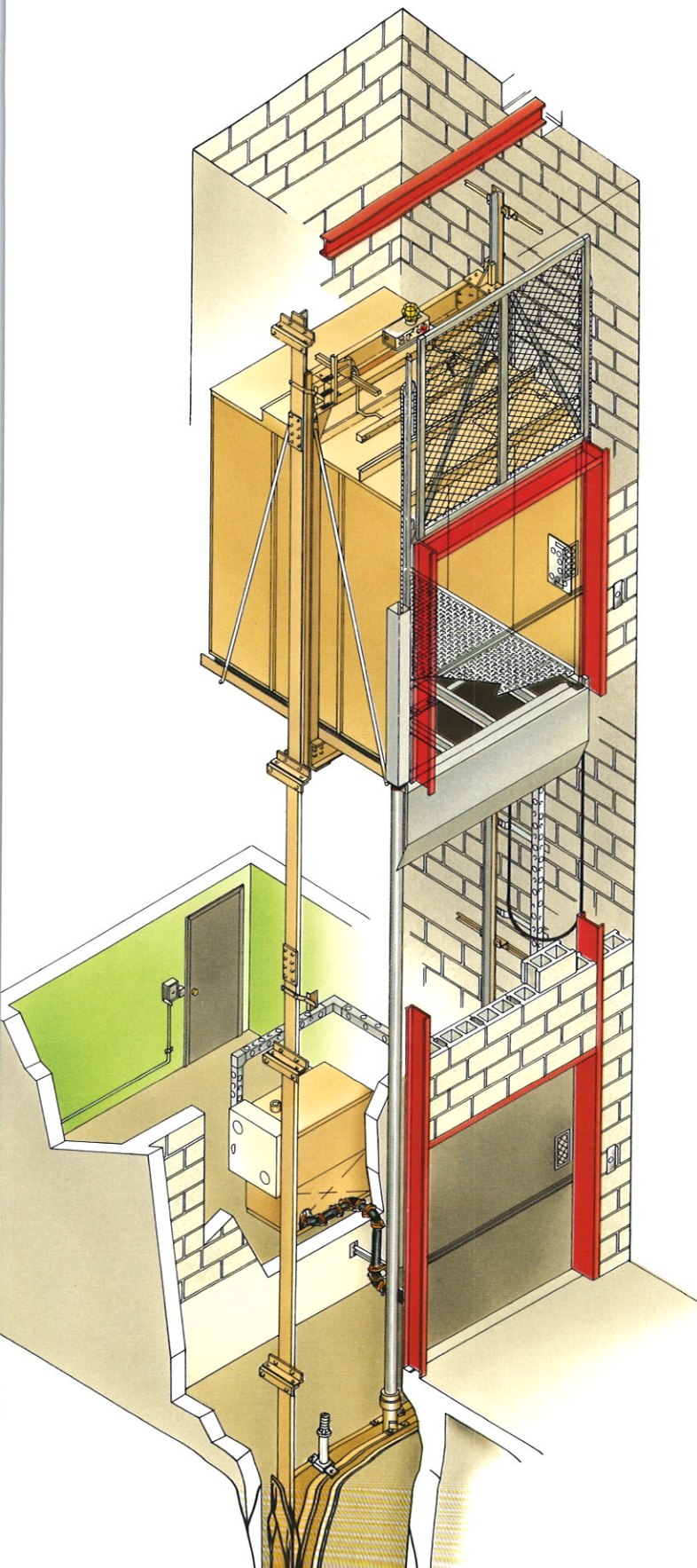


# FREIGHT ELEVATORS



montgomery®





There are a variety of matters to consider when designing or modernizing a Freight Elevator. Space will not permit a full presentation of all these items. However, this brochure, in conjunction with assistance from your Montgomery Sales Professional, will help you make an informed decision on the final design/modernization to satisfy your *Freight Elevator needs*.

Information presented here is based on the ASME A17.1 Elevator Code. Certain local and/or State Codes may differ from the requirements of "ASME" and may take precedence.

**HYDRAULIC—vs.—TRACTION:** Montgomery offers both Hydraulic and Traction Freight Elevators. When considering which type would be most appropriate, some items to be considered are:

- **TRAVEL:** Hydraulic elevators have travel (rise) limitations based on the use of a hydraulic plunger/cylinder assembly. Travel limitation for either inground or holeless applications is based upon the maximum (advisable) vertical projection of the hydraulic cylinder. While different applications create different limitations, a basic rule would set the maximum travel of a Hydraulic Freight Elevator at between 40 and 50 feet.
- **SPEED:** Usually, high speed is not a prerequisite for Freight Elevator application. A "general rule" for maximum speed for Hydraulic Freight Elevators is between 80 and 100 feet per minute.
- **BUILDING CONSTRUCTION OR ALTERATION:** While both hydraulic and traction equipment require special attention for guide rail bracket support, **traction equipment** requires additional consideration for structural support for the *Traction Elevator Machine*. Typically, Freight Elevators having identical speeds, sizes and capacities have different total weights depending on the use of hydraulic or traction technology. Traction elevators are typically heavier.
- **UNDERGROUND CONDITIONS:** Most Hydraulic Freight Elevators require the excavation of a hydraulic cylinder hole which is slightly deeper (measured from the pit floor) than the total elevator travel. Thus, subsurface conditions (e.g. potential difficulty in drilling, etc.) must be considered when deciding on hydraulic or traction equipment.

• Essentially, given the consideration of the points raised in



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**INTENDED USE:** Having decided that a Freight Elevator is needed, carefully evaluate actual intended use as the final design of the equipment must accommodate the existing (and future) needs of the structure. There are some questions which should be asked and answered. Depending upon the answers, the required Size and Capacity of the unit along with Speed, Control and Class of Loading can be determined.

