

Fire-Retardant-Treated Wood: An American Innovation

Attempts to increase the fire resistance of wood are by no means new. Coatings and dipping or steeping methods originated thousands of years ago as mentioned by Aulus Gellius in *Attic Nights*, and there are many more archaic descriptions covering materials for this purpose. Pressure impregnation methods of “fireproofing” wood are of more recent origin, though records of early efforts in foreign countries go back over two centuries. Joseph Louis Gay-Lussac is credited with the development of fire retardants for wood when in 1820 he proposed treatments with ammonium phosphates and borax. This article, however, explores the development, history and use of Fire-Retardant-Treated Wood in the United States.

In the United States, the commercial fire-retardant treatment of wood by pressure impregnation was commercialized by Max Bachert and the Electric FireProofing Company, later known as the Protextol Corporation, in the early 1890’s, with the first commercial installation reportedly made in 1895. The first important demand for fire-retardant treated wood in this country apparently came from the U. S. Navy for use in battleship construction. A few years later, in 1898, the City of New York gave further impetus to the embryo industry by adopting a revised building code, which required that wood, used in the construction of buildings over 150 feet in height, be treated to make it “fireproof.” From that time until the beginning of World War II the industry was localized around the New York – New Jersey area.

The tremendous military demands for fire-retardant-treated lumber in the early 1940’s caused the industry to expand nationwide. Its principal uses were for the construction of dirigible hangars and for shoring aboard ships. In 1943, 65 million board feet of plywood and lumber were treated. By 1946 production had dropped to less than 5 million.

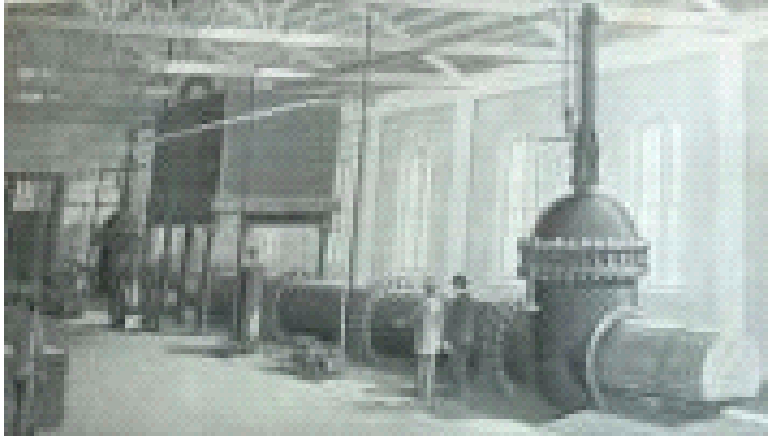
Growth was stagnant during the 1950’s and 60’s until the superior fire performance of pressure-impregnated fire-retardant-treated wood (FRTW) was recognized by insurance underwriting organizations on a national basis. In 1962, the Basic Building Code was the first model building code to acknowledge FRTW as a structural alternative to steel and concrete in noncombustible types of construction. FRTW was incorporated in Supplement 1 of the 1960 edition of the Basic Building Code promulgated by the Building Official Conference of America. Similar provisions for FRTW were published in the Uniform Building Code and the Standard Building Code in 1962 as well. In the 1970’s, exterior fire-retardant-treated wood was developed extending applications to cedar shake & shingle roofing, siding, and other applications requiring moisture resistance such as exterior decks and balconies.

With consolidation of the regional model codes into the International Building Code in 2000 and publishing of the first edition of the International Wildland Urban Interface Code in 2003, fire-retardant-treated wood has become an American Innovation specified for a greater range of structures than ever before (Table 1). Code-mandated or owner preferred applications are varied and significant, ranging from homes built in the wildland-urban interface to scaffolding in nuclear power plants.

