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1 FRÉNÉHARD & MICHAUX

A NEW INNOVATIVE PLAYER IN THE HEIGHT ACCESS, WORK CARRIED OUT AT HEIGHTS AND ROOFING HARDWARE SECTORS

FRENEHARD & MICHAUX

In 2016, TUBESCA-COMABI joined the Frénéhard & Michaux Group, the French leader in the fastening of roofing and guttering items and fall protection solutions.

The combined know-how of Frénéhard & Michaux and TUBESCA-COMABI makes it possible to develop new fall protection solutions and thus offer the first integrated solution ensuring a continuous chain of movement and working at heights that enhances safety.

As a family group of French industrial companies, Frénéhard & Michaux supports roofing specialists in their new building sector markets and its future is focused on fall protection and working at height solutions. All the companies of the Frénéhard & Michaux Group (Frénéhard, Securigard, TUBESCA-COMABI, FMS Ringue, Skyworks, Tendo, Artub, Roy, FM TSN, FM Merlet, FM Labelle, Syam) share the same industrial tradition, high level of expertise in "materials" based on aluminium and steel, as well as the same idea about height (scaffoldings and ladders, accessories for rooftops, fall protection and guardrails). Safety at heights is therefore the prerogative of their respective activities and its common denominator.

The group currently has a turnover of €160 million, 20% of which is generated internationally. It has 1000 employees spread over 9 production sites in France and 8 international locations (Spain, Netherlands and Germany) and aims to achieve a turnover of €200 million over 5 years.

Frénéhard & Michaux is a major French industrial group.

Its ambition is to create synergies between all entities to generate great ideas and strengthen the core businesses of each company. It wants to capitalise on its long-standing brands to win new markets, expand its presence in construction and industrial markets, and establish a leading European group with an industrial base in France.

Key dates:

- 1954: Creation of TUBESCA, the first European manufacturer to use aluminium in the production of heavy-duty ladders;
- 1954: Creation of COMABI, the French leader in steel scaffoldings and façades and materials lifts;
- 1999: COMABI joins the TUBESCA Group;
- 2011: TUBESCA and COMABI merge and become TUBESCA-COMABI;
- 2012: Construction of a new production site in Picardy;
- 2016: Acquisition of TUBESCA-COMABI by Frénéhard & Michaux. Emergence of a major player in safe working at heights;
- 2017: New visual identity for the entire new Frénéhard & Michaux Group.
- 2018: Acquisition of SYAM by Frénéhard & Michaux.

Key figures

FRÉNÉHARD & MICHAUX HOLDING

- Number of employees: 1,000
- Number of subsidiaries: 12 (+2 as joint ventures)
- Number of industrial sites: 9
- Number of international locations: 8
- Turnover: €160 million
- Sales forces: more than 150 people, including 30 working on international operations.



TUBESCA-COMABI

- Turnover of €83 million in 2016
- 311 employees
- 3 integrated design offices (development of standard products, custom-made products and work site applications)
- 100% French manufacturing
- 2 industrial sites (Ailly-sur-Noye and Trévoux)
- Around 110 active patents
- More than 200 projects being developed and implemented in 2016 with on-site support.

1 FRÉNÉHARD & MICHAUX

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Custom-made services

The new Frénéhard & Michaux Group draws its strength from its diversity. Its employees provide their expertise in many sectors of activity and support their customers by offering them relevant and efficient service. The Group is constantly looking to develop new services and products to meet specific customer demands, offer custom-made solutions and increase its market and expert-market position.

The services are tailored to each case and are structured around six main areas of expertise:

Rooftops & fasteners:

- Gutter hardware: gutter hooks, downspout flanges, accessories
- Rooftop hardware: slate hooks, tile hooks, tacks and nails, rooftop covering accessories, frames
- Fall protection: rooftop anchors, safety hooks

Access and working at heights:

- Ladders and stepladders
- Individual Rolling Platforms and Individual Light Rolling Platforms (PIR/PIRL)
- Aluminium or steel rolling scaffolding
- Façade scaffolding
- Multi-directional scaffolding

Aeronautical maintenance: custom-made solutions for the manufacturing and maintenance of all types of civil and military aircraft and helicopters on all continents.

