

General Motors plant fire changes roofing practices

General Motors' 35-acre transmission manufacturing plant in Livonia, Mich., stood as a testament to America's love affair with the automobile, and the post-war prosperity sweeping the land. The plant's devastation in a fiery holocaust in August 1953 would also become a testament—to the need for fire walls, sprinkler systems and a fresh approach to building a roof and attaching it to a deck.

Happy days

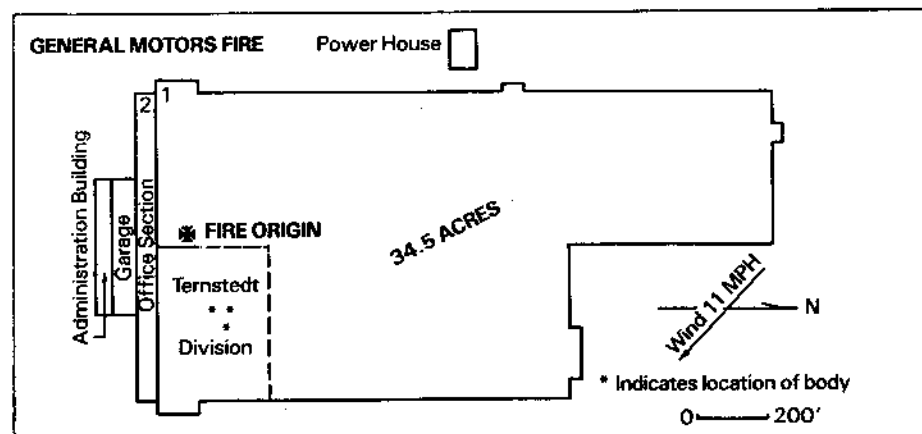
It was 1953, and Dwight David Eisenhower, who was to describe himself as "a soldier" until the day he died, summed up the prevailing sentiment eight years after World War II: "There is nothing wrong with America that the faith, love of freedom, intelligence and energy of her citizens cannot cure."

The country was enjoying the most explosively bullish economic period it had experienced since the 1920s.

Demands for housing, household goods and automobiles, effectively dammed during the war, had finally burst onto American society, and manufacturers' cups were running over.

More than 20 million American homes were built between 1946 and 1956. In 1950, 9 percent of those homes had television sets. By 1960, this would climb to a whopping 87.1 percent. Construction expenditures, holding at \$80 million in 1940, shot up to \$733 million by 1950. From 1945 to 1947, 747,000 more construction firms entered the market than left it.

The number of roofing workers climbed from 33,000 in 1940 to 50,000 in 1950. The two biggest concerns of the roofing industry were an appalling shortage of apprentices and a critical need for more felt. In 1946 alone, construction on 50,000 new homes was delayed because there wasn't enough roofing felt to go around. The forerunner of NRCA, the



A diagram of the plant showing where the fire began.

▶ The General Motors Hydra-Matic transmission plant in Livonia, Mich., during the fire that destroyed the structure and changed roofing practices in the 1950s.

United Roofing Contractors Association, was busy working with the union on designing apprenticeship programs and lobbying Washington for help with the materials shortages.

Danger zone

The Baby Boom years also marked the beginning of suburbia as we know it. As people moved farther and farther away from the city, but still needed access to it, the car became an integral part of the American dream.

The General Motors Hydra-Matic plant in Livonia was built in 1949. It churned out automatic transmissions for Cadillacs, Oldsmobiles, Pontiacs, Nashes, Hudsons, Kaisers and Lincolns—the only facility making the transmissions these cars needed. It was a monster of a building, exemplifying the type of structures industry needed after the war. Under its roof was 1,502,500 square feet, or 34.5 acres, of space, housing 4,200 employees every shift.

The structure housed 3,000 metalworking machines, many of which contained lubricating, cutting or cooling oils. Heat-treating departments scattered throughout the plant contained small quench tanks. There were three 400-gallon wash tanks and three 450-gallon dip tanks of rust inhibitors; drums of various solutions were scattered throughout the facility. In all, several thousand gallons of flammable liquids were confined in a building devoid of roof vents or interior fire cut-offs; only 20 percent of the structure was protected by sprinklers, and this was mostly in the loading and shipping areas.

