



Robots & Robotics in Hospitals

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The International Federation of Robotics reports that using AMRs could **reduce the cost of delivery by as much as 80%** and could cut the average steps walked by a nurse by three to four miles every day in a typical 200-bed hospital.





AGVs and AMR

- **Automatic Guided Vehicles**

- Robotic Device (not actually a robot)
- Predecessor of AMR, evolving since 1950
- Located with fixed elements: magnetic tapes, magnets, beacons, etc., must have predictable route for effectiveness

- **Autonomous Mobile Robot**

- Robot
- Much more advanced software and hardware
- Use free navigation by means of lasers
- Has a certain degree of independence to make decisions in the middle of the work environment, without the need for human intervention

AGVs and AMR

- **Automatic Guided Vehicles**
 - Lacks the autonomy to determine or redefine its own route
 - Suitable for workspaces with a large number of fixed tasks, as they require installation of the infrastructure through which they will move
- **Autonomous Mobile Robot**
 - Can navigate without external guidance-has freedom of navigation and decision making
 - Suitable in dynamic environments where both humans and machines are needed, because of their ability to adapt to a changing environment



AGVs and AMR

Many Uses









Concerns

The installation and use of AGVS equipment raise concerns, including but not limited to the following:

1. obstruction of the useable width of egress systems
2. potential storage of combustible materials in egress systems
3. delays in the operation of smoke and draft control assemblies and fire assemblies

Concerns

...The installation and use of AGVS equipment raise concerns, including but not limited to the following:

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4. inappropriate operation of activated fire control assemblies

 5. installation of equipment in the egress system

 6. interference with the operation of elevators

 7. maintenance of equipment including battery-charging

AGVS

- Code Requirements

California Building Code (CBC), Sections 1003.6, 1018.1, 1020.3, 1024.2, 1028.3 and 1028.5 require that minimum egress widths be maintained and be unobstructed.

California Code of Regulations, Title 19 (CCR T-19), Sec. 3.11(a) and 3.11(b) prohibit the obstruction of the required width of an exit and the installation or placement of equipment in or exposed to any exit. CBC Sec.

716.2.6 describes the requirements for the automatic closing of fire assemblies.



Code Requirements

- When AGVS are installed and used in existing buildings, in accordance with California Existing Building Code (CEBC), Section 302A.6, such buildings shall be maintained in a safe and sanitary condition. Devices or safeguards which are required by the CBC shall be maintained in conformance with the code edition under which they were installed.