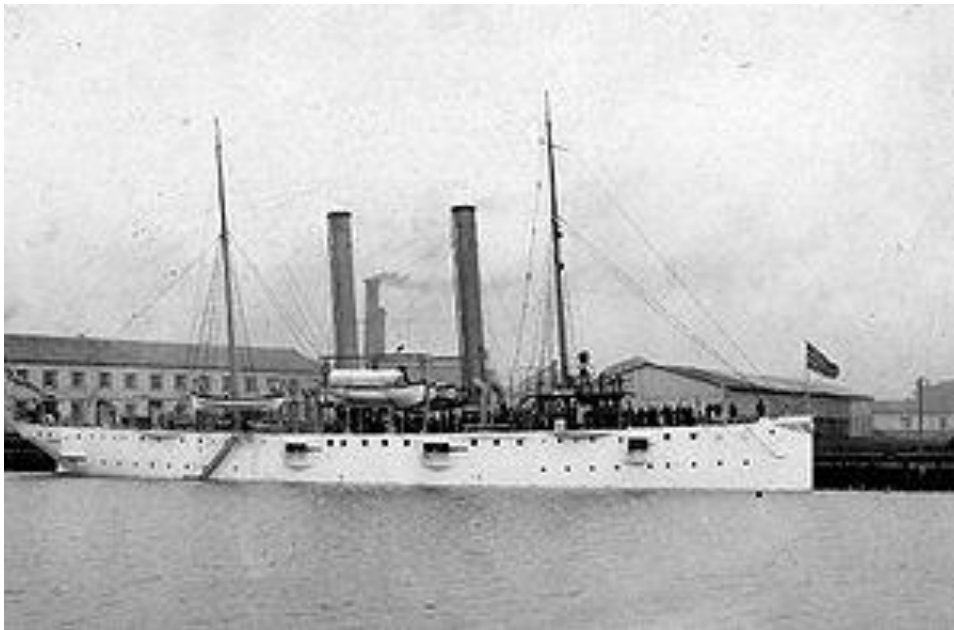
The demand for FRTW is still growing and applications for it appear almost limitless including warehouses, data centers, and offices for modern building owners like Amazon, Meta, and Google. But mostly, FRTW is used in familiar everyday places like schools, churches, hospitals, shopping centers, restaurants, theaters, high-rise condominiums and even single-family homes protecting people from fire protection where they live and work.

USES OF FIRE-RETARDANT-TREATED WOOD	IBC 2021 Ed.	NFPA 5000 2021 Ed.	NFPA 101 2021 Ed.
Architectural trim, exterior wall coverings	1405.1.1#3	37.2.1	*
Attics: Sprinklers not required in residential occupancies	903.3.1.2.3	See occupancy chapters	
Awnings & canopies	3105.2	32.4.2.1(3)	*
Balconies, porches, decks, and exterior stairways	603.1#1.4	37.2.2.2	*
Bay and oriel windows	705.2.4	37.2.2.1	*
Children playground structures in malls	424.2#1		
Combustible projections	705.2.3#4	37.2	*
Exterior bearing & nonbearing walls: Type III const.	602.3	7.2.4.2.1	4.4.2.1 ¹
Exterior bearing & nonbearing walls: Type IV const.	602.4.4.1	7.2.5.6.7(2)	4.5.6.7(3) ¹
Exterior nonbearing walls in Types I & II construction	603.1#1.2	7.2.3.2.12.1	4.3.2.12.1 ¹
Enclosed combustible spaces in sprinklered buildings of all types of construction: Sprinklers not required	NFPA 13: 1999: 8-13.1.1#9; 2002: 8.14.1.2.11; 2007-2016: 8.15.1.2.11; 2019: 9.2.1.12; 2022: 9.2.1.13		
Fire barrier: See partitions Types I & II construction	603.1#1.1	7.2.3.2.11.2	4.3.2.11.2 ¹
Fuel dispensing station (marine and motor vehicle)	406.7.2	32.4.5.2	*
Grandstands: Allowable areas increased		32.7.5.2(5)	12.4.10.3.3
Grandstands: Allowable heights increased		32.7.5.4	12.4.10.3.6
Interior finish with flame spread index ≤ 25 (Class A)	803.1.2	10.2.3.3(1)	10.2.3.3(1)
Kiosks in covered or open mall buildings	402.6.2#1.1	27.4.4.13.1(1)	36.4.4.11(1)(a)
Liquid storage rooms (shelving, racks, and wainscotting)	415.11.6.2#3	9.3.4 ³	*
Mechanical equipment screens	1511.6.2#2		
Parapet not required: FRTW sheathing:			
Exterior walls	705.11#5.1	37.1.3.1(6)(b)	*
Fire and party walls in Types III, IV, and V	706.6#4.3	8.3.3.7.4.2	6.6.4.2 ²
Townhouses: Exterior and common wall use within 4ft of such walls	Intl. Residential Code: R302.2.4	22.5.5(2)	*
Partitions (2 hr or less) in Types I & II construction	603.1#1.1	7.2.3.2.11.2	4.3.2.11.2 ¹
Partitions (fixed) establishing corridors in buildings with one tenant serving less than 30 people	603.1#11	7.2.3.2.11.2	*
Pedestrian walkways	3104.3#2		*
Platforms in Types I, II, and IV construction	410.3	7.2.3.2.7	4.3.2.7 ¹
Plenums in all types of construction	Intl. Mechanical Code: 602.2.1	4.3.11.2.6(2) ⁴	
Ramps		11.2.5.4.1(2)	7.2.5.4.1(2)
Roof construction in Types I & II construction	603.1#1.3	7.2.3.2.9	4.3.2.9.2 ¹
Roof construction in Types I, IIA, IIIA, & VA construction when ≥ 20 ft. above the floor	Table 601, Footnote b	7.2.3.2.8 (Types I & II)	4.3.2.9.1 ¹ (Types I & II)
Rooftop structures (penthouses)	1511.2.4		*
Shakes and shingles: Wood	1505.6	38.3.2	*
Scenery and stage properties (new construction)			12.4.7.11.3
Scenery and stage properties (existing construction)			13.4.7.11.3
Wood veneer	1404.5#1		*
Walls and ceiling furred & dropped more than 1-3/4"	803.15.2.1		*

