

RAM ELEVATORS



Elevator Electrical Planning Guide

This guide is intended for people with an understanding of electricity. If you are not, please consult a licensed electrician as errors in application of this guide can cause severe injury or even death.

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For mechanical considerations relating to interlock and call station mounting as well as general installation steps - see main installation manual for corresponding product

RAM Elevators are designed to meet ASME A17.1/ CSA B44 Safety Standards when properly equipped and installed. While RAM products meet national standards, it is imperative to check State/ Provincial standards as well as local code requirements before purchasing or installing to ensure code compliance. All State/ Provincial/ Local code compliance is the responsibility of the purchaser. Some states/ provinces may require fees for permits and inspection.

Section 1: Introduction

This guide is intended to help RAM customers plan for and work with our elevator products. It does not replace training and is not exhaustive in terms of explaining electrical theory, controls theory, or elevator code but does try to highlight some of the more common concerns as they relate to the installation of the electrical and controls associated with RAM equipment.

For more detailed instructions on the installation process for a specific elevator please refer to the corresponding installation manual. Those manuals will a step by step process of installation.

Additionally, this guide does not cover trouble shooting for controls or electrical components.

Section 2: Relevant Codes

Although there are numerous codes that could be reference the main ones that apply for the purposes of this guide are noted below and it should be noted that **all final tie ins to main power must be done by a licensed electrician.**

- CSA B44.1/ ASMEA17.5—Elevator and Escalator Electrical Equipment
- Canadian Electrical Code - “CEC” - CSA C22.1
- National Electrical Code - “NEC” - NFPA 70

Although we suggest you review the codes completely for the work you are responsible for, Article 620 of the NEC is specific to elevators and has one requirement, in particular, that can have a significant impact on how a RAM customer plans for electrical portions of installation in the USA.

Article 620, Section III states that in hoistways **“any cable, other than the travel cable, longer than 6ft (1.8m) shall be placed inside a wall rather than running freely on the inside of the hoistway wall.** This includes wiring methods such as flexible metal conduit, liquidtight flexible metal conduit, liquidtight flexible nonmetallic conduit, and flexible cords/ cables.”

To see article 620 please use the link below or obtain a hard copy.

http://www.elevatorbooks.com/Content/Site125/FilesSamples/179583pdf_00000088458.pdf

Section 3: Wiring Types

Soil-Oil-Water (SOW) Cable

- has a polymer outer protective layer that is not suitable for sharp object protection but will protect from soil, oil and water
- Also typically needs to be run in conduit for sharp object protection
- Can be cut to length on site easily but again wire numbering needs to be noted and preserved
- Typically placed in conduit during installation



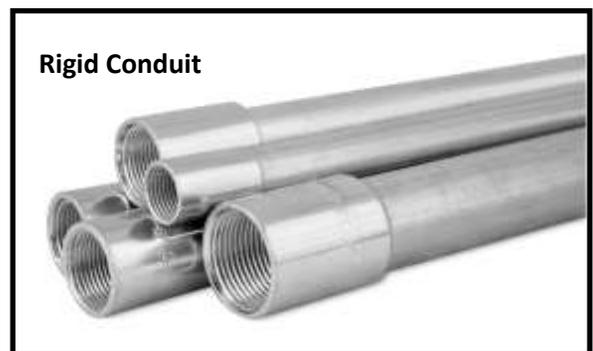
Flexible Conduit

- Loose wires run inside a flexible plastic protector sheath that can be sealed at terminations
- Suitable for indoor or outdoor applications as long as appropriate sealing procedure are done
- Requires fittings to secure the sheath at housing/ junction box entries but they are commercially available



Rigid Conduit

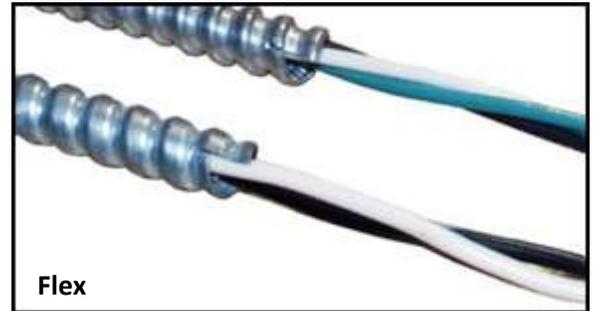
- Loose wires run inside either metal or plastic rigid tubes
- More rigid than flexible conduit and is allowed in the elevator shaft in most locations
- Good for outdoor use as well as indoor if sealed properly
- Requires fitting for entry points at junction boxes/ termination points



Section 3: Wiring Types

Flex (Flexible Metal Sheath)

- Loose wires run inside a flexible metal protector sheath
- Suitable for indoor applications as it is not environmentally rated
- Needs different fittings to secure the sheath at housing/ junction box entries but they are commercially available
- RAM may send short runs of this to connect some items



