TECHNICAL CODE

TECHNICAL STANDARD AND INFRASTRUCTURE REQUIREMENTS FOR BROADCAST NETWORK FACILITY

(FIRST REVISION)

Developed by

Registered by

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5 October 2016

DEVELOPMENT OF TECHNICAL CODES

The Communications and Multimedia Act 1998 ('the Act') provides for Technical Standards Forum designated under section 184 of the Act or the Malaysian Communications and Multimedia Commission ('the Commission') to prepare a technical code. The technical code prepared pursuant to section 185 of the Act shall consist of, at least, the requirement for network interoperability and the promotion of safety of network facilities.

Section 96 of the Act also provides for the Commission to determine a technical code in accordance with section 55 of the Act if the technical code is not developed under an applicable provision of the Act and it is unlikely to be developed by the Technical Standards Forum within a reasonable time.

In exercise of the power conferred by section 184 of the Act, the Commission has designated the Malaysian Technical Standards Forum Bhd ('MTSFB') as a Technical Standards Forum which is obligated, among others, to prepare the technical code under section 185 of the Act.

A technical code prepared in accordance with section 185 shall not be effective until it is registered by the Commission pursuant to section 95 of the Act.

For further information on the technical codes, please contact:

Malaysian Communications and Multimedia Commission (MCMC)
MCMC Tower 1
Jalan Impact, Cyber 6
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: +60 3 8688 8000
Fax: +60 3 8688 1000
http://www.skmm.gov.my

OR

Malaysian Technical Standards Forum Bhd (MTSFB)
Malaysian Communications & Multimedia Commission (MCMC)
Off Persiaran Multimedia
Jalan Impact
63000 Cyberjaya
Selangor Darul Ehsan
MALAYSIA

Tel: +60 3 8320 0300
Fax: +60 3 8322 0115
http://www.mtsfb.org.my

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Committee Representation

Broadcast Network Facility Working Group (BNF WG) under the Malaysian Technical Standards Forum Bhd (MTSFB) which developed this Technical Code consists of representatives from the following organizations:

Al Hijrah Media Corporation (TV Alhijrah)

Celcom Axiata Berhad

Dagang Teknik Sdn Bhd

Fraunhofer IIS

Global Invacom Sdn Bhd

LS Telcom

MEASAT Broadcast Network Systems Sdn Bhd (MBNS)

Media Prima Berhad

MYTV Broadcasting Sdn Bhd

Zettabits Technologies (M) Sdn Bhd

FOREWORD

This technical code for the Technical Standards and Infrastructure Requirements for Broadcast Network Facility ('this Technical Code') was developed pursuant to section 185 of the Act 588 by the Malaysian Technical Standard Forum Bhd ('MTSFB') via its Broadcast Network Facility Working Group (BNF WG).

This Technical Code was developed to outline the infrastructure requirements (for the purpose of setting up a common and integrated broadcast distribution system) to consulting engineers, developers, owners and other responsible parties for the provisions to be made available in the buildings. It also provides the minimum technical specifications necessary for the broadcast broadband distribution system to function as required in buildings.

This Technical Code cancels and replaces the Technical Standards and Infrastructure Requirements, Part 2: Broadcast Network Infrastructure MTSFB 006: 2005.

This Technical Code shall continue to be valid and effective until reviewed or cancelled.

TECHNICAL STANDARD AND INFRASTRUCTURE REQUIREMENTS FOR BROADCAST NETWORK FACILITY

1. Scope

This Technical Code covers the technical standards and infrastructure requirements for broadcast network facility for reception of broadcast services from satellite and terrestrial transmission.

It defines the in-building infrastructure requirement for premises (condo/apartment, low cost flats, single dwelling and office buildings) including the installation guidelines and standards, and performance specifications for the services as well as test procedures.

2. Normative References

The following normative references are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the normative references (including any amendments) applies.

See Annex A.

3. Abbreviations and Definitions

For the purposes of this Technical Code, the following abbreviation and definition apply.

3.1 Abbreviations

BBS	Broadband Broadcast System
BER	Bit Error Rate
BS	British Standards
CNR	Carrier-to-noise ratio
DB	Distribution Box
dCSS	Digital Channel Stacking System
DMT	Digital Multimedia Terminal
DTT	Digital Terrestrial Television
FM	Frequency Modulation
GHz	Giga Hertz
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
ITU-R	International Telecommunication Union – Radio
ITU-T	International Telecommunication Union – Telecommunication
LNB	Low Noise Block Downconverter
MDU	Multi-Dwelling Unit
MER	Modulation Error Ratio (dB)
MHz	Mega Hertz
MMDS	Multichannel Multipoint Distribution Services
MS	Malaysian Standards

NF	Noise Figure
ODU	Optical Distribution Unit
PVC	Polyvinyl chloride
RF	Radio Frequency
SDU	Single Dwelling Unit
UHF	Ultra High Frequency (470MHz – 790MHz)
VHF	Very High Frequency (174MHz – 230MHz)

3.2 Definitions

For the purposes of this Technical Code, the following definitions apply. See Annex B.

4. Requirements

4.1 Outdoor requirements

4.1.1 Roof space / Allocation

Space on the roof top for installation of the receiving antenna and satellite dish shall be provided. The minimum roof top space area required is 9m^2 on a flat horizontal surface dedicated for installation of antennas and satellite dish without any obstructions.

Developer is strongly advised to consult the broadcasters on the appropriate selection of the space to be allocated. This is to ensure that the antenna can be installed at a position where the signal strength is strong and steady without ghosting and interference. The space allocated should be able to withstand hacking and hammering not exceeding 1.0 kg /m² weight. The space should not be higher than the building lightning conductors and must not have any interference from any telecommunication equipment.

4.1.2 Antenna / Dish location

Where no suitable site can be found because of "shadowing" by other taller building, an aerial pole maybe erected. No link-up by overhead cable from aerial to block or block to block is allowed. Underground linking to another block for better TV reception is allowed.

4.1.3 Protective devices

Lightning conductors for the antenna mast should be installed and connected to the main building grounding system.

4.1.4 Stability / Security

Developer should provide a ladder (if necessary) on the rooftop so that the antenna mounting and the lightning connections can be inspected. Guy wires must be positioned to support the antenna mast against strong wind when necessary.

4.1.5 Electrical requirement

A minimum of 2 nos. of 13 A switch socket outlet is to be made available and shall comply with MS 589-2 or BS 1363-2. All socket installed shall be adequately protected from rain and rust. Circuit outlet shall also comply with at least Ingress Protection 54 (IP54) as per IEC 60529 or MS IEC 60529.

4.2 Head-End requirements

4.2.1 Space requirement

The developer must dedicate a room with security lock to locate all broadcast services head-end equipment, identified as the BROADCAST / TRANSMISSION HEAD-END room.

The BROADCAST / TRANSMISSION HEAD-END room shall be placed on the rooftop area nearest to the antenna fixtures and should be located free from perceptible vibration. Ducting, sewage pipes, air condition pipes etc. shall not pass through the BROADCAST / TRANSMISSION HEAD-END room. Refer to Table 1 for details.

4.2.2 Electrical requirement

The BROADCAST / TRANSMISSION HEAD-END room shall be equipped with a 20A Triple Pole and Neutral (TPN) metal clad DB (Distribution Box) of 20A. The DB should be equipped with the following:

a) Residual Current Circuit Breaker (RCCB) shall comply with MS IEC 61008 (Part 1 and 2) or IEC 61008 (Part 1 and 2).

b) Automatic Restoration System (ARS) - an auto re-closure device that works with the RCCB – to normalize the power system for ensuring minimum system downtime and site attendance.

c) Surge protection system of 40kA.

d) 20-way Miniature Circuit Breaker (MCB) (buildings with 6 floors and above) and shall comply with MS IEC 60898-1 and MS IEC 60898-2 or IEC 60898-1 and IEC 60898-2.

The electrical supply should be connected to the essential power generator if provided. An earth leakage circuit breaker shall be installed inside the room.

The BROADCAST / TRANSMISSION HEAD-END room shall be equipped with daylight type fluorescent lighting that can provide a minimum luminance of 300 Lux at floor level. The earthing system should have a resistance to earth of not greater than 10 ohm (Reference: BS 6651 and IEC 60364-1), and be terminated on an earth bus bar inside the room. The main earth conductor should have a cross section of not less than 70mm^2 via the shortest routing. The earthing system should be extended vertically downwards to the ground via the riser duct.

4.2.3 Temperature/Ventilation

The BROADCAST / TRANSMISSION HEAD-END room shall be air-conditioned or equipped to maintain humidity and room temperature at 30% to 50% relative humidity and below 30ºC respectively under all conditions. The room shall be fitted with a ventilation fan system capable of 30 air change/min, activated when the room temperature rises above 35ºC.

4.2.4 Accessibility

There should be no opening in the BROADCAST / TRANSMISSION HEAD-END room except for the door, the ventilation and cabling ducts. The door dimension shall be 1m x 2.5m. All windows if any, must be shut and sealed along the frames to keep out water and dust; and blind should be provided to avoid direct sunlight.

Solid walls should be provided for heavy equipment mounting. The walls and ceiling should be of normal finishing or be painted with light-colored vinyl emulsion or gloss paint.

Floor of the BROADCAST / TRANSMISSION HEAD-END room shall be of material that is easy to clean and not susceptible to accumulation of dust. Flooring requirement is anti-static vinyl type mat and bonded to the earth bus bar.

The room must be flood free. A 150mm kerb across the doorway is required to prevent water from entering the room.

4.2.5 Security

The BROADCAST / TRANSMISSION HEAD-END room shall be locked at all times and only authorized personnel be allowed for access. The key for this room shall be kept by the owner of the building or the building manager and made available to authorized personnel when required. No water tank, main water drainage pipes should be installed directly above the room. Developer shall observe all relevant ordinance and regulation regarding the fire safety requirements during the design of the Broadcast/Transmission Head-End room, by having:

a) Portable hand-operated fire extinguisher.

b) Emergency lighting connection to backup power supply.

Smoke detection device should be installed inside the BROADCAST / TRANSMISSION HEAD-END room and be connected to the central control of the building management office. The room should be fitted with a fire door as per “Jabatan Bomba dan Penyelamat Malaysia” approval.

The BROADCAST / TRANSMISSION HEAD-END room floor space dimension for each type of building can be referred as in Table 1 below:

Table 1. BROADCAST / TRANSMISSION HEAD-END room floor space

Building type	Floor space (L x B x H) (m x m x m)	#Floor / Wall opening (W x D) (m x m)	Door opening (W x D) (m x m)
a) Condo / Apartment			
x < 6 floors	3 x 4 x 3	0.4 x 0.15	2.5 x 1
6 < x , 16 floors	3 x 4 x 3	0.6 x 0.15	2.5 x 1
X > 16 floors	3 x 4 x3	0.9 x 0.2	2.5 x 1
b) Low cost Flats			
x < 6 floors	3 x 4 x 3	NA	2.5 x 1
6 < x < 16 floors	3 x 4 x 3	0.6 x 0.15	2.5 x 1
x > 16 floors	3 x 4 x 3	0.9 x 0.2	2.5 x 1
c) Single Dwelling			
Bungalow	NA	NA	NA
Semi-Detached	NA	NA	NA
Terrace Single Storey	NA	NA	NA
Terrace Double Storey	NA	NA	NA
Low cost	NA	NA	NA
d) Office Building			
x < 6,000m^2	3 x 4 x 3	0.7 x 0.15	2.5 x 1
6,000m^2 < x < 20,000m^2	3 x 4 x 3	1.0 x 0.2	2.5 x 1

Table 1. BROADCAST / TRANSMISSION HEAD-END room floor space *(continue)*

Building type	Floor space (L x B x H) (m x m x m)	#Floor / Wall opening (W x D) (m x m)	Door opening (W x D) (m x m)
20,000m^2 < x < 60,000m^2	5 x 6 x 3	1.1 x 0.2	2.5 x 1
x > 60,000m^2	5 x 6 x 3	1.1 x 0.2	2.5 x 1
e) Shop house			
x < 6 storey	Requirement to be determined case by case	Requirement to be determined case by case	Requirement to be determined case by case
f) Others			
Industrial Lot	Requirement to be determined case by case	Requirement to be determined case by case	Requirement to be determined case by case
Hotel			
Schools			
Hospital			
Club house			

NOTES:

a) NA implies Not Applicable.

b) # Two openings are required i.e. one serve the antenna cable access and the other serve the riser cable distribution.

4.3 Riser requirements

To obtain maximum benefit from the distribution system, the riser duct should be placed centrally with respect to the distribution in which it is to serve. To facilitate the installation and maintenance of horizontal cables, the distance between the riser duct and the outlet point in the home unit should be kept as short as possible that is less than 30m (< 30m). A 150mm high kerb shall be provided across the doorway to prevent water from getting in.

For low cost building, the cable riser shall be sited in easily accessible area inside the building like staircase landing area.

The following services are not allowed to share this riser:

a) Water piping.

b) Fire fighting.

c) Building Electrical System.

d) Gas distribution.

e) Any other services that may cause moist, danger or any harmful effect on human life.

4.3.1 Riser size / Working space

The size of the riser shall be based on the type of building as in Table 2 below.

