INSULATION AND INSTALLATION OF DUCTS

OREGON RESIDENTIAL SPECIALTY CODE (ORSC)

On April 1, 2021, the 2021 Oregon Residential Specialty Code (ORSC) became effective, introducing new requirements for the insulation and installation of ducts and revisions of existing provisions. Compliance with these new or revised sections became the mandatory prescriptive path for ORSC governed designs on Oct. 1, 2021. This technical bulletin highlights the intent of the new 2021 ORSC ductwork provisions for installing heating, ventilating and air-conditioning (HVAC) systems and provides compliance examples.

INSULATION OF DUCTS

Section N1105.2

All new duct systems, or new portions of duct systems exposed to unconditioned spaces, and buried ductwork within insulation that meets the exception to Section N1105.3, shall be insulated to a minimum level of R-8. Duct systems, or new portions of duct systems, located entirely within the building thermal envelope may be insulated to a level less than R-8.

INSTALLATION OF DUCTS

Section N1105.3

All new duct systems, air handling equipment and appliances shall be located fully within the building thermal envelope. Section M1601.4.11, *Ductwork installation location*, repeats this requirement.

Because it may not always be technologically or economically feasible, or practical to construct all duct systems fully within the building thermal envelope, there are exceptions to the requirements:

1. Ventilation intake and exhaust ductwork.
2. Up to 5% of the length of an HVAC system ductwork shall be permitted to be located *outside of the thermal envelope*.
3. Ducts *deeply buried* in insulation in accordance with all the following:
    a. Insulation shall be installed to fill gaps and voids between the duct and the ceiling, and a minimum of R-19 insulation shall be installed above the duct between the duct and unconditioned attic.
    b. Insulation depth marker flags shall be installed on the ducts every 10 feet or as approved by the building official.

DUCTS WITHIN ATTIC SPACES

When installing ducts in an attic space, there are a few options to prescriptively meet the ductwork requirements including the deeply buried exception.

Figure 1: All new duct systems, air handling equipment and appliances shall be located fully within the building thermal envelope, unless they comply with an exception.

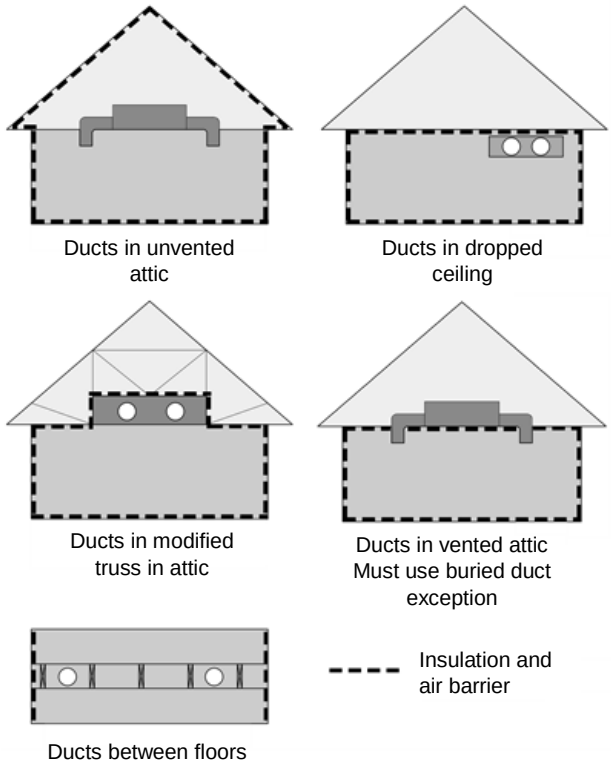


Figure 2: Ducts *deeply buried* in insulation.

Insulation shall be installed to fill gaps and voids between the duct and the ceiling, and a minimum of R-19 insulation shall be installed above the duct between the duct and unconditioned attic.

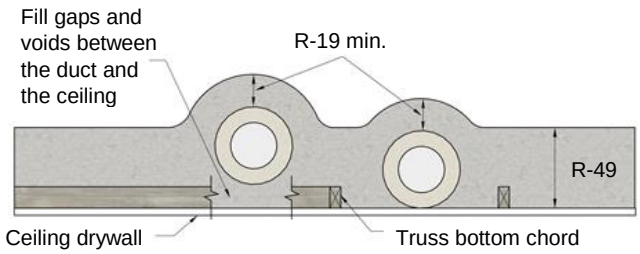


Figure 3: Ducts *deeply buried* in insulation.

Insulation depth marker flags shall be installed on the ducts every 10 feet or as approved by the building official.