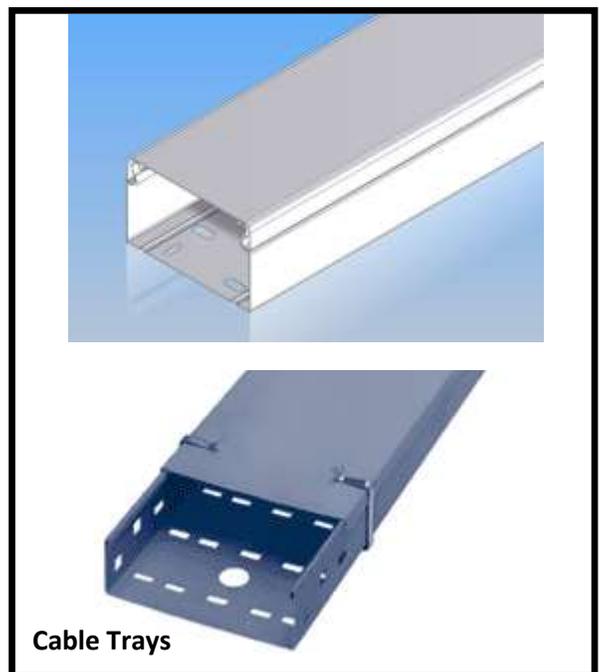
Tech Cable - RAM Standard Supply

- wires with environmental protection as well as a flexible metal protector sheath
- Wires are numbered and are all in black and white pairs
- Stiffer cable
- Slightly harder to trim to length
- Typically uses the same fittings as Flex at entries to housings and junction boxes
- Good for outdoor use as well as indoor
- May not be code compliant to run for longer than 6ft (1.8m) in side the elevator shaft for USA installations



Cable Trays

- The use of cable trays is a method to run cables and keep them tidy as well as protected
- For USA installations RAM would suggest utilizing our standard supply (Tech Cable) in conjunction with cable trays for areas of the shaft where you need to run cable through the shaft that are longer than 6ft (1.8m).
- Cable trays can come with or without cover lids and may also be available in PVC or metal materials—RAM does not typically supply these items as they are not always



Section 4: Disconnect Requirements/ Options

Quantity

Typically 2 disconnects are required as part of an elevator site preparation prior to RAM equipment arriving.

Disconnect (1) is to turn off power to the motor and motor controls but leave power to the lights and auxiliary components. **Disconnect (2)** is to turn off lights, auxiliary components, interlocks, etc.

The number of poles required for each depends on the specific configuration but in most cases it is a double pole, single pull, lockable, and fused disconnect for each.

In some cases, where auto-lowering, auto-operators for doors, and/or sliding doors are used are used, 3 or 4 pole disconnects may be required.

Location

Disconnects are required by code to be within visible distance of the motor controller.

In the case of RAM controls, if the upper control box (which contains the motor controller) is not within site of the upper landing door then the code requires a manual stop switch in line with the control circuit for the drive means (motor). This means that a secondary stop switch needs to be located near the motor. RAM does this as a standard to allow installations to move the upper control box/ disconnects to alternate locations.

There can also be specific working area requirements so that disconnects can be accessed effectively. Typically this means a space 30in by 42in clear in front of the disconnect

Aesthetics

While disconnects can be mounted directly on a wall this does not look very attractive. While commercial buildings may not be interested in appearances residential installations are typically very sensitive to appearance.

RAM would suggest that disconnects are placed in a cabinet that is either surface mounted or recessed in to a wall for all applications.

RAM has a cabinet and set of disconnects that can be purchased as a kit and images of that kit are shown below. An electrician is still required to do the tie in/ termination of these items.



RAM Kit Part Number: RAM-DIS-PACK & RAM-DIS-CAB

Section 5: Upper Control Box

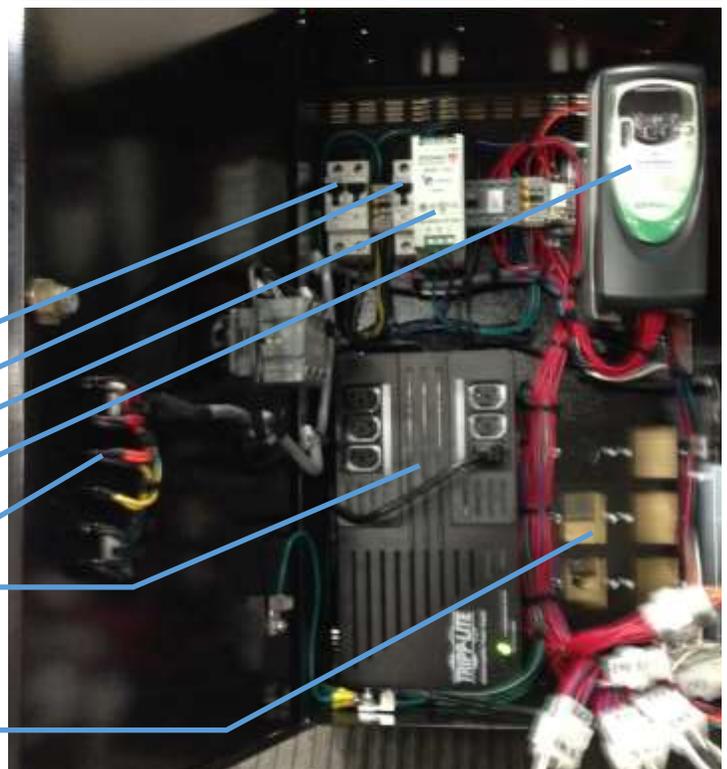
What's in the upper control box?