Table 2. Riser size

Building type	RISER		
	Cable trunking (W x H) (mm x mm)	Floor opening (W x D) (m x m)	Closet space (W x D) (m x m)
a) Condo / Apartment			
x < 6 floors	100 x 75	0.4 X 0.15	0.9 X 0.6
6 < x < 16 floors	150 x 100	0.6 X 0.15	1.2 X 0.6
x > 16 floors	150 x 100	0.9 X 0.2	1.5 X 0.8
b) Low cost Flats			
x < 6 floors	100 x 75	NA	NA
6 < x < 16 floors	150 x 100	0.6 x 0.15	1.2 x 0.6
x > 16 floors	150 x 100	0.9 x 0.2	1.5 x 0.8
c) Single Dwelling			
Bungalow	NA	NA	NA
Semi-Detached	NA	NA	NA
Terrace Single Storey	NA	NA	NA
Terrace Double Storey	NA	NA	NA
Low cost	NA	NA	NA
d) Office Building			
x < 6,000m^2	150 x 100	0.7 x 0.15	1.2 x 0.9
6,000m^2 < x < 20,000m^2	150 x 100	1.1 x 0.2	1.5 x 0.9
20,000m^2 < x < 60,000m^2	150 x 100	1.1 x 0.2	1.8 x 1.2
x > 60,000m^2	150 x 100	1.1 x 0.2	1.8 x 1.2
e) Shop house			
x < 6 storey	100 x 75	NA	NA
f) Others			
Industrial Lot	Requirement to be determined case by case		
Hotel			
Schools			
Hospital			
Club house			

4.3.2 Riser arrangement

Vertical closed cable trunking and the riser can be shared between broadcast services, and other Telecommunication services. The arrangement of these cables in the riser shall be as follows:

a) From the left is for Radio Communication (Cellular Network) services.

b) The center is for Telecommunication services.

c) From right side is for Broadcast services.

Closed trunking shall be used and shall be solidly grounded to provide shielding between different services. The trunking shall be galvanized steel plate, epoxy powder coated against corrosion with a finishing of light blue paint.

The Broadcast horizontal conduit / trunking shall be separated and dedicated to related services such as follows:-

a) Terrestrial broadcast radio and TV services (analogue and digital).

b) Digital satellite TV transmission.

c) Cable TV services.

d) Interactive digital services.

Sharing of services apart from those listed above is strictly prohibited.

The size of the horizontal trunking along the corridor shall be according to the number of cables as shown in Table 3.

Table 3. Horizontal trunking

Number of Cables	Size of trunking on floor (mm x mm)	Size of trunking on ceiling (mm x mm)
Less than 10	1 no. 100 x 25	1 no. 100 x 50
10 to 20	2 nos. 100 x 25	2 nos. 100 x 50
More than 20	NA	Comply to 50% space factor

The size of the horizontal drop cable into the individual unit shall be using at least a Polyvinyl chloride (PVC) conduit of 19 mm diameter. All conduits or cable enclosure need to be completely concealed and should not protrude so as to reduce the aesthetics either within or outside the customer premise.

4.3.3 Accessibility

Access to each riser will be necessary on each floor and should always be available from a corridor or other common area to avoid undue disturbance to occupants. The riser shall have a hinged and locked door on every floor and it is important that it be fire proof. The riser door key shall be kept by the building owner for safe custody.

4.3.4 Electrical requirement

The riser shall be fitted with sufficient flourescent lighting to facilitate work and the word "Telecommunication Services" shall be displayed on the door of the riser closure. A minimum of 2 nos. of 13 A power sockets shall be provided at the alternate building floor in the riser to cater for the need of broadcast services distribution equipment. The 13A power sockets shall comply with MS 589-2 or BS 1363-2. However if needs arise for larger blocks (i.e. more than 10 apartment units per floor), 2 nos. of 13 A switch socket outlets for every floor is recommended.

4.4 Home unit

4.4.1 Broadcasting Outlet

The minimum requirement number of ports per socket plate shall be as follows:

a) 2 Satellite signal ports (SAT).

b) 1 Digital Terrestrial Television (DTT) signal port.

c) 1 Frequency Modulation (FM) signal port.

as per Figure 1 below:

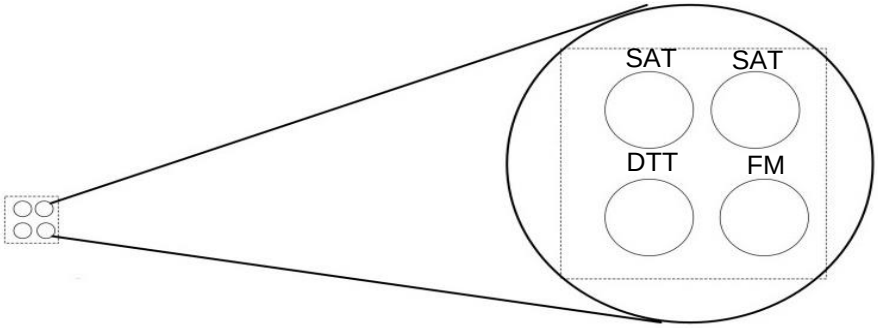


Figure 1. Number of ports per socket

Table 4 shows the number of recommended quad plate for various types of buildings.

Table 4. Number of broadcasting outlet socket for home unit

Building type	Recommended number of quad plate
a) Condo / Apartment	
x < 6 floors	3
6 < x < 16 floors	
x > 16 floors	
b) Low cost Flats	
x < 6 floors	2
6 < x < 16 floors	
x > 16 floors	
c) Single Dwelling	
Bungalow	5
Semi-Detached	3
Terrace Single Storey	2
Terrace Double Storey	3
Low cost	2
d) Office Building	
x < 6,000m^2	Requirement to be determined case by case
20,000m^2 < x < 60,000m^2	
x > 60,000m^2	

Table 4. Number of broadcasting outlet socket for home unit *(continue)*

Building type	Recommended number of quad plate
e) Shop house	
x < 6 storey	Requirement to be determined case by case
f) Others	
Industrial Lot	Requirement to be determined case by case
Hotel	
Schools	
Hospital	
Club house	

Every broadcasting outlet in the main/ living room must be adjacent to additional or parallel to telecommunication socket to facilitate upcoming interactive services which will require feedback channel over the internet. The wall outlet points should be aesthetically installed with safety and convenience given consideration. The outlet point should be at least 0.3m above the floor level and 0.3m from the corner of the wall or from electrical points. Wall outlet boxes and plates shall be fabricated from non-corrosive material or from metallic material treated to resist corrosion.

4.4.2 Location for the broadcasting outlet

The locations of the broadcasting outlets are recommended as Table 5 below:

Table 5. Location of broadcasting outlet socket

Building type	Location
a) Condo / Apartment	
x < 6 floors	1 x Living Room 1 x Master bedroom 1 x Bedroom
6 < x < 16 floors	
x > 16 floors	
b) Low cost Flats	
x < 6 floors	1 x Living room 1 x Master bedroom
6 < x < 16 floors	
x > 16 floors	
c) Single Dwelling	
Bungalow	1 x Living room , 1 x Master bedroom, 3 x bedroom
Semi-Detached	1 x Living room, 1 x Master bedroom, 1 x bedroom
Terrace Single Storey	1 x Living room, 1 x Master bedroom
Terrace Double Storey	1 x Living room , 1 x Master bedroom, 1 x bedroom
Low cost	1 x Living room, 1 x Master bedroom
d) Office Building	
x < 6,000m^2	Requirement to be determined case by case
20,000m^2 < x < 60,000m^2	
x > 60,000m^2	

Table 5. Location of broadcasting outlet socket *(continue)*

Building type	Location
e) Shop house	
x < 6 storey	Requirement to be determined case by case
f) Others	
Industrial Lot	Requirement to be determined case by case
Hotel	
Schools	
Hospital	
Club house	
Shopping complex	

Developer should provide provision for additional wall socket in other location in the room, that is specified in Table 5, as to meet the requirement of the occupant.

5. Technical Information

5.1 Broadcast Broadband Systems (BBS) Configuration

The BBS is the mean by which most MDU hotels, schools and other multi-unit buildings (offices, etc) distribute TV and FM radio signals to a number of receivers. In order to accomplish this without a loss of signal quality, these systems must be carefully planned and engineered through the effective use of BBS equipment and techniques.

The BBS is basically a network of optical fiber, and/or cables and specially designed components that process and amplify TV and FM radio signals and distribute them from one central location.

The system shall be designed to receive clear and interference free color television and FM Radio transmission. The signals received at the wall outlets should be according to Clause 7.4.

A standard system impedance of 75 ohms shall be used for all services within the BBS under clear sky reception condition.

The BBS system concept can be separated into two (2) divisions:

a) Head End; and

b) Distribution system.

A well-designed distribution system is necessary to guarantee that an adequate signal will be delivered to every receiver. It should provide a clean signal to the sets by isolating each receiver from the system and by delivering the proper amount of signal to each set. This portion of the system consists of trunk lines, splitters, feeder lines, and tap-off. Some of the other equipment used includes line taps, variable isolation wall taps, coaxial cables and band separators.

5.2 Head End equipment

5.2.1 Antenna and satellite dish

The BBS installation use broadband antennas (terrestrial television). However, if the channels to be received are in different directions or if adjacent channel reception is desired, a single channel antenna may be required.

The channel antenna to be installed should have sufficiently high gain, directivity, flatness of response, front-to back ratio and matched output over the entire band.

An antenna should be suitable for receiving the relevant channel. It should be securely mounted at favourable position to enable reception of maximum signal strength. Disturbances due to reflection of transmitted signals should also be taken into considerations when choosing an antenna, and phase shifter or 'ghost' eliminating devices should be used, where it is deemed necessary.

The number of channels to be received, the directions to the transmitters, the type of signals (UHF, VHF, FM) and the available signal levels all must be considered when designing an antenna requirement.

The antenna supporting structures including base guys swivel and other accessories shall be resistant to rust and corrosive atmospheric contaminants. Galvanizing of metallic articles for resistant to rust shall comply with MS 739 and MS 740. All contact shall be of similar metals or suitably designed otherwise to prevent electrolytic action taking place, causing corrosion. The cross-arm and elements shall be of high-strength aluminum alloy.

5.2.2 Terrestrial Antenna (typical antenna guide)

The general specification for terrestrial antenna shall be as follows:

Band Antenna for FM Radio

Frequency	:	87.5 MHz to 108.0 MHz
Elements	:	> 4
Gain	:	> 6dB

Band Antenna for VHF III

Channel	:	5 to 12
Elements	:	8 to 18
Gain	:	9 dB to 12 dB
Front to back ratio	:	16 dB to 25 dB
Wind load	:	63 N/m^2 to 77 N/m^2

Band Antenna for UHF IV / V

Channel	:	21 to 69
Elements	:	4 to 18
Gain	:	10 dB to 30 dB
Front to back ratio	:	25 dB to 30 dB
Wind load	:	39 N/m^2 to 209 N/m^2

5.2.3 Antenna for Multichannel Multipoint Distribution Services (MMDS)

The general specification for MMDS antenna (Integrated antenna with Down Converter) shall be as follows:

Integrated gain	:	38 dB to 50 dB
Gain	:	18 dB to 32 dB
Noise figure (NF)	:	1.7 dB (min)

5.2.4 Satellite Ku Band Dish

A parabolic antenna to be installed shall be specifically meant to receive the satellite transmitting signal. To receive the incoming satellite signal, the Satellite Dish, mounting kit and its accessories would to be installed on top of the building and will be facing to the specific direction.

Dish size for SDU	:	60 cm to 80 cm
Dish Size for MDU	:	80 cm to 120 cm

5.2.5 Low Noise Block Downconverter (LNB)

An LNB is the receiving device mounted on satellite dishes used for satellite TV reception, which collects the radio waves from the dish. The LNB receives the microwave signal from the satellite collected by the dish, amplifies it, and downconverts the block of frequencies to a lower block of IF. The output of the LNB can later be carried along using coaxial cable and/or fibre optic cable.

5.2.6 Digital Channel Stacking System (dCSS) LNB

A dCSS is a new type of LNB technology that receives the broadcast satellite TV signal and converts it to the IF. However unlike a normal universal LNB, all the satellite transponder signals are stacked together so that they can all be received on a single cable. The output of the dCSS LNB is with a standard satellite coaxial cable and the system is meant to be used with common SMATV systems found in many buildings.

Technical specifications

Output frequency range	:	950 MHz to 2150 MHz
Operating mode	:	Static dCSS (fixed transponder frequency shifting)
Reprogrammable	:	Yes, both manually and remotely
Number of supported transponder	:	At least 32
Transponder bandwidth (including guard band)	:	36 MHz with 4 MHz as guard band, 40 MHz between two centre frequencies of the transponders

5.2.7 Amplifiers

Amplifiers are used to increase the strength of received signals to a level greater than the losses in the distribution system. This provides an acceptable level to all components in the system.

The amplifier's specifications should be checked carefully to ensure that the output level is sufficient, to feed the system and that the strength of the input signal plus the gain of the amplifier does not exceed its rated maximum output capability. Exceeding the maximum output capability will result in overloading (cross modulation in broadband amplifiers) and overall signal distortion.

There are two (2) types of amplifiers:

a) Broadband amplifiers.

b) Single channel amplifiers.

Broadband amplifiers are more common type, provide a closely uniform gain across the entire band while the single channel amplifiers allow complete control of both the gain and the output level of individual channels. The latter are usually used in the head-end. These amplifiers must be DTT compliant to eliminate interference.