- Dockside maintenance platform
- Helicopter maintenance platform
- Access module for cargo hold
- Telescopic access platform
- Access stairway

Industrial maintenance:

- Aeronautics
- Rail transport
- Road transport
- Naval transport
- Energy industry: electricity, nuclear and oil

Fall protection systems: a complete range of fall protection systems designed for flat rooftops of residential, service or industrial buildings. Design and installation of specific equipment to ensure the safety of users of waste collection centres.

- Guardrails (temporary or permanent)
- Hooped ladders
- Skylight protection gratings and barriers
- Cross-over ladders
- Lifeline
- High and low platform solutions
- Mobile anchoring and PPE

External facilities:

- Aluminium and steel swing and sliding gates
- Gates, gratings and fences
- Wrought iron awnings, canopies
- Ironwork and decorative locks
- Guardrails for balconies
- Guardrails and walkways for flat roofs



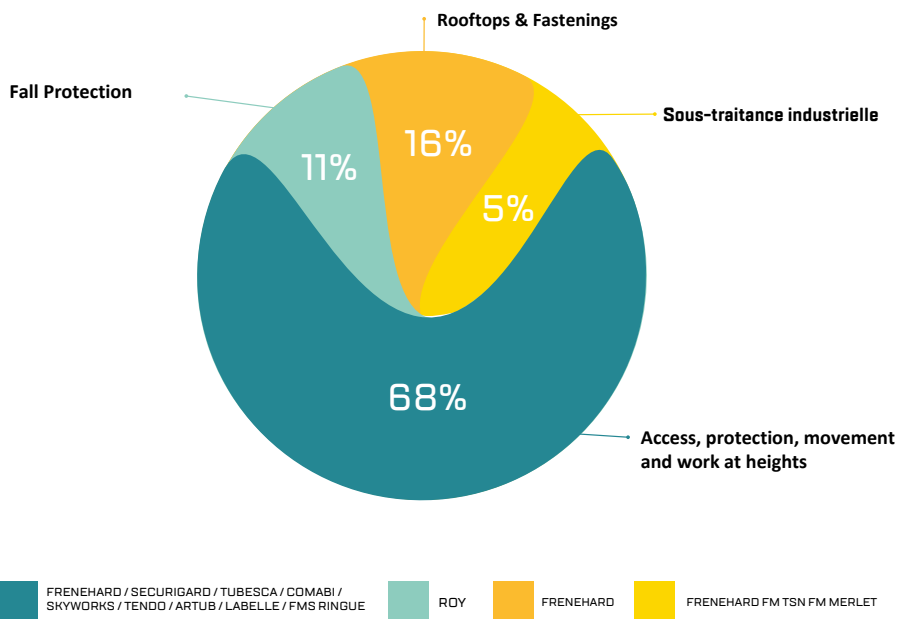
Frénéhard & Michaux Group

Its trademarks and subsidiaries:

- Frénéhard SAS: gutter hooks, hooks for small roofing elements, roofing accessories, temporary and permanent collective guardrails
- Securigard, individual fall protection and safety of waste collection centres
- FM Labelle: guardrails for balconies, locks and metalwork for the building sector;
- FMS Ringue: rental and sale of scaffoldings;
- FM TSN and FM Merlet: surface treatment;
- ROY: gates and fences for individuals;
- Securityguard.(Germany): sale of fall protection facilities;
- Tubesca-Comabi: platforms and steps, ladders, fixed and rolling scaffoldings, materials lifts, custom access for the building sector and industry;
- Skyworks (Netherlands): sale, rental and installation of solutions for access and working at heights (scaffoldings, suspended platforms and overhead platforms);
- Tendo (Spain): manufacturing and sale of scaffoldings;
- Artub: ladders, stepladders and rolling scaffoldings for the general public;
- Syam: personal protection equipment.

Group's markets

The Frénéhard & Michaux Group offers high quality support in the markets it covers irrespective of the sector concerned. Each field of activity requires specific know-how and the group deploys its areas of expertise to provide an optimal service while complying with all sector issues: time and technical requirements in the field of activity, applicable French and European legislation, and operational and social risks.



