



RUFIS

Remote Radio Head (RRH) Unit
Field Installation System

*Ease your transition towards
next generation base stations*

Introduction

Remote Radio Heads improve efficiency of next generation wireless base stations while introducing new installation challenges

What is a Remote Radio Head?

- Unlike coax-based base stations, in a distributed architecture the base band equipment is separated from the radio equipment (so called Remote Radio Head or RRH) and connected through a fiber link
- The RRH is the radio equipment, that includes filters and amplifiers, that is installed outdoors, as close as possible to the antenna

Why use Remote Radio Heads?

- Reduced power consumption by avoiding the 3dB power loss typical of the coax cable
- Higher capacity available due to better signal to noise ratio
- Cleaner and easier to install than bulky and heavy coax cables

What are the current challenges for installing and maintaining an RRH?

- For the fiber and power cables, need to splice on the field or pre-plan and use pre-connectorized cables
- Needs fiber and electrical experts for installation and maintenance who are capable/certified to climb the pole/tower/mast
- A change in RRH connector (e.g. new OEM release) requires to pull a new riser cable (from Base Band Unit to the tower top)
- New riser cables are required for sector capacity increase or upgrade to LTE
- The skills of the installers have a strong impact on overall site reliability and quality

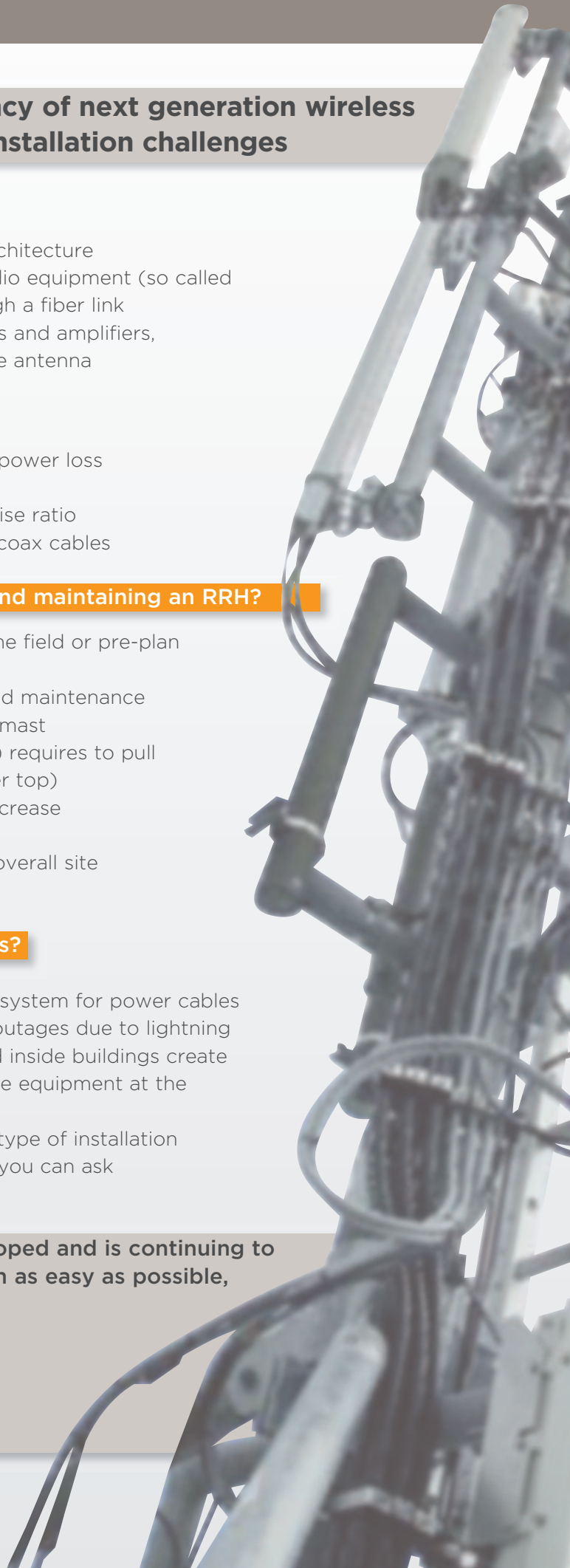
Is there a lightning risk for Remote Radio Heads?