5.2.8 Broadband amplifier

The general specification for broadband amplifier shall be as follows:

Frequency range	:	5 MHz to 2150 MHz
Gain	:	30 dB to 35 dB
Max output level	:	110 dBµV
NF	:	≤ 8 dB
Connection	:	F Connector (75 Ohm)
Operating temperature	:	500ºC ± 5%

5.2.9 Single channel amplifier

The general specification for single channel amplifier shall be as follows:

Amplifiers module	:	Specific channel
Gain	:	20 dB to 45 dB
Max output level	:	125 dBµV
Connection	:	F Connector (75 Ohm)
Operating temperature	:	50ºC ± 5%

5.2.10 Pre-amplifiers

In weak signal areas, it is often necessary to amplify the signal prior to the distribution amplifier in order to get a signal of sufficient strength and acceptable quality. In addition most BBS pre- amplifiers act as 300 ohm to 75 ohm matching transformers is eliminating the need of balun.

Noise is seen on the TV as snow, so whenever a pre-amplifier is needed, it is important to choose a unit with low NF. This is because the NF of the pre-amplifier establishes the NF of the entire system. The pre-amplifier should always increase the signal as much as more than it increases the noise. The amplitude of the noise must be kept small in relation to the amplitude of the desired signal. These pre-amplifiers must be DTT compliant to eliminate interference.

5.2.11 Modulators

A modulator accepts video and audio source and combines them onto a single RF channel. Audio and video modulation levels may be adjusted for optimum performance based on the output level desired.

5.2.12 Filters

Channel Rejection Filters cleanly suppress an entire 7 MHz or 8 MHz wide TV channel so that another video source can be inserted in its place. Filters are used in the head end to eliminate undesired frequencies and provide interference-free reception. Filters and other head end equipment (except baluns and pre-amplifiers) are mounted indoors. They should be readily accessible for adjustment and servicing.

Band Pass Filters permit a desired range of frequencies to pass through the line, while they greatly attenuate all signals on either side of the desired range.

5.2.13 Attenuators

As signals are picked up by an antenna or by a combination of antennas, there may be a wide variation in signal levels. In order to ensure the same picture quality on all channels, the signal levels should be equalized to prevent the stronger signals from overriding the weaker ones. This is accomplished with the use of attenuators, which reduce the incoming stronger signals, by a specified amount.

Attenuators can be either fixed or variable. They are either designed for one specific attenuation level, or they are switch-able so that the signals can be reduced or increase to the exact level required. Since attenuators reduce all signals that pass through them by the same amount, the frequencies to be reduced should be separated from the rest of the signals so that only the stronger signals are reduced.

5.2.14 Optical Distribution Unit (ODU)

The ODU shall be able to combine electrical signals coming from both satellite and DTT. The unit shall have two (2) inputs for this. Signals shall then be converted into optical signals and thus distributed to splitters and/or Optical Termination Unit.

5.3 Broadband distribution system

5.3.1 Coaxial cables

All coaxial cables used shall be of low loss and shielding shall be maintained with normal bending and pulling encountered during installation. The characteristic impedance should be 75 Ohm.

Cable specification shall be at least equivalent or better than the Annex C and D.

5.3.2 Fibre optic cables

All fibre used shall be to a minimum of ITU-T G.652.D for optical performance, though it is recommended to use ITU-T G.657A1/A2 as they fully secure transmission over the 1260 nm to 1650 nm window whilst still being compatible and compliant to G.652.D.

Fibre specification shall be at least equivalent or better than the Annex E.

5.3.3 Splitters

The cable that carries the signal away from the head-end toward the TV sets is called the main trunk line. Occasionally BBS operate with a single trunk line, but it is usually more efficient to separate (split) the signal into several lines for distribution to the receivers. This is accomplished with the use of a line splitter. Line splitters split the signal into 2, 3, 4, 8, 16 or 32 separate lines. Splitters divide the input signal equally, providing the same amount of signal at each output of the splitter.

There are two (2) types of splitters:

a) Coaxial splitter.

b) Fibre optic splitter.

The general specification for for coaxial splitters shall be as follows:

Splitter type	:	2-way, 4-way, or 8-way
Frequency range	:	5 MHz to 2150 MHz

F Connector	:	Yes
Earthing connections	:	Yes
Impedance	:	75 ohm

The general specification for fibre optic splitter shall be as follows:

Splitter type	:	2-way, 3-way, 4-way, 8-way, 16-way, or 32-way
Fibre type	:	Single mode
Fibre core/cladding	:	9/125 microns
Fibre standard\	:	ITU-T G.657A
Fibre coating	:	Jacket simplex with Kevlar Cladding
Fibre connector	:	SC/UPC, FC/PC
Fibre wavelength range	:	1310 nm to 1625 nm
Attenuation	:	0.4 dB/km (1310nm), 0.25 dB/km (1550nm)

5.3.4 Optical Termination Unit

The Optical Termination Unit is used to convert the optical signals back into RF signals. There are two (2) types of Optical Termination Unit:

a) Quatro
The Quatro will output all four satellite sub-bands and terrestrial signal on five separate coaxial cables. This equipment is for use with a multiswitch as it has dedicated outputs for each of the satellite polarities and terrestrial signal.

b) Quad
All four satellite sub-bands and terrestrial signal is available on each of the Optical Termination Unit output port.

5.3.5 Wall sockets (Broadcast outlets)

The 4-connector wall outlet (Radio -TV - SAT) shall be suitable for all FM, TV and satellite receivers. It shall be suitable for flush mounted and fully shielded. The output impedance for the FM, TV and SAT socket shall be 75 ohms.

a) Satellite socket shall be female F-type (IEC 169-24 Female).

b) TV socket shall be male type (IEC 169-2 Male).

c) Radio socket shall be female type (IEC 169-2 Female).

5.3.6 Consideration when implementing the system

5.3.6.1 Cable loss

A certain amount of signal will be lost as it travels through coaxial cable. This loss is dependent on two factors: the type of cable used and the frequency of the signal being carried. Losses are greater at higher frequencies.

5.3.6.2 Fibre optic cable loss

The estimated attenuation loss according to ITU G.652 for fibre optic cable measured at 1310nm wavelength is 0.4 dB/km .The longer the fiber optic cable, the higher the attenuation loss. Generally, 1310nm wavelength is used to test the fibre because it has the highest attenuation compared to the other wavelength.

5.3.6.3 Coaxial splitter loss

When coaxial splitters are used, the maximum loss should be as below:

a) 2 way coaxial splitter 3.5 dB to 4 dB

b) 4 way coaxial splitter 6.5 dB to 7.2 dB.

c) 8 way coaxial splitter 13 dB to 16 dB.

5.3.6.4 Optical splitter loss

When optical splitters are used, the maximum loss should be as below:

a) 2 way optical splitter 4 dB

b) 3 way optical splitter 6.5 dB

c) 4 way optical splitter 7.5 dB

d) 8 way optical splitter 11 dB

e) 16 way optical splitter 14 dB

f) 32 way optical splitter 17.5 dB

5.4 Typical system design

System design is very crucial in determining the signal level and picture quality at high-rise building (homes) which uses the BBS. System design varies from one consultant to another, but the ultimate result is to provide good picture quality at individual homes by following the standard requirement.

A BBS schematic must be prepared in detail for every block prior to any installation work related to the system.

Critical elements to be included in the system schematic diagram:

a) Signal level at Head-end reception.

b) Signal level at every active and passive components.

c) Signal level at the broadcast wall socket outlet.

d) Cable type recommended to be used.

Examples of typical design for a BBS schematic diagram are as shown in:-

a) Annex F - Full fibre system;

b) Annex G - Hybrid system (integration of both coaxial and fibre connection);

c) Annex H - 5-Cable system (coaxial cable 5-wire);

d) Annex J – dCSS system (single wire)

6. Installation guidelines

6.1 Outdoor installation

The outdoor installation will consist of the following:

a) Antenna.
b) Satellite dish.
c) Pole and bracket.
d) Cable.
e) Metal conduit.
f) Trunking.
g) Grounding.

6.1.1 Antenna

The antenna is the first component of the BBS, which receive the broadcast signal. A good quality antenna and good antenna installation is necessary to receive good quality signal throughout the BBS. As some transmitters in Malaysia are located in different sites, one antenna per band per transmitter site is needed to be installed.

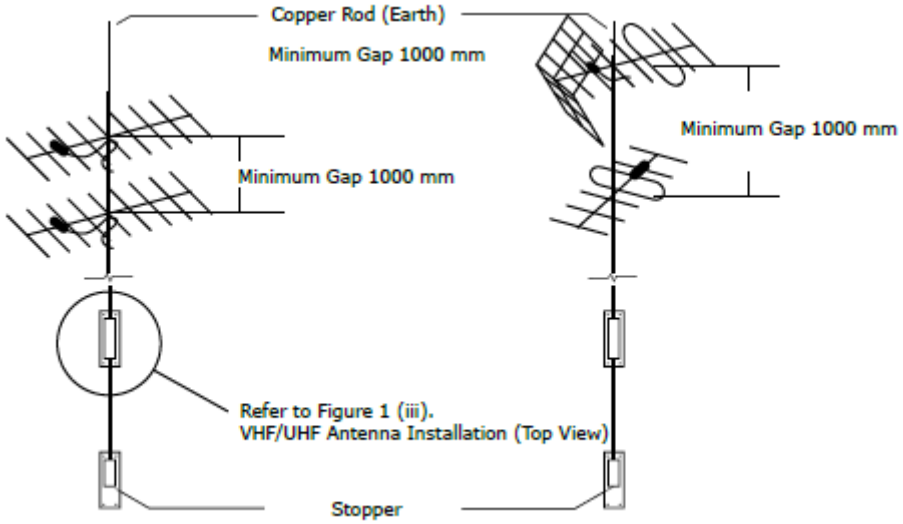


Figure 2a. VHF/UHF Antenna Installation (front view)

6.1.2 UHF/VHF antenna installation

For the BBS, the height of the antenna must be lower than the height of the lightning conductor rod. The distance between the antenna and any power lines should be at least 2 times the combined height and length of the antenna. All antennas should be directed toward the transmitter stations. The minimum distance between antennas should be at least 1000mm. Refer to Figure 2. Antenna installation should be planned in such a way that the line of sight of one antenna is not obstructed by others. The centre of the gravity of the antenna installation shall be well designed to minimize wind load effects.

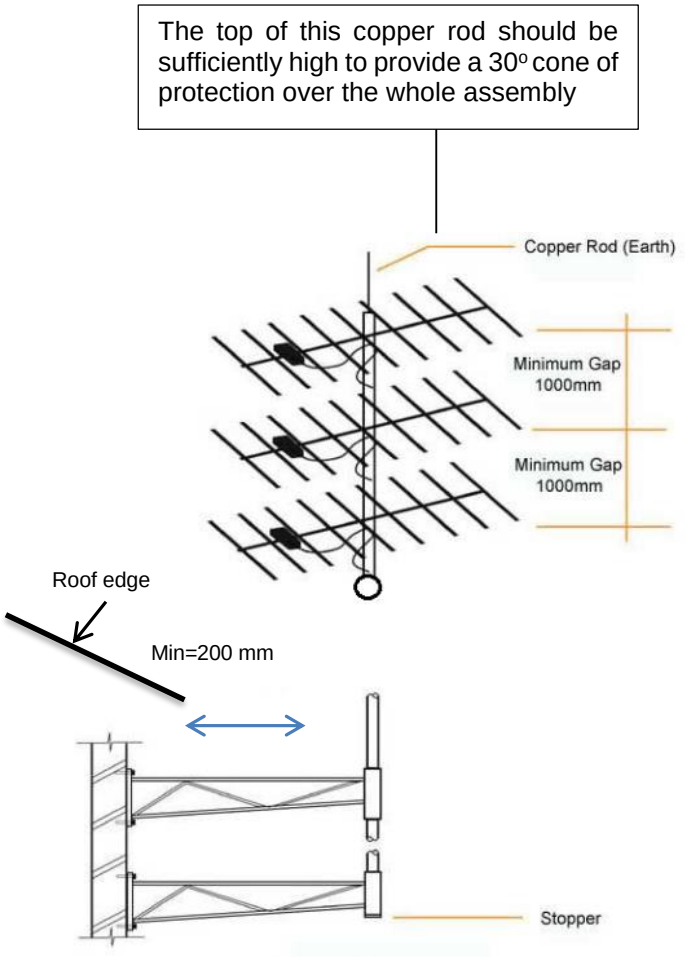


Figure 2b. VHF/UHF antenna installation (side view)

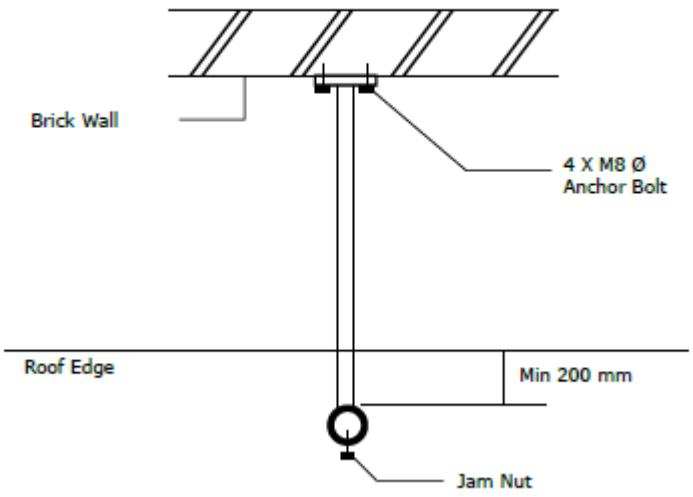


Figure 2c. VHF/UHF antenna installation (top view)

6.1.3 Satellite dish installation

The installation of a satellite dish requires attention to potential microwave interference sources, the exact satellite and transponders to be received.

