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Questions and Answers for the upcoming change for Low GWP refrigerants that are A2L

To: Clients and Attendees From: Jordan & Skala Engineers, Inc.
Date: December 28, 2023 Re: A2L Updates Q&As 2023
Updated January 3, 2024
Update October 29, 2024

The following are Questions and Answers from an A2L refrigerant transition seminar on December 19th and 21st, 2023. The questions are grouped by subject.

December 20th, the EPA moved the deadline by 1 year to January 1, 2026 for single zone systems. Even though the date has been pushed, this will not change the design aspect for providing a design that will meet the requirements of the new A2L refrigerants. The EPA update can be found at: <https://www.epa.gov/climate-hfcs-reduction/technology-transitions>

These answers are based on the unamended International Mechanical Code and other International Codes associated with refrigeration systems. Local jurisdictions may delete, amend, or modify the base code. JSE recommends contacting your local AHJ to determine what is applicable to your specific building in your specific situation.

EPA Sunset dates and manufacturer timelines:

“So, this is only a code requirement vs. a federal law like ADA? The transition for A1 to A2L refrigerants is an EPA mandate. Would the AHJ have any enforcement authority over an EPA mandate, or will they only enforce compliance with the 2021 Mechanical code once A2L refrigerants are present in the building?”

The federal law, known as the AIM Act, is the reduction of high-GWP refrigerants in mechanical systems. The code requirements are based on the classification of the low-GWP refrigerants as not being Group A1 refrigerants. Local AHJ would at this time only have the authority to enforce the local building codes.

Refer to “How does the EPA evaluate petitions?”

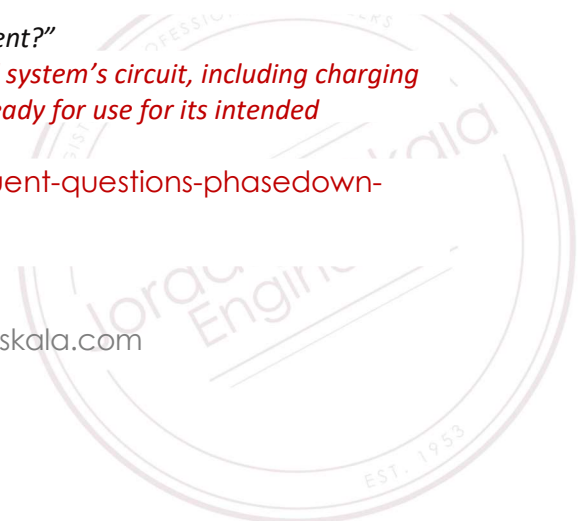
<https://www.epa.gov/climate-hfcs-reduction/overview-petition-process>

“What is the definition of installed as it relates to this EPA requirement?”

- *Installation of a system means to complete a field-assembled system’s circuit, including charging with a full charge, such that the system can function and is ready for use for its intended purpose.*

<https://www.epa.gov/climate-hfcs-reduction/frequent-questions-phasedown-hydrofluorocarbons#technician>

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"Where can we get the latest information from the EPA? Website? Is there a newsletter?"

We are checking daily to see if the EPA is providing further guidance on equipment deadlines, definitions and other changes.
<https://www.epa.gov/climate-hfcs-reduction>

"Is this new equipment available now or is this something being developed now? If it's being developed, when do the manufacturers expect to have these available for purchase?"

As of October 29, 2024 most major manufacturers including Carrier, Goodman, Rheem and Trane have cooling only and heat pump options available.

"Have you reviewed the EPA'S ruling from last week?" <https://www.epa.gov/climate-hfcs-reduction/regulatory-actions-technology-transitions>

The ruling on 12/20/2023 allows for inventory of higher-GWP HFC equipment manufactured or imported before 1/1/2025 to be installed until 1/1/2026.

We are continuing to monitor the proposed ruling for VRF systems that will extend the install date by one year.

"Is there a difference between procurement and equipment secured date and the 2025 install requirement? Or is there currently a hard stop even if we own the equipment? Is there any idea on when/whether they will reintroduce the sell-through provision?"

As of Wednesday 12/20/2023, the EPA has revised their installation date until 1/1/2026. Manufacturers will not be able to sell equipment on or after 1/1/2025.

"What is the timing of the sunset of the A1?"

There is not a sunset date for A1 refrigerants specifically, only refrigerants that have a Global Warming Potential above 700. This includes R-410A, a common refrigerant in multifamily construction utilizing Direct Expansion Split Systems.

"How responsive has the EPA been to date? Meaning do we anticipate further clarification in the next 30 days - or is it more like 6 months? Etc."

The EPA provided clarification on December 20, 2023, to clarify the sell through date and rule the install date is 1/1/2026. They will likely provide additional guidance in the coming months that lead up to the deadline. In June 2024, a proposed change was requested for VRF systems to have the same 1 year install date allowance. There has not been a final ruling on this proposed change as of 10/29/2024.