- ITU-T recommendation K.56 suggests a protection system for power cables installed outdoors to prevent damage and service outages due to lightning
- The DC power cables along towers/mast/poles and inside buildings create a conductive path for destructive surges to sensitive equipment at the base station
- Equipment damage probability per region and per type of installation can be calculated following recognized standards (you can ask our experts for a tailored study)

For these reasons, Tyco Electronics has developed and is continuing to improve a solution that makes RRH installation as easy as possible, as well as plug and play and highly reliable.

The solution includes:

- A. RUFIS PnP aggregation box**
- B. RUFIS cable assemblies**
- C. RUFIS Lightning Surge Protection Device**





TE RUFIS solution solves most challenges for RRH installation, maintenance and upgrades

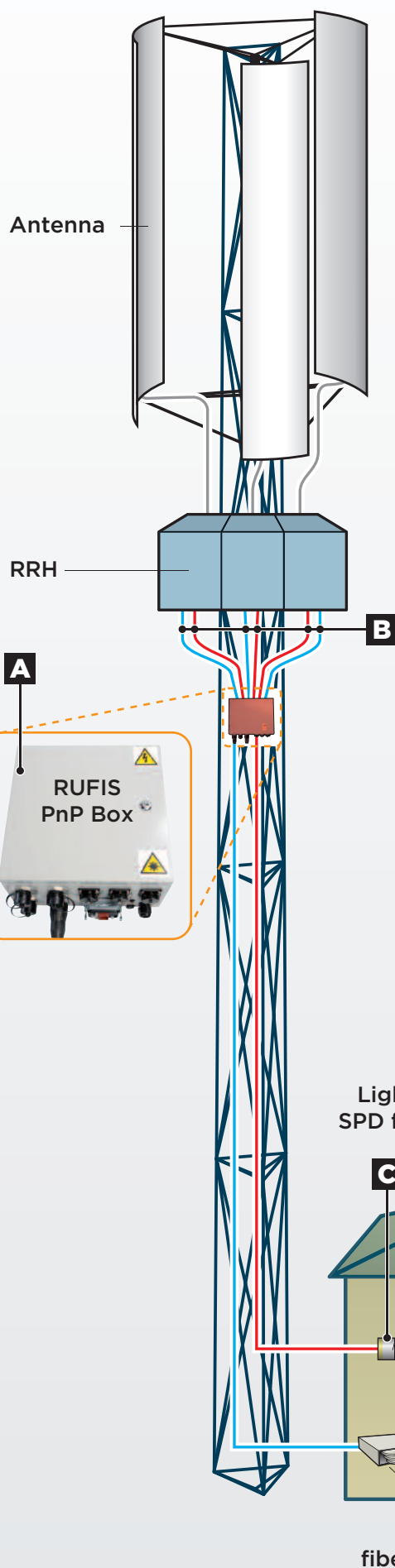
	Splicing	Pre-connectorized cable	TE RUFIS solution
Speed of installation and/or maintenance	●	● ●	● ● ●
Easy to install and/or maintain on pole/mast/tower top	●	● ●	● ● ●
Management of cable overlengths	● ● ● ●	●	● ●
Readiness for capacity or LTE upgrade	●	●	● ● ● ●
Level of lightning protection system	● ● ¹	● ● ¹	● ● ● ●
Total cost of ownership	●	● ●	● ● ● ●

● = poor ● ● ● ● = excellent

¹ Based on fuse-based 20 KA Surge Protection Device and/or shielded power cable

RUFIS System Solution

A RUFIS PnP Aggregation Box



Fiber

In 1 multifiber (12)
Out 3 double fiber
 + 1 multifiber (6) for site upgrade

Power

In 1 or 2 connectors
Out 3 connectors
 + 1 connector for site upgrade

Aggregation box for fiber and power connectivity

- IP65 rated metal or plastic box
- Weight²: 4.2 Kg (Plastic) or 7.1 Kg (Metal)
- Size: 30cm x 30cm x 15cm
- Mounting options: pole, mast, tower, wall
- 100% plug and play outdoor sealed connectors
- outdoor rated fiber cable fan-out
- internal bus power distribution system
- circuit switches and LED for safety during works on site
- LPL IV Surge Protection Device

