

PIPE AND DUCT COMPONENT IMPORTANCE FACTOR

S3.1 – Introduction:

Pipe and Duct are categorized in ASCE/SEI 7-05 as non-structural components. There are just two values for the Component Importance Factors for pipe and duct, 1.0 and 1.5. The Component Importance Factor is designated as I_p in the body of the code. All pipe and duct must be assigned a component importance factor. The design professional that has responsibility for the pipe or duct is also responsible for assigning the Component Importance Factor to that pipe or duct.

S3.2 – Criteria for Assigning a Component Importance Factor to Pipe and Duct:

For pipe and duct, the Component Importance Factor (I_p) assigned to the pipe or duct shall be determined as follows.

1. If the pipe or duct is required to remain in place and function for life-safety purposes following an earthquake the importance factor assigned to the pipe or duct shall be 1.5. Some examples of this type of pipe or duct would be;
 - a. Fire sprinkler piping and fire suppression systems.
 - b. Smoke removal and fresh air ventilation systems.
 - c. Systems required for maintaining the proper air pressure in patient hospital rooms to prevent the transmission of infectious diseases.
 - d. Systems that maintain proper air pressure, temperature, and humidity in surgical suites, bio-hazard labs, and clean rooms.
 - e. Medical gas lines.
 - f. Steam lines or high pressure hot water lines.
2. If the pipe or duct contains or is used to transport hazardous materials a Component Importance Factor of 1.5 shall be assigned to that pipe or duct. Examples are as follows.
 - a. Natural gas piping.

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- b. Fuel oil lines.
 - c. Ducts used to exhaust laboratory fume hoods.
 - d. Boiler and furnace flues.
 - e. Ducts that are used to ventilate bio-hazard areas and infectious patient rooms.
 - f. Chemical or by-product pipe or duct lines which are required for industrial processes.
3. If the pipe or duct is in or attached to a building that has been assigned to Occupancy Category IV (Seismic Use Group III), i.e. essential or critical facilities, and is required for the continued operation of that facility following an earthquake, then a Component Importance Factor of 1.5 shall be assigned to that pipe or duct. Hospitals, emergency response centers, police stations, fire stations, and etc. fall in Occupancy Category IV. The failure of any pipe or duct could cause the portion of the building it serves to be evacuated and unusable. Even the failure of domestic water lines can flood a building and render it uninhabitable. So, all of the items listed above under items 1 and 2 would apply to facilities in Occupancy Category IV.
4. If the pipe or duct that is located in or attached to an Occupancy Category IV facility and its failure would impair the operation of that facility, then a Component Importance Factor of 1.5 shall be assigned to that pipe or duct. This implies that any pipe or duct that could be assigned a Component Importance Factor of 1.0 that is located above pipe, duct or equipment that has been assigned a Component Importance Factor of 1.5 must be reassigned to a Component Importance Factor of 1.5.
5. All other pipe or duct that is not covered under items 1, 2, 3, or 4 may be assigned a Component Importance Factor of 1.0.

S3.3 – Summary:

The Component Importance Factor is very important to the designer responsible for selecting and certifying the seismic restraints for a pipe or duct system. This factor is a direct multiplier for the horizontal seismic design force, which shall be discussed in a later section. If a Component Importance Factor has not been assigned to a run of pipe or duct, the designer responsible for

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selecting the seismic restraints must assume that the Component Importance Factor is equal to 1.5. If the run of pipe or duct actually could be assigned a Component Importance Factor of 1.0, this could result in a large increase in the size and number of restraints required along with a corresponding increase in the cost for the system.

It is in the best interest of the design professionals responsible for the systems that are served by the pipe and duct to properly assign the Component Importance Factors to the pipe and duct. The Component Importance Factor for each pipe and duct system should be clearly indicated on the drawings that are distributed to other design professionals, contractors, suppliers, and building officials.

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