

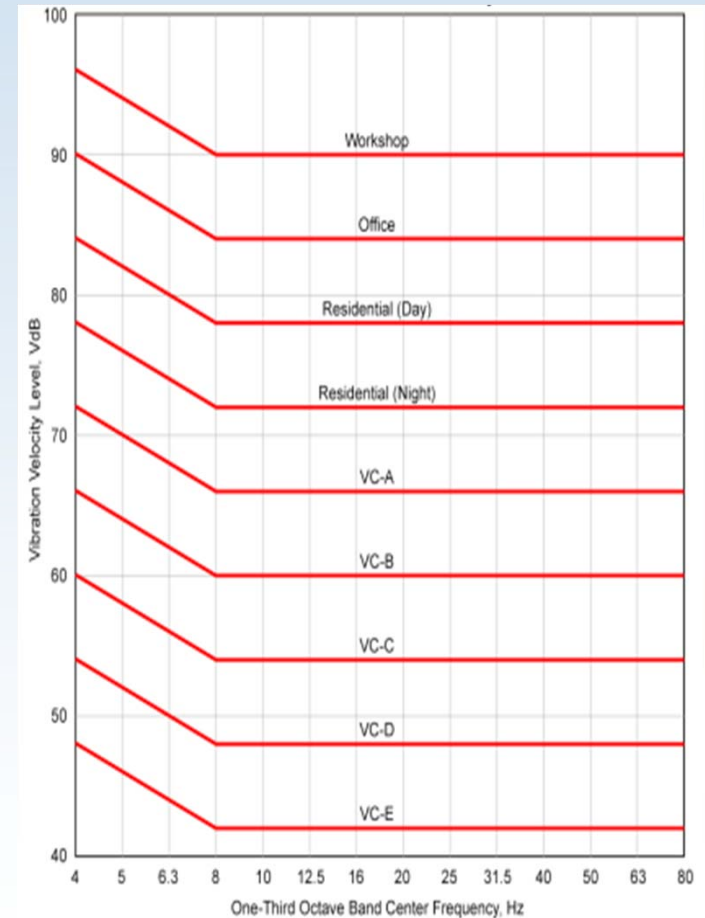
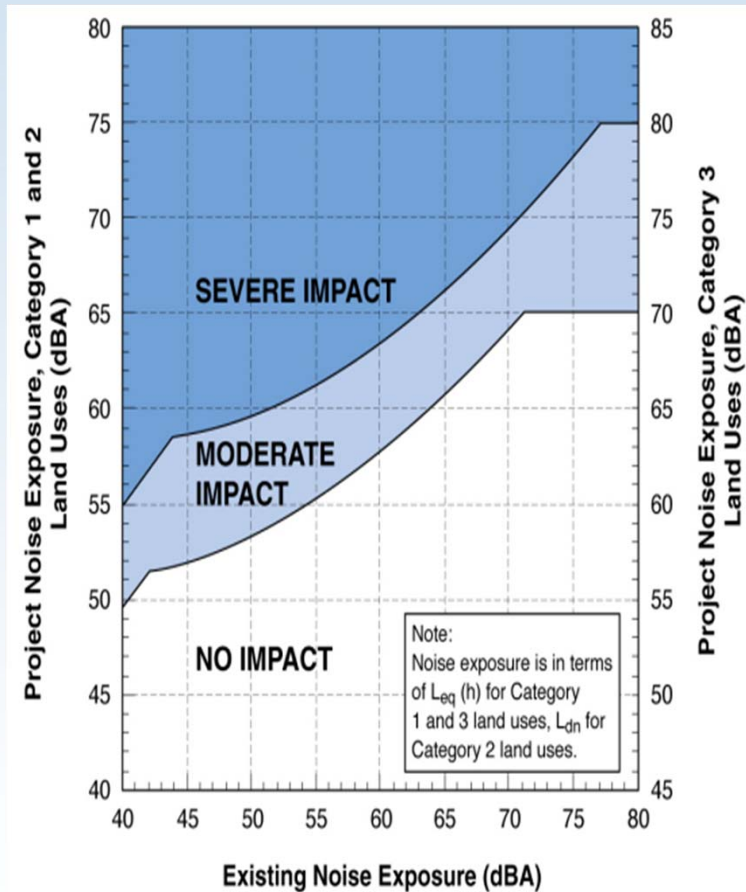