Joseph MIQUEL,
Executive Director
Rooftops & Fastenings
Fall Protection



Dominique PAGNIEZ,
Executive Director
Height access and work
at heights

1 FRÉNÉHARD & MICHAUX

A NEW INNOVATIVE PLAYER IN THE HEIGHT ACCESS, WORK CARRIED OUT AT HEIGHTS AND ROOFING HARDWARE SECTORS

The view of Bernard ROTHAN, Chairman of the Executive Committee



Bernard Rothan
Chairman of the Executive Committee

How would you define Frénéhard & Michaux?

The acquisition of TUBESCA-COMABI by Frénéhard & Michaux, accompanied by a pool of investors selected on the basis of long-term commitment, was a rallying point for the leading French player in safe height access and working at heights.

The two entities are fully complementary in their respective markets. Each brand of the Group, and in particular TUBESCA-COMABI, has its own area and specialisation, and is developed in all its specificities. The industrial and R&D synergies resulting from this new group enable the rapid deployment of new solutions and services for the safety of work sites and buildings.

What are the Group's aims? How do you see the future?

The aim is to become a leading player in Europe by developing the most complete and innovative solutions based on the "SAFE WORKING AT HEIGHTS" concept, with complete? integrated solutions for the industrial, construction, services and transport markets. At the same time, we will consolidate the Group's long-standing "Rooftops & Fasteners" sector. We seek to offer our customers the best products, solutions and services, and to this end we continue to invest in technology and innovation and in our industrial capability in general.

Our ambition is to achieve a turnover of €200 million over the next 5 years and to develop internationally by generating one third of our turnover outside France.

What distinguishes the Group?

The Group draws its inspiration from its "Made in France" label. This is a French industrial project the decision-making centre of which is in France. Height-related expertise is the common denominator of each entity that keeps - in its markets - its own freedom and independence. Firmly rooted in the construction and industrial markets, Frénéhard & Michaux serves its professional clients with the best products and solutions fully tailored to their needs. The Group is also distinguished by a true unifying family spirit and aspires to provide its employees with a sincere, sustainable and empowering work environment.

"We expect to generate a turnover of €200 million over the next 5 years and develop the company internationally, with a third of our turnover generated outside France. "

A strong commitment to an environmental and socially-responsible policy

Social and environmental responsibility is a vibrant constant at Frénéhard & Michaux. The Group's management system is based on operational, managerial and support processes that define the Group's strategy and management, while unequivocally including the social and environmental concerns of sustainable development, as well as quality, and health and safety and aspects.

Frénéhard & Michaux regularly invests to improve business management.

The businesses of the Frénéhard & Michaux Group are directly concerned by the challenges of green growth. The industrial group is convinced that steel and aluminium, which are infinitely recyclable materials, are essential to reduce the energy consumption of buildings and establish a world with low CO2 emissions. Each day, the Group's various companies strive to limit the environmental impact of their activities, improve waste management and intensify recycling.

FRÉNÉHARD & MICHAUX's values

The Group has five values. Like the five fingers of a hand, they are in action. These 5 values are activities and are logically expressed by verbs: listen, commit, innovate, protect and progress.



LISTEN



COMMIT



INNOVATE



PROTECT



CULTIVATE



2 TUBESCA-COMABI

PRODUCTS THAT MEET ALL STANDARD AND CUSTOMISED HEIGHT ACCESS AND WORKING AT HEIGHTS NEEDS

TUBESCA-COMABI invests human skills and industrial resources to creating high quality products and services that meet all standard and customised height access needs in complete safety. With production capabilities spread over France and Spain, TUBESCA-COMABI markets "universal access solution" products (ladders, steps, platforms, rolling scaffolding, permanent and temporary roof guardrails), as well as work site applications (scaffolding, umbrellas, materials lifts) and solutions developed for industrial, aeronautical and transportation maintenance. Its global offer covers all access and work at heights needs expressed by professionals and individuals.



- Multi-purpose access solutions

TUBESCA-COMABI offers ranges that provide multiple purpose solutions to cover as many problems encountered on site as possible.