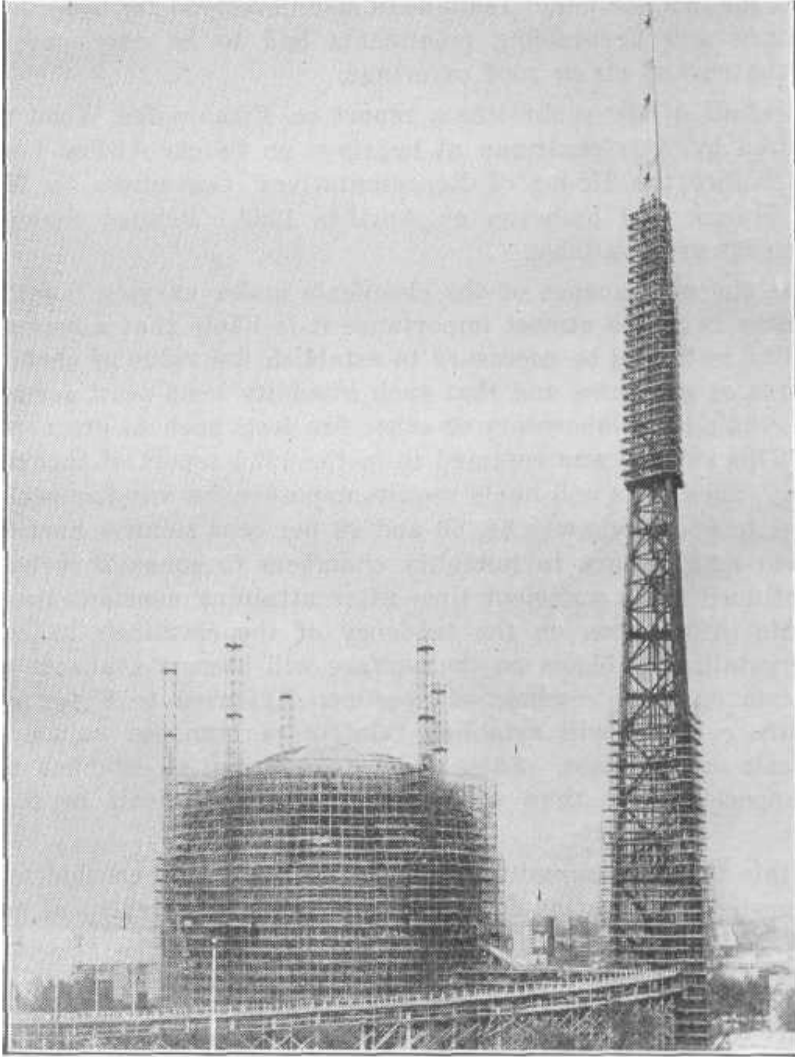
*See the building code ¹NFPA 220 ²NFPA 221 ³NFPA 30 ⁴NFPA 90A