As in the installation of antenna, line of sight is the most important point to be considered when choosing a site for satellite dish mount installation. See Figure 3a and Figure 3b for good installation location and Figure 3c and Figure 3d for bad installation locations. Always seal all holes drilled to install the satellite mount. This is to prevent any leakage into the building. The important points to be considered when installing satellite dish are the setting and fine tuning of the Elevation, Azimuth and the LNB skew angle.

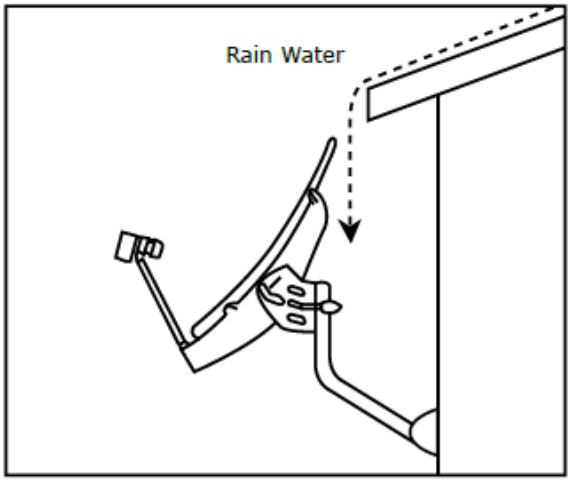


Figure 3a. Good, cleared from running

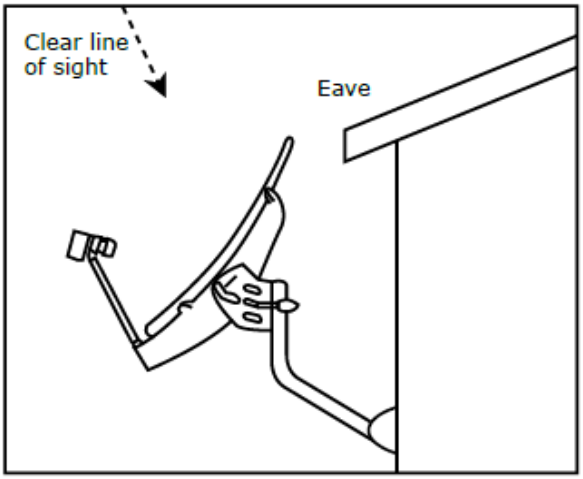


Figure 3b. Good, cleared from eave

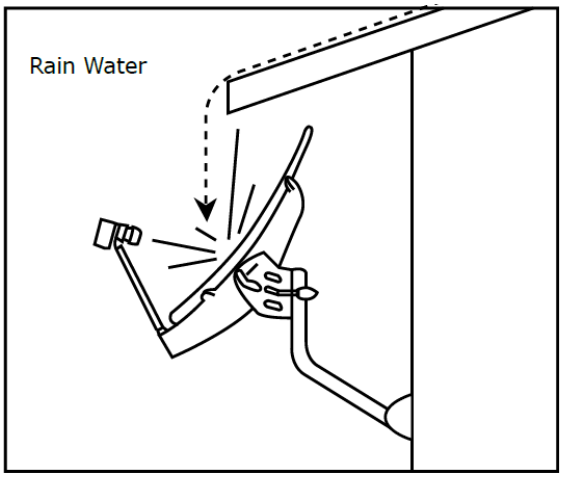


Figure 3c. Bad, in the path of running water

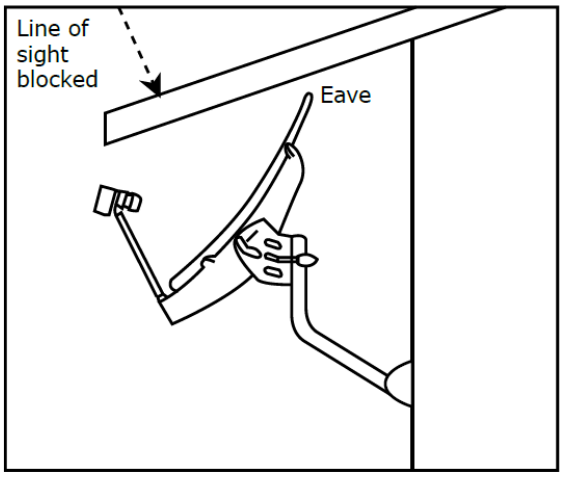


Figure 3d. Bad, blocked by

6.1.4 Pole and bracket

The installation of pole and bracket is a vital part of the antenna installation. Improper pole and bracket installation will result in inconsistent picture quality and unnecessary maintenance. There are some important procedures to be followed:

a) Use only metal raw plug and screw to install on concrete base;

b) Use self-tapping screw when installed on wooden base;

c) The minimum size of pole should be 25 mm diameter; and

d) Pole lengths of more than 2000 mm should be sufficiently rigid to support the antenna, wall mounted and fixed at minimum 2 points to the wall.

6.1.5 Cable

6.1.5.1 Coaxial cable

Installation of cables from the antenna to the head-end is critical. This is because it is susceptible to weather factor and it can also pick up stray signals if it is not properly installed. There are some important procedures to be followed during installation as below.

a) Ensure that all connectors (crimping type, compression type or screw type) are properly installed;

b) Cable braids should not be protruding out of the connector;

c) Center conductor should not come into contact with any other metallic parts of the cable. (Metallic foil and braids);

d) Seal cable termination using a water proofing material;

e) Cables should not be deformed or crushed. The bending radius of the cable should be a minimum of 10 times the cable diameter;

f) An allowance of 0.5m minimum should be added to the length of the cable for future maintenance;

g) Install a drip loop at the end of vertical part of the cable to prevent rain water from seeping into the conduit and trunking;

h) All cables should be fastened to the pole by using a cable tie. The cable tie should be installed 0.5m apart;

i) All cable should be tagged. The tag should indicate the channels and the transmission station. E.g. A01/RTM1/KLT, Cable no. A01/Channel RTM1/ Transmission station is KL Tower; and

j) A fire resistant material should be used to seal the entrance of the conduit/ trunking into the building.

Cable specification shall be at least equivalent or better than the Annex C and D.

6.1.5.2 Fibre optic cable

Fibre cables installation require critical precautions. The fibre cable needs to be installed correctly, to prevent unusual loss issues. There are some important procedures to be followed during installation as below.

a) For pre-terminated fibre it is important to avoid damage to the fibre-connector connection by holding the connector gently.

b) Caps and covers on fibre connectors shall remain until it is being connected. All fibre connections must be cleaned prior to connection by using proper cleaning kit.

c) It is important to refer to the manufacturer specifications on the bend radius of the fibre cable.

d) For un-terminated fibre, fusion splicing is recommended with a suitable breakout box to protect the splice.

6.1.6 Metal Conduit

Trunking or 25mm Galvanized Iron (G.I.) conduit should be installed to run the horizontal cable from the antenna to the BROADCAST HEAD-END ROOM or the trunking. The trunking or G.I. conduit shall be grounded for protection against lightning and to act as shielding against interference. In the

event of only G.I. pipe being used to run the cable to the BROADCAST HEAD-END ROOM, a minimum of 1 spare conduit must be installed for maintenance and future expansion. The spare conduit shall be installed from roof top to BROADCAST HEAD-END ROOM with temporary seal.

a) All metal conduit/ trunking should be coated with rust resistant paint.
b) All cable must be in conduit/ trunking complying to 50% space factor requirement.

6.2 Head-End

The head-end is where all the signals are filtered, up or down converted, balanced and amplified before being distributed.

6.2.1 Equipment Installation and arrangement

Head-End is an area where a comparatively large number of equipment and cables are installed. All equipment and cable should be wall mounted or rack mounted and arranged in a proper manner to facilitate quick and effective maintenance.

Head-end cabinets should be manufactured exclusively from metal. These cabinets should show high quality finishing, being most appropriate complement for a well-assembled head-end.

Cabinets generally should be electrical tested, build in with back and upper blowing units and come with lockable door to avoid unauthorized access to the equipment. Equipment rack should be transportable with lockable wheels.

The recommended head-end equipment arrangements are indicated in figures below. Refer to Figure 4 and Figure 5.

6.2.2 Labeling

All cables should be tagged according to Clause 6.1.5.1 (i).

6.2.3 Lightning surge protector

All cable from the terrestrial TV antenna must be equipped with lightning surge protector to minimize the possibility of damage from any lightning strike. Lightning arrestor should be connected to the building ground.

6.2.4 Grounding

All equipment should be grounded to the building grounding system via copper grounding bar, which should be installed in the Telecommunication Room.

6.3 Riser

The riser may be shared with the other communication providers, all cables and equipment should be installed according to the space allocated. All cables and equipment should be properly tagged.

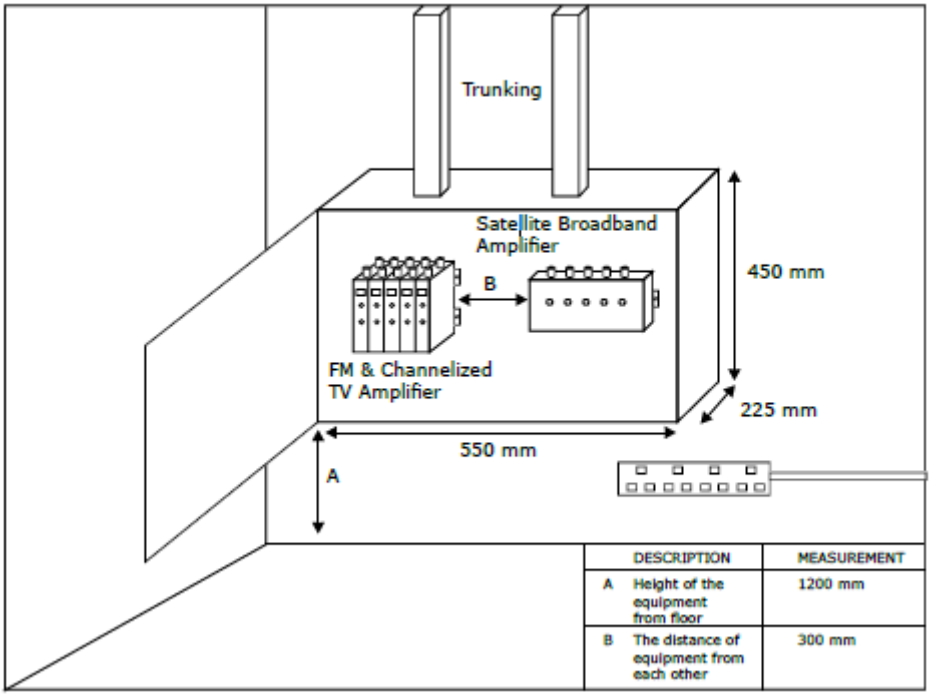


Figure 4. Recommended Head-end equipment arrangement (wall mounted type)

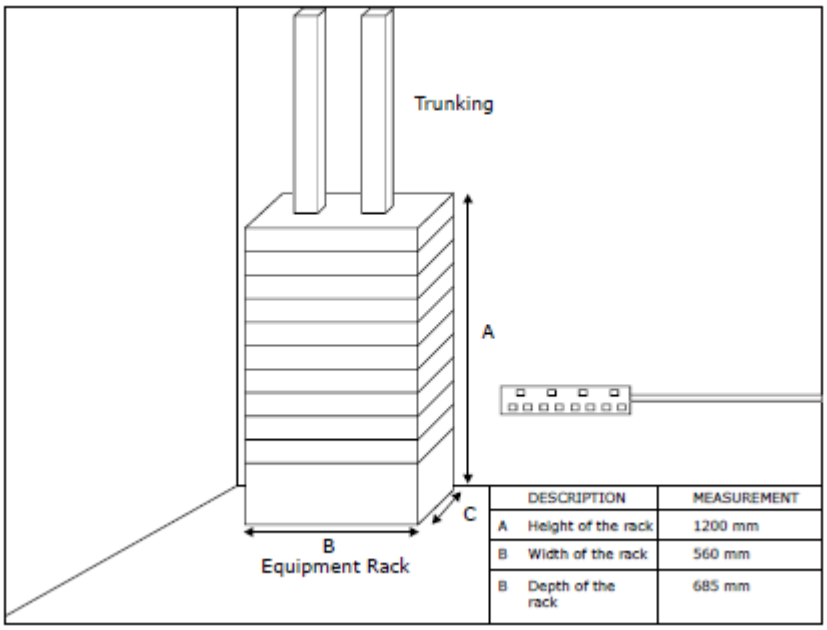


Figure 5. Recommended Head-end equipment arrangement (rack mounted type)

6.3.1 Equipment installation and arrangement

All broadcast equipment inside the riser should be installed on the right-hand side of the wall. All equipment should be installed on a secured orderly manner either on a wooden board or PVC box as shown in Figure 6. All unused port should be terminated by using 75 Ohm terminator/dummy load.