- What type of freight is to be carried?
- How will the elevator be loaded and unloaded?
- What is the maximum weight of any single item to be moved?
- What is the maximum size of any single item to be moved (width, length & **height**)?
- Will "passengers" be permitted to use this Freight Elevator?

**DOORS:** A Freight Elevator typically has a **gate** which rides on the elevator car itself. In most cases, this is a vertical rising device. At each landing, **freight doors** are installed. To determine final elevator design, "door matters" need to be evaluated. These are briefly mentioned in the following and are expanded upon in greater detail later:

- Determine the minimum door size (finished opening dimension/width and height).
- Determine the type of doors (i.e., manually operated—or—power operated).
- Determine the material, configuration and construction of the doors.

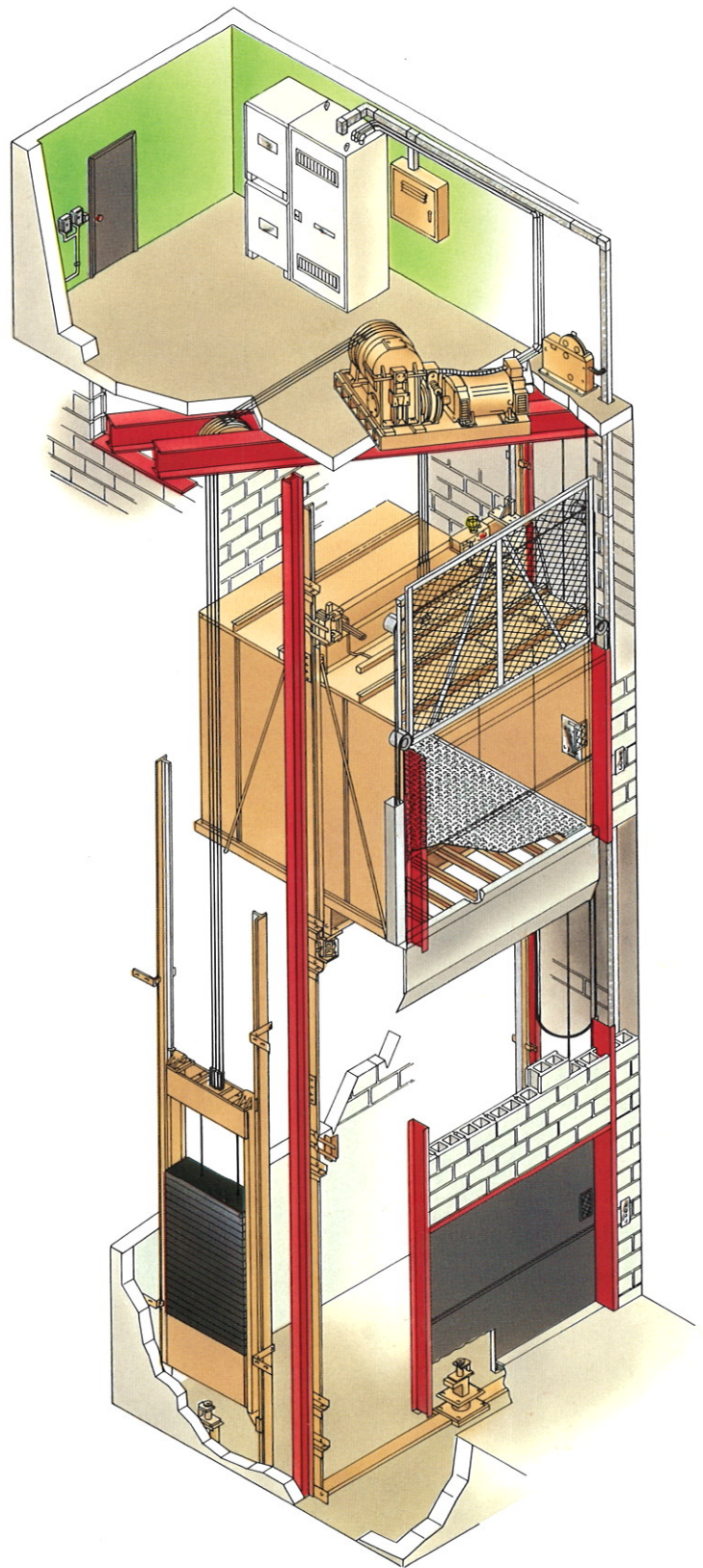
**CONTROL:** Both Hydraulic and Traction Elevators are electrically operated. Both require provision of three-phase and single-phase power.

Montgomery Hydraulic Elevators use an electric motor and pump to raise the elevator. Electrically operated valves lower the unit.

Montgomery Traction Elevators typically use solid state motor control which converts three-phase Alternating Current to Direct Current. In some cases, Traction Power Control may use Variable Voltage/Variable Frequency Alternating Current Control.

In either case, elevator **Logic Control** must be chosen. The two most frequently chosen Freight Elevator Logic Controls are:

- Full Automatic PushButton (FAPB) Control.
- Selective Collective (S/C) Control.



Class "C1" Geared Traction Freight Elevator  
Power Operated Bi-Parting Freight Doors &  
Vertical Rising Single Section Gate



## FREIGHT ELEVATOR SIZE:

- After determining the maximum size of any single item to be carried, determine the maximum size necessary to accommodate the projected maximum **number of items** to be carried. From this information, the net inside elevator width and depth can be determined.
- Consider not only the net inside car width and depth...but also the HEIGHT. The maximum height of the tallest piece will determine the clear inside car height and also the door opening height.