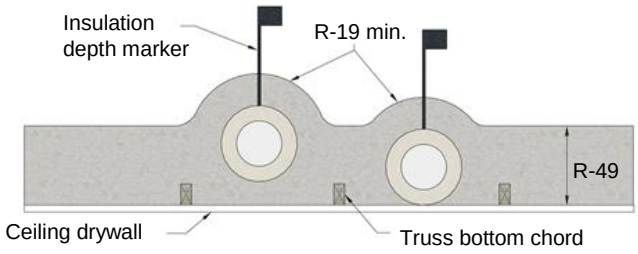


Figure 4: Fiberglass batt material may be used to achieve the R-19 insulation level above the duct.

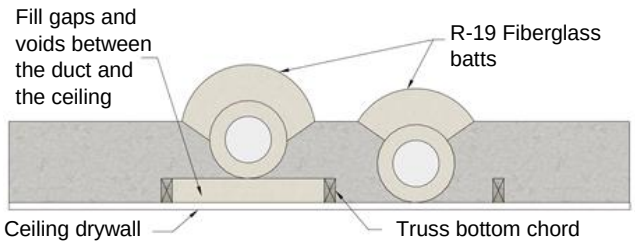


Figure 5: For buried ducts to be considered inside conditioned space, the air handler must be installed inside conditioned space. This practice typically requires constructing a mechanical closet below the ceiling plane.

For air handlers installed in attics, the unit should not be buried in insulation to ensure access for maintenance and proper function of the equipment.

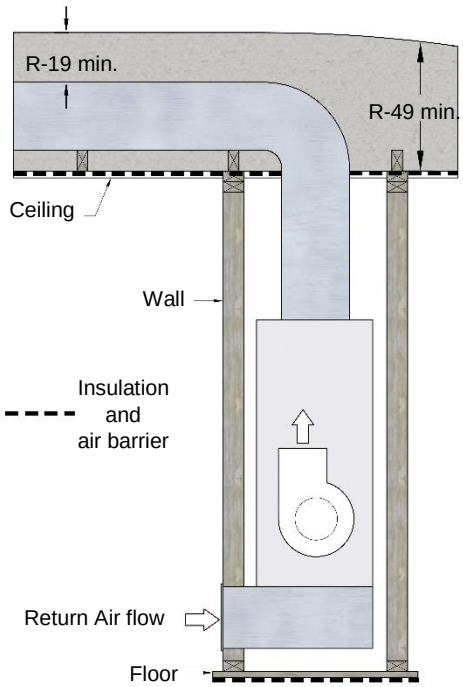
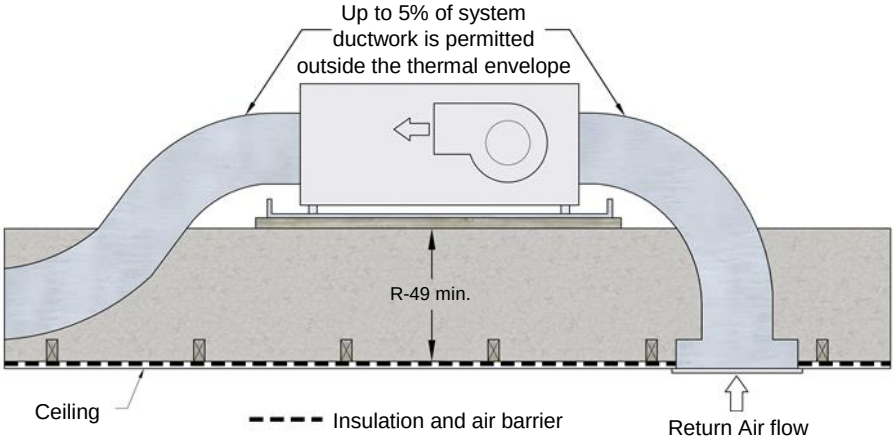


Figure 6: Up to 5% of the length of an HVAC system ductwork shall be permitted to be located *outside of the thermal envelope*.



DUCTS WITHIN UNDER-FLOOR SPACES

When installing ducts in an under-floor space, there are a few options to prescriptively meet the ductwork requirements including the deeply buried exception.

The following are examples of compliance for ducts related to under-floor spaces and options for compliance with the exceptions.

Figure 1: The most straightforward of these options is to make the under-floor space part of the thermal envelope.