"What happens if we purchase our units in 2024 with the old refrigerant? With the intent to install in 2026. We have heard conflicting information on this."

Based on the EPA ruling on 12/20/2023, equipment will need to be installed before 1/1/2026.

"I didn't see anything on mini splits --are these considered "VRF" systems due to the additional potential of refrigerant charging, and therefore exempted for another year?"

It is our current understanding that mini splits that are a 1-to-1 configurations are under the residential and light commercial deadline. This includes PTACs, VTACs, and dehumidifiers as well.

“Regardless of the AHJs, have you heard of the manufacturers stopping production of the old refrigerant models?”

Yes, manufacturers are required to stop manufacturing systems that exceed the GWP the EPA set.

“When can we expect the next switch in refrigerant types? 10 years?”

At this point the next generation of refrigerant phase in is unknown, however going from R-22 to R-410A occurred in early 2000s. That is approximately 20 years cycles. The change from CFC to HCFC refrigerants began in 1990s after the 1987 Montreal Protocol.

“If we purchase and store R410A equipment in 2024, and then install it after January 1st, 2026, will the AHJ have any authority to not allow this equipment in the building? How will the January 2026 deadline be enforced at our projects in the field? I understand that the manufactures are making the change to comply with the EPA, however its very likely on larger phased projects that we will install R410A equipment that we have on hand, past January 2026. “

This is a federal law, which contractors and owners must comply with; however, generally local AHJs cannot enforce federal law unless given the authority. Note that this question was edited for dates, as the EPA revised the installation year.

Refrigerant Shaft and Pipe Enclosure Questions:

“You quickly mentioned this, but I wanted clarification. The refrigerant penetration through the roof does not count as one of your two penetrations?”

Section 1109.2.5 specifically calls out refrigerant piping that penetrates two or more floor ceiling assemblies.

“Do the shafts need to be located on the exterior wall due to exhaust vents or can it be located on the interior of a dwelling unit?”

No, the shaft does not need to be located on the exterior wall. In fact, there is an exception with piping located on the exterior of a building (outside the building envelope) when it is vented to the outdoors.

“Is there a limit to the lateral distance between an air handler and the shaft? Also, the lateral piping between the air handler and the shaft has to be ventilated, correct?”

There is not a limit in the international mechanical code as it relates to the horizontal distance from the refrigerant pipe shaft to the air handler.

There is currently no requirement for the lateral piping enclosure to be ventilated.

"So, if I understood this correctly, we could potentially use hard copper instead of soft copper line sets in lieu of a shaft or did I misunderstand."

In the 2021 IMC the shaft enclosure is required when passing through 2 or more floor/ceiling assemblies. The shaft enclosure does not discuss pipe material. In previous code, pipe enclosures called for soft annealed copper containing refrigerants other than Group A1 or B1 to be in a pipe enclosure. Soft annealed copper is easy to damage. The use of hard copper is a viable option to get around pipe enclosures for jurisdictions that have not adopted the 2021 building codes or amended older versions of the code to give specific direction regarding A2L refrigerants.

"Can you explain more about the pros/cons of natural ventilation over mechanical ventilation? Multiple unconditioned shafts in the building is less than ideal."

"Can you explain why mechanical ventilation wouldn't be preferred over natural ventilation? Seems less desirable from a waterproofing standpoint. The code only stipulates air flow requirements, right?"

The use of natural and mechanical ventilation in this context is only related to the refrigerant pipe shaft requirements.

A naturally ventilated shaft requires a 4" round duct at the bottom to allow refrigerant to release in the event of a refrigerant leak and a 4" intake at the top. Mechanical Ventilation shall be operated continuously, potentially a larger shaft due to the amount of air and must have refrigerant detectors.

"Can you run the refrigerant piping underground to reach the shaft?"

Yes, however unground pipe needs to be protected against corrosion, makes venting the shaft difficult as the vent must slope to the exterior, and many split system manufacturer's do not recommend running line sets underground. This is not ideal in the event for future change outs as well.

"Is your understanding that lines can leave the rated shaft and travel horizontally (unprotected) to the unit it is serving? Does the shaft need an access panel?" "Where a 2hr shaft with multiple refrigerant lines is running down a building and needs to get to a unit closet with an AHU, can the refrigerant lines run any distance horizontally exposed, or will they need to be run horizontally within a 2hr shaft."

It is our understanding that a shaft is not required in the horizontal direction. Refrigerant pipe enclosure 1109.2.2 and pipe protection 1109.3.1 is required to be maintained.

"What kind of access panels are needed for installation and maintenance or future replacement of line sets?"

The shaft is to be constructed based on the International Building Code Section 713. Openings into the shaft should be based on the building code. Access is recommended at each floor for service and inspection. In the event of an equipment line set replacement access to each support location will be needed.