The National Fire Protection Association's (NFPA) *Quarterly* dated October 1953 describes the roof of the GM plant: "The flat roof, which had much to do with the spread of fire, consisted of a roof deck of narrow plates of No. 18 (U.S.) gauge steel with exterior covering and insulation of built-up layers of 'tar paper' with asphalt mopping between plies, 3/4-inch-thick fiber glass, several more layers of 'tar paper' with asphalt mopping, and a tar and gravel surface. There were more than 3 pounds of tar and asphalt per square foot, or more than 2,000 tons on the entire roof."

"It was raining fire"

Sometime before 3:50 p.m. on Aug. 12, 1953, sparks from a plumbing contractor's oxyacetylene torch ignited a fire in a drip pan beneath a conveyor that ran just beneath the lower chord of the roof trusses; the contractor's crew had been working on ladders and immediately tried to extinguish the fire with standby carbon dioxide extinguishers handed up to them. The extinguishers were emptied before the blaze was under control, while the lack of sprinklers and roof vents contributed to its spread. The NFPA *Quarterly* relates the horrifying scene that resulted.

"While employees were making an ineffective attack, the drip pan, roof trusses and roof deck were gradually becoming hot. At about the time the drip pan warped and spilled its flaming contents on the floor, the oily condensate on steel roof members in a nearby heat-treatment area ignited, adding fuel to heat the roof deck.

"... Soon hot tar and asphalt were flowing through cracks between strips in the heat-warped roof deck and igniting. The fire then spread laterally behind the increasing area of melted tar that oozed through the roof and simultaneously several fires broke out on machinery, in flammable liquid containers and on the wood floor as hot tar dropped down."

"It was literally raining fire all over the building," John Stinson, then a construction superintendent for GM, reported. Firefighters bolted, dodging the drops of flaming tar. Two were later found in a bathroom and one of the divisional fire chiefs was found in a locker room where they had desperately sought shelter; all three were dead.

Never again

Actually, it was a miracle more lives were not lost. But between the plant employees and other workers affected by the facility's shutdown, an estimated 250,000 people were out of work. Damages to the plant itself were estimated to be \$60 million. And *Business Week* reported: "The fire at Livonia has changed the course of the entire automobile industry. As

a result of the Livonia production stoppage, the industry may turn out 300,000 fewer cars in this model year than it had planned. The loss: about \$750,000,000 in sales."

GM immediately appointed a task force to investigate the fire and recommend improvements in future construction. John Stinson was a member of that team; he would go on to be head of General Motors' roofing operations for 30 years. He has now formed his own corporation and works as a consultant for the Roofing Industry Promotion Fund in Detroit.

"The major change in the national building codes was the demand for smoke and heat vents," he relates. "The metal deck industry faltered, because within six months, neither GM nor any other manufacturer was using metal decking; we were specifying cement or concrete tile. And the major industrial plants would no longer put combustible materials under combustible insulation; it was the asphalt under the insulation mopped to the metal deck that began to melt.

"And the fire was entirely responsible for the creation of the polyvinyl chloride vapor barrier. Originally, that's what PVC was intended for: a vapor barrier," he reports.

Factory Mutual noted the amount of asphalt present on the metal deck at Livonia, and began advocating strip, or serpentine mopping to attach insulation to the deck. Strip-mopped roofs did not present adequate wind resistance, however; now FM requires the first layer of insulation to be mechanically fastened to a steel deck rather than strip-mopped.

The NFPA *Quarterly* valiantly attempted to find the silver lining in a devastating industrial accident: "It is almost fortunate in some respects that this tremendous fire occurred in the property of a company that is financially well-equipped to withstand such a loss... The one beneficial effect of this is the general awakening of industrial management to the potentially disastrous results of fire on production."