Platforms are workstations that are increasingly used in the building and industrial maintenance sectors. Each solution covers many applications. Each professional placing their trust in TUBESCA-COMABI can find the tool that best suits them, whether made of steel to provide better ability to withstand attacks from solvent or cement, or aluminium to make the product lighter and facilitate handling without compromising the ability to withstand intense stress.

TUBESCA-COMABI's range of standard access solutions is designed to provide a better response to the needs and problems of the working at heights sector. These solutions include all the ranges of platforms, stepladders, ladders and rolling scaffoldings, permanent and temporary roof guardrails, intended for industrial maintenance and building professionals. Some of the products in this range are also designed for domestic use and for home DIY enthusiasts.

- Specific access solutions (work sites & structural work)

The need to offer ranges appropriate for new construction, renovation, insulation, finishing or historical monuments, which are all unique situations, lies in the fact that it is up to the access solution to meet the work site's requirements and not the other way round. The ranges developed in this environment are based on TUBESCA-COMABI's long-standing know-how, which has evolved to offer solutions that are ever closer to the needs of demanding professionals.

TUBESCA-COMABI's range of fixed scaffolding, special applications and umbrellas allows is to develop solutions for working ever higher and safer. The specific access solutions are designed to meet all the needs of structural and civil engineering professionals while ensuring maximum comfort and unfailing safety. With its team of highly qualified technicians, TUBESCA-COMABI develops its know-how to meet the most stringent requirements.

- Specific access solutions (industrial maintenance)

Contractors' concerns for the comfort and safety of their teams have completely transformed the approach to working at heights. Maintenance work often requires remaining for extended periods at specific heights and under sometimes difficult conditions. These actions can no longer be carried out without considering the safety and comfort of technicians. TUBESCA-COMABI's research and development teams have used the company's long-standing know-how to create customised solutions to each problem.

TUBESCA-COMABI's industrial and aeronautical maintenance special access range focuses on Modul'access, hopped and fixed scaffolding structure solutions and aims to meet the needs of manufacturing and industrial maintenance professionals.



3 L'INNOVATION

INNOVATION AS A DRIVER OF TUBESCA-COMABI'S STRATEGY

A R&D centre of excellence

TUBESCA-COMABI asserts its position as a European leader through innovation and remains attentive to its customers needs by using its human values to win the trust of professionals.

New technologies are constantly being implemented at TUBESCA-COMABI in order to constantly tailor its products and design new solutions. R&D thus makes it possible to create new products to fully meet the needs of its customers and the safety of users. It includes engineers who define Research and Development strategy in line with TUBESCA-COMABI's main objectives.

R&D at TUBESCA-COMABI involves:

- product creation and innovation;
- special product design;
- more than 20 patents filed per year and 110 active patents;
- a design office;
- 30 engineers.

With a team operational on a daily basis, TUBESCA-COMABI is constantly working on continuously improving its ranges, always attentive to the needs of distributors and users. It is constantly looking for new technologies, new processes and new solutions to provide a better response to the needs of its customers.

Focus on the X-Tower

TUBESCA-COMABI has revolutionised the rolling scaffoldings market by offering a brand new product that can be deployed in 3 minutes: the X-Tower.

As a new generation rolling scaffolding, the X-Tower is designed to be versatile, compact and telescopic in one piece. It thus provides the closest possible response to meeting the expectations of construction and industrial maintenance stakeholders.

It offers considerable advantages, in particular fast erection time through easy deployment with no screws, tools or lost parts and the possibility of being handled by a single person. The X-Tower thus saves considerable time and productivity. In addition, this innovation won an award in Spain at the SMOPYC 2017 exhibition.



Mathieu Dimonte, Marketing Manager at TUBESCA-COMABI was asked

What specific innovation approach was used for the X-Tower?

"A large number of craftsmen, industrialists and partners were involved in the project throughout the design process, from the product's emergence to the use tests. We have gathered all the ideas from all employees giving importance to everyone, from marketing to logistics, from welders to design offices... The X-Tower thus mobilised 10 people working in house for 3 years. Its particularity is that we shared the material gathered in the field with all those involved. This allowed us, on the one hand, to have the same level of information before the project. And this also allowed some participants, less in touch with end users, to understand their needs more quickly. "

What for you are the challenges faced?