Pre-sales engineering support to customize type and capacity of fiber and power connectivity for your installation needs

B RUFIS cable assemblies and fiber accessories

- **Wide range of cable lengths and connector type to cover most OEM interfaces**
- **Wide choice of:**
 - fiber splice/patch shelves (e.g. FIST-GPS2) for flexible connectivity to the base band unit
 - fiber boxes (e.g. FIST-MB2) in different configurations for backhauling connectivity
- **Quick turnaround for make to order**
- **Global reach**

² Size and weight depend on configuration and customization

C RUFIS Lightning Surge Protection Device for AC and DC

Lightning overvoltage protection is today installed in all base stations to protect the AC line. In a distributed base station architecture with Remote Radio Heads, to avoid damage to the outdoor active equipment and the internal equipment connected to the outdoor cable, ITU-T Recommendation K.56 recommends the use of Surge Protection Devices on the outdoor DC line.

Depending on the region, the installation layout and the quality of SPD, it is possible to forecast the probability of direct strike to the infrastructure and the consequent probability of damage. In this way it is possible to calculate in detail the financial benefit of installing a better protection system in your base stations.

The RUFIS Lightning Surge Protection Device (for AC and DC) is the best in class maintenance free solution. It has the lowest total cost of ownership because it significantly lowers the probability of damage and downtime costs associated with lightning events.

Conventional fuse based SPDs

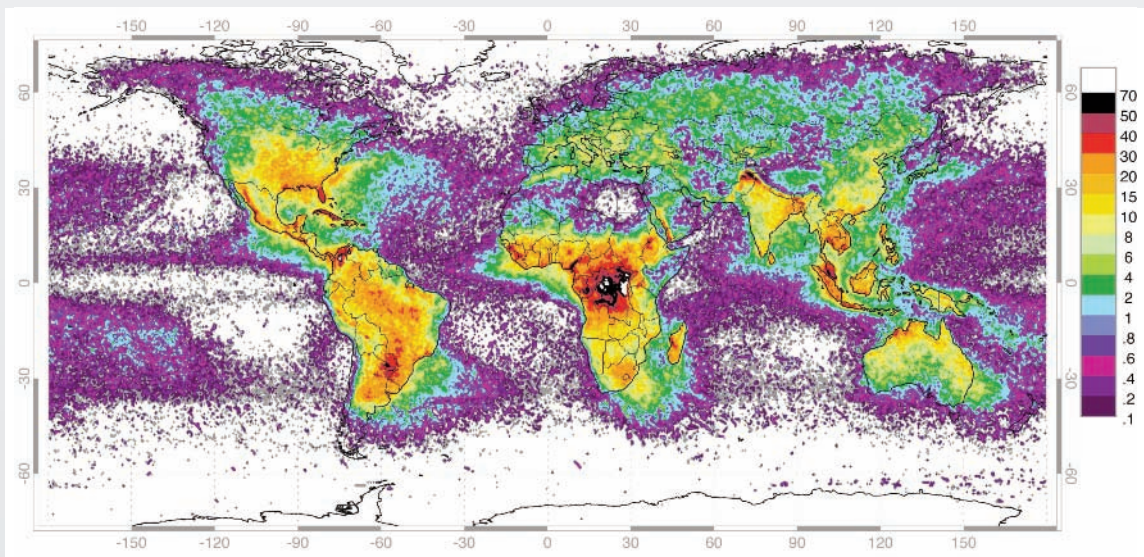
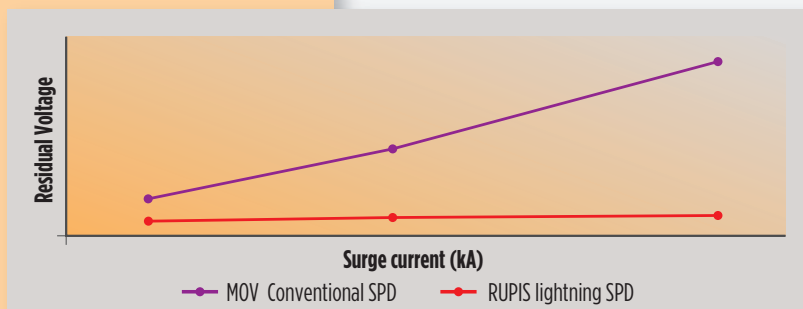
- Usually compliant with only one between UL and IEC/EN standards
- Most of them certified for indirect Class II (8-20 μ s) current waveshapes only
- Affected by ageing effect: suffer damages when exposed to over voltages and vibration environment
- Characterized by higher residual voltages due to requirement of additional cabling when installed