RAM elevator controls are split in to two main pieces — there is a control board (PCB) that sits in the carriage and then there is an upper control box that houses items like relays, variable speed drive, and other large electrical components.

The division allows RAM controls that are onboard the carriage to be low voltage (24VDC) while the higher voltage items remain in the upper control box.

The image at the top right of this page shows the front of the upper control box and it has a keyed cover that swings open to reveal the main power components and relays.

The image on the lower right show the upper control box open with the main power components exposed. The exact components in the control box will vary depending on the options and configuration selected for your elevator but a number of components will be common in all configurations.



- Main Power Breaker
- Lights and Auxiliary Breaker
- 24VDC Power Supply
- Variable Speed Drive
- Trouble Shooting LED's
- Uninterruptible Power Supply (UPS)
- Cable connector entry points

Section 5: Upper Control Box

Upper Control Box Size

Although the width and depth always remain the same the height of the control box can vary between 2 standard sizes.

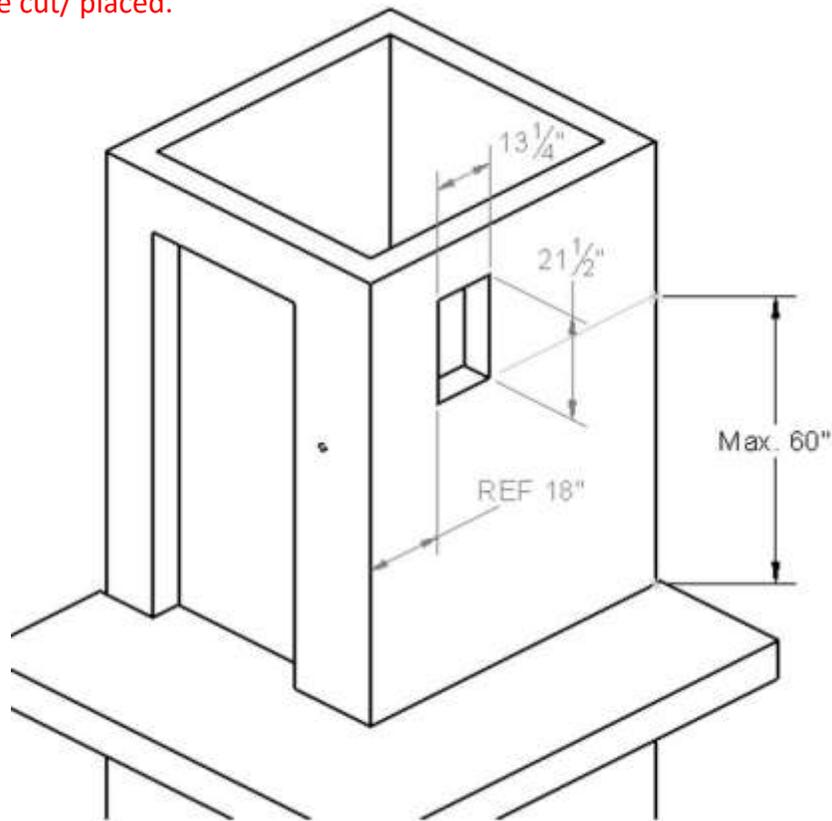
Most typically the height of the control box is 21in but in some cases there is additional equipment added and RAM extends this box to be 28in tall.

For wood/ drywall construction the height is not typically a significant concern but **when working with concrete or cinderblock walls specific control box size may be something you need to know in advance to have the hole cut/ placed.**

Standard Location

As outlined in RAM installation manuals the standard location for the upper control box is at the top landing on one side of the rails. The control box is sized in width (12.75in) so that it can fit between 2x6 studs on the rail wall.

Typically the control box is at a height of roughly 5ft to allow for easy access and to avoid accidental access if it was mounted at a lower height.