«Historically speaking, height access or working at heights in Europe has primarily been based on 4 main product families: ladders, stepladders, platforms and scaffolding. However, we realised a few years ago that some users do not identify themselves as being in this product segmentation. The X'TOWER, for example, is a scaffolding, but in one piece like a stepladder, which unfolds like a platform, and the height of which can be adjusted like an extension ladder. It is a hybrid product, which has been able to take the qualities of all products to meet different, more demanding needs... We have been able to identify these needs and respond to these market segments that did not previously exist. And its success clearly illustrates our analysis. The strategic challenge is therefore considerable. "

The significant innovations in 2018

2018 was an important year in terms of safety with strong demand from customer users. In addition, TUBESCA-COMABI wanted to strengthen and streamline its ranges by including permanent and temporary guardrails and rolling scaffoldings into its offering, with the aim of providing ever more collective protection.

Innovation at TUBESCA-COMABI is the result of cooperative work between the design office and the marketing department and also includes customer service and regulatory changes.

NEW LADDERS & ROLLING SCAFFOLDING

On 1 January 2018, the amendments to the EN-131(-1/-2/-3) standards for portable ladders and stepladders became applicable and imposed new rules on manufacturers to provide users with greater safety and better information.

To meet the new requirements and to provide its customers with the best height safety solutions, TUBESCA-COMABI has elected to comply with them by upgrading its ladders and applying new tests and new signs on all its ladder and stepladder ranges.

Several ladders in the ranges have undergone profound changes.



Platinum range

The essential PLATINIUM range, which includes the most remarkable changes, is the benchmark for quality and durability, for all demanding industrial and construction uses. Rope-operated extension models now feature a new robust and fully foldable stabilisation system,

which meets the new EN-131 standard while offering great ease of transportation and installation. Another new feature in 2018, convertible and rope-operated extension models now feature a striker PLV. The Platinum range is designed to ultra-intensive use. It thereby provides access to significant heights of up to 17.61m for the rope-operated extension ladder.

The PLATINIUM models feature:

- the adding of a base with reinforced shoes for single straight ladders and hand-operated extension ladders more than 3 m long
- the widening of the flare for single flared ladders;
- the adding of stabilizers (Agrip kit) for rope-operated extension ladders;
- the widening of the flare on convertible ladders. For the latter products, the 3rd section is made inseparable on models longer than 3 m, in order to comply with the EN-131-1 standard.



X-TENSO

Through its anti-slip shoes, its installation indicator light, its Teflon sliding rings, its unlocking deceleration system or its travel stop, the X-Tenso model already provided a large number of assurances from a safety standpoint.

With the addition of a retractable stabiliser base with reinforced, non-slip shoes, the X-Tenso Stab has now taken this question to a new level. This new step towards greater stability does not come at the expense of storage and ease of transport, since the base in question can be handily retracted.

Neolium, a complete range of welded aluminium scaffolding



This new range of scaffolding offers a large number of different models based on a common concept: working at heights in complete safety. Craftsmen are sometimes faced with needs that are difficult to reconcile: having a mobile but stable scaffolding, or a compact model capable of the reaching significant heights.

To suit the greatest number of uses, this range of scaffoldings is divided into three main families:

- Single-floor Neolium scaffolding, for demanding work sites;
- Double-floor Neolium scaffolding, designed for complex access and multi-level work;
- Neolium SX scaffolding, designed for confined work sites.

Neolium single-floor scaffoldings are designed for demanding outdoor work sites. Available in 200, 250 or 300 versions (depending on the length of floors),

these rolling scaffoldings are provided with stabilisers with anti-slip swivel pads, wheels with very powerful locking and millimetric adjustment, etc.