- Elevator wall, ceiling and floor materials should be considered based upon intended use. Cold rolled steel (14 gauge) is the usual choice for walls and ceilings. Variations in material and finish are available based upon desired appearance and site conditions. Depending on Capacity and Class of Load, flooring choices include checkered steel plate in varying thicknesses, special non-skid flooring, galvanized steel as well as high density wood. As shown above and at right, perimeter Bumper Guards can be installed to reduce potential wall damage caused by forklift/load contact with walls.

**CAPACITY:** Rated capacity of a Freight Elevator is oftentimes confusing. In many cases, the capacity rating (and the corresponding maximum weight which may be placed on the car at any time) are different. This curiosity will be addressed in the area explaining **Class of Load**.

- Depending upon Class of Load...the ASME A17.1 Code provides formulae to determine MINIMUM capacity. A calculation which determines such a **minimum** does not necessarily establish the rated capacity but does point out a rated load **minimum**.
- Actually, a Freight Elevator may be rated at any capacity (above the minimum). Of course, the hoistway structure, elevator equipment sizing, etc., are affected by this decision and must be designed to accommodate the actual rated capacity chosen.
- After determining the **minimum capacity permitted**... determine the maximum weight of individual items to be moved and the maximum number of such items in any given load. This will help establish the **actual rated capacity**.
- In the event that the Freight Elevator is intended for occasional "passenger use," more restrictive calculations apply. Based on the ASME A17.1 Code, such a Freight Elevator must have (as a minimum) a rated capacity which corresponds to calculations used to determine **passenger elevator capacities**. Your Montgomery Professional can assist in determining rated capacity required depending upon intended usage, projected maximum weight which might be moved on the elevator, minimum capacity permitted as well as the effect of use of this unit for the movement of "passengers."





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**CLASS OF LOAD:** Freight Elevators may fall under a variety of different classifications. A more detailed explanation along with appropriate formulae for calculation, etc., are available through review of the "ASME" Code. The following is a condensed explanation of these classifications:

- **Class A: General Freight Loading.** Material is moved on and off the elevator manually or by means of a single hand truck. No concentrated loading is permitted. Minimum capacity is based on 50 lbs. per square foot of inside net platform area. Single piece loads are restricted to **25% of the rated capacity.**
- **Class B: Motor Vehicle Loading.** This is an uncommon classification designed **solely** to carry trucks or passenger automobiles. Minimum capacity is based on 30 lbs. per square foot of inside net platform area.
- **Class C:** Three variations of this classification are identified:

**Class C1: Industrial Truck Loading.** The elevator is permitted to **carry a forklift** along with the load. However, the total of the load and the forklift **may not exceed** the rated capacity of the elevator.

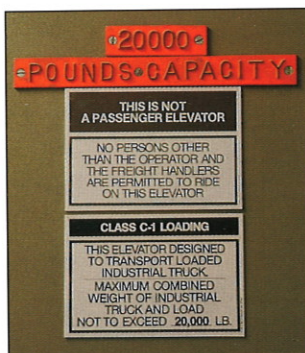
**CAUTION:** If forklift usage is planned, be certain that floor construction (outside of the elevator hoistway) is designed to accommodate the weight of the forklift and the weight of any load which it might be transporting.

## **Class C3: Other Loading With Heavy Concentrations.**

For this classification, a truck is not usually used. This has more to do with the movement of items which create concentrated loading (i.e., where the weight of a single piece exceeds 25% of the rated elevator capacity).



Class A Loading



**Class C2: Industrial Truck Loading.** For this classification, a forklift truck is normally not carried by the elevator but may be used for loading and unloading. While this classification does not affect the rated capacity, the fact that the elevator does not carry the forklift does permit exceeding the Rated Capacity during the loading and unloading functions. However, during elevator movement, the rated capacity may not be exceeded.



Class C1 Loading



**FREIGHT DOORS:** Freight Doors are usually Bi-Parting units. A Bi-Parting Door opens with the upper panel traveling in the Up direction with the lower door panel in the Down direction. The upper edge of the lower panel incorporates a "truckable sill." Normally, each panel is the same size. In some special cases, a Freight Door may be a single section unit which opens Up. Where a limited pit depth exists, 1/3 - 2/3 Bi-Parting Doors can be applied permitting the lower section to open down within the restricted depth of the pit.

Other types of design considerations apply where the opening height of an entrance will not permit the upper door section at a floor to fully open because it would come in contact with the lower edge of the lower door panel above it. In such case, Pass Type Doors are applied. This permits an entrance to have door panels "offset" so that the upper door panel (when open) "passes" the lower panel above it. Special design considerations may or may not be applicable.

