As you travel down Interstate 85 at the border between Georgia and South Carolina, you will pass within a long stone’s throw of Hartwell, Georgia. The small town, almost surrounded by its namesake Lake Hartwell, an Army Corps of Engineers hydroelectric project, has long been home to the southeastern presence of a Tenneco Automotive (TA) shock absorber and McPherson strut manufacturing plant. Known for years as Monroe Auto Equipment Company, the TA plant was built in 1956 and has produced ride control products ever since.

Visitors to the plant who receive the “fifty cent tour” will generally view the manufacturing facilities and support functions. Tours may also include the plant’s chemical storage building, a rather large and separate structure located to the west of the plant, immediately between the wastewater treatment facility and the manufacturing plant. The visitor may well wonder why chemical storage would be included in the facility tour since most manufacturing operations tend to show off only their manufacturing capabilities. The answer lies within the storage building itself. The first steps inside invariably cause mouths to open and eyes to scan upward, downward, and side to side as the tour pace suddenly slows. The first
utterance may be an almost silent exclamation of, “Wow, just look at this!” The cause of the sudden reverence is the immaculate and well-cared-for appearance of the building’s interior storage area. The lighting is excellent, the aisles are shotgun straight, signage is appropriate, and the obvious cleanliness often results in references to “eating from the floor.” Many visitors believe that the building has just been cleaned especially for them and that it couldn’t possibly be maintained in the pristine manner presented to them. The plain truth of the matter, and one that is only appreciated on subsequent visits, is that the building is constantly maintained in its “ready-for-a-tour” shape. Any visit to the building will yield the same level of organization and aesthetic appeal.

So abrupt is the aura of clean efficiency and the controlled presence of the building that it may be tempting for the visitor to overlook the fact that the structure is indeed a chemical storage building, complete with hazards, safeguards, and other associated mechanisms. The building is quite profound in its level of cleanliness, structure, organization, and consistency. One may wonder how such a structure came to be and what caused it to be built and maintained in such a well-organized manner. To fully appreciate the building, one must look at what existed prior to the building and at the ensemble of problems which existed. The building’s conception, design, construction, and organization owe their existence to the history of chemical storage at the TA facility.

**Background**

Completed early in 1990, the 7,700 square-foot structure represented the culmination of almost four years of effort, planning, and construction on the part of several TA engineers, managers, and hired consultants. Plagued by problems associated with a storage capacity shortage and issues related to safety, quality, and chemical management in its previous chemical storage facility, the company sought to learn from its mistakes. Obvious sources for information relevant to building design were regulatory requirements—both Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA)—National Fire Protection Association (NFPA) standards, National Electrical Code (NEC) requirements for hazardous locations, local fire and building codes, and company needs. Examples of other, not so obvious sources for information were insurers, lighting specialists, other company bench marks, potential spill-retention methodologies, fire control equipment manufacturers, and facility inventory planning specialists.

**Design Issues**

Chemical inventories and usage served as the major bases for determining appropriate building size, in concert with reliably forecasted future growth assumptions. TA assessed the need for adequate floor space and height along with entry and exit requirements. The degree and types of chemical hazards to be safely accounted for in storage required accurate planning based on regulatory considerations, practicality, NFPA references, and referrals to Material Safety Data Sheets (MSDS). Chemical hazards and incompatibles required ample floor space and height in order to avoid spills, dangerous reactions, and other issues. Centralized interior and exterior fire suppression systems were designed in concert with local fire inspectors and in conjunction with NFPA standards.

**Contingency Planning**

After establishing the sizing needs, TA considered the planning for potential chemical releases, leaking containers, runoff areas, and containment. The building was to contain several thousand gallons of hazardous materials in containers ranging in size from one-pint bottles to 330-gallon totes, many of which exhibited incompatible characteristics. The existing facility Spill Prevention Control and Countermeasure (SPCC) and Resource Conservation and Recovery Act (RCRA) Contingency Plans served as springboards to adequately plan for regulatory contingency needs.

The building was designed and built prior to the advent of regulatory requirements for storm water permitting, but, owing in part to the proximity of Lake Hartwell, the facility storm water drainage areas were carefully considered as the building design took shape. TA installed downstream storm water retention devices along with an oil-water separator within the building confines. Also, utilization of a unique floor drain component design allowed the release of liquid from the building floor area only when one inch of liquid was present over the entire surface of the floor. The philosophical rationale behind the concept mandated that any chemical spills within the building must be dealt with directly and not allowed to drain to storm water retention areas. The only circumstance dictating release of any liquid from the building surface would be activation of the fire sup-
pression sprinkler system, whereas subsequent liquid or water would be transported through the oil-water separator prior to being discharged into the storm water retention area. Appropriate sealing compounds helped seal the floor surfaces in order to accommodate the chemicals and provide adequate protection against chemical permeation into the surface.

Owing to the higher vapor density of most of the stored chemicals, TA installed several floor-level mounted exhaust fans with appropriate NEC spark-proof wiring. The building also contained two independently ventilated dispensing rooms designated for flammable liquid distribution. The two rooms contained grounding equipment for all anticipated use.