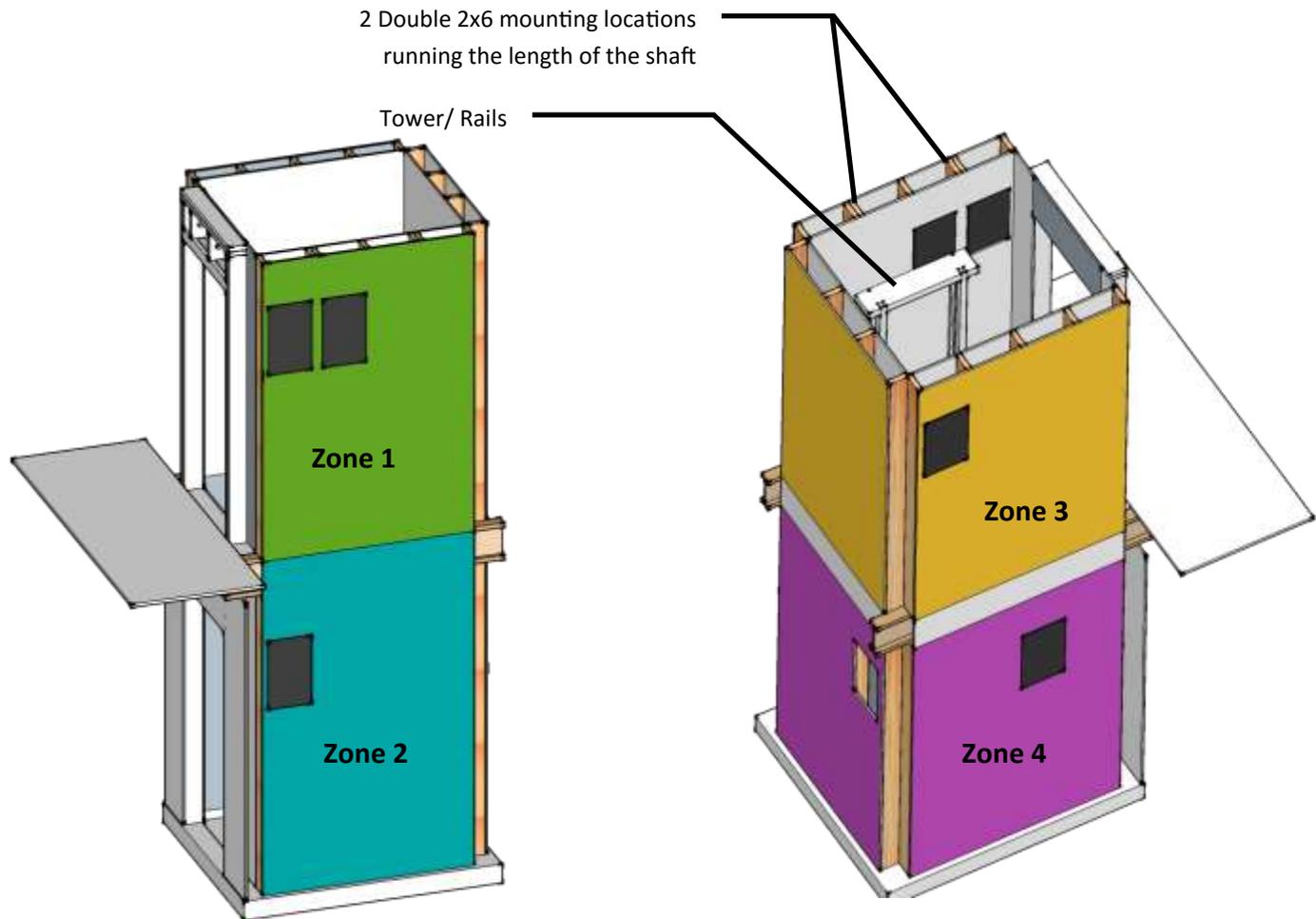
Alternate Locations

In some cases a client does not want to mount the upper control box in the standard location. While there are numerous other locations that the control box can be mounted; there will be impacts on the installation process and, in some cases, additional costs for extra wiring extensions/ junction boxes/ fittings to allow for this.

Section 5: Upper Control Box

Alternate Locations

The following outlines a number of additional mounting locations and breaks them down in to zones for wiring extensions that will need to be selected during the quotation process if you intend to mount in these locations. RAM has broken these down in to zones so that you can simply inform a sales person of the zone you need and they can add the extension package that corresponds to the zone in question



Zones are defined relative to the rail mounting wall and landing. So, for instance in the images above the rail wall is show and the GREEN section at the top landing is on the rail wall and this is defined as Zone 1. The rail wall can be identified by the wall that has double 2x6 studs where the rails/ tower are located.

This is the standard location for mount the upper control box.

Only one of the black rectangles is required for an installation but multiple options for locating the box have been indicated.