RUFIS Lightning Surge Protection Device

- Compliant with both the 2007 & 2009 UL 1449 3rd edition standard (North America) and the IEC/EN standards (Europe & Rest of the World).
- Certified for direct Class I (10-350 μ s) and indirect Class II (8-20 μ s) current waveshapes
- Negligibly affected by ageing effect
- Characterized by a residual voltage much lower than competitive products
- Highly reliable and performing - No fuse and no shielded cable required
- Minimizes total cost of ownership

**Rufis Lightning SPD
"Strikesorb"**



Lightning frequency map in flashes per km² per year

Global distribution of lightning April 1995 - February 2003 from the combined observations of the NASA OTD (4/95-3/00) and LIS (1/98-2/03) instruments.

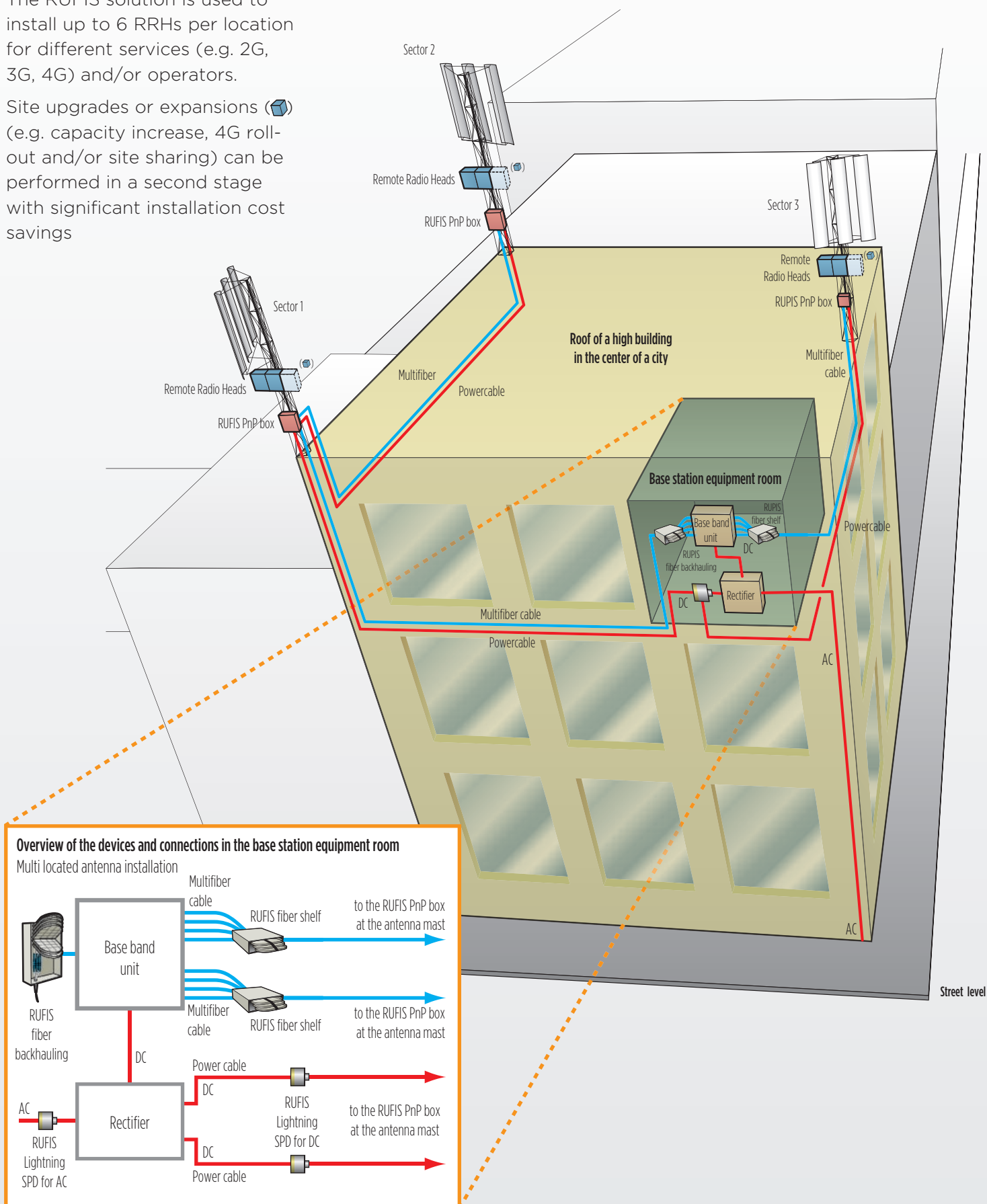
Rooftop example 1

Single-sector (multi-sites) antenna poles

Case A Multi operator and/or multi technology usage

The RUFIS solution is used to install up to 6 RRHs per location for different services (e.g. 2G, 3G, 4G) and/or operators.

Site upgrades or expansions (e.g. capacity increase, 4G roll-out and/or site sharing) can be performed in a second stage with significant installation cost savings



