial Cable Corrosion Protection Flow–This test is to determine that moisture blocking material used in cables intended for indoor and aerial applications do not flow or drip out of the cable.

IPS-TP-015 Diameter of Drop Cable–The purpose of this procedure is to determine one or more of the following characteristics relating to flexible coaxial drop cables. · Cable jacket outside diameter. Average core diameter over foil. · Center conductor diameter. · Percentage of braid coverage. This method is intended to make use of relatively inexpensive equipment. For a more precise method using laser micrometers and the like see IPS-TP-018.

IPS-TP-016 Jacket Web Separation–The purpose of this procedure is to provide the best methodology for separating messenger from messenger cable, with intent to ensure the validity of the measured data and that the data falls within specified requirements as dictated by this procedure.

IPS-TP-017 Moisture Inhibitor Corrosion Resistance–This is to test the corrosion resistance of flooded drop cable.

IPS-TP-018 Measuring Diameter Over Core–To document sample preparation, sample testing, and test procedure for off-line measurement of diameter over tape and ovality over tape of messenger cables.

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IPS-TP-102 Center Conductor Bond to Dielectric for Trunk, Feeder and Distr. Coaxial Cables–This test is to determine the bond strength between the center conductor and dielectric for specified semi-flexible cables.

IPS-TP-103 Air Leakage Test Method for Trunk, Feeder, and Distribution Coaxial Cable–The purpose of this test is to detect voids in the dielectric (if applicable) and voids between the center conductor and dielectric.

IPS-TP-108 Static Minimum Bending Radius for Coaxial Trunk, Feeder and Distribution Cables–This test procedure is to be used for initially establishing or alternatively verifying the minimum static bend radius for coaxial distribution cable products. This procedure establishes the methodology to be used in the determination of a minimum bend radius as well as establishing a acceptance criteria by which products can be tested or compared.

IPS-TP-110 Test Method for "Mainline" Pin (Plug) Connector Return Loss–The purpose of this procedure is to provide instruction to measure the return loss characteristics of a single Mainline Pin (Plug) Connector to cable interface, at the end of the cable, from 5MHz to 1 GHz. This test method applies to SCTE specifications IPS-SP-501 and IPS-SP-502. It implements the time domain gating feature of the network analyser which removes the near end interface, and termination from the far end connector (Device Under Test).

IPS-TP-111 Test Method for "Mainline" Splice Connector Return Loss–The purpose of this procedure is to provide instruction to measure the return loss characteristics of a single Mainline Splice Connector interface between 2 mainline cables, from 5 MHz to 1 GHz. This test method applies to SCTE specifications IPS-SP-501 and IPS-SP-502. It implements the time domain gating feature of the network analyser which removes the near end interface, and far end termination from Splice connector (DUT).

IPS-TP-201 Insertion Gain/Loss, Frequency Response and Bandwidth–The purpose of this test is to determine the insertion gain or loss (as appropriate) as a function of frequency of a properly terminated device, as measured across the frequency range of interest. Depending on use of the data minimum and maximum gain or loss, response variation and/or bandwidth can be derived. Components exhibiting high loss characteristics (isolation) may be more accurately measured using IPS-TP-203.

IPS-TP-202 Return Loss–The purpose of this test is to determine the precision of the impedance match provided at a given port of the component being evaluated, as measured across the frequency range of interest.

IPS-TP-203 Isolation–The purpose of this test is to determine the degree of signal isolation provided by the component being evaluated, as measured across the frequency range of interest.

IPS-TP-204 Hum Modulation–The purpose of this test is to determine the degree of amplitude modulation at power-line-related frequencies added to a transmitted signal by the component being evaluated. The numeric result of the test is consistent with the definition used by the FCC [C.F.R. 47, §76.605(a)(11)] in its performance standards as applied to cable television systems, i.e. The peak-to-peak variation in signal level caused by modulation expressed as a percentage of the unmodulated carrier signal level (the level measured during the synchronising pulse for NTSC television signals). This numerical value is double the conventional definition of amplitude modulation in which 100% modulation results in the minimum carrier level just reaching zero.

IPS-TP-205 Test Method for Noise Figure–The purpose of this test is to determine the noise figure of a properly terminated amplifier device, as measured across the frequency range of interest. This specification is applicable to testing of 75 ohm components which are equipped with type "F" connectors.