# Car builder perspective on wheel / rail noise and vibration requirements and mitigation measures

Bryce Dudgeon, Siemens Rail systems



# FTA performance requirements are flowed down to specific design requirements



Source: FTA Guidance Manual, 2006

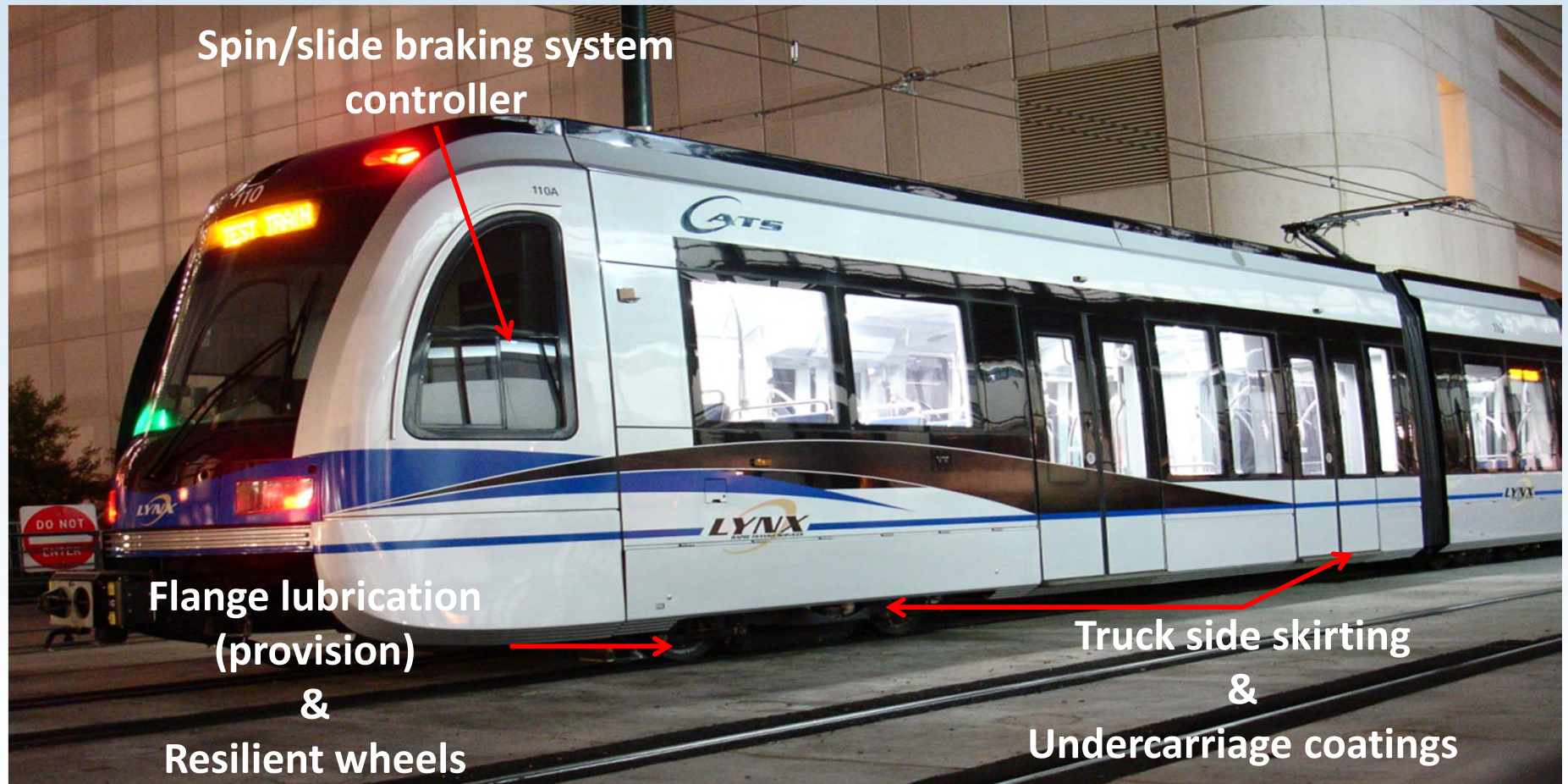


# Typical LRV design requirements – specifics from flow-down

- **General design requirements defined by spec:**
  - Wheel / rail interface defined:
    - Wheel profile
    - Wheel types permissible (resilient)
    - Back-to-back dimensions
    - Truck and axle spacing
  - Vehicle architecture – e.g. low-floor of given length, capacity, and number of trucks, and weight
  - Primary suspension types and permissible natural frequency
  - In all cases: vehicle running behavior assessment deliverable
  - In some cases: wheel / rail interface study deliverable



# Noise and vibration mitigation measures, LRVs

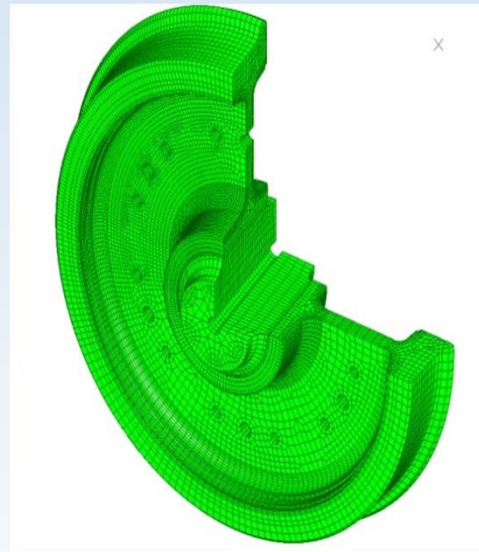