Rooftop example 2

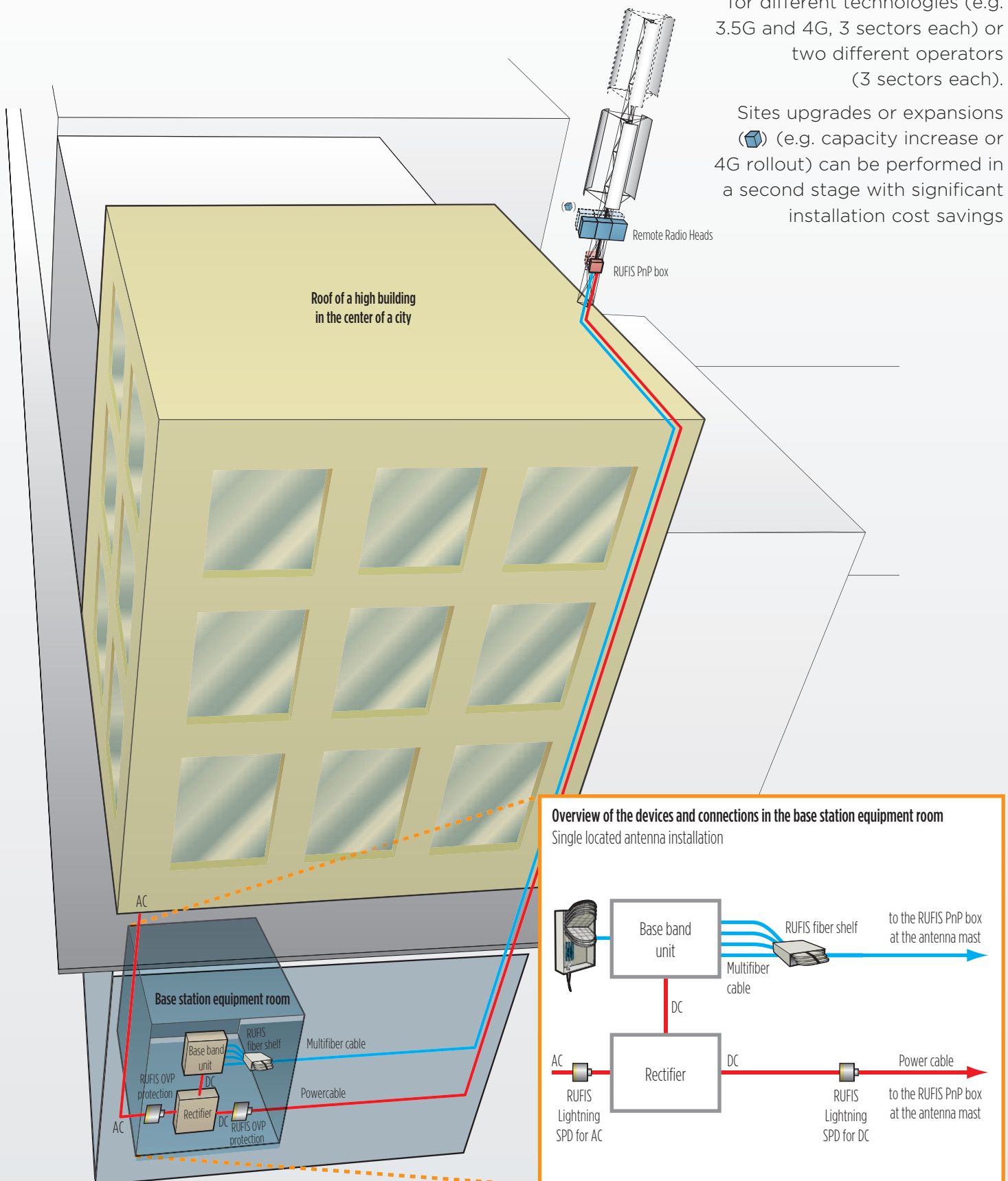
Multi-sector (in one site) antenna pole

Case B

Multi-sector, Multi-Technology or Multi-Operator usage

The RUFIS solution is used to install up to 6 RRHs per location for different technologies (e.g. 3.5G and 4G, 3 sectors each) or two different operators (3 sectors each).

Sites upgrades or expansions (e.g. capacity increase or 4G rollout) can be performed in a second stage with significant installation cost savings



Benefits of the RUFIS system

Capex benefits

- **Quicker to install**
(Lower labor and downtime costs)
- **No need for fiber or electrical specialist during installation**
(100% plug & play with positive feedback)
- **Easy and cost efficient to upgrade from 3 to 6 RRH**
(no new riser cables; no specialists required)
- **Less cables required**
- **No electrically shielded cable required**

Opex benefits

- **Quicker to disconnect and remove RRH for maintenance**
(Lower labor and downtime costs)
- **No need for fiber or electrical specialist during removal**
- **Intermediate test point for fiber. Possible to use extra fiber for redundancy**
- **Less damage and service outage due to lightning risk**

Other benefits

- **Standard installation quality across all the sites**
- **No need to pull a new riser cable in case of change of RRH connector**
(only the short jumper cable needs to be replaced)
- **Esthetics: lower number of cables and compact aggregation point**
- **Less spare cable**
- **Safety during work on sites with no line of sight to main circuit breaker**
(e.g. rooftops)
- **Different jumper cable lengths fit most scenarios**
(tower, rooftops, DAS)
- **Upgrade box can be used for site sharing**

TE (logo) and Tyco Electronics are trademarks of the Tyco Electronics group of companies and its licensors. Strikesorb is a trademark.

The information given herein, including drawings, illustrations and schematics which are intended for illustration purposes only, is believed to be reliable. However, Tyco Electronics makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. Tyco Electronics' obligations shall only be as set forth in Tyco Electronics' Standard Terms and Conditions of Sale for this product and in no case will Tyco Electronics be liable for any incidental, indirect or consequential damages arising out of the sale, resale, use or misuse of the product. Users of Tyco Electronics products should make their own evaluation to determine the suitability of each such product for the specific application.

Tyco Electronics Raychem bvba
Diestsesteenweg 692
B-3010 Kessel-Lo, Belgium
Tel 32-16 351 011 - Fax 32-16 351 697
www.tycoelectronics.com
www.telecomosp.com

TC 1074/BR/1 10/10

 **Tyco Electronics**
Our commitment. Your advantage.