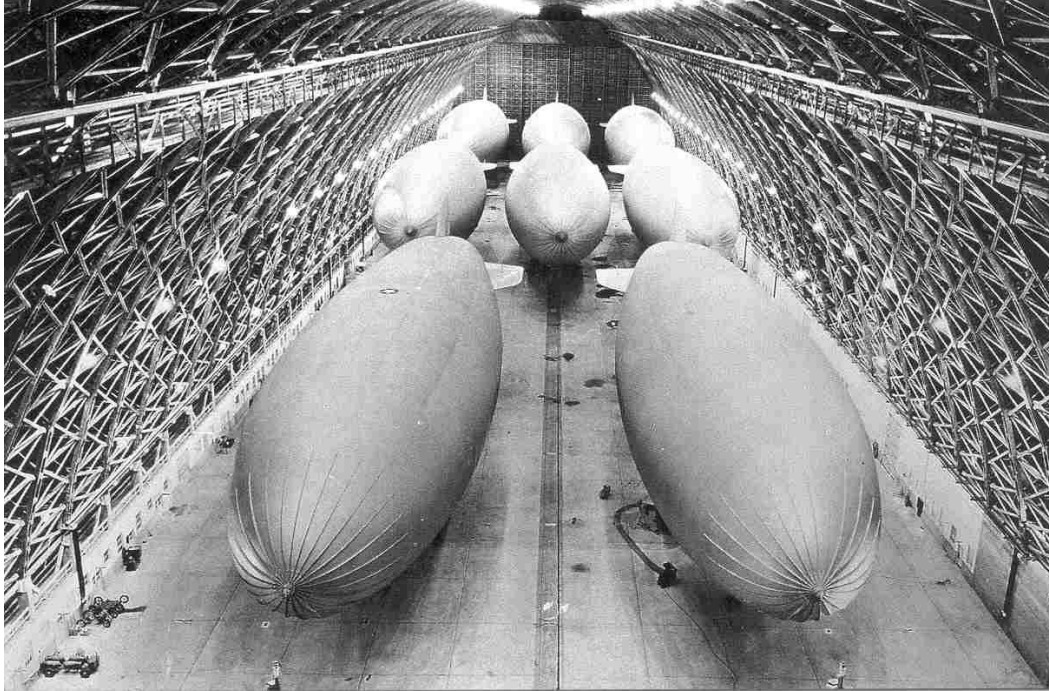
Electric Fireproofing Company Plant New York City, NY



USS Nashville first ship to be protected with fire-retardant-treated wood 1895.



All wood (including formwork and scaffolding) used in the construction of the Perisphere, Trylon and Helicline at the 1939 New York World's Fair, was fire-retardant-treated.



Hanger used to house US Navy submarine patrol blimps were constructed of fire-retardant-treated lumber and plywood during World War II.



Modern 1.2 million square foot warehouse that features a hybrid panelized roof system utilizing fire-retardant-treated lumber and plywood.

THE ELECTRIC FIREPROOFING PROCESS

IN THE LARGEST FIREPROOF BUILDING IN THE WORLD.

The picture in the upper left hand corner of this page will be recognized as the partially completed Metropolitan Life Building. There remains to be built the northwest section, the site of which is now occupied by the Madison Avenue Presbyterian Church. When complete this building will contain the largest floor space of any office building in the world, which may be considered as an example of artistic architecture and from its colossal proportions, as a wonderful achievement.

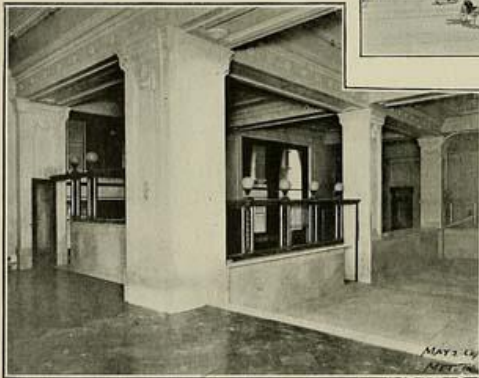
The doors, wood trim, etc., in this structure are of quartered oak, mahogany, and birch, which was supplied and rendered non-combustible by the Electric Fireproofing Company, of New York City. Lumber running into hundreds of thousands of feet was used in this work, but the unusual capacity of the yards, the perfection of apparatus, and the indefatigable expert attention and care, at the command of this company, were equal to the emergency and able to keep pace with the rapid progress of the builder.

A feature of great importance, conspicuous in the wood treated by the "Electric" Company is its inability to shrink. The reason for this being that the materials used do not injure the cellular and fibrous structure of the wood, but on the contrary, they protect and preserve it. The importance of this is evident by the fact that there is no checking

While the excellence of the external appearance of the woodwork has been pointed out and illustrated in this short article, on account of the capacity of the wood to receive the highest finish which the most skilled polisher is capable of giving, it is well to bear in mind that the inestimable importance of the wood, is the fact that it is non-flammable. It is in the fact that the



METROPOLITAN LIFE INSURANCE COMPANY'S BUILDING.
V. J. Hedden & Sons Co., Builders. N. Le Brun & Sons, Architects.