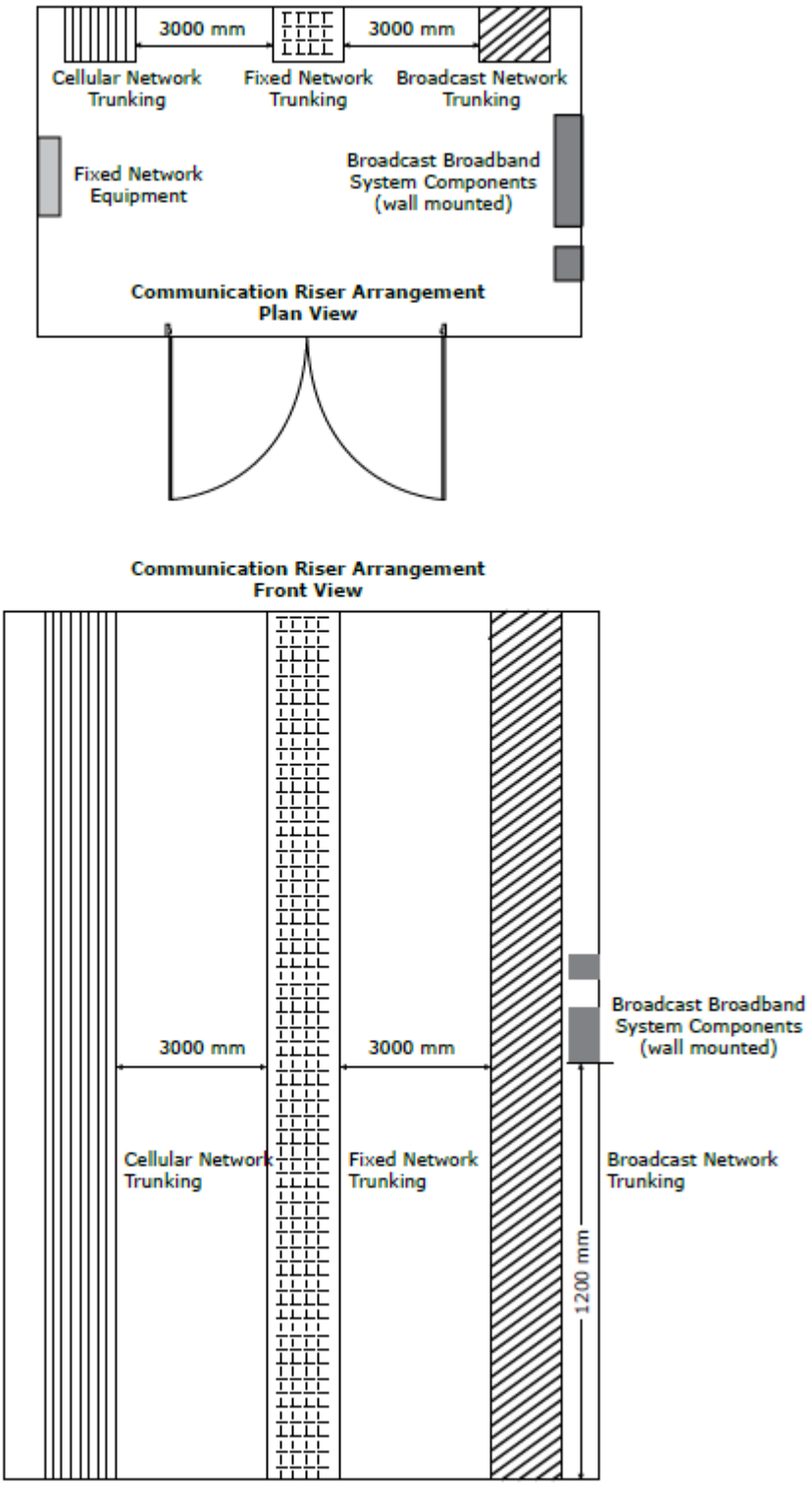


Figure 6. Telecommunication Riser arrangements

6.3.2 Vertical Cable installation and arrangement

Vertical cables for Broadcast Services should be installed on the right-hand side of the cable trunking inside the riser. Use only specified distribution cable as in Clause 5.3.

Vertical cable shall be equivalent or better than specified as per Annex C and E.

6.4 Horizontal cabling

6.4.1 Cabling installation

Horizontal cabling should be installed in a trunking along the corridor. The horizontal cable should not be looped from 1 unit to another. Ensure that the cables are not damaged and the bending radius is at least 10 times the diameter of the cables. Use only approved distribution cables.

Horizontal cable shall be equivalent or better then specified as per Annex D and E.

6.4.2 Conduit/Trunking installation

All trunking installed for horizontal cabling should be installed firmly on the ceiling by using screws or suspension rods. Refer to Table 3.

6.5 Home unit

6.5.1 Termination

All cables in the home unit should be terminated by using a DC block wall socket. The wall socket should have 4-connector wall outlet for Terrestrial TV, FM radio and for Satellite TV reception. All wall sockets are preferably be installed close to the telephone socket. The wall sockets should be 150 mm away from the nearest power point. The wall sockets outlet shall be surface mounted or flush in wall mounted.

7. Technical specifications

7.1 Testing procedure

7.1.1 Testing procedures for signal survey – prior to antenna installation

A signal survey prior to installing the system can help to avoid problems. The required equipment's are an antenna/satellite dish, a TV/satellite analyzer and the certified service provider's receivers.

If at all possible, use the type and size antenna that will be installed at the site. If this is not possible, use an antenna that has a known gain (dipole) so that the actual signal level for the proposed antenna may be determined.

In weak signal areas, antenna location is usually a critical factor. A lateral distance of only 50 meter can produce vastly different signal levels. Antenna height can also make a difference. Although signals normally become stronger as the antenna is raised this is not always true. Optimum height should always be determined at actual site.

The TV/satellite analyzer is used to measure the signal strength received on each channel. These levels should be recorded for future use (refer to Annex K). With these measurements, equalizing signal levels becomes a simple matter and the need for any preamplifier becomes apparent. Since antenna location is important, the measurement should be taken at several points at the site. The point with the best overall signals should be chosen as the optimum location for the antenna installation.

The signal quality measurement for DTT/Satellite Signal is measured by CNR or MER.

7.1.2 Testing procedures for fibre systems

A fibre system should be inspected to ensure that all the optical levels are correct. This is very important especially after a fibre system is installed or connected. A light source can be used for identification of the cables and to ensure there is no breaks throughout the fibre connection. This can be done at a point before the connection to the antenna or dish, as long as power supply is available. It is highly recommended, however, that true measurements with an optical power meter is done to ensure the operation is in correct condition and that the optical levels are within specification.

The optical level from the transmitter to the receiver should be checked to ensure it is within acceptable value.

7.2 Testing procedures for commissioning – after installation

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 properly 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.

A complete test shall be conducted on the whole BBS and every service that is available should be measured based on the parameters given in the Clause 7.4 and the performance shall comply according to Clause 7.5.

7.3 Measurement Method

The installer has to take the signal strength level at the points indicated below:

a) Roof Top
   i. Terrestrial Antenna – Signal level and MER.
   ii. Satellite KU Band Dish, at LNB output- Signal level and MER

b) Head-end
   i. Signal level before the amplifier/ ODU; and
   ii. Signal level after the amplifier/ ODU.

c) Last Component before Socket Outlet

d) Signal level for digital broadcast services, CNR/MER and Bit Error Rate (BER) at the last component in the system

e) Within the Units

f) Signal level, CNR/MER and BER at all broadcast socket outlets

The installer is required to tabulate all the result from signal level based on the form as in Annex K.

7.4 Performance specifications

Table 6 below shows the performance specifications.

Table 6. Performance specifications

Point of measurement	System / Services	Requirement
Minimum signal level at antenna / dish	Terrestrial analog	≥ 75 dBµV
	Terrestrial digital	≥ 48dBµV
	FM Radio	≥ 60 dBµV
	Satellite dish	≥ 75 dBµV
Minimum signal level at the broadcast socket	Terrestrial analog	63dBµV – 80dBµV and CNR ≥ 40dB
	Terrestrial digital	48dBµV – 100dBµV; CNR ≥ 28dB and MER ≥ 20 dB
	FM Radio	≥ 54 dBµV
	Satellite signal	65dBµV – 80dBµV; BER (after Viterbi) ≥ 2 x 10^{-8} and MER ≥ 14 dB

7.5 Test equipment

The following is the list of the test equipment.

a) TV/Satellite analyzer for satellite and terrestrial services. Recommended features shall include but not limited to the following:

   i. Continuous tuning from 5 MHz to 862 MHz and 950MHz to 2150 MHz.

   ii. RF Input Impedance, 75 Ohm.

   iii. Digital Readout to be absolute value calibrated at least in dBµV.

   iv. Measurement for Terrestrial Band:

   - Analogue Channels: Signal Level, CNR, Video-Audio Ratio; and
   - Digital Channels: Channel Power and CNR, MER and BER.

   v. Measurement for Satellite Band:

   - Digital Channels: Channel Power, CNR, MER and BER.

b) Optical power meter.

c) Receiver/Decoder for the dedicated digital terrestrial, MMDS and Satellite Services.

d) Dipole Antenna (for signal reception survey)

8. Testing

8.1 Tools

The following is the list of useful tools and miscellaneous materials that might be handy during an installation.

8.1.1 Basic tools

a) A complete set of nut driver (spin tight);

b) A set of ratchets and sockets;

c) A pocket compass, for orienting the antenna and when the compass bearing(s) of the transmitter tower(s) is known;

d) A drill with a wide assortment of bits;

e) A good quality tool belt;

f) Cable stripper;

g) Caulking compound for sealing the holes where the cables enters the house;

h) Roofing tar (Plastic roof cement), for sealing around screws on the roof;

i) Silicone grease for waterproofing coaxial cable connector;

j) A sledge hammer for driving in ground rods; and

k) A strong step ladder (In addition to extension ladders).

8.1.2 Specialized tools

a) A crimping tool for fastening coaxial connector; and

b) A signal level meter to measure the incoming signal level.

8.1.3 Fibre optic tools

a) Fibre cleaning wipes;

b) Light source (for identification); and

c) Fusion splicer.

Annex A
(normative)

Normative References

BS 6651:1999, *Code of practice for protection of structures against lightning.*

Communication and Multimedia Act 1988, *Class Assignment No. 2 of 2015,* dated 22 May 2015.

Electricity Regulations 1994, *Approval of Electrical Equipment (Electricity Regulations 1994) Information Booklet 2014 Edition by Energy Commission*.

IEC 169-2, Radio-frequency connectors - Part 2: Coaxial unmatched connector.

IEC 169-24, *Radio-frequency connectors - Part 24: Radio-frequency coaxial connectors with screw coupling, typically for use in 75 ohm cable distribution systems (Type F).*

IEC 60364-1, *Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definition.*

ITU-R Recommendation P.1546-2, *Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz.*

ITU-R Recommendation P.1812-2, *A path-specific propagation prediction method for point-to-area terrestrial services in the VHF and UHF band.*

ITU-T G.652, *Characteristics of a single-mode optical fibre and cable.*

ITU-T G.657 A1/A2, *ITU-T G.657: "Characteristics of a bending-loss insensitive single-mode optical fibre and cable for the access network".*

MTSFB 002:2009, *Technical Standard in-Building Fibre Cabling for Fibre-to-the-Premise*

MTSFB 006:2005, *Technical Standards and Infrastructure Requirements: Broadcast Network Infrastructure (Part 2)*

MS 589-2 / BS 1363-2, *13A Switch and unswitch socket outlet*

MS 739, *Specification For Hot - Dip Galvanized Coatings on Iron Threaded Fasteners*

MS 740, *Specification For Hot-Dip Galvanized Coatings on Iron And Steel Articles*

MS IEC 60529 / IEC 60529, *Degree of protection provided by enclosures (IP Code)*

MS IEC 60898-1 / IEC 60898-1, *Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for a.c. operation*

MS IEC 60898-2 / IEC 60898-2, *Circuit-breakers for overcurrent protection for household and similar installations - Part 2: Circuit-breakers for a.c. and d.c. operation*.