"Could you elaborate a little about the mechanical ventilation and/or ventilated pipe options? Shafts can also be very expensive, and difficult to include in the design?"

A shaft is required when going through 2 or more floor/ceiling assemblies. Mechanical ventilation is required to be provided on a continuous basis and meet a minimum velocity based on the cross-sectional area of the shaft.

"What type of protection would be appropriate for the rooftop since it'd be hard to group Fan Coil Units within 6' of a doghouse. Is that also a requirement in IMC 2021 that may not be required for previous years?"

Pipe enclosures can be used once outside the building. The pipe enclosure is to protect from damage from weather, and foot traffic around the systems.

"Will we need to provide access panels at regular intervals in the building to access these shafts for refrigerant piping?"

It is our understanding that since these shafts are solely for venting purposes and to contain an enclosed system, access panels are not needed.

"Can you explain/expand on what a "pipe enclosure" is per 2018 IMC 1107.3?"

The pipe enclosure section calls for rigid or flexible metal enclosures to be provided for soft annealed copper tubing to protect them when they contain refrigerants other than group A1 or B1. The intent of this section is to protect refrigerant piping from physical damage that could a refrigerant leak or a hazardous condition. The protection is required for soft copper tubing. This type of tubing is more susceptible to damage.

"Is there a rating requirement to get the pipe to the shaft? Is there a max distance a line can run before it reaches the shaft?"

No there is no rating requirement to get the refrigerant pipe to the shaft. Reference 2021 IMC 1109.2.2. exception 2. Refrigerant piping outside the shaft will need to be in a pipe enclosure when located beyond 6 feet of the refrigerant unit or appliance.

Previous codes clarified the material for refrigerant pipe enclosure to be rigid or flexible metal enclosure or pipe ducts.

Note that manufacturer line set limitations still apply.

"Under the 2021 IMC, what length is allowable for horizontal piping? Do these need to be protected - wrapped, in conduit, or as part of a 2-hour rated enclosure?"

Section 1109.2.2 calls for refrigerant pipe enclosures. There are exceptions including when the refrigerant pipe is installed 7'3" above finished floor or within 6 feet of the refrigerant unit or appliance (air handler).

"Since the refrigerant is heavier than air, will we need to pipe the "low pipe" through slabs, or will stack effect be sufficient to ventilate if the "low pipe" goes through the first- floor floor/ceiling assembly?"

The low pipe will need to be at the lowest point in the shaft. We are recommending stopping the shaft enclosure at the top of the first level above

grade so that the vent pipe does not need to go through the slab or be routed under the slab.

"Seems you have already committed to shafts. Is there not a fire wrap that can be used on individual line sets eliminating the rated shaft requirement?"

The 2021 IMC section 1109.2.5 specifically calls for a "Shaft enclosure" and makes no allowance for a fire wrap product. The shaft enclosure limits the spread of refrigerant leakage throughout the building. Fire wrap material may not contain refrigerant to the space as intended by the code.

"Are there any additional requirements on the roof deck once it leaves the shaft within the building?"

The shaft shall comply with Section 713 of the International Building Code.

"Can you explain in more detail the shaft sizing and how it is being established? (understand the 1 1/2" clearance) but it looks like the shafts are growing due to supports?"

The shaft dimensions are based on typical suction and vapor line sets with insulation, piping supports, and the 1-1/2" clearance.

"Do we have to run the rigid conduit the other whole run or just thru the floor ceiling assembly?"

The IMC prior to 2021 only mentions a piping enclosure. The code section does not use the term "continuous" piping enclosure, so you could argue that non-continuous protection is allowed. We highly advise you to discuss your approach with the AHJ before proceeding.

"Is there going to be any changes to the current IBC? The current IBC already mentions that any flammable mechanical refrigerants has to be in a fire rated shaft no matter how many floor/ceiling penetrations"

While the ICC may update or provide addenda to older codes, it is up to the AHJ, state, or local official to update or amend their specific codes.

"Why is there no concern for leaks on horizontal runs? Seems inconsistent in theory."

Refrigerant pipe enclosure protection is still required in the horizontal direction to reduce the likelihood of pipe damage.

"For IMC versions prior to 2021..... 1107.2.2 do we meet exception #4 which reads "Penetrations by piping in a direct system where the refrigerant quantity does not exceed Table 1103.1 for the smallest occupied space through which the piping passes". If not, don't we need a shaft?"

This is a project specific issue that would need to be analyzed on a case-by-case basis. Note Exception 5 does require a fire-resistive duct or shaft for systems that exceed the allowable threshold.

Pipe enclosures are required for systems that contain a refrigerant other than Group A1 or B1.

"Can the shaft be non-rated if it is inside a rated wall?"

The mechanical code calls for a shaft to be constructed based on IBC section 713. Consult with the local AHJ to determine if alternative paths are available.