VIEW IN OFFICES OF METROPOLITAN TRUST CO., IN ATLANTIC BUILDING EXTENSION.

The Thompson-Starrett Co., Builders. Clinton & Russell, Architects.

or splitting of the joints after a few months, as may be found in wood which has undergone another method of treatment.

On the Fourth Avenue side of the fourth floor are the offices of the contractors who have erected this remarkable building, the V. J. Hedden & Sons Company. No one visiting these offices can fail to be attracted by the beautiful doors, windows and other trim. These are made of rare oak which the experts of the contractors selected from the large and varied stock in the "Electric" company's yards. It is known as "curly oak" from the exquisite curves and waves of the grain, of which the panels and doors in the Hedden offices are splendid specimens. The management of the Hedden Company is most enthusiastic in its expressions of satisfaction with the material supplied by the "Electric" company.

The photograph on the left side is of an interior view of the extension to the Atlantic Building on Wall Street. This modern building is another of the rapid construction achievements which have given to the Thompson-Starrett Company a widespread and well deserved reputation for high class work. No one who has any acquaintance with buildings and builders needs to be informed of the conscientious completeness with which their work is accomplished, without sacrificing one iota of thoroughness to the remarkable rapidity of their system of building. The Electric Fireproofing Company naturally feels great satisfaction in calling attention to the fact that ever since the organization, in 1899, of the Thompson-Starrett Company, whose reputation is of the highest, they have supplied the fireproofed wood used in all the buildings erected by that company when required.

The woodwork in the offices of the Metropolitan Trust Company, as illustrated, is of a fine grade of mahogany, birch, and oak, finished with exceptional care, and it is safe to say that finer finished woodwork cannot be found in any building in the city. The color is deep and rich, and the general design is carried out with great skill.

wood treated by the "Electric" process will neither flame or communicate flame that its great value lies. It is impossible to over-estimate this point in the protection of human life and property.

The "Electric" is the "pioneer" process and is unquestionably without equal. The inventor is Max Bachert, the manager of the company.

The severity of the tests of fireproofed wood made by the United States Navy Department are generally well known. The particular test which appears to govern the selection of the wood is undoubtedly that known as the "shaving test." This is the subjection of thin shavings, cut from the center of treated wood, to fierce heat.

The Electric Fireproofing Company is in the proud position of having met all the requirements of the naval experts and furthermore it is the only company which has never failed to carry out its contracts and meet its obligations with the Bureau of Construction and Repair of the U. S. Navy.

Such was the confidence of the Building Department of New York City government in the integrity and uniformity of all the work turned out of the plant of the Electric Fireproofing Company, that their product was approved unconditionally by the Department. No other company can say the same.

The Electric Fireproofing Process which is being operated in England and on the continent, by the London Nonflammable Wood Company, Ltd., is also used in the construction of passenger coaches, for the Charles T. Yerkes' London underground railways as well as for the Metropolitan Underground Railway in Paris, where their first consideration is the protection of human life and property more than the question of cost, in which respect it is to be regretfully admitted that they differ somewhat from some of our American contractors and manufacturers with whom the pecuniary end, to secure at the lowest cost, receives first consideration regardless of quality or genuine fireproofness of material. The Electric Fireproofing Process is also operated in Canada, controlled by the Electric Fireproofing Co., of Canada, Ltd., at Montreal.

The works and offices of the Electric Fireproofing Company are at the foot of East 19th street, New York City.

The R. G. Dun Building, Atlantic Mutual Building, Hotel Martini-que, No. 68 William Street Building, are but a few of many buildings whose woodwork has been supplied by the Electric Fireproofing Company. This company is also providing a million feet of selected birch, mahogany and other lumber for the new hotel "Belmont," on 42d street and Park avenue, Messrs. Warren & Wetmore, architects, now being erected for the Rapid Transit Subway Company, by the well-known building contractors Messrs. Marc Eldlitz & Sons. When completed this will be the largest and one of the finest equipped of hotels in the world.

Wood used for structural purposes is handled extensively by this company, but the greater part of their business is in the finer grades of wood, where appearance, as well as utility, is an important factor.