Line or Box. While all offer working heights of between 4 and 14 m, they have some differences: the Neolium Box range is provided with diagonalising single-piece guardrails (which is not the case with the railed Line versions). Box versions therefore give priority to ease of erection (they are known as "MDS", for safe erection and dismantling), whereas Neolium Line versions, which are closer to a "tower" format, provide a greater adjustment capability. Indeed, through the removable rails, they can get as close as possible to a wall, which is a significant advantage for renderers.

Neolium Line versions 400 and 600 can be provided with a double floor.

Neolium SX rolling scaffoldings are more compact allowing work to be carried out at very low heights of up to 7.80 m. These models are logically differentiated by their compactness provided by their detachable folding base, which allows these scaffoldings to pass through 83 cm wide doors. This device also allows quick installation. Like Neolium Box range, the Neolium SX range are MDS.

The entire Neolium range (Line, Box and SX) complies with the NF EN 1004 standard. The latter involves class 2 and 3 rolling scaffoldings with a floor height not exceeding 8 m outdoors and 12 m indoors. They must also allow erection and dismantling with horizontal adjustments, and the distance between floors must be less than 3 m. Finally, these rolling scaffoldings must withstand a maximum working load of between 150 and 200 kg/m².

PIRL (Individual light rolling platforms)

The SHERPAMATIC FIXE and SHERPASCOPIQUE TÉLESCOPIQUE platforms are designed to be the reference for safe platforms. Their reinforced posts, wide platform, adjustable stabilisers and semi-automatic rigid guardrails make them both robust and stable products. Rear anti-lift locks and crane rings have been added and comply with PIR-PIRL and EN 131-7 and are also NF certified.

TUBESCA-COMABI COMES TO THE ROOFTOPS!

After years of ensuring safe height access, TUBESCA-COMABI now addresses issues relating to rooftops and terraces and thus offers two new ranges of guardrails. These systems, whose design complies with the aesthetic appearance of buildings, solve two different problems: ensuring the safety of temporary work sites, but above all ensuring the permanent safety of high rooftops and terraces. This is why TUBESCA-COMABI offers two types of ranges: the Moment'Top range, designed to temporarily ensure the safety of rooftops and terraces, and the Horizon range, which permanently ensures safety.



Moment'Top range

The Moment'Top range has been designed to ensure the safety of rooftops and terraces on a temporary basis, during waterproofing or maintenance work on solar panels, for example. Guardrails can be fastened to a wide range of supports: slabs, gables and steel roof decks or cap roofing.



Horizon Range

The Horizon range includes several products: fixed guardrails, specially designed to protect rooftops and terraces that are not accessible to the general public, or technical terraces accessible for maintenance operations; free-standing systems, recommended when attaching to the terrace is complex or impossible; various systems to ensure the safety of rooftops and terraces, such as cross over walkways. Fixed guardrails and guardrails for skylights all comply with French and European standards NF E 85-015 / EN ISO 14122-3, which define the characteristics of guardrails (dimensions, presence of baseboards, etc.).

4 QUALITY, SAFETY AND ENVIRONMENT APPROACH:

TUBESCA-COMABI's COMMITMENTS

Made in France production committed to a high level of quality

Through its two production sites in France and the one located in Spain, TUBESCA-COMABI designs, manufactures and markets its ranges in France and in more than 60 countries worldwide. 100% of its products and solutions are designed and manufactured on 2 industrial sites in France and are certified by national and European organisations.

Light access products such as ladders, rolling scaffolding, platforms and stepladders, mainly made of aluminium, are manufactured in the Ailly-sur-Noye factory.

In addition to standard products, TUBESCA-COMABI's design office also offers custom-made products to meet all types of customer needs.

The integrated test laboratory ensures that its products comply with the applicable standards and decrees in each country. Light access ranges are manufactured on various dedicated production lines. The manufacturing process involves cutting and punching aluminium profiles.

Steel heavy access products (façade scaffoldings, rolling scaffoldings and materials lift) are manufactured in Trévoux. Large spaces ensure the very special, complex logistics of these bulky products. A team of highly qualified engineers and technicians designs all the products on a custom basis. Several dedicated production stations are used to manufacture all products to the highest quality standards.