**Chemical Distribution**

Company engineers and hired consultants conducted extensive studies to determine a storage and distribution design that would be sufficient for growth, safety, efficiency, and storage needs. They considered several storage design plans before adopting the final plan, which featured an initial floor space allocation based on NFPA ratings of the various chemicals tied to flash point. Storage of incompatibles—such as acidic and basic chemicals—along with oxidizers was considered and carefully incorporated in order to satisfy regulatory requirements, NFPA standards, and retrieval efficiencies. The facility MSDS program featured a numbering system whereby each chemical approved for storage received a unique number which served as a reference for all employees. TA determined that hazard labels showing the reference number would be affixed to each chemical container upon receipt into the building. As part of the program, careful administration ensured that all chemicals received, dispensed, and distributed into the manufacturing plant would first receive approvals from environmental and health and safety management and that the unique tracking number had been assigned. The company adopted the procedure and communicated it to all employees as the building was completed and its management begun.

**Implementation and Administration**

As construction of the building became a reality, it became apparent to the engineering staff that administration, maintenance, and proper stewardship of the facility would require a different approach than had previously been used to control chemical usage. Access to the existing chemical storage facility had been virtually unlimited, which contributed to a myriad of concerns concerning safety, potential chemical releases, and other issues. Planning for introduction of the new storage building to the employees became a high priority as the company sought to place a greater emphasis on chemical awareness. TA decided that access to the building would be limited to a select few individuals and that the structure would be staffed by an individual who would be placed in charge of all dispensing, chemical delivery, inventory, maintenance, and housekeeping. The following points were considered salient as the project became reality:
All chemicals were to be inventoried weekly, with discrepancies investigated.

A building operator was to be assigned permanently to the building.

A written procedure governing operation of the building was to be incorporated in its management.

Housekeeping would receive extremely high priority.

Only chemicals approved by EH&S management were to be stored in the building.

Withdrawals from the building were to be made only by the operator in charge; departments seeking chemicals would place orders through the operator, who would then adjust inventory.

The building would be occupied by the operator for only one daily operating shift; chemical withdrawals made for other shifts would be required to be made in advance of the end of the operating shift.

The operator in charge would receive extensive training commensurate with the company’s expectations for the building operation’s success.

Aisle and area labeling requirements would be large, accurate, and vigorously adhered to.

SPCC and RCRA Contingency Plans were to be adhered to judiciously.

Little tolerance would be granted for failure to follow procedures.

Routine access to the building was to be granted only to the operator in charge and to Security.

Routine inspections of all systems were to be made without failure.

Dispensing areas were to be maintained and controlled by the building operator.

Using the above bullets as assumptions, TA placed the building into service in May 1990. The mindset in the manufacturing plant had long been to regard chemical storage as an area of easy access for all personnel, that they could come and go as they pleased. A firm, controlled hand had to be taken to change the ingrained thinking of personnel and to embrace the new procedures as they applied to the new building. Making the building secure to the presence of unauthorized personnel was a key in making the transition happen. Only those personnel who would have significant roles in the building’s operation received door keys; those personnel included the building operator, security personnel, the environmental manager, and maintenance. The initial operating period was fraught with misconception, misunderstanding, and some defiance by many, and it was only with diligent, sincere application and consistency that the “rules of the building” came to life.

Choosing a quality individual to operate the building has likely been the most compelling reason for the building’s operational success. The company spent much time sifting through qualifications of those desiring consideration and conducting the subsequent interviews. The successful candidate would need a unique skill set in order to handle the new and demanding requirements that the building’s operation presented. The operator who was ultimately chosen has remained as the building operator until the present time. He is intelligent, patient but firm, consistent, cognizant of the needs of the building’s operation, and immensely proud of the building’s housekeeping, assuming a type of virtual ownership. He has embraced the goals surrounding the building’s operation as his own and seeks to constantly improve. Any changes to operating procedures are completely discussed, debated, and approved by him prior to implementation.

**Conclusion**

As they say, “the proof is in the pudding,” and the pudding related to TA’s operation of its chemical storage building is proof positive that conscientious attention to detail, consistency, and effort can support a change in culture necessary to achieve an attainable goal. The chemical storage building at TA’s Hartwell, Georgia, plant is without peer within the organization and has been the recipient of countless compliments from individuals and organizations outside TA. Its success is exemplified by one chemical sales representative stating that he had never seen its equal in organization, cleanliness, and consistency. Most of the pride associated with the building comes from the building’s operator and the environmental staff who are together involved in the success that it has shown. The plant takes pride in the building and its administration.

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Dan Moorhead is the manager of Environmental Programs at the Tenneco Automotive plant in Hartwell, Georgia. He wishes to thank Mr. Bennie Hicks for his help on this article. Mr. Hicks has been in charge of the operation of the chemical storage building at the Tenneco Automotive facility at Hartwell, Georgia, since 1990. He resides in the Hartwell area and has been with the company for over forty years. He is considered by most people at the plant as the person most responsible for any successes related to the building’s operation. This article would not have been possible without his contributions.