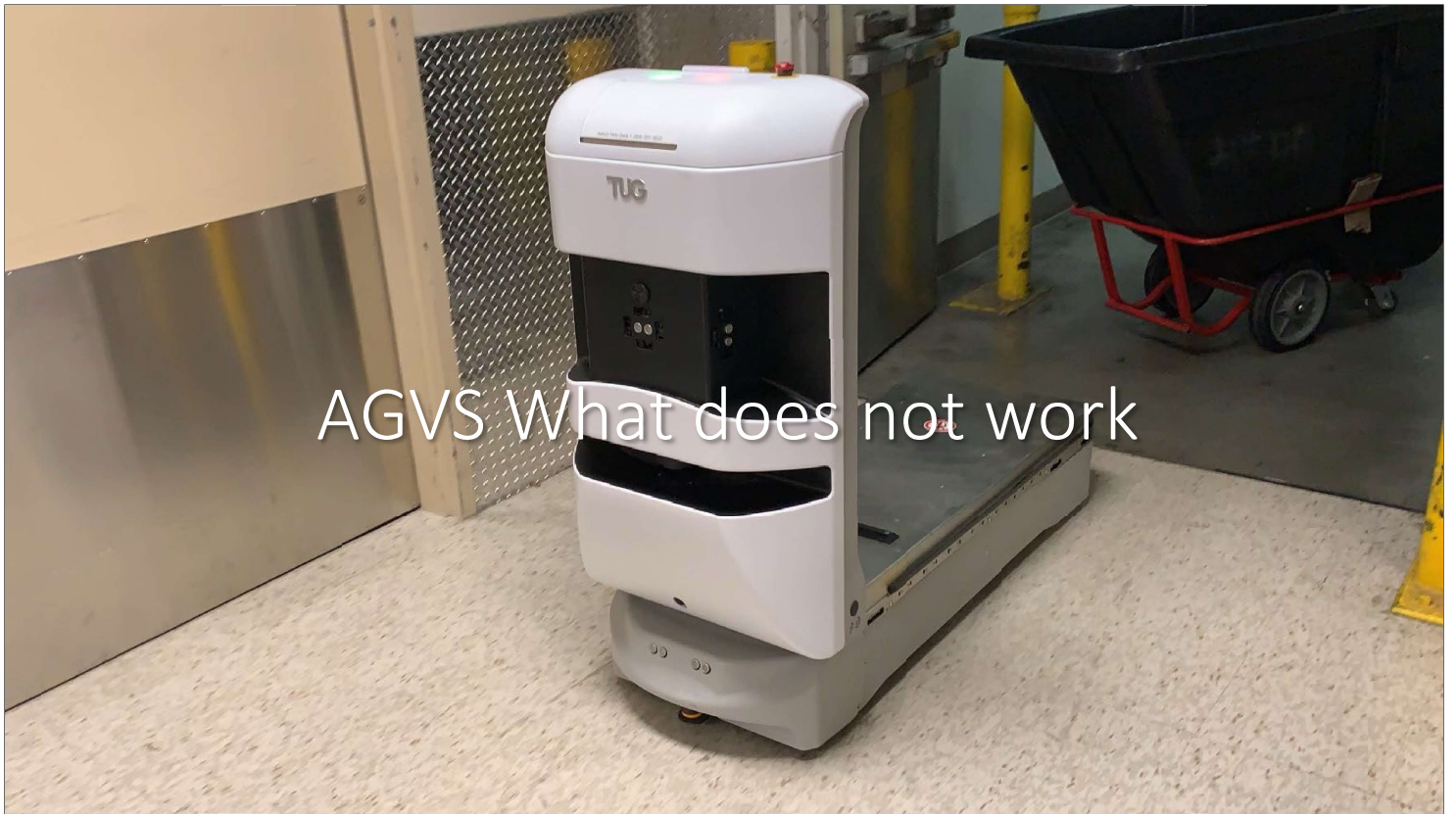
PIN 69

Many or all the materials that are transported by an AGVS are now transported by other means. These other means of transportation have operational issues that are under the jurisdiction of the California Department of Public Health and the local fire authority. However, an AGVS requires some construction and/or remodeling and therefore the AGVS installation and use is within the scope of the CBSC. The enforcement of operational and maintenance issues is outside the scope and authority of OSHPD. Therefore, when an AGVS installation and use is contemplated, the local fire authority must also be consulted.