"Does the refrigerant piping need to be enclosed from the shaft to the indoor equipment?"

The refrigerant piping will need to meet IMC 1109.2.2. There are exceptions including enclosed within building elements or protective enclosures, installed without ready access, or located 7'-3" above finished floor, and within 6 feet of the air handler.

"Not to be too general here, but is this requirement essentially in place to reduce the risk of lines leaking? And how far can a line run from the apartment unit (AHU) to the shaft and then ultimately up to the roof? What are our limits, in other words?"

The overall refrigerant pipe limit for long line applications in some manufacturers is approximately 200 feet total developed length, but this will vary based on manufacturer and equipment used. The purpose of the shaft is to contain leaks in the refrigerant pipe and prevent leakage into other areas of the building.

"So for 2hr shafts there are going to be dozens of penetrations at every level AND top and bottom for ventilation? Any UL concerns for those penetrations?"

As long as the through penetration area is below the allowance, this should not be a concern. This will limit the number of overall systems that can be contained in a single shaft.

"Will a drain pan or something similar be required at the bottom of the shaft?"

This is outside the scope of this presentation.

Existing buildings:

"What will happen over the life span of the building?"

This will vary based on the jurisdiction. With systems that are being replaced they will need to comply generally as new systems. Systems that have components replaced can remain as is. This is per the existing building code.

Note: there have always been requirements in the mechanical code for refrigerants other than group A1.

“Any insight on how AHJ will address replacements in existing buildings?”

This will vary based on the AHJ's knowledge of different refrigerant types and how they impact the building safety.

New in the 2021 IFC Section 608.2: a permit section has been added for refrigeration systems.

The 2024 IFC has broken out flammable gases into separate categories. 1A and 1B (High BV) and 1B (Low BV) where “Low BV” is a burning velocity less than 3.9 in/s. Also note that Refrigeration systems including HVAC systems exempt from section 5001.

“If an existing building had to transition from R-410A systems to A2L systems, would rated shafts have to be installed? Line sets changed? Should we be future proofing building currently under construction with R-410A systems?”

R-410A is a Group A1 refrigerant. If the systems are changed to a different refrigerant type, the requirements of the new refrigerant type will need to be followed. This change is different than previous changes by the EPA to reduce ozone depleting refrigerants. Commonly used refrigerants have been Group A1 until this transition.

This is in alignment with the 2024 IMC section 1101.7(4) where the replacement refrigerant is classified into a different safety group, the system shall comply with the requirements of this standard for a new installation, and the change of refrigerant shall require code official approval.

“Regarding renovations, I read that if 75% of the HVAC is being replaced in an existing building, the system must comply with the new refrigerant code. What is encompasses the 75% replacement they code is calling out?”

Refer to the EPA's Technician FAQ section found at in regards to R-410A components to build a new R-410A system: <https://www.epa.gov/climate-hfcs-reduction/frequent-questions-phasedown-hydrofluorocarbons#technician>

As noted in the previous question, a system change with a different refrigerant safety group shall meet the standard for a new installation, and the change of refrigerant shall require code official approval.

“Has there been any discussion into how to solve retrofits with new A2Ls in existing high- rise buildings where there is no fire-rated, ventilated shaft? What if an old system goes down and this new system or requirement is in place. Do I have to add shafts for the new system?”

Contact the AHJ, this will vary on a case-by-case basis. However, some means of code compliance will likely be required.

“Is the purpose of the shaft for fire protection or to protect the pipe from damage. If to protect from damage, why can't the pipe be run in a non-rated chase?”

Both – the rated chases are required once you pass through two or more floors/ceiling assemblies regardless of the refrigerant type, with the exception of Water and Group A1 refrigerants. Shaft ventilation is required for A2L, A2, A3, B2L, B2, and B3 refrigerants.

The rated shaft also slows refrigerant leakages into other portions of the building allowing the shaft to vent.

“Assuming the R-410A line set was installed to meet the new code for ratings, are we able to use that line set when changing to the new refrigerant?”

Contact the code official. R-410A refrigerant is a Group A1 refrigerant. If the new system uses an A2L refrigerant, Group A2L refrigerant piping requirements will need to be met.

“What happens to our existing mid-rise condos when it just needs replacement for a refrigerant leak. I think you just answered we can still get it for a while.

The refrigerant R-410A is not going away, only the equipment for new installations. Charging a system can still be performed with existing R-410A stock refrigerant.

“If a system replacement is required after 2026 to an A1 system installed prior to 2026 can an A1 system be used for the replacement?”

Currently there is not an A1 refrigerant mechanical system that is below the 700 GWP threshold. Refer to <https://www.epa.gov/climate-hfcs-reduction/frequent-questions-phasedown-hydrofluorocarbons> for additional guidance.

“Are there any grandfathering provisions for single replacements of equipment and lines in an existing building? How does this affect renovation projects which may need to be brought up to current codes?”