The Spanish industrial site, located in Tarazona, manufactures steel scaffoldings meeting European standards. The integrated design office designs functional and customised solutions and offers complete customer support for their multiple applications including the construction, standard industry or petrochemical sectors.

The implementation of a production control system and AENOR certification provide assurance of the quality and reliability of the products manufactured.

The company works closely with professional distribution sector and offers professionals in the building and structural trades, rental companies and aeronautical maintenance professional with custom-made solutions.

NEW FEATURES IN 2018

TUBESCA-COMABI joins the French Fab movement

TUBESCA-COMABI proudly flies the flag of French industry internationally through a label focused on know-how and innovation: French Fab. To promote its international expertise through a strong symbol, TUBESCA-COMABI has joined hundreds of industrial companies that "play as a team" within the French Fab network of the future. This innovative label, designed to revitalise French industry, includes companies rooted in common values: superior know-how, made in France, innovation and job creation.

By partnering with French Fab, TUBESCA-COMABI proves its long-standing know-how in the industry and its forward-looking values. The company is firmly rooted in France and has 60 years of know-how marked by an ever-increasing quality requirement.



Quality commitment: an essential step

The group is stepping up its efforts to satisfy its customers by continuously improving the quality of its products, services and processes.

It is committed to measuring and improving the quality of its products and services, meeting its deadline commitments and continuously improving the efficiency of all its processes.

The cornerstone of TUBESCA-COMABI quality approach is its ISO-9001 (Quality Management System) certification, the standard that outlines the requirements for a recognised quality system. All processes and procedures have been designed to meet all the requirements of the standard. To ensure its customers the best quality, TUBESCA-COMABI has a test laboratory incorporated into the Ailly-sur-Noye production site.

TUBESCA-COMABI's qualified technicians ensure the quality follow-up of all its product references, from components to finished products. The laboratory works in close cooperation with certification bodies and its customers.

The laboratory operates in 5 areas:

1. implementation: product quality, conformity and certification monitoring tests;
 2. metrology: calibration of site measuring equipment;
 3. checking: product manufacturing and inspection monitoring;
 4. records: recording and documentary management of test results;
 5. continuous improvement: participation in establishing and improving test protocols.
- French and European safety standards

French and European safety standards

Standards, and national, European or international reference texts, define the design characteristics of height access and work at height products: dimensions, materials, performance requirements, test methods and appropriate uses. European standards EN 131 and EN 1004 and French standards PIR93352 and PIRL 93353 impose design and manufacturing criteria.

They are therefore an assurance of quality products. In addition, all scaffoldings meets the requirements of the new European standard EN12810 - EN12811, which reinforces the concepts of strength and safety.

The French decrees (96 333 and 2004-924) pertain to general safety regulations. In particular, they define the safety requirements to be met by the various categories of height access and working at height products.

- Decree 96 333 requires EN 131 compliance for ladders and stepladders.
- Decree 2004-924 provides assurance that the product meets the minimum safety requirements for the user.

TUBESCA-COMABI's products are NF certified, a label that certifies the compliance of products or services with the related national, European and international standards. Awarded by official laboratories, labels are not mandatory and are the result of a voluntary approach by the manufacturer.

The ranges are tested by independent laboratories that ensure product traceability. TUBESCA-COMABI works closely with all national and European organisations in the standards and safety field. TUBESCA-COMABI is also a member of the European and French commissions for height access and a member of the scaffolding union.



5 EMBLEMATIC WORK SITES

LESSONS LEARNED ON WORK SITES AND TUBESCA-COMABI'S FLAGSHIP SOLUTIONS:

WORK SITES AND STRUCTURAL WORK



Notre-Dame Cathedral in Rouen: Total height of 152 m

TUBESCA-COMABI was selected for the restoration of the Rouen cathedral spire. A prestigious and technical project carried out in partnership with Lanfry, a specialist in the renovation of historical monuments. Scaffoldings 152 metres high installed in 7 technical phases over a period of 7 years.

The TUBESCA-COMABI design office has specifically designed a new custom-made scaffolding that will reach a height of 152 m (all phases combined) to meet the technical problems of non-standard work sites.