MS IEC 61008-1 / IEC 61008-1, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

MS IEC 61008-2/ IEC 61008-2, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 2-1: Applicability of the general rules to RCCB's functionally independent of line voltage*

SKMM MTSFB TC T005:2013 First Revision, *Specification for Direct-To-Home Satellite Broadcast Receiving Antenna*

Annex B
(normative)

Definitions

Approval Authority	It is embodied in the CMA, Street, Drainage and Building Act (SDBA) 1974, Uniform Building By Laws (UBBL) and Town and Country Planning Act (TCPA) 1976 that approval from the State Authority or Local authority or any other authority is a must before any development or construction activities can be carried out. In approving a development or building plan, the State Authority or local authority must satisfy all requirements pertaining to essential services which should in accordance with the proposal above include public utility services in line with the Communication and Multimedia Act (CMA) 1998.
Attenuation	Signal loss in a transmission medium or component expressed in dB.
Azimuth	The magnetically corrected compass bearing (360 degrees) for locating an orbiting communication satellite.
Broadband Broadcast System.	A network of optical fiber, and/or coaxial cables and components in the frequency range of 5 MHz – 2150 MHz. It receives broadcasting signals from a common antenna/dish or system of antennas, centrally integrates and distributes the signal and to all outlets within the building.
Bit Error Rate	In a digital transmission, BER is the percentage of bits with errors divided by the total number of bits that have been transmitted, received or processed over a given time period. The rate is typically expressed as 10 to the negative power.
BROADCAST HEAD-END ROOM	A dedicated secured room to locate all necessary receiving and processing equipment and components for the Broadcast Broadband System.
Building	Shall have the same meaning provided for the National Land Code 1965, and shall mean to include any structure erected on land.
Building owner	The actual proprietor of a building, or its agents or its authorized personnel.
Campus Style Property	A property with single document of title issued to a single proprietor of any land which parcel of land is not sub-divided.
Cellular Network	A mobile communications network system.
Civil Infrastructure	Basic communications infrastructure installation needed for the establishment of fixed communications network services such as pits, ducts, manholes and etc. but does not include a line.
Carrier-to-noise ratio (CNR)	The ratio of the level of the carrier to that of the noise in the desired frequency band, expressed in dB.
dCSS LNB	Digital Channel Stacking System LNB – The electronic device is mounted at the center of the satellite dish and collects the signals and down converts the frequencies for staking before feeding it to the Digital Multimedia Terminal (DMT) via the satellite cable.
Commercial Building	A building or portion thereof that is intended for office use.
dB (decibel)	A unit of measurement which expresses changes in signal power levels along a logarithmic scale. 3 dB represents a multiplication factor of 2; 10dB a factor of 10; 20 dB a factor of 100; 30 dB a factor of 1000; etc.

Developer	Any person, body of person, company, firm or society (by whatever name described), who or which engages in or carries or undertakes or causes to be undertaking housing development.
Digital Multimedia Terminal (DMT)	An indoor unit, also known as Set-top Box (STB) that can receive authorized signals for television, radio, data and interactive services from the satellite dish and/or internet access point. It can be connected to the television set, hi-fi stereo, home theater system, computer and telephone.
Drip Loop	Several inches of slack in a cable that prevents water from collecting on the cable or running along the surface of the cable. A drip loop between the LNB and the entry point in to the building also allows free movement of the Dish while adjusting it.
Duct	Means a single or multi-way duct made of P.V.C. or other materials. An enclosed raceway for wires or cables usually used in soil or concrete an enclosure in which air is moved.
Digital Video Broadcasting Standards	An increasingly global format specifies modulation and coding schemes for each mode of transmission – satellite, cable, microwave and terrestrial.
Elevation	The angle (0 to 90 degrees) at which the antenna tilts up towards the sky.
F- Connector	A coaxial connector for use with cables which have a characteristic impedance of 75 ohms.
Filters	Used in the head end to eliminate undesired frequencies and provide interference-free reception.
Floor Distributor	The distributor is used for generic / structured cabling in the commercial building. Its purpose is to connect between the horizontal and other cabling sub-systems or equipment.
Frequency	The number of times in which an alternating current goes through a complete cycle of 360 degrees in one second of time.
Gain	The amplification factor for communication devices expressed in decibel (dB). For antennas, gain is expressed in dBi.
Generic / Structured Cabling	A structured communication cabling system, capable of supporting a wide range of applications. Generic cabling can be installed without prior knowledge of the required applications. Application specific hardware is not a part of the generic cabling
Giga Hertz (GHz)	The prefix Giga means billion, and Hertz means cycles per second. Signals in the GHz range are often called microwaves.
Housing Development	Develop or construct or cause to be constructed in any manner more than 4 units of housing accommodation and shop house in, on, over or under any land with the view of selling the same.
IEC	An organization that sets international electrical and electronics standards.
Infrastructure	Any telecommunications plant and shall include post, ducts, manholes, relay, rack, cable racks, cable ladders, terminal frames, backboards, concrete slabs, riser passage, risers and the like, but does not include a line.
Interactive Services	These enable subscribers to use the television to shop, bank, and make travel arrangements and play interactive games. They are provided independently or in conjunction with television and radio programs. Distance learning is another example of an interactive service supported by the system.

Internal telecommunication wiring	Any telecommunications line cable, wire, optical fiber, conduits or other physical media required to connect customer's terminal equipment and the network termination unit at the Private Property Boundary.
Internet Protocol Television (IPTV)	Television and/or video signals are distributed to subscribers using Internet protocols. Often this is in parallel with the subscriber's Internet connection, supplied by a broadband operator and/or television broadcaster using the same infrastructure.
Ku-Band	A high frequency satellite band (12 to 18 GHz) that makes the use of small satellite dishes possible. The band is primarily used for satellite communications, particularly for broadcasting satellite television.
Line	A wire, cable, optical fiber, wave guide or other medium used or intended for use as a continuous guide for or in connection with carrying telecommunications, but does not include infrastructure.
Low Noise Block Downconverter (LNB)	Low noise Block Converter – The electronic device is mounted at the center of the satellite dish and collects signals and down converts the frequency before feeding it to the DMT via the satellite cable.
Multi-Dwelling Unit (MDU)	A MDU is a group of household units that contain a Telecommunications Room (TR), and where it is not appropriate or feasible for individual satellite dishes to be installed. This includes most apartments and condominium blocks.
Mega Hertz (MHz)	The prefix mega means million, and Hertz means cycles per seconds.
Multichannel Multipoint Distribution Services	It is a wireless telecommunications technology used as an alternative method for cable television programming reception. Reception of MMDS-delivered television signals is done with a special rooftop microwave antenna and a set-top box for the television receiving the signals
Multi Network Provider	More than one Network Provider.
Multi Storey Building	Any building of multi levels which requires a telecommunication riser for the provision of internal distribution cables to the customers by the Network Providers.
Multiswitch	A device used in conjunction with a Quattro LNB to distribute satellite signals to multiple STBs at the same time. The multiswitch takes all four quadrants of the satellite broadcast (Vertical Low (VL), Vertical High (VH), Horizontal Low (HL), and Horizontal High (HH)) and outputs to the individual STBs with the quadrant required by each STB.
Network Facilities Provider	Means a person who owns or provides any network facilities.
Network Service Provider	Means a person who provides network services
Network Provider's Equipment	Any apparatus, device, line, infrastructure, interfacing device or equipment used or intended to be used in connection with a telecommunications network to supply telecommunication services.
Noise Figure (NF)	The NF is usually expressed in decibels (dB), and is with respect to thermal noise power at the system impedance, at a standard noise temperature (usually 20o C, 293 K) over the bandwidth of interest.
Optical power meter	An optical power meter is a device used to measure the power in an optical signal. The term usually refers to a device for testing average power in fiber optic systems. Measurements of optical power are expressed in units of dBm.

Quadrature Phase Shift Keying (QPSK)	It is a phase modulation algorithm where the phase of the carrier wave is modulated to encode bits of digital information in each phase change.
Residential Premise	A parcel of land consisting of buildings designed, adapted or used for residential habitation and shall include semi-detached buildings, detached building and terrace house.
Riser	An utility room specific to accommodate cabling, component for services related to Fixed Network, Broadcasting, Cellular and Wireless.
Satellite Dish	A highly directional parabolic antenna designed to receive signals from satellites in space. Direct to Home Satellite subscribers can receive its service using parabolic antennas as small as 60cm in diameter.
Single Dwelling Unit (SDU)	A SDU is an individual household premise, to which satellite dishes may be installed. This includes all forms of houses (terraced, Semi-detached, Bungalows, townhouses, etc.) as well as shop-lots, standalone community premises (petrol station, community hall, etc.)
Semi-Detached House / Semi-D House	Any building designed to be built as one pair having a party wall as one of its walls.
Shop House	Any building or any part of the building designed, adapted or used for business purpose and shall be of four storey or less, and shall include any building of a light industrial nature, such as factories.
Splitters	Divide the input signals equally, providing the same amount of signal at each output of the splitter.
Subscribers Distribution Frame	A connecting unit between external and internal lines. It allows for public or private lines coming into the building to connect to internal networks.
Tap-Off	Is a means of delivering signal from the distribution lines to the outlet, while providing enough isolation to prevent the sets from interfering each other's.
Telecommunication Closet (TC)	An enclosed space for housing telecommunication equipment, cable terminations and cross-connect cabling.
Telecommunication Room	A space provided by building owner for a Network Providers to enable the supply of telecommunication service to the customer.
Telecommunications Network	A system or series of systems for carrying, conveying or transmitting telecommunications.
Telephony Cable	A plain old telephone system (POTS) cable.
Terrace House	Any residential building designed as a SDU and forming part of a row or terrace of not less than three such residential buildings.
Transponder	Equipment on the satellite that receives signals from earth stations and sends them back to receiving satellite dish. The transponders can be switched between various countries in the satellite's footprint.

Annex C
(normative)

Minimum Coaxial Cable Specifications for RG 11

Mechanical Specifications

Type	:	IF Coaxial Cable – RG 11
Inner conductor	:	1.55 mm ± 0.01 mm Copper Cover Steel
Dielectric	:	Formed Polyethylene
Diameter over dielectric	:	7.25 mm ± 0.2 mm
Outer conductor	:	copper braid + copper foil
Foil	:	copper
Braiding	:	96 x 0.15 mm bare copper
Coverage braiding	:	60%
Diameter over screen	:	7.9 ± 0.25 mm
Sheath	:	PVC
Diameter over sheath	:	10.1 ± 0.3 mm
Minimum wall thickness	:	0.7 mm
Minimum static bend radius	:	100 mm
Minimum temporary setting radius	:	100 mm
Adhesion of dielectric	:	12 N to 120 N at 25mm
Total weight	:	80.0 kg/km
	:	

Electrical Specifications

Characteristic impedance	:	75 ± 3 Ω
DC loop resistance	:	≤ 20.0 Ω/Km
Inner conductor	:	≤ 9.4 Ω/Km
Outer conductor	:	≤ 10.6 Ω/Km
Capacitance	:	≤ 55 pF/M ± 2 pF/m
Velocity ratio	:	0.81 ± 0.02
Insulation resistance	:	> 10^4 MΩ/km
Nominal attenuation at given frequencies	:	

FREQUENCY (MHz)	LOSSES (dB/100m)	FREQUENCY (MHz)	LOSSES (dB/100m)
5	0.9	1000	16.4
50	3.0	1350	20.4
100	4.3	1600	22.5
200	6.2	1750	23.6
400	9.2	2150	26.3
600	11.2	2400	28.5
800	13.0		

Return Loss

5 – 30 MHz	:	≥ 23 dB*
30 – 470 MHz	:	≥ 23 dB*
470 – 862 MHz	:	≥ 20 dB*
862 – 2150 MHz	:	≥ 18 dB*

* Max 3 peak values 4 dB lower than specified

Screening efficiency (A) : 30 MHz to 1000 MHz, ≥ 85 dB

Annex D
(normative)

Minimum Coaxial Cable Specifications for RG 6

Mechanical Specifications

Type	:	IF Coaxial Cable – RG 6
Inner conductor	:	1.00 mm ± 0.02 mm Copper Covered Steel
Dielectric	:	Formed Polyethylene
Diameter over dielectric	:	4.8 mm ± 0.15 mm
Outer conductor	:	Copper + bare copper braiding
Foil	:	Copper Foil
Braiding	:	128 x 0.12 mm bare copper
Coverage braiding	:	90 %
Diameter over screen	:	5.34 mm ± 0.15mm
Sheath	:	PVC
Diameter over sheath	:	6.9 mm ± 0.2 mm
Minimum wall thickness	:	0.4 mm
Minimum static bend radius	:	70 mm
Nominal wall thickness	:	0.69 mm
Adhesion of dielectric	:	7.8 N to 78 N at 25 mm
Total Weight	:	44 kg/km

Electrical Specifications

Characteristic impedance	:	75 ± 3 Ω
DC loop resistance	:	≤ 41.0 Ω/Km
Inner conductor	:	≤ 23.0 Ω/Km
Outer conductor	:	≤ 18.0 Ω/Km
Capacitance	:	54 pF/m ± 2 pF/m
Velocity ratio	:	0.82 ± 0.02
Insulation resistance	:	> 10^4 MΩ/km
Nominal attenuation at given frequencies	:	

FREQUENCY (MHz)	LOSSES (dB/100m)	FREQUENCY (MHz)	LOSSES (dB/100m)
5	1.8	800	18.9
50	4.7	1000	21.8
200	9.5	1350	25.4
300	11.0	1750	29.0
400	12.8	2150	32.8
500	15.65	2400	34.2

Return Loss

5 – 30 MHz	:	≥ 23 dB*
30 – 470 MHz	:	≥ 23 dB*
470 – 862 MHz	:	≥ 20 dB*
862 – 2400 MHz	:	≥ 18 dB*

* Max 3 peak values 4 dB lower than specified
Screening efficiency (A) : 30 MHz to 1000 MHz ≥ 85 dB

Annex E
(normative)