Due to the refrigerant classification, this question will need to be asked to the AHJ and may vary by location.

“Will there be any code requirements for indoor storage of A2L refrigerant onsite (i.e. in cylinders, spare condensers, reclaim cylinders) similar to what is seen for propane cylinders?”

Yes, this is referenced in the International Fire Code.

Project's currently in construction during and after the deadline:

“Will JSE reach out to jurisdictions on current project with construction set to be completed in 2025? Or are you deferring to the Architect?”

Yes, as part of our code due diligence we are reaching out on active projects to determine the course of action for each jurisdiction. We are coordinating this with the Architect to ensure the design requirements are met.

“Are you guys saying that if drawings have already been approved and permitted, we might still have to adhere to this new code to pass mechanical inspections?”

Based on our reading of the Technology Transition Program, new products installed after the compliance deadline will be required to follow the threshold requirement. The new systems use a different type of refrigerant and refrigerant classification thus would need to comply with those requirements.

“There doesn't seem to be a lot of specifics on when or if the equipment will be produced in time, are we looking at the possibility of construction delays in getting equipment or the refrigerant at the end of next year if this goes into effect?”

The EPA provided a ruling on 12/20/2023 as it relates to installation of “Low-GWP” systems. They have extended the deadline by 1 year. The EPA is sending out these requirements, and they are open to public comment from stakeholders.

"If any job under construction now that gets all systems installed and pressure tested as currently designed by Jan 1 2025 then this new issue does not apply to that job, correct?"

Yes, this is further clarified and extended in the EPA ruling on 12/20/2023.

"Regarding projects that have already been designed, will the plans need to be re-done to be inclusive of these requirements?"

This will depend on the project timeline. If systems can be installed prior to the installation cutoff date, no. Otherwise, yes. This is a change in design requirements and is not covered under the current design scope. If the project construction has started, JSE recommends contacting the AHJ for their interpretation of the shaft requirement.

Equipment Sizing and Limitations:

"Do you anticipate that refrigerant line lengths will be similar to what they are for R-410A? 200' max? Will new refrigerant impact the sizing of equipment (tons) or power requirements? Does anything change with the actual condensers? Size, compressors etc."

Yes, it is our understanding that the new refrigerants operate similar to R-410A in terms of pressure and performance, and based on this, we're being told that line sets will have similar parameters. The physical equipment size is not expected to be impacted.

"Have any manufacturers commented on whether the A2L is a 1 for 1 change out from R-410A requiring any sizing changes for the line sets or any increase in compressor amp draw?"

The proposed A2L refrigerants (R-32 and R-454b) operate at similar pressures and have similar refrigeration capacities (Btu of heat removal) as R-410A. They will be similar; however, due to the change in refrigerant, labeling and other criteria the manufacturer is responsible for, these refrigerants will not be a "Drop-in" refrigerant. Some jurisdictions do require notification of the fire department when installing and maintaining systems other than Group A1 refrigerants. Jurisdictions under the 2024 IMC are required to seek code official approval per 1101.7.

"Are there less flammable refrigerants being developed?"

"Do you think there is any chance at all of a drop in replacement for R-410A that will meet the GWP requirements? Similar to what happened with R-22?"

There are for instance R-470A is a drop-in replacement for R-410A. It is a Group A1 refrigerant but has a GWP of 900.

Alternative designs are being considered to minimize direct/high probability systems with A2L refrigerants installed in occupied spaces.

“Can the AHJ override this mandate for projects under construction?”

The AHJ will not be able to override the mandate of low-GWP refrigerant use and manufacturing; however, they can approve alternatives in shaft enclosure requirements. This can make the building unsafe by putting A2L refrigerants in a place that is not properly designed for their use. Contact the AHJ to determine options.

Field Installation (inspections and other types of questions):

“Who performs the site inspection?”

Since this is a requirement of the mechanical code, it would generally be a certified mechanical code inspector and/or building inspector.

“Isn’t inspection only required at joints? If a continuous soft roll copper is used, then the joints would only be at the units? Do all 4 sides of the shaft wall need to be unfinished for a visual inspection?”

Inspection of connections points and joints would be necessary. It may not be necessary for all 4 side to be unfinished at the time of inspection. Contact the AHJ to determine if they have specific requirements.

“Where can we find the required testing parameters?”

2021 IMC Section 1110 provides the refrigerant piping system test requirements.

“Are methods of compliance with 1107.3 (pipe enclosures) familiar to subcontractors? Is one or another more commonplace?”

In the 2018 IMC, Pipe enclosures is not common practice because most systems in use today are Group A1 refrigerants. Pipe enclosures are not required for Group A1 refrigerants.

“How does JSE recommend sealing line sets where they exit the rated shaft? Does the Armaflex on the line set present challenges w/ appropriate sealing?”