# Noise and vibration mitigation measures, LRVs

- **Generalized design philosophy**
- Minimization of un-sprung masses
- Low-stiffness, resilient primary suspension
- Provisional features for noise and vibration isolation
- Auxiliary equipment noise reduction through use of : roof shrouding, state-of-the-art fan blade designs for HVAC, vibration isolation from carbody structure



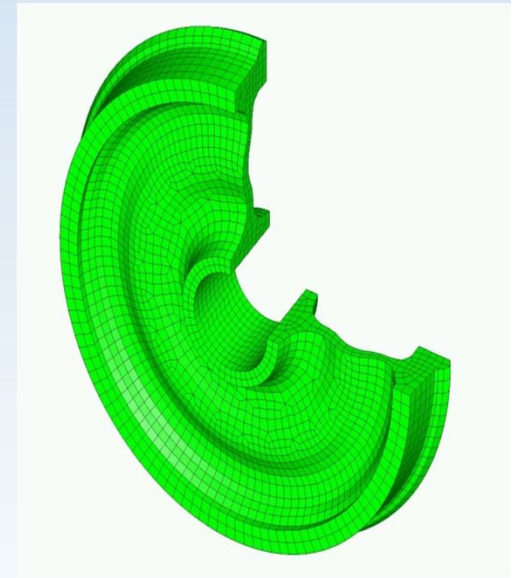
# Noise reducing wheel designs aid high speed systems



Low Noise

SPL – wheel = 105 dBA

SPL – track = 109 dBA



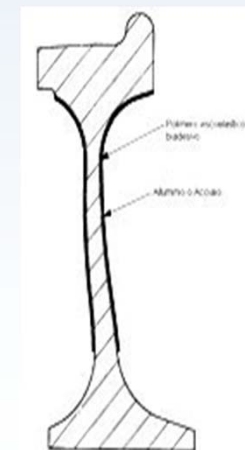
Classic

SPL – wheel = 111 dBA

SPL – track = 109 dBA



# Wheel damping devices are also deployed



# Perhaps more interaction between truck and track up-front?

- Truck and track designer seldom speak directly
- Insert a feedback mechanism for truck/track designer(s) during analysis and testing phases of project
- Wheel and rail design as a system
- Current process is functional and works well – however can be improved with systems approach

