**REPI-78-21**

**IECC®: SECTION 202, R403.3.1, TABLE R405.4.2(1)**

**Proponents:**

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**Revise as follows:**

IECC2021P1E\_RE\_Ch02\_SecR202\_DefTHERMAL\_DISTRIBUTION\_EFFICIENCY\_TDE\_ ~~THERMAL~~ DISTRIBUTION SYSTEM EFFICIENCY (~~TDE~~ DSE). ~~The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct.~~ The ratio of the thermal energy transferred to or from the conditioned space to the thermal energy transferred at the equipment distribution system heat exchanger. Energy delivered to or from the conditioned space includes distribution system losses to the conditioned space.

R403.3.1 Ducts located outside conditioned space.

Supply and return ducts located outside conditioned space shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Ducts buried beneath a building shall be insulated as required per this section or have an equivalent *~~thermal~~ distribution system efficiency*. Underground ducts utilizing the *~~thermal~~ distribution system efficiency* method shall be listed and labeled to indicate the R-value equivalency.

TABLE R405.4.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

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**Reason Statement:** Thermal Distribution System Efficiency (TDSE) defined in Section R202 is inconsistent with the term (DSE) used in Table R405.4.2(1).The change to Distribution System Efficiency (DSE) is to provide consistency. This definition is from the ASHRAE Standard 152, aconsensus standard titled “Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal DistributionSystems.”

**Bibliography:** ANSI/ASHRAE Standard 152-2014: Method Of Test For Determining The Design And Seasonal Efficiencies Of Residential ThermalDistribution Systems, ASHRAE, [https://webstore.ansi.org/standards/ashrae/ansiashraestandard1522014](about:blank).

**Cost Impact:** This proposal does not increase the cost of construction.

**Working Group Recommendation: Accept as modified by WG.**

**THERMAL DISTRIBUTION EFFICIENCY (TDE).** The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct. This is back to the definition that is in the 2021 IECC.

**DISTRIBUTION SYSTEM EFFICIENCY (DSE).** The ~~ratio of the thermal energy transferred to or from the conditioned space to the thermal energy transferred at the equipment distribution system heat exchanger. Energy delivered to or from the conditioned space includes distribution system losses to the conditioned space.~~

A system efficiency factor that adjusts for the energy losses associated with delivery of energy from the equipment to the source of the load.

N1103.3.1 (R403.3.1) Ducts located outside conditioned space.

Supply and return ducts located outside conditioned space shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Ducts buried beneath a building shall be insulated as required by this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the *thermal* *distribution ~~system~~ efficiency* method shall be listed and labeled to indicate the R-value equivalency. This returns the wording back to what is in the 2021 IECC.

**TABLE N1105.4.2(1) [R405.4.2(1)]  
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

|  |  |  |
| --- | --- | --- |
| **BUILDING**  **COMPONENT** | **STANDARD REFERENCE DESIGN** | **PROPOSED**  **DESIGN** |
| Thermal  distribution  systems | Duct insulation: in accordance with Section R403.3.1.  A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems.  Duct location: same as proposed design.  **Exception**: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft (9.29 m ) of conditioned floor area at a pressure of differential of 0.1inch w.g. (25 Pa). | Duct location: as proposed.    Duct insulation: as proposed.    As tested or, where not tested, as  specified in Table R405.4.2(2). |

This returns the wording back to what is in the 2021 IECC. The wording of this table is being proposed for clarification in REPI 86.

**Working Group Remarks:** The original proponents of having TDE in the IECC reached out to the WG to explain the reason why the term was added to the code. Underground ducts are tested in accordance with NSF P374. The term, *thermal distribution efficiency (TDE)*, comes from this testing protocol. Underground ducts are listed in accordance with ICC ES LC1014, which also refers to NSF P374. While neither of these are ANSI standards, they are the only methods currently available for testing, listing and labeling underground ducts. There are several manufacturers of underground ducts that certify to these methods. To be consistent and to facilitate enforcement, *thermal distribution efficiency (TDE)* needs to remain in the IECC.

Separately, the WG learned that ANSI/RESNET/IECC Standard 301 has a different, but similar definition for DSE. Since Standard 301 is already referenced in the IECC, it makes sense to use this definition. DSE is used in Table R405.4.2(1).