The line sets would need to be fire stopped where they exit and enter the shaft and pass through fire rated assemblies. You may need to use a sleeve to qualify for an approved U.L. listed assembly.

Design considerations (piping underground, system selections like PTACs and VTACs, units on balconies)

“Most of the discussions have appeared to be around multi-family, but this would also apply to commercial/office as well, correct?”

Yes, if the system used is classified as a “direct”, “high-probability system” that is using an A2L refrigerant.

“Can 4th and 5th floor [top floor] go directly to roof without a shaft enclosure?”

Refrigerant piping that connects 3 or more stories is required to be enclosed in a fire rated shaft to protect the piping and limit the spread of refrigerant leakage through the building. However, if the 4th and 5th floors are your top levels, they should be able to route to the roof without a shaft enclosure.

“Assuming there is a need for protected vertical shafts between rated assemblies, is there a need to protect shafts horizontally?”

The mechanical code in section 1109.2.5 calls out for refrigerant shafts to be protected in the vertical direction. Section 1009.2.2 does require refrigerant pipe enclosures. There are currently no requirements to protect the refrigerant lines in the horizontal direction with a rated shaft. This is determined based on the manufacturer's installation criteria the general overall length for refrigerant piping is approximately 200 feet.

“Without manufacturer info, how are we designing to new standard?”

JSE has been informed by several manufacturers that the A2L equipment will be “similar” to the current R-410a equipment. Once the new equipment data is released, JSE will review as needed on a project-by-project basis.

“Is there any chance that someone challenges this item as a future life safety issue? (Flammable seems worse than “contributing to global warming)”

Yes. This is why the mechanical code has provisions for refrigerants other than Group A1. ASHRAE Standard 15 (referenced in the mechanical code) has additional requirements for these types of refrigerants.

“What are the ventilation requirements for exterior unrated shafts for the condenser lines?”

2021 IMC 1109.2.5 exception 3 allows piping located on the exterior of the building where vented to the outdoors. As the code does not indicate the venting requirements, JSE interprets this to mean they should be vented similar to interior shafts, which is 4” round, or equivalent at the top and bottom.

“For the exposed exterior lines beyond 6’ are we only required to provide a UV protected wrap?...or must this be a rated wrap?”

2021 IMC Section 305.5 calls for piping protection in concealed spaces, 2021 IMC Section 1101.3 calls for protection of any portion of a refrigerant system that is subject to physical damage to be protected in an approved manner, this includes refrigerant piping.

2021 IMC Section 1109.3.1 calls for additional protection of refrigerant piping that contains Group A2L or B2L refrigerants.

The IECC, International Energy Conservation code, calls for piping insulation to be protected from sunlight, moisture, equipment maintenance and wind.

Exposed piping is generally accepted when located within 6 feet of the

refrigerant unit or appliance (indoor and outdoor heat exchangers).

"Explain further - double wall refrigerant piping... is it even available. and how would it work? Are any manufacturers working on a prefabricated piping/wall assembly product for addressing these A2L requirements?"

Double wall refrigerant piping is beyond the scope of this presentation. This type of piping is "tube-in-tube" and generally has a fluid in both pipes acting as a heat exchanger. At this time, we are not aware of a prefabricated double wall assembly that is more than 2 feet in length.

Pipe enclosures are called out in the code as pipe enclosures that are metal enclosures or pipe ducts to protect soft annealed copper tubing for use in systems that contain refrigerants other than Group A1 or B1, as the other refrigerant types are classified in a higher flammability category.

"Can the shaft be shared with other utilities? Can anything else be included within these shafts, such as ERRCS wiring? Can that shaft be a duct enclosed in a rated shaft? Pipes within a piece of ductwork? Are other items or pipes (non-refrigerant) allowed in the shaft or do they have to be dedicated?"

Check with the local jurisdiction. In the 2021 IBC 713.7.1 and 713.8.1 "Other than those necessary for the purpose of the shaft". Penetrations of the shaft enclosure by materials that are combustible can compromise the purpose of the shaft to keep fire contained within the enclosure.

"On the roof we always run over 6 ft horizontal. Is Armaflex considered enclosed?"

The 2024 IMC 1109.2.2 provides additional guidance for refrigerant pipe enclosures exceptions when located outdoors.

This code does not require pipe enclosures outside the building where the pipe is protected from damage from weather, expected foot traffic and when installed underground, protected from corrosion.

In the 2024 IMC, an outdoor rated Armaflex system could be appropriate if the conditions are met.

"Is there a limit on how many line sets we can combine in a single shaft?"

This is not addressed in the code itself; however, other limitations in terms of refrigerant pipe distances and refrigerant pipe enclosure requirements apply.

"For new development/new construction...in areas where 2021 IMC is not in effect, does JSE recommend "future proofing" by installing fire-rated shafts now?"