IPS-TP-206 Composite Triple Beat Distortion–The purpose of this test is to determine the degree of composite third order (triple beat) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most-affected carrier.

IPS-TP-207 Composite Second Order Distortion–The purpose of this test is to determine the degree of composite second order (CSO) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most-affected carrier.

IPS-TP-208 Cross Modulation Distortion–The purpose of this test is to determine the degree of cross modulation (Xmod) distortion caused by passing a spectrum of carriers through the component being evaluated, as measured on the most-affected carrier.

IPS-TP-209 Test Method for Power Consumption–The purpose of this test is to determine rate of consumption of 60 Hz energy by AC line powered devices.

IPS-TP-210 Coaxial Cable System Customer Premise Protection–This document covers the test procedures for the evaluation for the surge protectors used for coaxial cable systems at the customer premise. This document is to be used in conjunction with the SCTE specification IPS-SP-204.

IPS-TP-211 Test Method for Group Delay–The purpose of this test is to determine the group delay of a properly terminated device, as measured across the frequency range of interest. This specification is applicable to testing of 75 ohm components which are equipped with the type "F" connectors.

IPS-TP-215 Test Method for Torque Requirements for Ground Wire Penetration of Bonding Set Screw –This test procedure is to determine the mechanical force needed to penetrate ground wire to the appropriate depth. Ground wire penetration should be less than 25% of wire outer diameter.

IPS-TP-400 Withstand Tightening Torque–To determine the strength required per IPS-SP-401 (through torque) that will cause one or more of the following conditions to occur to the male interface. · Stripping of the internal threads. · Breakage of the male interface. · Failure of the nut hex-flats. Adopted.
IPS-TP-401 Axial Pull Connector/Cable–To determine the tensile pull required to cause one or more of the following conditions in a cable/connector test system: · Catastrophic cable structural failure. · Connector structural failure. · Separation due to slip at the cable/connector interface.

IPS-TP-402 Push-On Insertion Force–This document describes the test method for determining the axial installation force to install the indoor push-on connector onto the "F" female plug (port). This method is intended to allow for manufacturer's freedom of design yet control the effort to install the connector. Every push-on connector has a different method for installing based on individuality of design. This document intends to encompass a wide variety of such designs, being flexible in some sections and standard in others.

IPS-TP-403 Shielding Effectiveness (GTEM Method for RF Signal)–This test procedure measures the shielding effectiveness (SE), in dB, of cables, connectors, and small devices such as splitters and traps commonly used in the CATV environment, using the technology known as the GTEM (Giga Hertz Transverse Electromagnetic Mode) cell.

IPS-TP-404 Axial Load Temperature Cycling–This test procedure is intended to evaluate the connection between the connector and the coaxial cable when it is subjected to a continuously

varying environmental cycle. The installed connectors have an axial load of 15 pounds applied to them during the environmental cycling.

IPS-TP-405 DC Contact Resistance–This test procedure is intended to evaluated the DC contact resistance between the connector and the coaxial cable following exposure to a salt spray test per MIL-STD-202F, method 101D.

IPS-TP-406 Salt Spray–This test procedure is intended to evaluate the plating of connectors and the coaxial cable following exposure to a salt spray test per ASTM B 368.

IPS-TP-407 F Connector Return Loss–The purpose of this procedure is to provide instructions to measure the return loss characteristics of a single type "F" connector-to-cable interface, at the beginning of a cable, from 5 MHz to 1,000 MHz. This test method applies to SCTE specifications IPS-SP-402, IPS-SP-403, and IPS-SP-404. This test method makes use of the time domain gating feature of the network analyser to remove the far end connector effects from the near end connector under test. ANSI/SCTE.

IPS-TP-408 F-Connector Return Loss In-line Pair–The purpose of this procedure is to provide instructions to measure the return loss characteristics of a pair of type "F" connectors and the cable interface, inserted in the middle of a cable, from 5 MHz to 1,000 MHz. This test method applies to SCTE specifications IPS-SP-402, IPS-SP-403, and IPS-SP-404. This test method makes use of the time domain gating feature of the network analyzer to remove the near end and far end test set connector effects from type "F pair" in the middle of the cable, joined by a type F(f) - type F(f) adapter.