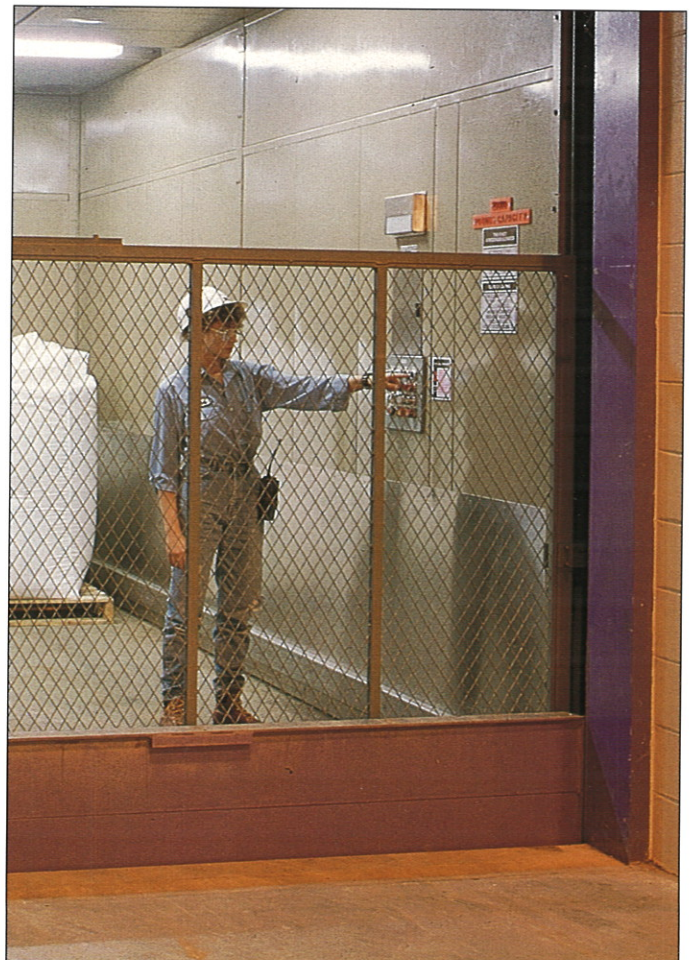
- **MANUAL DOORS:** Doors are counterbalanced, interlocked and manually operated. Doors may be opened only when the elevator is at a landing. Even with counterbalancing, it is advisable to not exceed 8 feet in width and 7 feet in height. When manual doors are installed, the car riding gate is also (usually) manually operated.

Because manual Freight Doors do not close automatically, a **door open audible signal** is provided advising someone at the landing (where the doors are open) that doors must be closed manually before the elevator can respond to demand required elsewhere.

- **POWER DOORS:** Where the size of opening exceeds the recommended maximum for manual doors or where Freight Elevators are anticipated to be used frequently...Power Operated Freight Doors are normally recommended.



**Manual Bi-Parting Door**



**Power Bi-Parting Door**

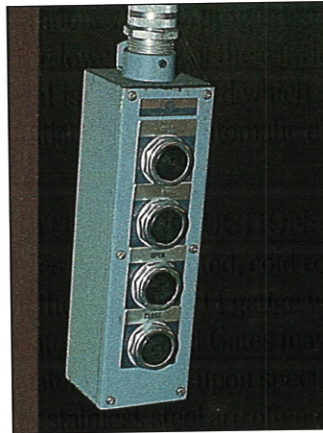


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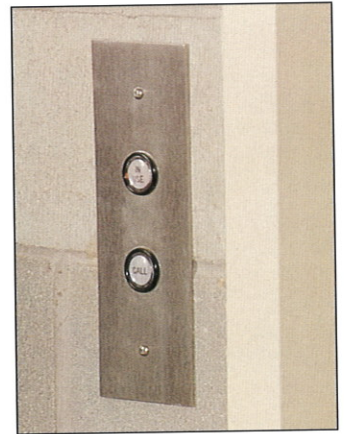
- **POWER DOOR OPERATION:** Power operated doors are opened and closed by means of Pushbuttons located at each landing and within the Elevator. The car riding gate is usually power operated and is also controlled by the Power Door Pushbuttons. When arriving at a landing, doors and gate may open automatically or by momentary pressure on the Door Open Pushbutton. Closing the doors and gate requires **constant pressure** on the Door Close Pushbutton. (There are optional features which would permit **automatic** opening and closing of gate and doors.)
- **PASSENGER USAGE:** Where the occasional movement of passengers will be permitted on a Freight Elevator, special capacity calculations along with Power Freight Doors are required. In addition to the previous explanation of operation, other features are required for this door operation. A **reversing edge** is required to be installed on the lower edge of the car riding gate. An **audible signal** is also required which sounds 5 seconds prior to the initiation of the automatic door closing sequence.
- **DOOR & GATE CONSTRUCTION:** The basic application uses primer painted, cold rolled steel for fabrication of the doors and 14 gauge wire mesh for the Car Gate. Doors and Gates may also be fabricated from other materials based upon special applications. Galvanized or stainless steel are often called for depending on intended elevator use, atmospheric conditions within the structure, etc. **Frames for each landing door are not provided nor installed by Montgomery.** Usually, frames are fabricated from structural steel channel. This channel must run up to a point where adequate structural support can be obtained. The structural integrity of these frames is important because the actual door mechanism is mounted directly to the inside face of the structural channel.
- **FIRE RATING:** Bi-Parting Freight Doors carry a U.L. fire rating. Where door opening size exceeds certain maximums, actual labeling may not be possible but certification can be provided stating that the doors are fabricated in accordance with U.L. procedures. Where applicable codes require the hoistway to be fire rated and

the hoistway is constructed of drywall, the aforementioned channel frame requirement is still necessary along with a special exterior frame cladding supplied by Montgomery which is designed for drywall application.

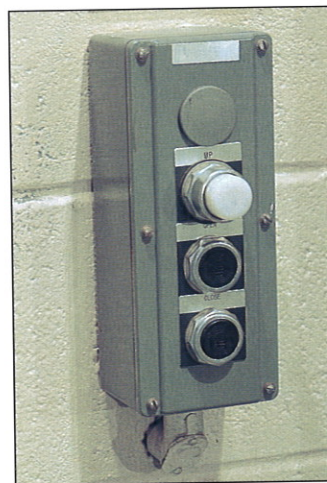
- **PENDANT STATIONS:** Where a high volume of forklift traffic is anticipated, Pendant Stations are often advisable. These devices are suspended at a predetermined height outside of one or more entrances giving the forklift driver the ability to register a car call and operate Power Doors without the need to leave the vehicle. This feature does not replace wall mounted devices for "pedestrian use."