Key figures:

- 7 phases in 7 years
- 152 m of scaffoldings in height (all phases combined)
- The technical solution: multi-directional scaffolding
- The M368's 8 positions



Lakanal High School in Sceaux: 37,500 m² of scaffoldings

For this complex work site, TUBESCA-COMABI designed a structure using free-standing scaffolding and suspended scaffolding with cantilevers on certain levels.

The proposed solution had to reflect the specificities of the various trades involved. Two categories of scaffolding were thus installed. A class 3 scaffolding for maintaining the red brick and a class 5 scaffolding for replacing the cut stone to protect and facilitate their transportation. The latter was installed on most of the work site as being designed in different lengths, it is suitable for all types of work sites (façade, rooftop and offset) and offers optimal packaging in trucks during its transport.

Key figures:

- 3 phases between February 2014 and July 2016
- 37,500 m² of scaffoldings / 7,500 m² of scaffolding
- 240 metric of equipment
- About 30 fitters to be coordinated per phase

Technical solutions:

- M368, class 5
- R200, class 3
- M368, class 3
- 7 companies
- 200 people mobilised



Aubervilliers chimney: 40 m of self-stable scaffolding for an 80-ton structure

The Aubervilliers matches factory is an emblematic site at the gates of Paris, built at the end of the 19th century. Its chimney has been protected as a Historical Monument since 2005. In order to meet the structure preservation requirements and provide the restoration company with the best working conditions, TUBESCA-COMABI had to create a custom-made solution.

The site presented several difficulties: the building's weakness and height, the plot size and the overall wind resistance. A complex technical equation, to which only TUBESCA-COMABI had a solution.

The solution implemented by TUBESCA-COMABI is based on the M368: multi-directional scaffolding, particularly suitable for complex projects. In Aubervilliers, the M368's 8 directional positions were used to adjust to the circular building. It thus follows the structure's contours so as to facilitate work and limit the impact of wind. It was anchored by a 30cm circular concrete slab cast on the ground to compensate for the scaffolding's vertical load distribution.

Key figures:

- 5 months in all for the Aubervilliers scaffolding;
- 4 weeks for the Design Office to design the solution;
- 6 weeks, only, to carry out the erection;
- 24 levels and a 48m supply tower built into the scaffolding;
- 15,000 items for a total weight of 80 metric tons.

SPECIFIC ACCESS SOLUTIONS FOR INDUSTRIAL MAINTENANCE



ERDF Pont de Baldy dam in Briançon (05): hooped ladders and walkway platforms

The Pont Baldy dam is EDSB's (Energie Développement Services du Briançonnais) main power generation facility with an output of around 18million kWh per year. ERDF technicians thus have to be able to work safely on the structure when carrying out maintenance and repair operations.

A specific concept was developed in cooperation with the customer. A "turnkey" custom-made solution was created and provided on a "turnkey" basis. Hooped access ladders and routing platforms made it possible to solve the problem ergonomically.

Keolis maintenance platform in Angers (49): 3 custom-made working platforms

The TUBESCA-COMABI design office worked closely with Keolis' technical departments to provide a specific response to the problems of ensuring safety during tram train general maintenance.

Each maintenance area (front, side and rooftop) has its own access, mobility and safety issues.

TUBESCA-COMABI thus created a set of 3 work platforms to ensure comfortable and safe working conditions and access.

Each of these platforms has been developed to meet the needs of each maintenance area.



Access staircase with a platform for the SFR operator in Saint-Denis (93)

the SFR operator in Plaine Seine Saint-Denis has a number of pipes on its rooftop for the flow of fluids. Building standards require that the contours on the roofs of buildings and walkways over cooling facilities and piping should be as safe as possible with pathways being created. It was not possible to drill the flat rooftop either, as this would have posed a risk of infiltration.

TUBESCA-COMABI has provided a customised solution to this problem which can be adjusted to all heights or widths to be spanned. The specifications required that, even along these special pathways, maintenance operations would not at any time present a risk of falling. As drilling was prohibited, the best solution was to use sufficiently heavy ballast weights. All structures have been specifically designed in accordance with dimensional requirements and have been provided with guardrails with fall protection rails and under-rails.



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