Minimum Single Mode Fibre Optic Cable Cable Specifications

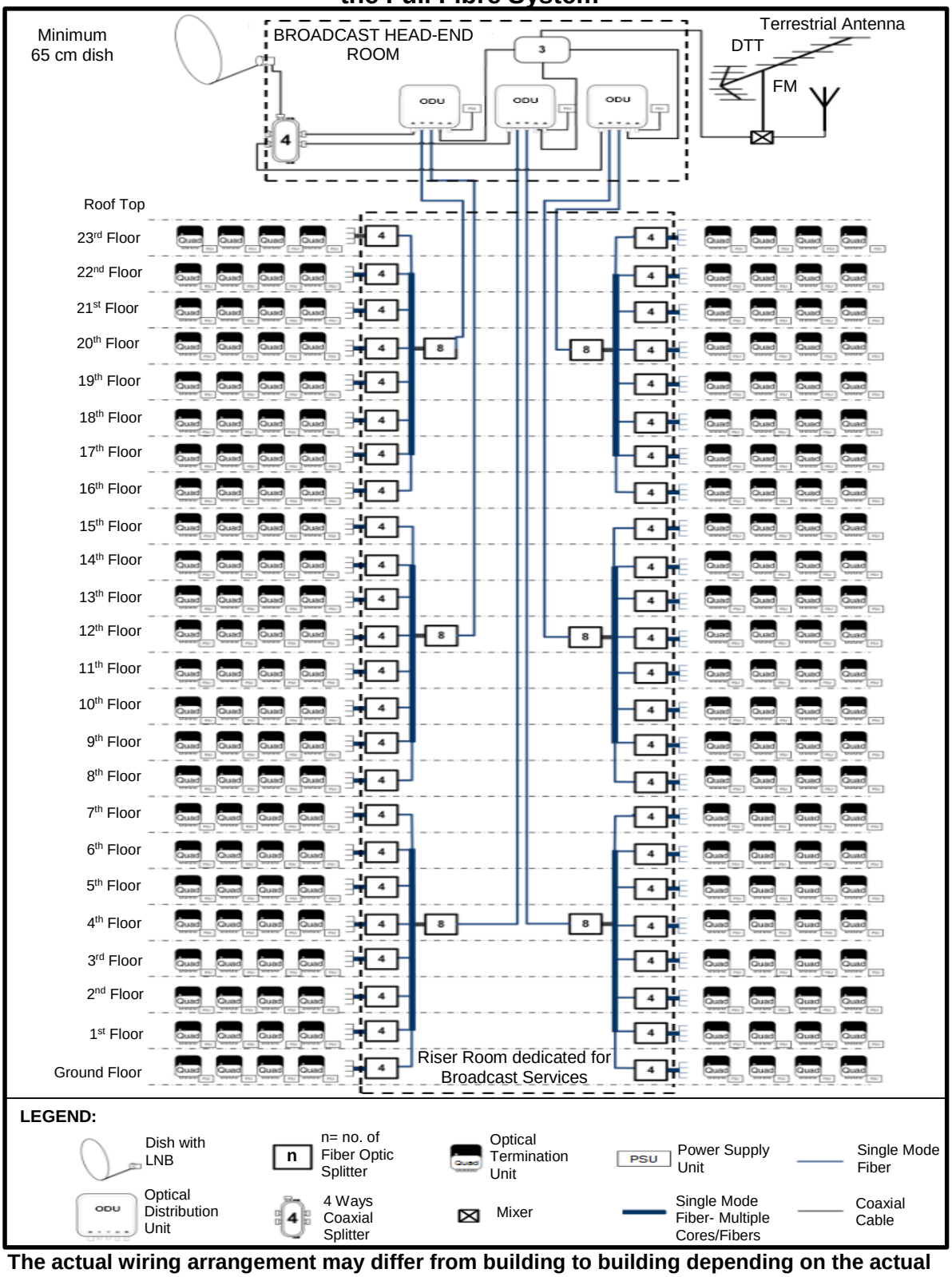
Mechanical Specifications

Fibre type	:	Single mode
Fibre core/cladding	:	9/125 microns
Fibre standard	:	ITU-T G.657A1/A2 and ITU-T G.652.D
Fibre coating	:	Low Smoke Zero Halogen (LSZH) and UV stable
Fibre protection	:	Suitable for the environment in which it is installed.
Fibre connector	:	Suitable for the equipment used.
Crush Tolerance	:	2000 N
Operating Temperature	:	-15 ^{o}C to 70 ^{o}C
Minimum Tensile Load	:	500 N
Minimum Bend Radius	:	15 mm

Optical Specifications

Fibre wavelength range	:	1310 nm to 1625 nm
Attenuation (1310nm / 1550nm)	:	0.4 / 0.25 dB/km

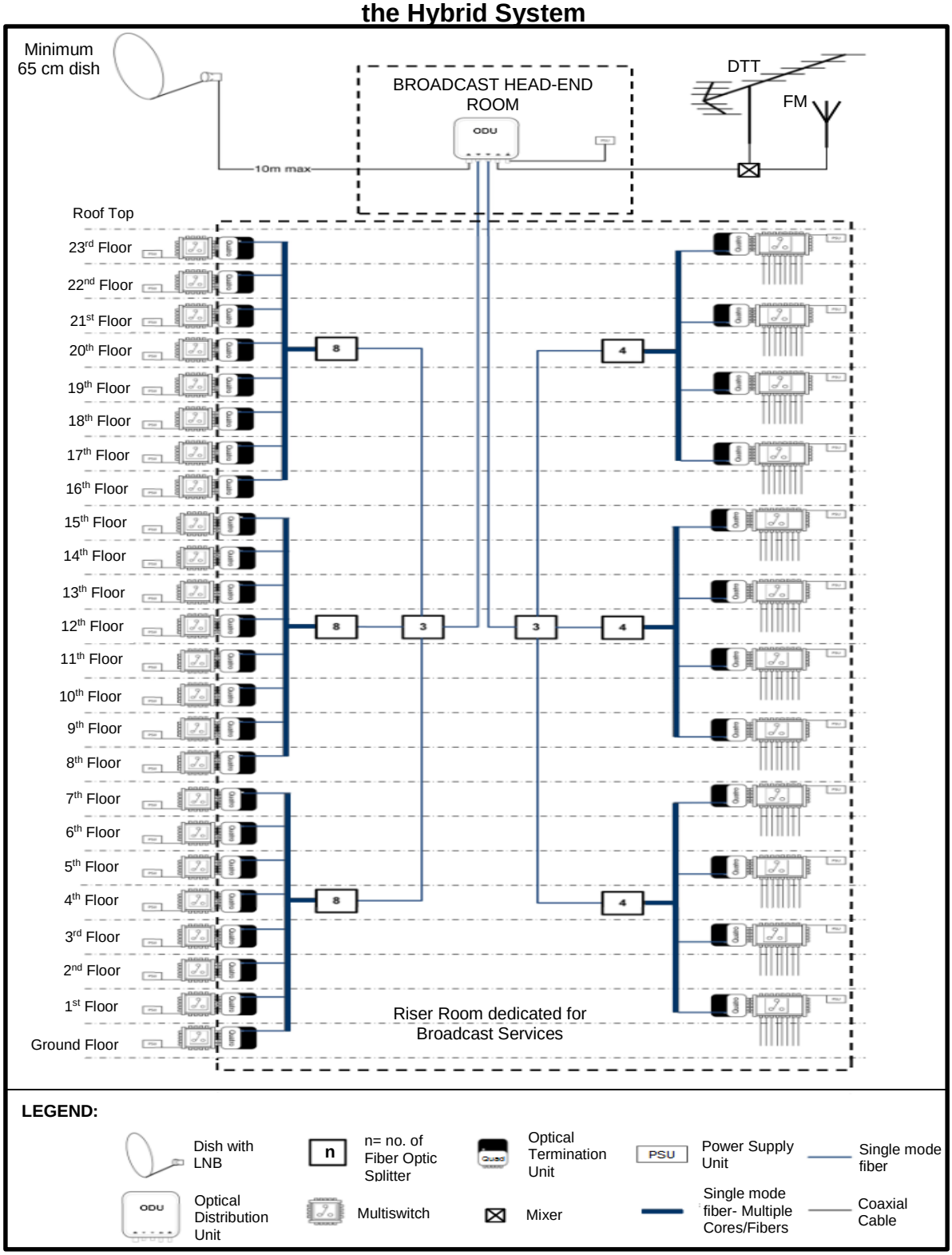
Annex F
(normative)
Typical Design of a Broadcast Broadband System Schematic Diagram Using the Full Fibre System



The actual wiring arrangement may differ from building to building depending on the actual requirement

Annex G
(normative)

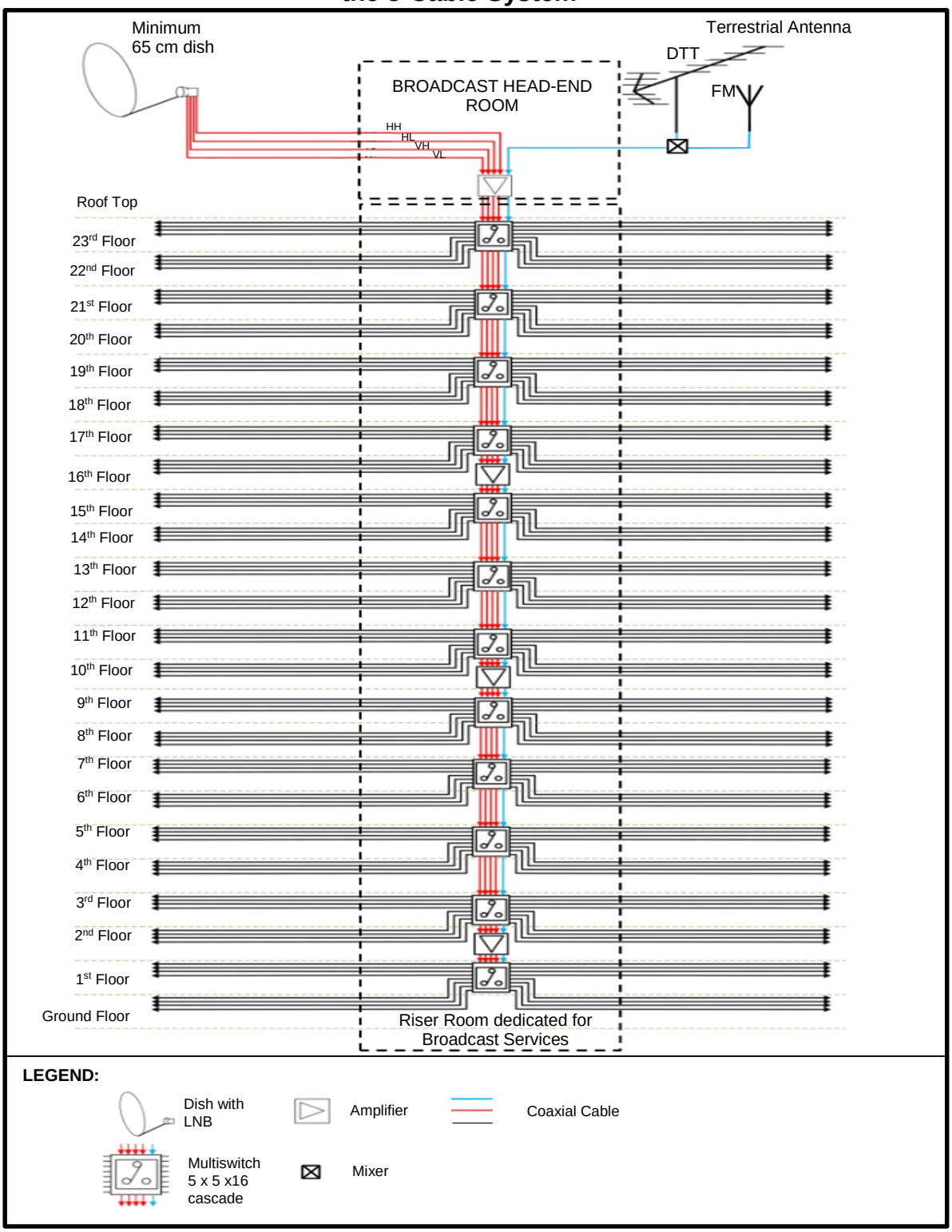
Typical Design of a Broadcast Broadband System Schematic Diagram Using the Hybrid System



The actual wiring arrangement may differ from building to building depending on the actual requirement

Annex H
(normative)