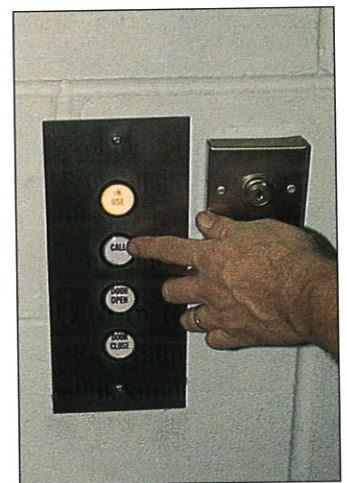
Pendant Station  
w/Power Door Buttons  
(Special NEMA Design)



Standard Hall Station (FAPB)

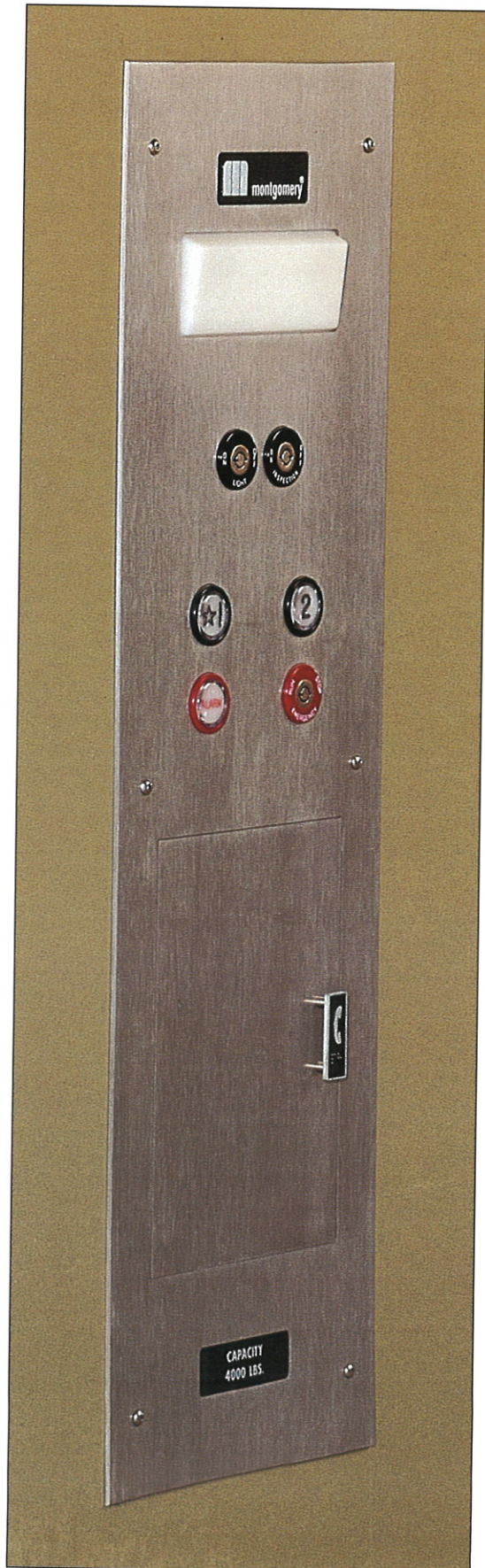


Hall Station (FAPB)  
w/Power Door Buttons  
(Special NEMA Design)



Standard Hall Station  
w/Power Door Buttons





**ELEVATOR LOGIC CONTROL:** There are two usual types of Logic Control applicable to Freight Elevators.

- **FAPB (Full Automatic PushButton):** Here, only one Hall Call may be registered at a time to allow uninterrupted use of the elevator. When not in use, the elevator will answer a registered Hall Call. No other Hall Calls may be registered while the elevator is in use.
- **S/C (SELECTIVE COLLECTIVE):** Multiple Hall and Car Calls may be registered at the same time. The control system “remembers” each call and will answer them in the order in which the landings are reached based on the direction of travel of the elevator, irrespective of the order in which they were registered.

**CONTROL FIXTURES AND FEATURES:** In addition to Power Door Pushbuttons, other fixtures and features are applicable (or advisable) for Freight Elevator application.

- **CAR AND HALL PUSHBUTTONS:** For FAPB Operation, a single Call Button is supplied at each landing. When the elevator is already **in use**, an illuminated signal is activated indicating that no additional Hall Call can be registered until the light is extinguished.

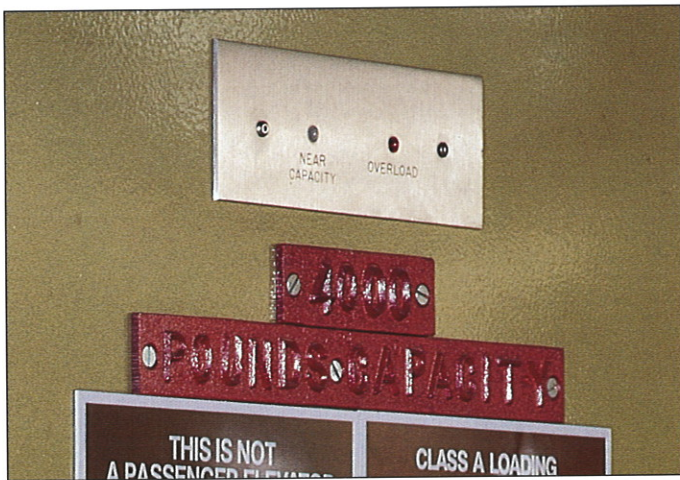
For Selective Collective Operation, multiple Hall Calls can be registered with the elevator responding as explained previously. If three or more landings are involved, intermediate landings will have both an Up and Down Pushbutton so the desired direction of travel can be registered. Those buttons illuminate when pressed and are extinguished when the elevator responds to that particular call. Other buttons, switches and illuminated signals are provided in the Car Station per job and code requirements.