Zone 1 = All Green Area, Zone 2 = All Blue Area, Zone 3 = All Yellow Area, Zone 4 = All Magenta Area

Section 5: Upper Control Box

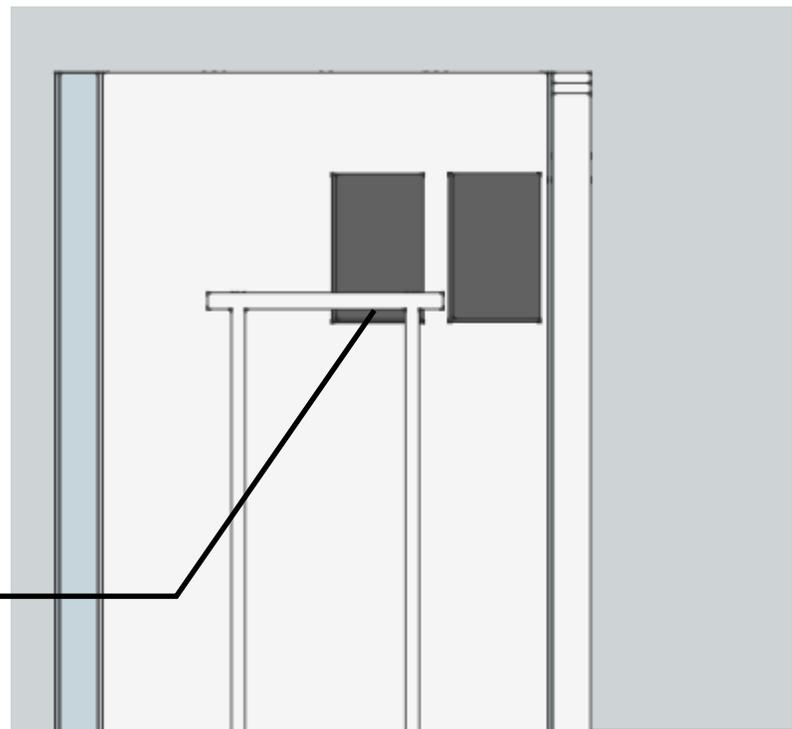
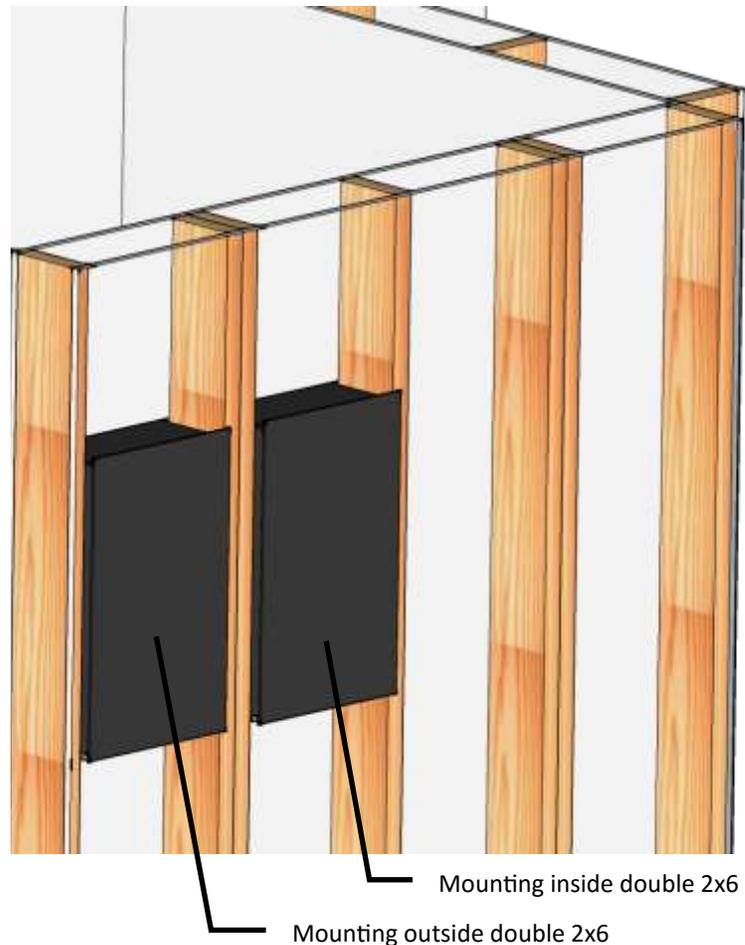
The control box can be mounted outside of the double 2x6 or inside the double 2x6 as shown in the image with the outer wall hidden below.

When the control box is located outside the double 2x6 mounting points there is limited possibility of interference between the tower/ rails/ wall mounting brackets and the entry point for the cables to the control box unless the shaft is very small.

As shown below you can see that when you mount the upper control box between the rails this can occur and special care needs to be taken to run the cables/ wiring that is connected to the upper control box.