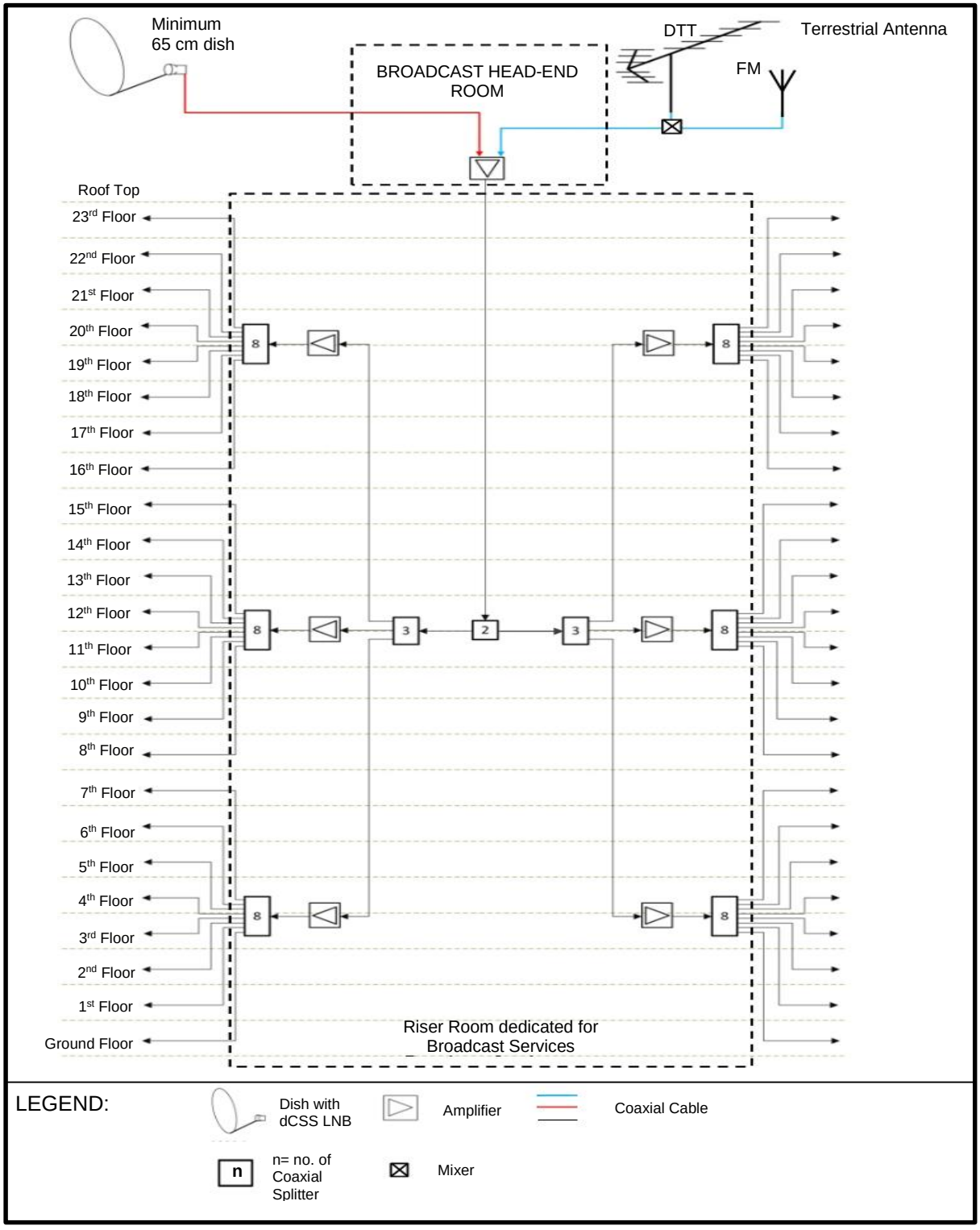
Typical Design of a Broadcast Broadband System Schematic Diagram Using the 5-Cable System



The actual wiring arrangement may differ from building to building depending on the actual requirement

Annex J
(normative)

Typical Design of a Broadcast Broadband System Schematic Diagram Using the dCSS System



The actual wiring arrangement may differ from building to building depending on the actual requirement

Annex K
(normative)

Test Result Sheet for Broadcast Broadband System

Company : _____ Date : _____

Name of Dwelling : _____ Ref No. : _____

Address : _____ Block No. : _____

Roof Top

Channel / Transponder/ Frequency	Signal level (dBµV)	MER level (dB)	Carrier to Noise Ratio (dB)	Remark

Head-End

Channel / Transponder/ Frequency	Amplifier signal level (dBµV)		Remark	ODU signal level (dBm)		Remark
	Before	After		Before	After	

Last Component before Socket Outlet

Level	Signal Level At Broadcast Broadband Socket																
	Satellite [Signal level, MER (dB)]				Analog Terrestrial [Signal level, dBµV (C/N)]							Digital Terrestrial [Signal level (dBµV) or MER (dB)]					
	1	2	3	4	TV1	TV2	TV3	NTV7	8TV	TV9	AH	1	2	3	4	5	6

Within the units

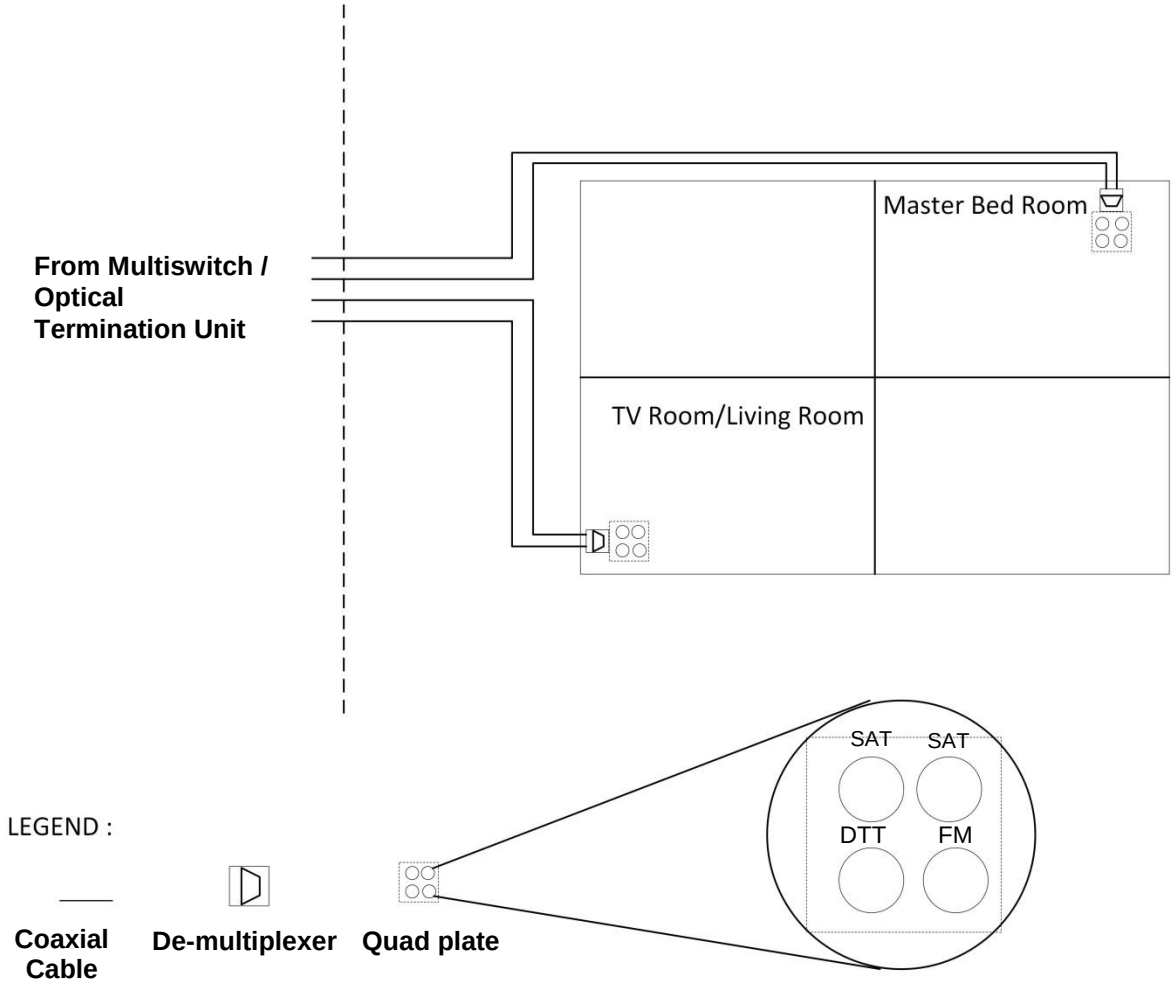
Level	Signal Level At Broadcast Broadband Socket																
	Satellite [Signal level, MER (dB)]				Analog Terrestrial [Signal level, dBµV (C/N)]							Digital Terrestrial [Signal level (dBµV) or MER (dB)]					
	1	2	3	4	TV1	TV2	TV3	NTV7	8TV	TV9	AH	1	2	3	4	5	6

Annex L
(informative)

Diagram for Horizontal Wiring of Broadcast System Distribution

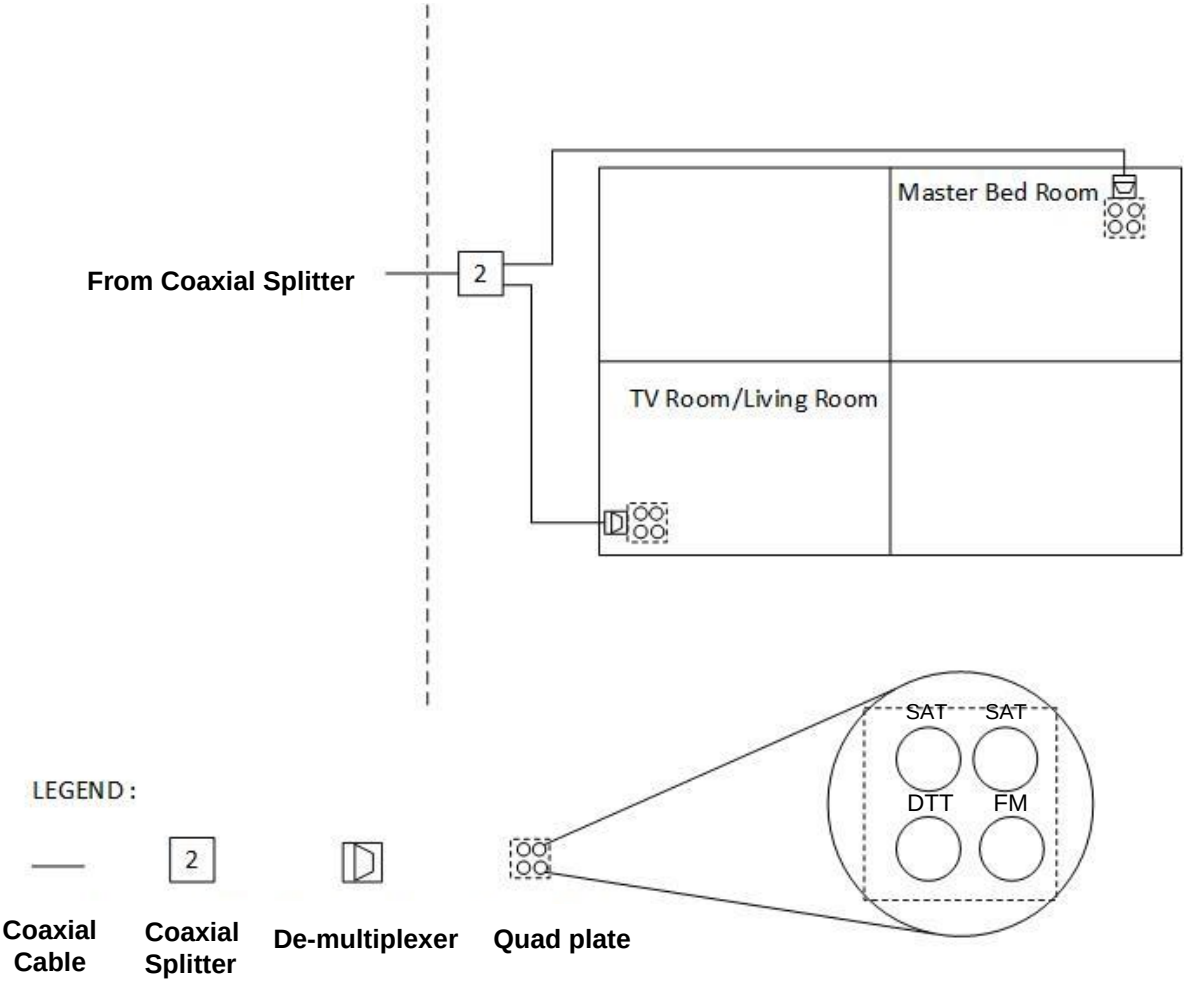
Mainly for:

a) 5 Cable System
b) Hybrid System
c) Full Fibre System



Annex M
(informative)

Diagram for Horizontal Wiring of dCSS System



Acknowledgements

Members of the Broadcast Network Facilities Working Group

Mr. Mohamad Isa Razhali (Chairman)	MEASAT Broadcast Network System Sdn Bhd
Mr. Shamsul Najib Mohtar (Vice Chairman)	MYTV Broadcasting Sdn Bhd
Mr. Muhammad Rezza Alui (Secretary)	MEASAT Broadcast Network System Sdn Bhd
Mr. Mohamad Hafizal Arifin /	Al Hijrah Media Corporation (TV Alhijrah)
Mr. Suffian Yahya /	
Mr. Wan Khairul Nizam	
Mr. Tan Chor Man	Celcom Axiata Berhad
Mr. Tan Kwong Meng	Dagang Teknik Sdn Bhd
Mr. Sharad Sadhu	Fraunhofer IIS
Mr. Azimin Wan Abdul Kadir /	Global Invacom Sdn Bhd
Mr. Jon Chia Wen Hun	
Mr. Pine Pienaar	LS Telcom
Mr. Ahmad Fahmi Ahmad Zubir /	MEASAT Broadcast Network System Sdn Bhd
Mr. Barry Fong /	
Mr. Hee Jenn Wei /	
Ms. Norsaiza Abdullah /	
Mr. Prakash Maniam /	
Mr. Zulkarnain Hamidon	
Dr. Ahmad Zaki Mohd Salleh /	Media Prima Berhad
Mr. Natjman bin Zakaria /	
Ms. Norazah Binti Abdullah /	
Mr. Muhammad Rahimi Ismail /	
Mr. Sukumar Lechimanan /	
Mr. Yong Joon Fah	
Mr. Mohd Azmi Mohd Zahit /	MYTV Broadcasting Sdn Bhd
Mr. Zul bin Deresid	
Mr. Kuo Hai Ann	Zettabits Technologies (M) Sdn Bhd