**Standard Car Operating Panel**



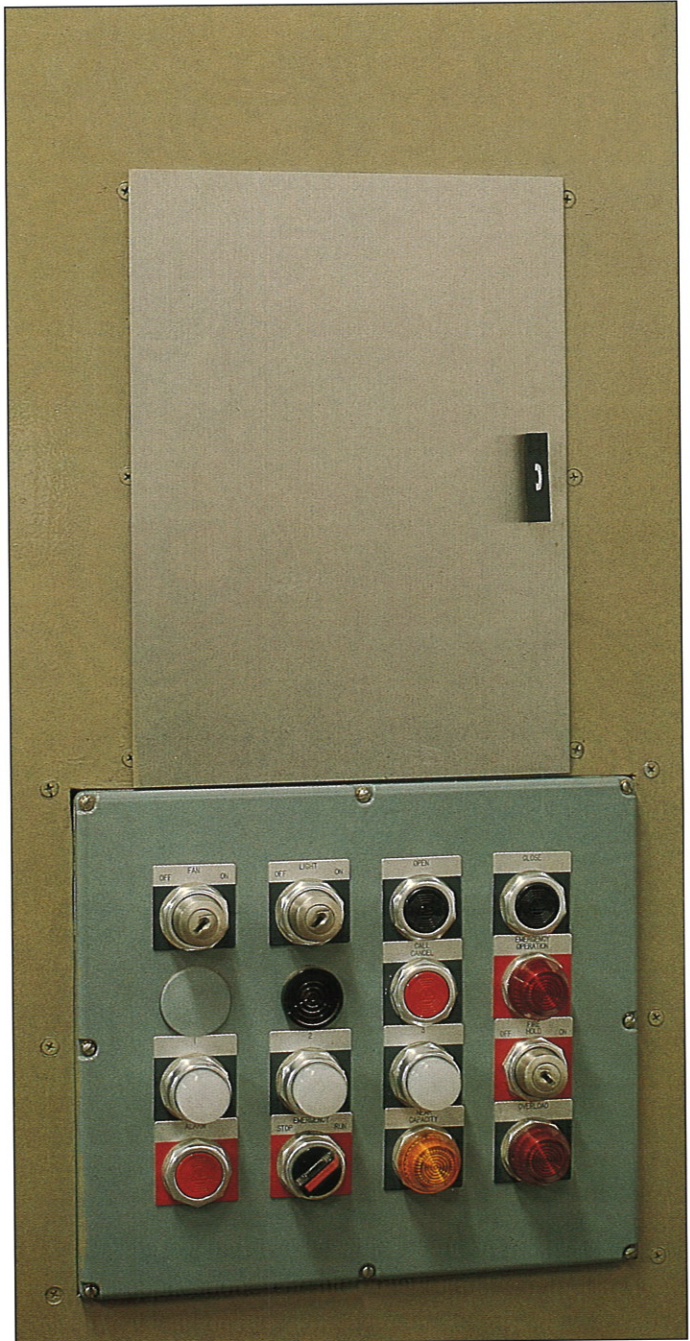
# FREIGHT ELEVATORS

- **EMERGENCY COMMUNICATION DEVICE:** In accordance with code, provisions for this device are provided by Montgomery. The actual communication device (e.g. telephone) is normally the responsibility of the Owner.
- **FIRE SERVICE:** All elevators, including Freight Elevators, are required to have appropriate Fire Service features in accordance with applicable codes including the ASME Code.



Load Limiter

- **LOAD LIMITER:** This is a highly advisable feature for any Freight Elevator application. The illuminating signals advise status of load on elevator (percentage of contract capacity). The first signal illuminates when the load on the car reaches approximately 80% of capacity. This is a "warning signal." The second illuminating device advises that the load has exceeded 100% of contract capacity. With illumination of this signal, the elevator will not accept any car or hall call and will remain stationary until adequate weight is removed from the car in accordance with contract capacity limitations.



Special NEMA Design Car Operating Panel  
with Load Limiter and Telephone Cabinet



**HOISTWAY CONSTRUCTION:** The design and construction (or alteration) of the elevator hoistway and machine room is the responsibility of the owner. Design and dimensions must interface with the final characteristics of the Freight Elevator. Certain matters bear special attention.

**HOISTWAY WALLS ①:** Local building codes govern design characteristics. Be certain to consult with appropriate agencies to determine requirements such as fire rating. Proper interface and planning is necessary regarding structural and electrical considerations.