IPS-TP-409 Common Path and Intermodulation Distortion–The intent of this test procedure specification is to provide a means of measuring the coaxial interface that becomes non-linear to the path of radio frequencies.

IPS-TP-500 Core Depth Verification–The purpose of this test method is to determine the cored depth of semi-flex aluminium sheath cable. The core depth is the internal measured distance between the dielectric foam and the square-cut end of the outer aluminium sheath. This test method will define the suggested method for core depth measurement.

IPS-TP-700 Hex Crimp Tool Verification/Calibration–This test method is used to determine and verify the actual crimp dimension of hex crimp tools. It also provides a measurement technique for determining the final hex size that may affect pull-off performance of the cable-to-connector interface. A calibration technique for adjusting hex crimp tools is also specified.

APPENDIX B.7 ANTENNAE AND INSTALLATION (NON-MANDATORY FOR BCS SYSTEM)

1. General

1.1 Each part of the antenna and the mast shall be adequately protected against the deterioration that may be caused by the worst weather conditions. Antennae shall be installed on and cables shall not pass through roofs with soft covering. Locations where atmosphere is explosive or flammable shall be avoided.

2. Antennae

2.1 Antenna to be installed for BCS systems shall meet or exceed the minimum requirements indicated in Table 1 so as to enable the systems to meet the requirements of this standard.

Table 1. Minimum requirements of antennae

Designated Band	Gain (min)	Front-to-back ratio (min)	VSWR (max)
I	4.0 dB	15 dB	)
II	4.0 dB	10 dB	) 2:1
III/IV/V	6.0 dB	20 dB	)

2.2 The antennae shall be designed to withstand a wind velocity of 100 km/h.

2.3 Antennae elements shall be made of aluminium, with clamps of diecast aluminium, zinc base alloy, anodised metal or ferrous material that is adequately protected against corrosion and has good electrical and mechanical properties. Clamp supports may also be made of ultra-violet stabilised plastic material.

2.4 Bolts, nuts, washers and screws that are used for securing the elements to the antennae boom shall also be adequately protected against atmospheric and electrolytic corrosion.

2.5 The characteristic impedance of the antennae shall be 75 ohms.

2.6 Stainless steel antennae shall be used where heavy-duty performance is required.

3. Antennae Mast and Mounting Bracket

3.1 The mast shall be constructed of galvanised steel (preferably hot-dip galvanised), stainless steel or other material of adequate mechanical strength to withstand the bending movements caused by the combined wind loading and the weight of the antennae.

3.2 The top open end of the mast shall be capped to prevent ingress of water.

3.3 The mast shall be supported by at least three sets of stay (or guy) wires that are evenly spaced.

3.4 The mounting bracket of the mast shall be galvanised, preferably by the hot-dip process and painted with zinc-enriched primer paint.

3.5 Dynabolts, rawbolts, clamps, u-clips, turnbuckles and sleeve anchors that are used to secure the mounting bracket and for anchoring the stay (or guy) wires shall be corrosion resistant.

3.6 Stay (guy) wires shall be of the electro-galvanised or stainless steel type.
3.7 The gap between the antennae mast and the mast holder of the bracket shall be sealed with silicon rubber or other waterproofing sealant.

3.8 Protective coats that are damaged during installation must be painted with anti-rust paint of zinc-enriched primer paint if the galvanised part is affected.

4. Protection Against Lightning

4.1 The elements and the boom of the antennae, the mast, the outer conductors of the antennae cables at inputs of the amplifiers and at the outputs of the amplifiers, shall be bonded to the down conductors of the lightning protective system of the building.

4.2 The inner conductor s of the antennae cables shall be protected with surge diverters which are also bonded to the down conductors.

4.3 Metallic distribution conduits on roof-top shall also be earthed.

4.4 Clamps and connectors used for securing the lightning conductors (or bonding cables) shall be of electro-galvanised or stainless steel type.

Notes: 1. For building developments where cable TV services are not yet available due to technical or operational reasons, building developers or owners (as the case may be) may install antennae to enable free-to-air TV signals to be distributed through the BCS to all dwelling units until cable TV services are available from the cable TV licensee(s).

2. Where antennae are installed on the BCS, such antennae should meet the minimum requirements which are specified in Appendix B.7.

APPENDIX B.8 FLOW CHART FOR BCS COMPLIANCE PROCEDURES (AN OVERVIEW)