APPARATUS DESIGN

Apparatus design plays a significant role in preventing occupational injuries and MSDs. When a fire department is purchasing equipment, its design and the risk for musculoskeletal injuries and disorders during use should be considered. Injuries can occur when personnel are getting on or off an apparatus or when trying to retrieve or store equipment. Table 1 lists a sample of good design elements to consider. If relevant National Fire Protection Association (NFPA) guidelines exist, they also should be considered when designing an apparatus.

Table 1. Good Design Elements of Apparatus/Equipment

- ☐ Proper placement of handrails
- ☐ Proper placement of steps
- ☐ Proper positioning of lights
- ☐ Surfaces are of appropriate length and width
- ☐ Surfaces where fire fighters tread have a non-slip surface
- ☐ Compartment layout allows for equipment storage based on weight, size and frequency of use
- ☐ Compartment slide-out trays to allow for better accessibility
- ☐ Warm-water station

STEPS AND HANDRAILS

Minimum depth and height requirements should be considered to ensure an individual's ability to ascend and descend steps safely. It is recommended that step depth be increased and step height be decreased to prevent injuries or MSDs. Steps should be slip-resistant and outfitted with fluorescent and/or reflective material. Steps should have adequate lighting to illuminate the step and surrounding area. It's also important to look at the boot/step interface to make sure that boots don't get caught on the steps and cause a trip and fall. Slip-resistant handrails should be available to aid personnel with ascending and descending.

APPARATUS SURFACES

Apparatus surfaces should be slip-resistant and indicated with fluorescent and reflective material, and should have adequate handrails to aid the user. Surfaces that are intended for foot traffic should be clearly designated. Edges, corners and protrusions should be rounded to minimize contact injuries.

LIGHTING

Adequate lighting should be located below running boards, tailboards and bumpers; around steps and ladders; and in the cab. Lights should illuminate automatically when power is turned on, a door is opened or an exterior step is lowered/activated.

STORAGE COMPARTMENTS

Storage compartments should be equipped with slide-out trays, which allow for heavier equipment to be brought to the fire fighter and allow for better accessibility and body mechanics. With higher compartments, slide-out and tilt-down trays may be more appropriate. Handles or levers should be located at multiple points to allow for correct body mechanics. All equipment should be securely fastened in compartments to prevent items from falling out and injuring personnel when opening a compartment. It is recommended that self-contained breathing apparatus (SCBAs) be stored outside the crew cab to maintain a "clean cab" and reduce carcinogen exposure in the cab.

CAB

The NFPA requires that each crew riding position shall be fully enclosed. Low-hanging ceilings should be padded and outfitted with reflective surfaces to warn and protect personnel. All equipment carried in the cab should be securely fastened so that equipment doesn't become projectiles in the event of abrupt braking or motor vehicle collision. Adjustable seats and steering wheels allow for better ergonomics and accommodate all operators. In-cab headsets should be worn to allow for better communication and hearing protection.

AERIAL LADDERS

The rungs on aerial ladders should be slip-resistant and indicated with fluorescent and reflective material.

TAILBOARD AND RUNNING BOARDS

Running boards, tailboards and bumpers should have appropriate length and width to allow personnel to climb, retrieve equipment and dismount safely while wearing full PPE and SCBA. These areas should be outfitted with slip-resistant surfaces, fluorescent and reflective material, and adequate handrails and lighting to aid personnel in mounting and dismounting these surfaces.

HOSE BED

Hose beds equipped with diamond plate or heavy covers should be outfitted with electric/powered openers or sliders and automatic lighting.

LARGE-DIAMETER HOSE

Large-diameter hose (LDH) is heavy, bulky and awkward to move and load, making it a common contributor to occupational injuries during training and emergency incidents. It is recommended that LDH be moved with a folding hand truck that can be stored in a compartment or via a two-person carry. A tool such as a New York hook or prybar can be inserted in the middle of the rolled LDH to provide the carriers with handles. When loading, it is recommended that a lazy Susan be used to limit the amount of bending required to unroll LDH to load a hose bed.