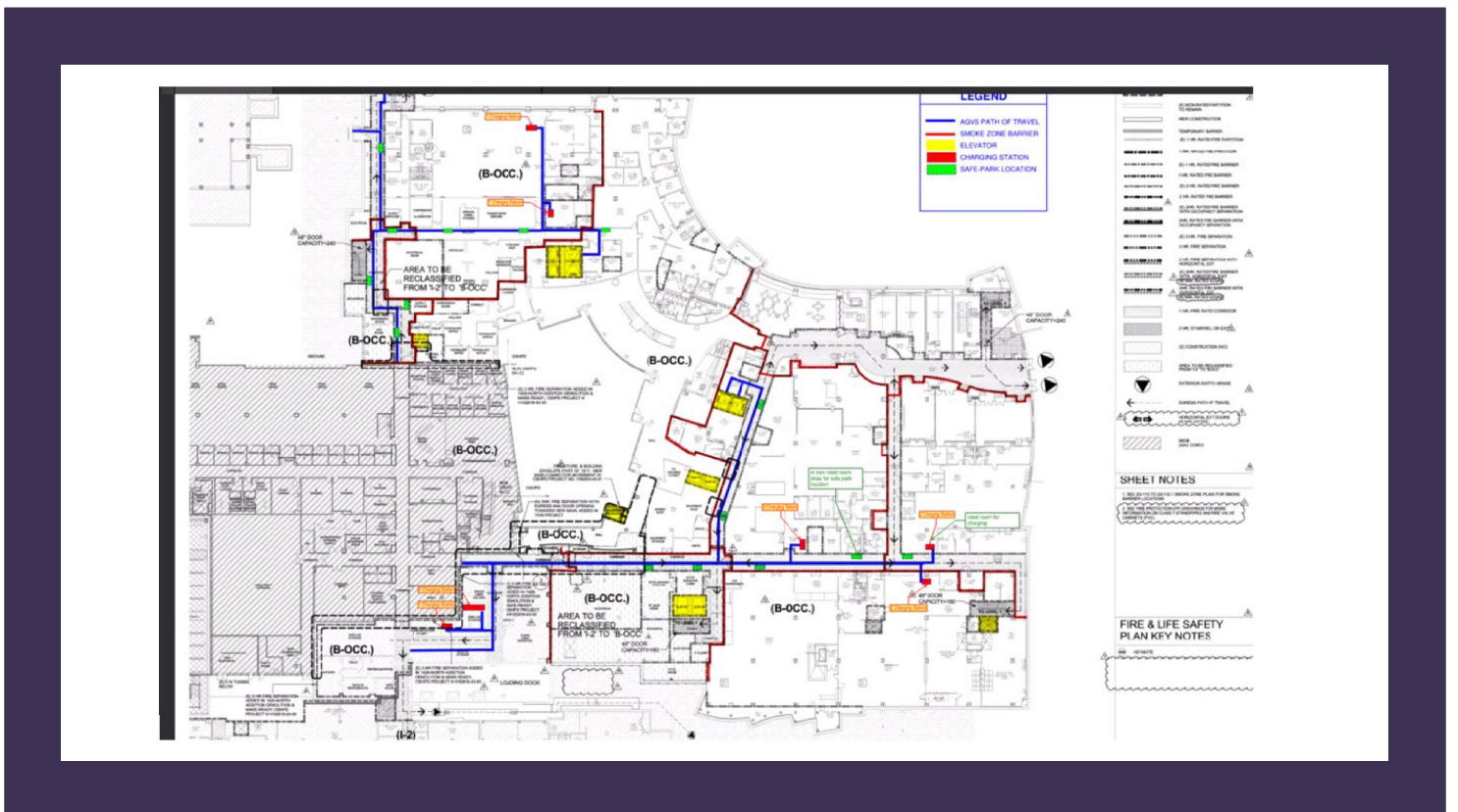


PIN 69

- The installation and use of an AGVS must be approved as an alternate design or method of construction (AMC) and an alternate means of protection in accordance with CBC Section 104.11 and CCR T-19, Section 2.02. Applicable portions of ANSI/ITSDF B56.5-2019, "Safety Standard for Driverless, Automatic Guided Industrial Vehicle and Automated Functions of Manned Industrial Vehicles," should be used as a guide in developing the AMC.

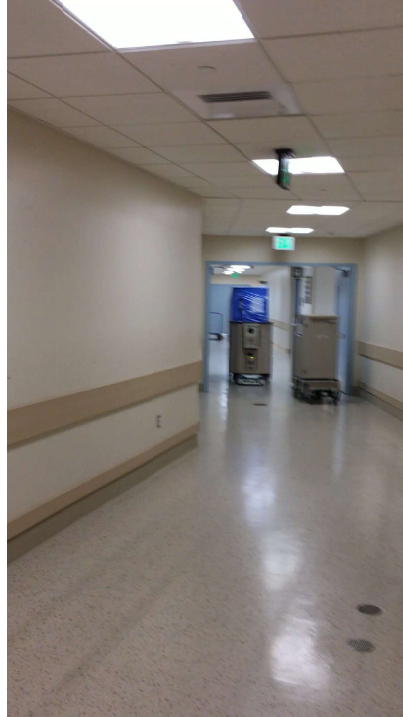


AGVS What does not work









As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:



A. AGVS units may not be parked in exit corridors or corridor alcoves. The AGVS may not use an exit corridor for charging, staging, or other moderate/long term duration uses.