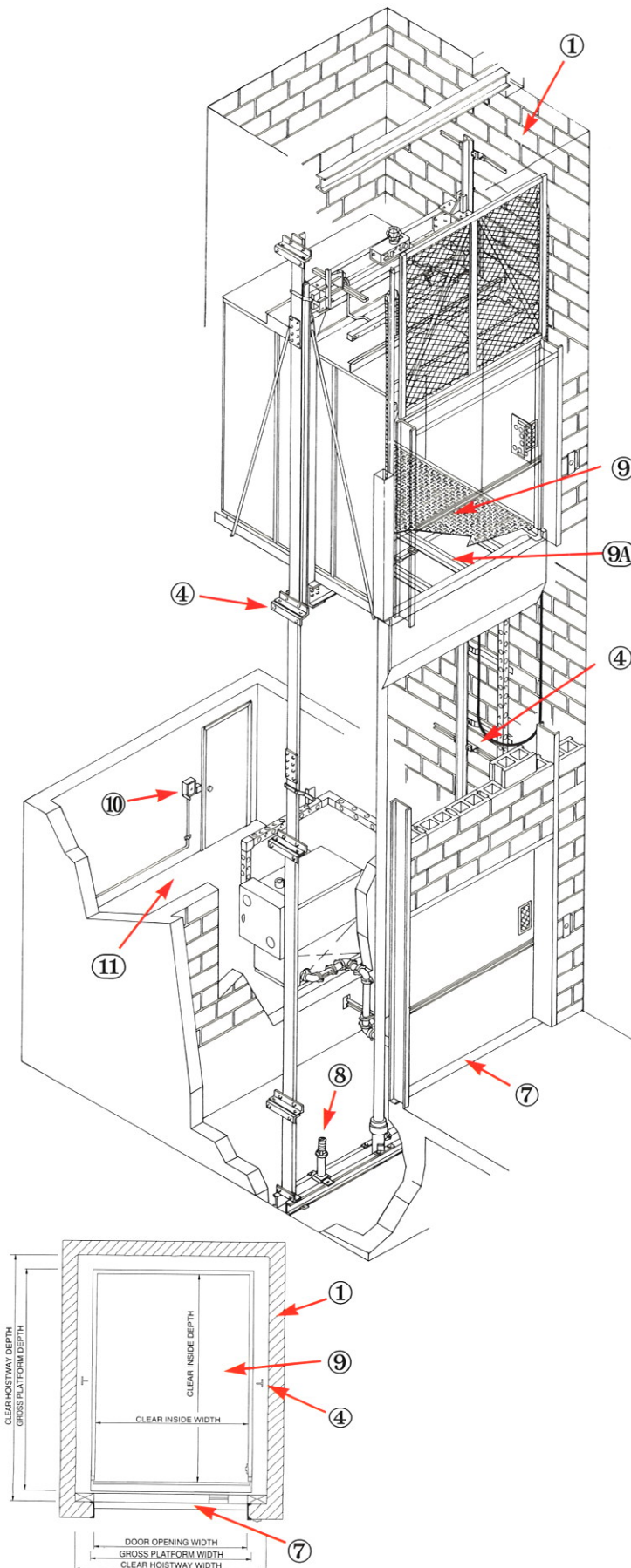
**TRACTION ELEVATORS** may have the hoisting machine mounted directly overhead ② or at the side of the hoistway at any level including the lowest landing. In any case, special structural design considerations are necessary based upon reactions created by the use of traction equipment. Coordinate with your Montgomery Professional regarding these reactions so that correct support is planned and provided ③.

**GUIDE RAIL BRACKET SUPPORT:** Freight Elevators create horizontal reactions which are greater than that created by passenger elevators. Especially when the Class of Load is **B, C1, C2, or C3**...guide rail bracket support ④ is critically important! For these classifications, guide rails are "double bracketed" ⑤ and must have appropriately designed structure to accommodate fastening. In many cases, vertical steel ⑥ is installed within the hoistway to provide such bracket support at any elevation where bracket locations occur. The support for guide rail brackets is not the responsibility of Montgomery.

**TRUCKABLE SILLS ⑦:** At the edge of the building floor (leading into the elevator hoistway) structural steel angle must be in place to avoid deterioration of the building floor through the continued use of hand trucks, battery operated pallet lifts, forklifts, etc. Montgomery can provide **information** to assist in planning for the design and installation of these *truckable sills* (in conjunction with the freight door frames) but is not responsible for the provision or installation of same.

The design of the pit floor must accommodate planned reactions on pit buffers ⑧.

**FLOORING:** A Freight Elevator may use a variety of materials for flooring ⑨ including checkered steel plate, non-skid materials, galvanized steel or high density wood. For Class B & C Loading, additional floor supports (stringers) ⑨A are included in the elevator platform design.