In some cases, where the shaft is quote small there is insufficient room to mount the upper control box outside the double 2X6 and it can then be mount between the rails or on an adjacent wall that may not even be part of the elevator shaft.

If you are going to mount on the inside of double 2x6 then RAM would suggest adjusting the position of the control box so that the front cover is no longer flush with the outside of the shaft. This would then potentially allow the cables to run through the inside of the wall.



Potential interference or entry point below top of tower/ rails depending on control box mounting height and actual travel

Section 5: Upper Control Box

Special Note:

When mounting the control box at a lower landing you will not be able to mount the control box between the rails due to issues with cable runs that may have to run either through or around a floor joist.

RAM does not recommend drilling holes through floor joists to run cable and running back in to the shaft around a floor joist is equally poor practice.

Section 6: Wiring Extensions by Zone

Depending on the zone you intend to mount the upper control box you may need to order an extended wire harness.

The table below outlines the extension package you will need to ask for with certain control box zone mounting so that pricing on your quote/ order is accurate.

Zone	Extension Required	Extension Pack
1	No	n/a
Zone 2 & 3	Yes	1
Zone 4	Yes	2
Zone 5	Yes	Custom*

***Zone 5** is not indicated on the hoistway walls depicted earlier in this guide. Zone 5 is essentially a remote location and the extension length/ cost/ feasibility will need to be reviewed with RAM on a case by case basis but should be **limited to less than 30ft (9m) away from hoist way.**

Extension packages on new installations RAM will be in continuous pieces to avoid potential failure modes.

If you need to move the control box after receiving your elevator package RAM can provide extensions that incorporate junction boxes and clip connectors as shown in the image to the right.

These junction boxes would then need to be mounted to/ in walls and if they are being installed in the USA cable trays may be required for longer cable runs in hoist ways.



Section 7: Upper Control Box Mechanical Mounting

There are two main styles for mounting the upper control box in a wall.

1. Flush with wall
2. Proud of the wall

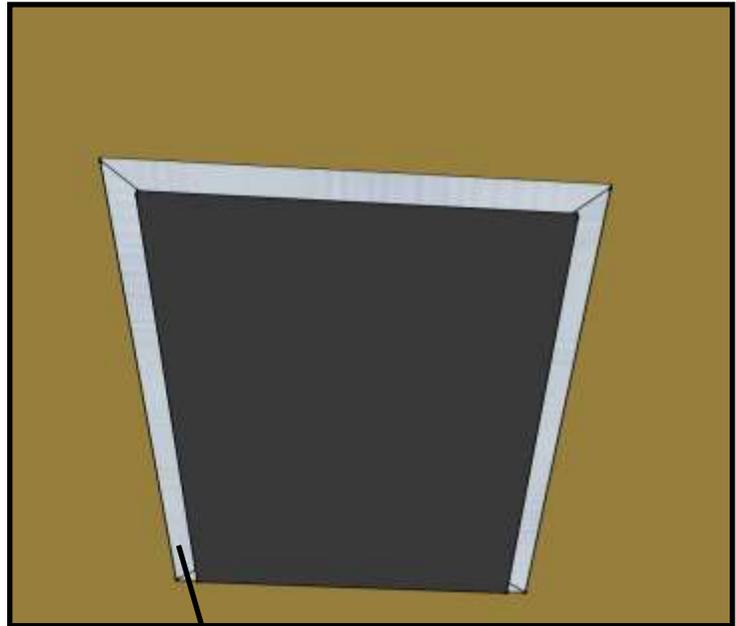
Scenario 1 is typical but, depending on the thickness of the wall and location of the control box, it may be required to mount the control box proud of the wall.

Simply cutting drywall and installing the control box is not very attractive so RAM suggests that you finish the hole for the control box with some kind of trim. Base board material that matches the home is quite common but you can also use aluminum trim that is readily available at most home supply stores.

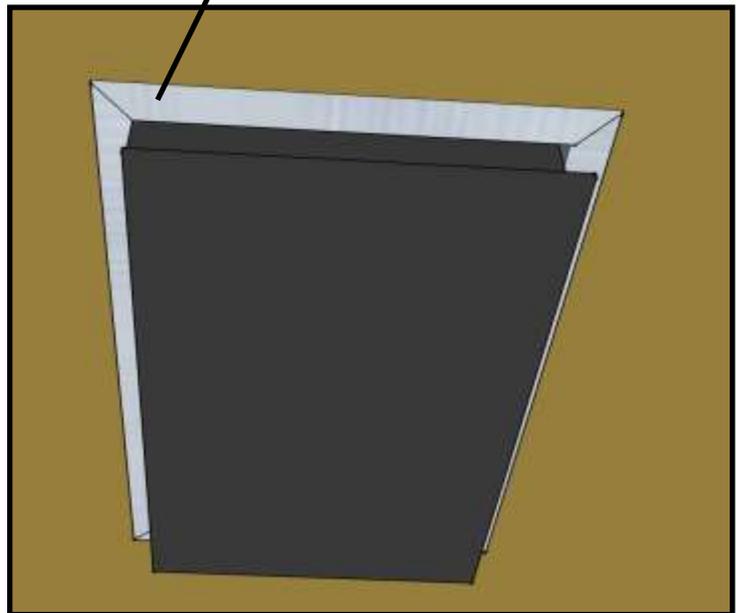
Alternatively, a cabinet door can be placed in front of control box to conceal it and make it fit in with the style of the home rather than having exposed painted metal.