B. AGVS units should be autonomous. Ensuring patient, staff, and visitor safety is the hospital's responsibility.



C. The use of AGVS units in corridor systems serving the general public and patient care areas should be minimized. Indicate the minimum guide path clearance that will be maintained.

As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:

- D. The minimum egress width required by the building code is to be provided.
- E. Corridor systems and adjacent rooms containing the AGVS guide path system must be provided with a complete automatic smoke detection system.
- F. AGVS unit storage/recharging home room must be provided with a complete automatic smoke detection system. It should be demonstrated how the AGVS will be programmed to not open the door to the storage/recharging home room if smoke detection in the room has been activated. The door to the room must be equipped with auto-openers/auto-closers connected to the building Essential Electrical System. Smoke detection will deactivate all power operators; power operators required to activate during fire alarm for AGVS transport will require approval of the fire alarm matrix for sequence.

As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:

- G. Protection of battery storage/charging rooms shall comply with CFC 1207 and 1207.7.4.
- H. To allow the passage of AGVS units, the activation of the automatic closure or reclosure of smoke and draft control assemblies and fire assemblies should not exceed a delay of more than 10 seconds from the time of smoke detection activation. A closure or reclosure delay of 20 seconds may be permitted with a reduction in the spacing of required smoke detector protection.



As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:

I. Where AGVS carts pass through exit doors or exit access doors, such doors should be provided in pairs. An AGVS cart must not obstruct more than one half of the required opening width of such openings, and it must not obstruct the doors from completely closing. AGVS should confirm path is clear prior to entry of door width. The status of AGVS carts during a fire alarm condition must be addressed. It should be demonstrated how AGVS carts will be programmed to proceed to holding rooms equipped with smoke detection and auto openers and auto closers connected to the building Essential Electrical System, and whether they will remain in elevators or vacate elevators. It should also be demonstrated how the AGVS unit is programmed to return to its designated holding room and not pass through cross corridor doors in response to the fire alarm when approaching cross-corridor doors that have been released by activation of smoke detection at the cross-corridor doors.

As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:



J. When AGVS carts stop at a fire door that has closed in response to a fire alarm, a clear zone equal to at least the required minimum corridor width must be maintained at the approach to the closed fire door/s, and the AGVS should proceed to its designated holding room within the smoke compartment. AGVS should not traverse cross traffic during fire alarm; AGVS should stop momentarily and then proceed to safe home base.



K. It must be demonstrated how the AGVS units are programmed to discontinue travel if fire is within the contents of an AGVS cart.

As part of the AMC the hospital must submit a plan of operational functions for review and approval of the AGVS that addresses the following issues:

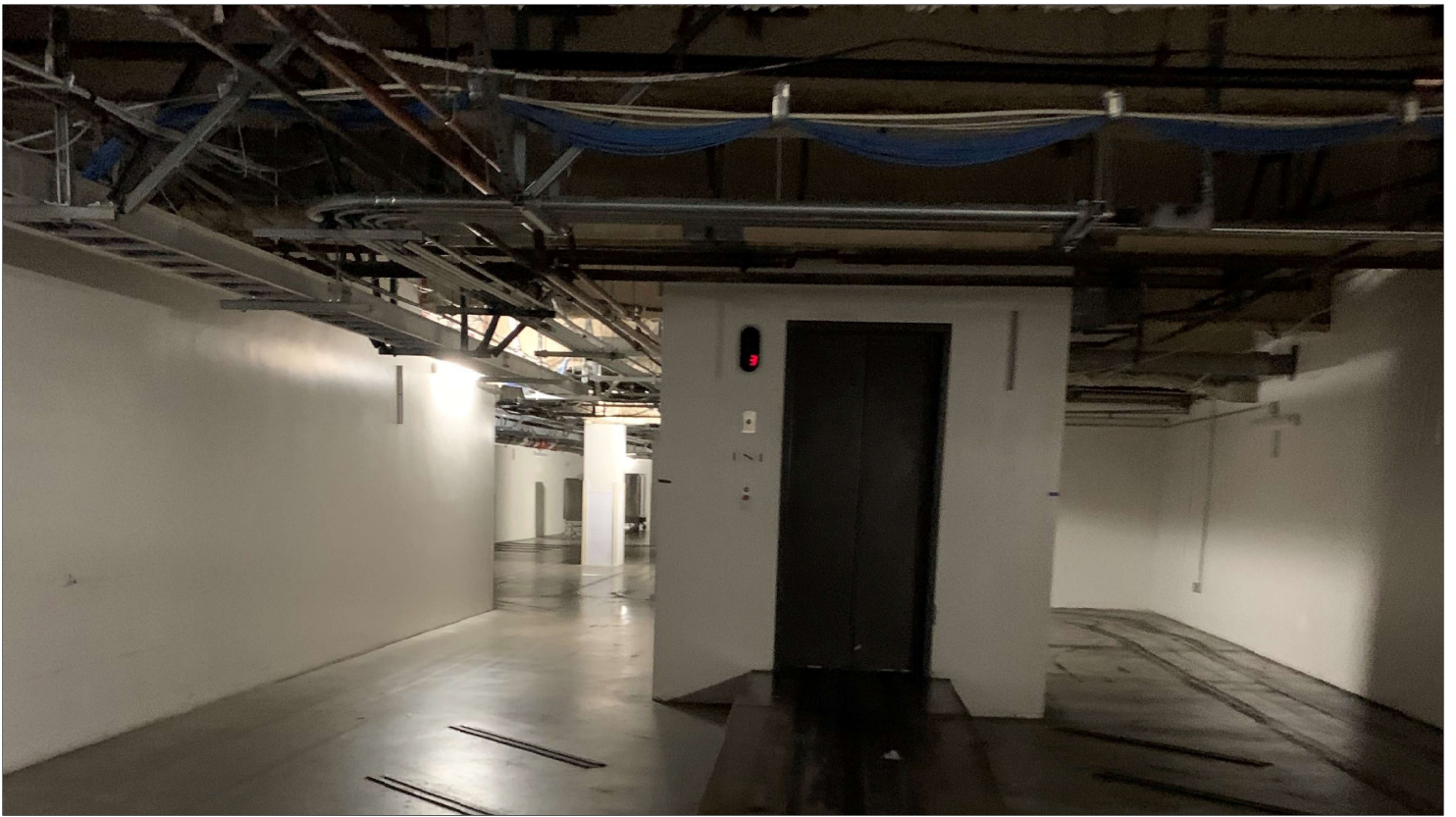
L. An AGVS should not be capable of opening a fire door at a location where a smoke detector has activated. Fire alarm will shunt all power operators and door functions, any door operation during fire alarm will require approval. An AGVS cart must not interfere with the operation of elevator recall. For AGVS in a recalled elevator, programming will need to address function of AGVS at the recalled floor. This will require local fire authority approval.

