The Hackney “H-Drop” Frame

All Hackney Emergency Vehicles (except light duty) are mounted on a modified chassis first developed by Hackney more than 30 years ago and deemed the "H-Drop" frame.

Our "H-Drop" frame modification consists of removing the two original chassis frame rails behind the cab and replacing them with our new rails: two drop-frame rails routed under the apparatus body compartments, and two center-brace rails routed down the center of the body between compartments.

The standard measurement for frame strength is a term known as "RBM" (Resistance to Bending Movement). The RBM is the yield strength of the frame material multiplied by the section modulus of the frame rail. A typical yield strength of steel used in commercial truck chassis is 50,000 psi, and the section modulus per frame is 13.3 to 13.4 inches cubed. Therefore, the RBM per rail is approximately 670,000 inch-pounds, with the RBM of the entire chassis frame (both rails) being double that, or 1,340,000 pounds.

The compound beam produced by the Hackney "H-Drop" frame dramatically increases the section modulus to 37.57 inches cubed using 50,000 psi high-strength steel. This produces a RBM per side of 1,878,550 inch-pounds, for a total RBM of 3,757,100 inch-pounds. The result, a frame system **2.8 times the strength of the original frame rails**.

There is no guessing involved in the design. To assure the integrity of any stress related Hackney-manufactured components, a state-of-the-art engineering analysis process is employed on everything from the "H-Drop" frame to shelving. To ensure there are no critical or weak stress points in a new design, Hackney performs an analysis using high-powered computers running a sophisticated design software known as ARIES®. ARIES technology provides the design engineer with the capability of solving very complex design problems that cannot be solved using traditional design methods: solids modeling and finite element analysis.

Hackney engineers build a three-dimensional conceptual chassis modification on the computer. The solids model is then subjected to a “what if” analysis, which reduces weight, ensures proper fit, suggests appropriate welding points, and eliminates interference problems. The model is then subjected to finite element analysis, in which theoretically operating forces are applied and the resulting stresses are ascertained. This is especially important where vibration loads are involved, as fatigued stress has traditionally been the primary cause of failure in transportation equipment.

Stresses are displayed in varying colors corresponding to the stress levels, with red being high to blue being low (see photo at top of page). When potential problems are detected, changes are made in the design and the analysis is repeated until the problems are eliminated.

Hackney is proud of our highly qualified staff of Registered Professional Engineers skilled in the use of this technology. We invite you to visit our engineering department and witness the marvels of today’s technology first hand. Or contact your Hackney Dealer to find out more.