"Future proofing" can be accomplished in other ways including system type selection.

Fire-rated shafts is one option of many. This should be a discussion for your specific project. Feel free to contact your current JSE contact. We can help you with additional questions to determine the best approach for each situation.

"How far can you run horizontally in a floor truss system from the shaft to the unit in a closet? Horizontal runs do not need to be protected? Can you address how this will affect the overall run length that each connection will be limited to?"

The IMC does not limit the horizontal run distance. In section 1109.2.2, refrigerant piping will need to be located more than 7'-3" above finished floor or be concealed and protected in accordance with 1109.3.1. Manufacturer installation requirements limit overall run length.

"If the 2-hour shaft extends to the slab the drain pipe for leaking refrigerant would be under the slab and go to daylight, correct?"

The lowest point of the shaft connects to daylight. This can be accomplished by stopping the shaft above the slab to prevent under the slab piping for refrigerant to leave.

"Any idea if refrigerant line set diameters will change from R-410a to new A2Ls?"

Based on our understanding, the refrigerant line sizes are not going to change.

"If the building face is on the property line on all four sides, how would you ventilate the shaft from the bottom of the shaft?"

In this instance, naturally ventilating the refrigerant pipe shaft would not be an option.

"For the exterior line set run application do you know what the distance the line set needs to be off the structure to adequately sweep back into the floor truss cavity? for the sweep. My understanding is that ICC stated that when located on the exterior of the building it would have to be "attached to the outside". Have you heard this interpretation?"

There is no set distance for a sweep. Type L and H copper can generally turn 90 degrees without a sweep.

"Approximately how much space should be allotted for each unit being served in a given shaft?"

Nine line sets in a refrigerant shaft would need 8-inch x 36 -inch clear. There are multiple other combinations that can be used.

"Would the condensers footprint get bigger, smaller, stay the same? I'm thinking just make a larger balcony and stick the condenser on the balcony. Any code restrictions, other than getting a lift to hoist it up there."

"One of our GoTo HVAC subs for MF said that we may go back to closets on balconies with equipment in this closet to minimize venting. Is this feasible or cost effective in your opinion?"

The system physical size is not expected to get larger. Using a system located at the balcony would eliminate the refrigerant shaft requirement. When heat pumps are located on the balcony, a drain pan and method to remove condensate is highly recommended.

"Would NFPA13 change that thought process the chase or ruling?"

JSE is unaware of any NFPA direction regarding the chases at this time.

"Is there a spacing requirement between multiple lines in one shaft? Or a limit on how many lines in one shaft?"

JSE is recommending ½" spacing for a work clearance.

"Some AHJs only allow shaft assemblies that rest on concrete (Slab on Grade (SOG) or Podium). How do you foresee adding a bottom vent location under SOG that still provides enough fall to move condensed moisture to the exterior? Is it even possible on a flat site?"

JSE recommends reviewing this on a case-by-case basis.

"The clamps looked new and non-metal. What polymer is recommended?"

The fasteners in the presentation are made by a company called Uniclamp. It is unclear what the material is. <https://uniclampusa.com>

"Are there any specific code requirements if employing equipment with self-contained refrigerant systems installed in interior spaces like water source heat pumps and PTAC units? Does a certain weight of refrigerant charge exempt a system from regulation?"

Yes, there are codes that self-contained systems are required to meet. The refrigerant type and the allowable volume calculation, 2021 IMC 1104.3 and 1104.4. ASHRAE Standard 15 (referenced in IMC 1101.1.1) provides further limitations for systems in egress pathways.

"I think the max length of the shaft needs to be less than 24" because of joist, can the pipes be installed back to back to reduce the length?"

Yes, pipe can be installed back to back.

"Double walled pipes are used on gas stations to recover fuel vapor and protect the environment in the event of a leak in the main pipe. Has anyone consulted with any fuel station designers/engineer/manufacturers to explore the double wall solution?"

We haven't consulted fuel manufacturers on this subject.

"Will you no longer be allowed to use the HVAC closet as a return air plenum if you have the pipe exposed in that closet? Do we need to hard pipe our return air?"

Return air plenum closets are still permitted, as this is similar to the evaporator coil in the supply air stream.

"Is humidity within the shaft a possible concern, especially once the shafts increase in size to account for additional line sets?"

Yes, this was addressed in the presentation.

"If we use a VRV type "central Boiler" per floor of units, can the new refrigerant be compliant staying in the ceiling floor system and remaining just a horizontal distribution? In other words, if we use a high-rise floor plate system, can they translate into wood framed apartments?"

Yes, this can be used to get around the refrigerant shaft, however there are other requirements that need to be met.

"It appears that VTAC would be a economical option to eliminate the shafts and lost NRSF. Will the VTAC's be able to meet 2021 IECC efficiency standards?"

The systems themselves meet the 2021 IECC, however other prescriptive requirements will need to be met including ERVs.