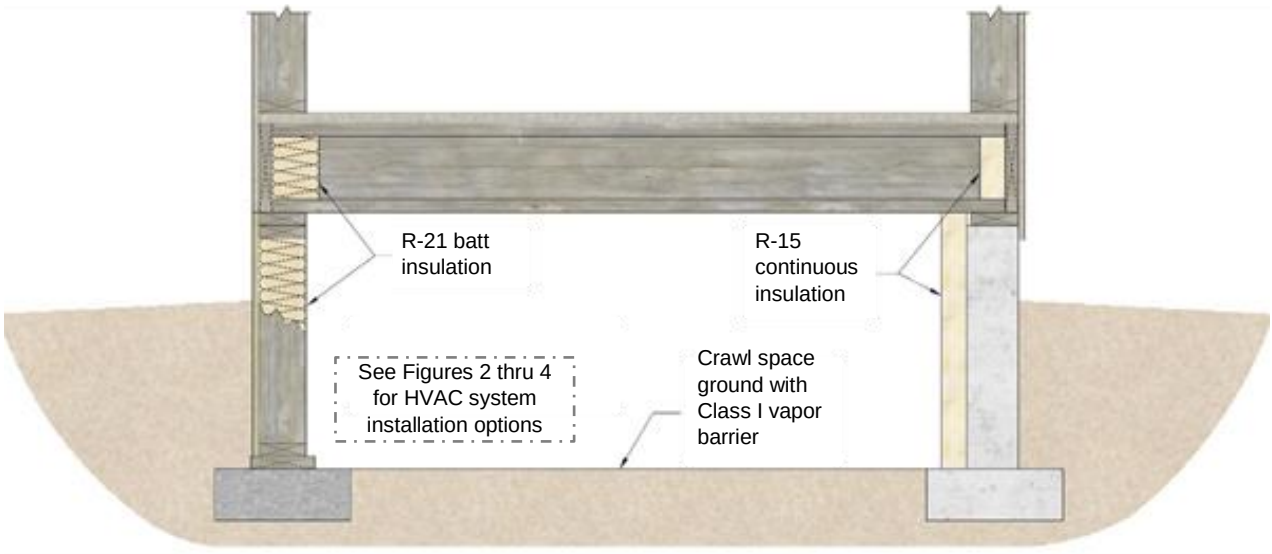
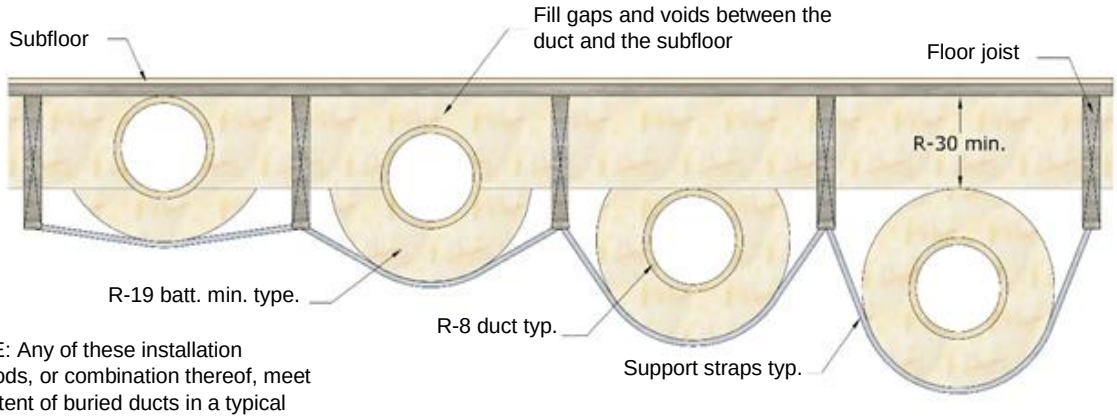


Figure 2: When in an under-floor space batt insulation may be used to achieve the R-19 insulation level around entire surface area of the duct not in contact with the required R-30 floor insulation. Floor insulation shall be installed to fill any gaps and voids between the duct and the floor. Depth marker flags are not required as long as the additional batt insulation is clearly marked as R-19 and there is little to no evident compression of the batt by support straps or other material.



NOTE: Any of these installation methods, or combination thereof, meet the intent of buried ducts in a typical crawl space

Figure 3: For air handlers installed in under-floor spaces, up to 5% of the total system length (inclusive of both the ducts and air handling equipment) may be outside the thermal envelope. Access for maintenance and proper function of the equipment must be available.