Images of the flush and proud mounting arrangements are show on the right.

Flush Mount Control Box



Anodized Aluminum Flat Bar Trim -
secured with adhesive or screws



F Proud Mount Control Box

Section 8: interlock and Call Station Wiring Through Headers

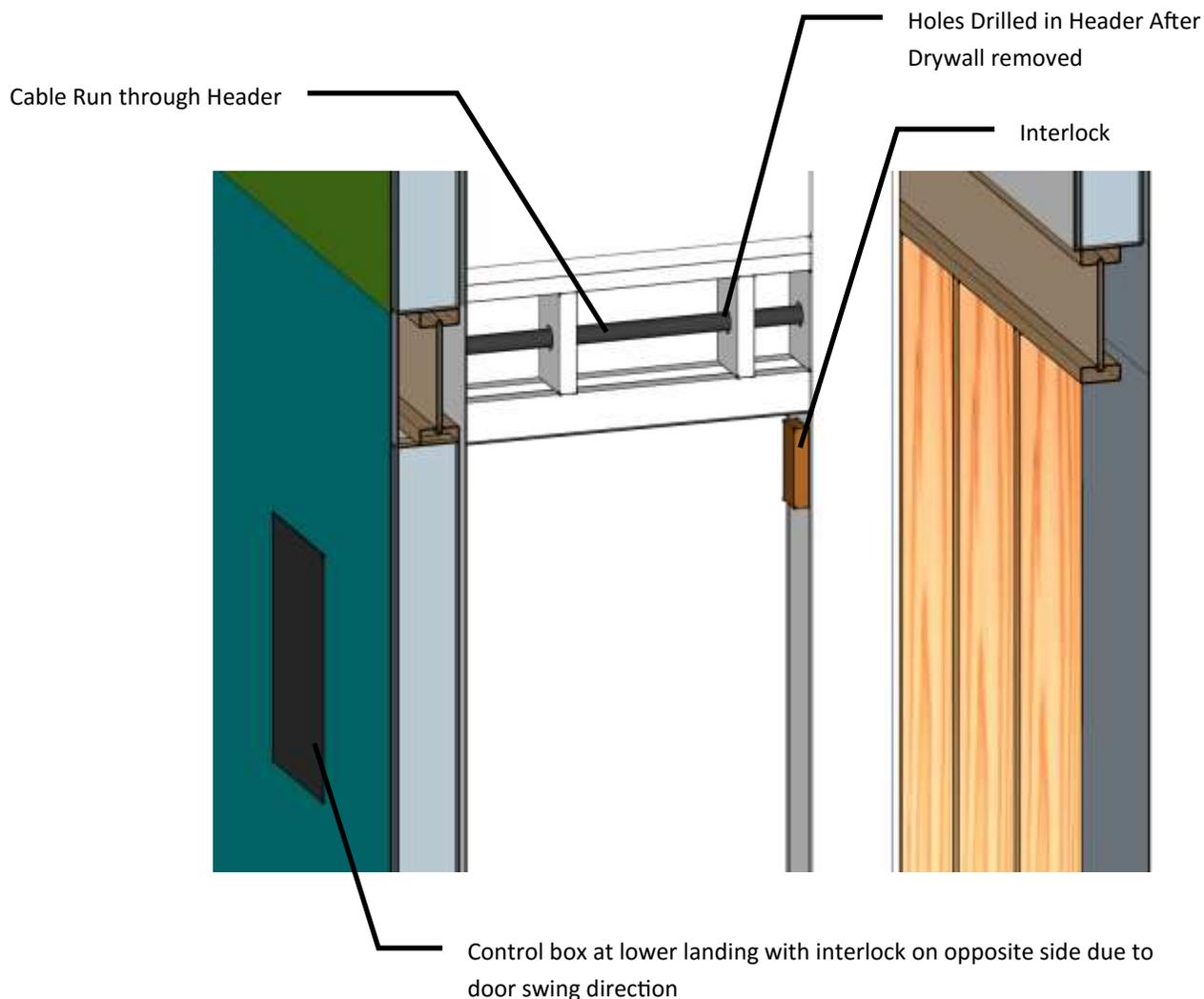
The corresponding installation manual will depict interlock and call station mounting but for the purposes of planning on electrical installation the following special case for routing is noted in this guide.