"In Type III Construction (3-story building), if you took the first two floors down and upper floor up, would you be into the shaft requirement?"

Yes, this can eliminate shafts in 3-story buildings.

"So technically you can have a 4 story building with 2 up from the ground and 2 down from the roof and avoid the chase?"

Yes, this can eliminate shafts in 4-story buildings.

"What shaft size is need for a vertical stack of hvac units 4 stories tall (4 refrigerant lines)? Would a pipe referenced in the presentation be better in this situation?"

There is not enough information to answer this specific question.

"Will this ruling apply to single family at all of what is the trigger point as it relates to height and number of floors?"

The trigger point for refrigerant shaft is for refrigerant lines that contain a specific refrigerant type and pass through more than 2 floor ceiling assemblies.

"How can the top of shaft venting be accomplished with occupied roofs; can the top opening be horizontally offset?"

Yes, in the code it does not provide this restriction.

"To clarify or expand, is a 4" snap lock round duct authorized to be used as a enclosure for the line sets? If using the 4" snap lock, how would you support the pipe for the entire drop? I believe the minimum distance between supports is 10'. Would they approve the longer distance without supports? Not the 4in pipe, but the line set inside the 4in pipe"

This method would need to be discussed with and authorized by the AHJ.

"I may have missed, did you say the sloped ventilation pipe to the exterior at the lowest level needs to be 10' AFF from the public way? Are you concerned where you run the duct at the bottom of the shaft relative to doors, windows, walkways?"

In the presentation we discuss the vent relief termination point at around the 7-minute mark.

“From a cost perspective, are these shafts and requirements for A2L still less expensive than water source systems?”

A cost analysis has not been performed as of the presentation date.

“Have you done any cost analysis of switching a particular product type to VRF, in lieu of adding shafts?”

A cost analysis has not been performed as of the presentation date. VRF systems are required to meet the federal mandate on 1/1/2026, and A2L refrigerants are being proposed for these systems as well.

“What is determining if we need a 1hr shaft vs. a 2hr shaft? I might have missed this in the video.”

This is based on the construction type and is beyond the scope of this presentation.

“Does this also impact heat pump water heaters?”

The phasedown of HFC does impact heat pump water heaters. Water heater manufacturers are utilizing a Group A1 refrigerant that operates at different pressures than HVAC systems.

“Are their Rockwool brand rated line sets in lieu of shafts?”

Mineral wool does not provide containment of the refrigerant gas in the event of a leak.

“Does the rated sleeve eliminate the requirement of the constructed shaft?”

This is not a listed exception and may not allow the refrigerant to vent to the exterior of the building.

“What is the appropriate copper type for A2L?”

Appropriate refrigerant pipe materials is covered in 2021 IMC section 1107.

“For the refrigerant shafts, is JSE recommending one shaft per each stack of units?”

In the presentation we provide options of a shaft per unit stack as well as shafts serving multiple units.

State Specific Questions:

"Is this just IMC? We have a project in a city using the UMC."

The unamended 2021 UMC 1104.6 Appliance for Human Comfort and Nonindustrial Occupancies does not allow Group A2, A2L, A3, B1, B2L, B2 and B3 refrigerants in *high-probability systems* (defined in 2021 UMC 1103.2.1) for human comfort. Table 1104.1 provides a guide for each occupancy group and system type.

Section 1109.7 calls for pipe enclosures for systems that contain other than Group A1 refrigerant.

Some jurisdictions have amended the UMC heavily, and the specific jurisdiction will need to be contacted.

The unamended 2024 UMC has provisions for A2L refrigerants.

"Has Georgia adopted the 2021 Mechanical Code? I thought 2018 was current. Is this new change part of a Georgia State Amendment?"

Georgia is currently under the 2018 IMC; however, Georgia does have amendments. These can be found at <https://www.dca.ga.gov/node/6164>. In the amendments that will take affect 1/1/2024, A2L refrigerants have been incorporated into the code. Refrigerant shafts are not part of this code, however refrigerant pipe enclosure is part of the 2018 IMC.

"For states like FL that don't seem to mention A2 within 1107.3, do we think federal will supersede the state code?"

In section 1107.3 of the 2020 Florida Mechanical Code, it states refrigerant piping erected on premises and containing other than Group A1 or B1 refrigerants. A2L and A2 are refrigerants other than Group A1 or B1, and thus would need to comply with the pipe enclosure requirement.

"Have you heard that CA struck the fire rated shaft requirement? Is this something we think other municipalities will accept?"

California's code is based on the Uniform Mechanical Code and has been amended from the base code. California still has the requirement for Pipe Enclosures (CMC 1109.7) for tubing that contains refrigerants other than Group A1.

Presentation questions (slides and questions)

"Can we get a copy of the presentation, memo and/or video?"

Yes, the video and slides will be available upon request.