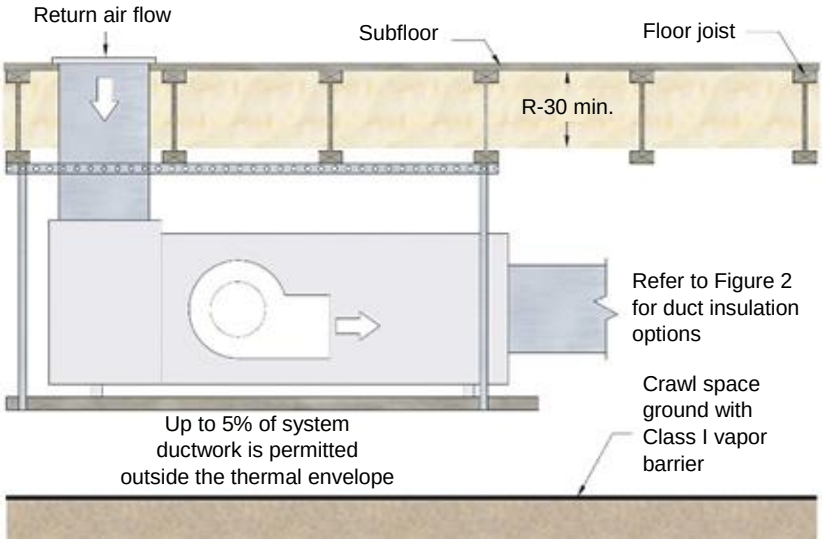
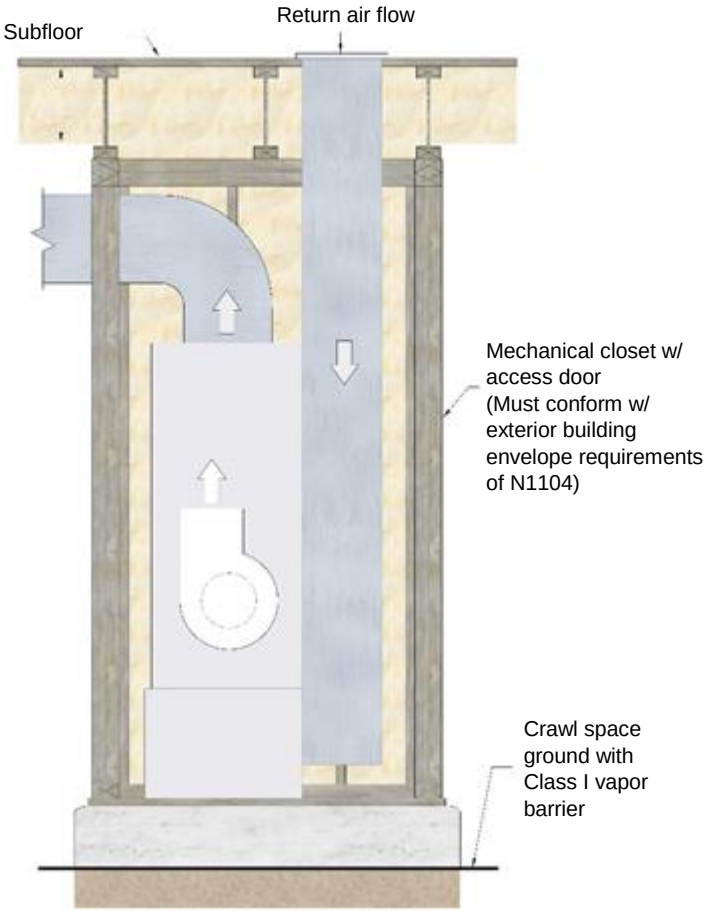


Figure 4: For buried ducts to be considered inside conditioned space, the air handler must be installed inside conditioned space. This practice typically requires constructing a mechanical closet below the floor plane.



USE OF BUILDING CAVITIES FOR AIR DUCTS OR PLENUMS

In new construction—Section M1601.1.1.1

Except as allowed by Section M1601.1.1, the use of building cavities for air ducts or plenums is *not* allowed in new construction or in an addition to an existing structure. For stud wall cavities and spaces between solid floor joists to be used as transfer air plenums, they must comply with five specified conditions.

In existing buildings—Section M1601.1.1.2

The use of building cavities for air ducts or plenums is allowed in the alteration or remodel of an existing structure. For stud wall cavities and spaces between solid floor joists to be used as air ducts or plenums, they must comply with five specified conditions.

JOINTS, SEAMS AND CONNECTIONS OF DUCTWORK

Section M1601.4.1

Tape shall *not* be used to seal metal ductwork, or be used as the sealing method between metal duct and flexible or fibrous duct. Tape is *only* allowed to be used with metal duct at connections to equipment requiring future replacement. Joints, longitudinal and transverse seams, and connections of ductwork shall be securely fastened and may only be sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants, or approved equivalents.

CONCLUSION

To achieve the U.S. Department of Energy (DOE) Zero Energy Ready Homes (ZERH) performance equivalency for regulated site energy use by 2023, the division took this step to improve heating and cooling performance by incorporating portions of the ZERH insulation and installation requirements into the 2021 ORSC.

There are many ways to locate the duct systems and air handling equipment fully within the building thermal envelope. If this is not feasible, then the duct systems deeply buried in insulation is an acceptable alternative. The use of building cavities and tape is no longer allowed, except as outlined above.

As with all site-specific matters, it is recommended to begin development discussions early in the initial planning stages. This technical recommendation also reminds the end user that local building officials retain broad local flexibility and discretionary authority on administration and enforcement of the state building code.