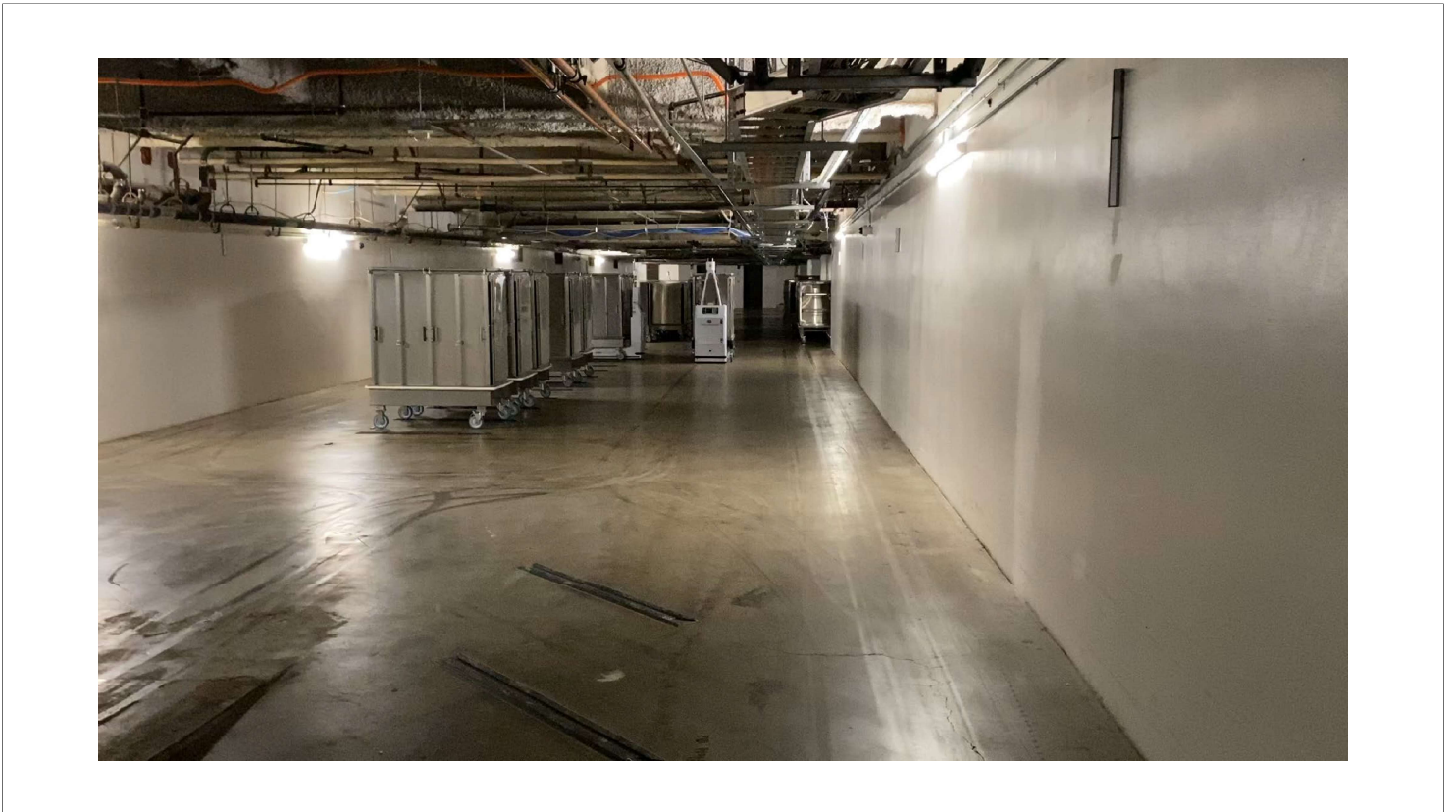
M. An AGVS cart must not exceed the weight limitations of an elevator, floors, ramps, etc. or any other spaces it traverses, stops, or is parked.

N. The strength of structural load bearing members should be evaluated when an AGVS is considered.

O. In accordance with CCR T-19, Section 2.02, a review of alternate designs or methods of construction or alternate means of protection involving fire and life safety issues, requires a local fire authority approval.











AGVS

Can it be done?

- Use the guidelines in PIN 69
- Talk with us regarding the specific needs of the facility, our ideas and helpful hints
- Submit the AMC

Thank you!