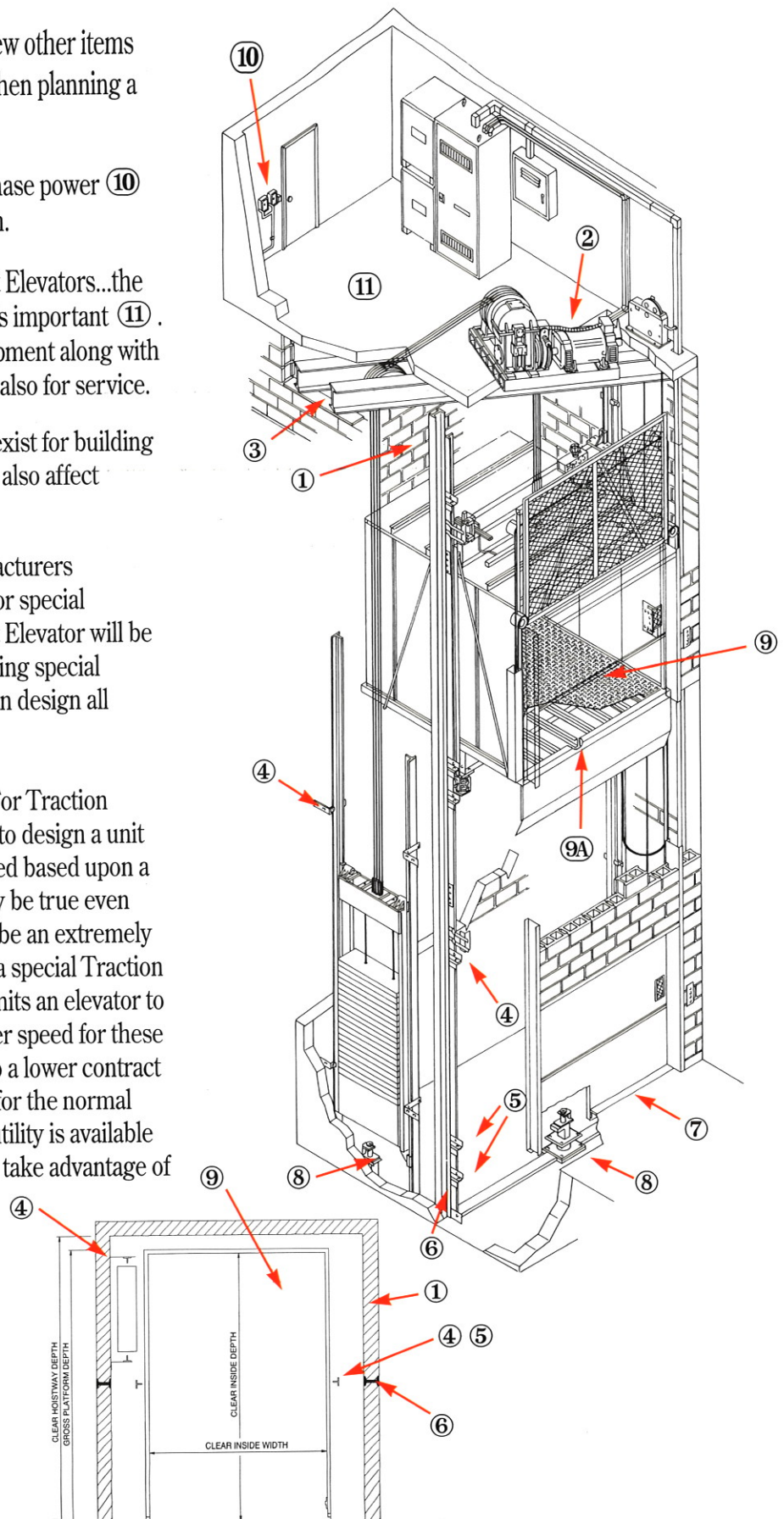




# FREIGHT ELEVATORS

**GENERAL COMMENTS:** There are a few other items that should be mentioned as a reminder when planning a new or modernized Freight Elevator.

- Provide necessary 3 phase and single phase power ⑩ and adequate Machine Room Ventilation.
- For either Hydraulic or Traction Freight Elevators...the size and location of the Machine Room is important ⑪. It must be adequately sized for the equipment along with safe and easy access for installation and also for service.
- In certain areas, Seismic requirements exist for building construction. These requirements may also affect required elevator features.
- **NEMA:** The National Electrical Manufacturers Association has established standards for special electrical applications. Where a Freight Elevator will be installed in certain environments requiring special NEMA considerations, Montgomery can design all equipment in strict compliance.
- **DUAL SPEED/DUAL CAPACITY:** For Traction Freight Elevators, there is often a need to design a unit with a rated capacity and a contract speed based upon a **WORST CASE CONDITION**. This may be true even though such a condition is projected to be an extremely infrequent event. Montgomery offers a special Traction Freight Elevator application which permits an elevator to accommodate a high capacity at a slower speed for these occasional conditions while reverting to a lower contract capacity (at a higher operating speed) for the normal course of operation. Significant dollar utility is available to the Montgomery Customer who can take advantage of this special application.



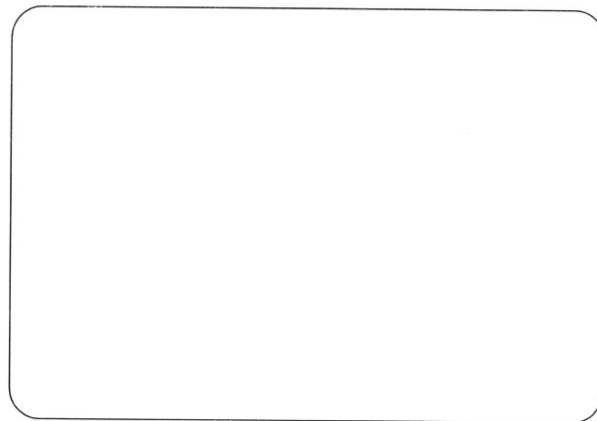




**ADDITIONAL INFORMATION:** Designing or modernizing a Hydraulic or Traction Freight Elevator need not be complicated. Your Montgomery Sales Professional is prepared to evaluate your needs and assist in specifying the best elevator design to meet your current and future needs. We invite you to contact us for further information about:

- Specific Code(s) applicable in your area.
- Potential seismic requirements.
- Potential need for special NEMA provisions.
- The most appropriate Logic Control for your intended elevator/building use.
- Determination of correct Freight Elevator size, Capacity and Class of Load.
- Determination of proper Freight Elevator Door size, configuration, construction, operation, etc.
- Valuable information for use by your contractor, architect, structural engineer, etc., for the appropriate design of the Elevator Hoistway including provision of correct structural support for hoisting equipment, guide rail attachment, etc.

The unmatched expertise and resources of the entire Montgomery organization are available to you directly through your Montgomery Sales Professional.



ELEVATORS • ESCALATORS • POWER WALKS • POWER RAMPS • MODERNIZATION • SERVICE

Montgomery Elevator Company, One Montgomery Court, Moline, Illinois 61265  
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