The case shown here is one where the upper control box is in a location opposite or adjacent to the door swing where the interlock and call station are mounted on the lower landing.

This arrangement means that either, 1. the cable has to run all the way up the shaft - across the ceiling - backdown the shaft and to the door or 2. you run the cables through the head of the door.

An example image of this type of arrangement is shown in the image below. You will notice that there are holes drilled in the header and this is typically done with an auger bit after the drywall has been cut away. The drywall is then replaced/ repaired after the cable have been run.

This can still be an issue in other cases but this illustrates the technique to use with wood construction. In concrete or cinderblock wall construction the issue is more complex and may need more careful consideration during planning stages.



Section 9: Pit Switch

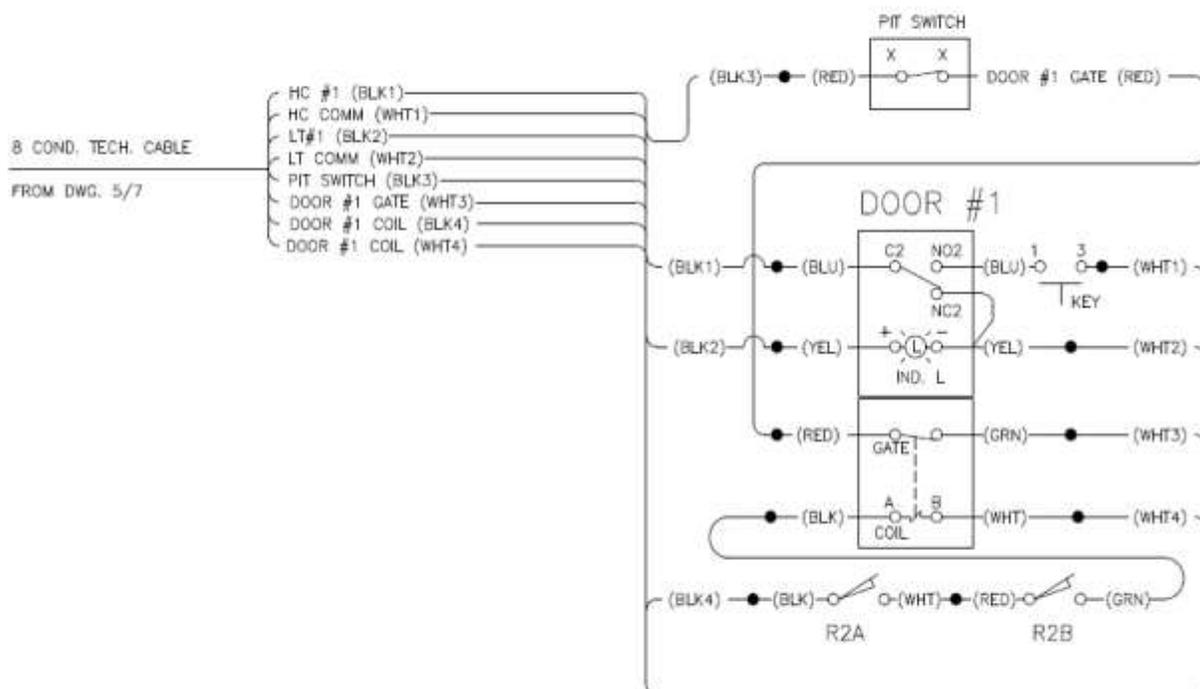
Elevator shaft require a pit switch to be placed in the control loop so that if a technician is doing work underneath the platform the pit switch will be pressed and prohibit operation of the elevator.

RAM typically provides the pit switch shown on the right hand side of this page and the flex cable is then run to the lower landing interlock as shown in the wiring image below.

The exact wiring will be shown on the job specific wiring diagrams provided in your documentation package but you should be prepared to run this cable in the shaft.

In some cases this cable will need to be run up and over the door.

Engaging the pit switch will also allow the lower door to be opened as it is connected to the lower door interlock.



Section 10: Multi-Stop Elevators

This guide has been developed around the concept of a 2-stop elevator but the principles will apply to multi-stop elevators as well.

Multi-stop for RAM comprises up to 6 stops depending the specific product.

Although it is possible that the upper control box is mounted at a middle floor rather than the upper floor or the lowest floor this would be a special scenario that you will need to consult with RAM on before placing an order to ensure that the cable lengths provided with your package have the highest probability of being adequate for your application.

The zones for control box location will still apply for multi-stop elevators as our standard offering will assume that the control box is mounted in Zone 1.

For multi-stop elevators installed in the USA it will likely be even more important to utilize cable trays to guard cables so that your installation meets safety code requirements. (see page 3 and 4 regarding Article 620 and the cable trays)

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