LoRaWAN Transmission Distance

While LoRaWAN can transmit exceptionally far and penetrate through multiple layers of building materials LoRaWAN does have its limits. We have put together a table below showing different building materials and the db (link budget) or amount of energy it takes to penetrate through a typical building material. A typical LoRaWAN radio has a budget of about 150 db. For example, it takes about 2.8 db to penetrate through 3 inches of wood or about 27 db (~10x more energy) to penetrate through 3.5 inches of reinforced concrete. Radio signals have the most difficulty penetrating through metal. One of the items that impact the range HotDrop is the metal gauge of the service panel. The thicker the metal the smaller the HotDrop's transmission range.

Because every installation is different the type of building material between the HotDrop varies we try to be conservative in our range estimates. We typical see ranges of 1,000 ft feet in box retail store settings between the HotDrop and gateway. In a seismically reinforced hospital in California, we see a range of about 4 floors between the HotDrops and the gateway when the HotDrop is located 4 floors directly above the gateway. Also a rule of thumb, we recommend a gateway per building because building facades of often contain metal mesh or metal that limit radio transmissions.

Here are some guidelines about how much energy it takes for LoRaWAN to transmit through different building materials.

		Link Budget	150			
Material	Material (Thickness mm)	Material (Thickness inches)	Path loss (dB)	Number of Material	% of Total Energy	Penetration (Ft)
Glass	6	0.2	0.8	187.5	0.5%	3.7
Glass	13	0.5	2	75.0	1.3%	3.2
Wood	76	3.0	2.8	53.6	1.9%	13.4
Brick	89	3.5	3.5	42.9	2.3%	12.5
Brick	178	7.0	5	30.0	3.3%	17.5
Brick	267	10.5	7	21.4	4.7%	18.8
Concrete	102	4.0	12	12.5	8.0%	4.2
Stonewall	203	8.0	12	12.5	8.0%	8.3
Brick concrete	192	7.6	14	10.7	9.3%	6.7
Stonewall	406	16.0	17	8.8	11.3%	11.8
Concrete	203	8.0	23	6.5	15.3%	4.3
Reinforced concrete	89	3.5	27	5.6	18.0%	1.6
Stonewall	610	24.0	28	5.4	18.7%	10.7
Concrete	305	12.0	35	4.3	23.3%	4.3
https://smartmakers.io/en/lorawan-range-part-1-the-most-important-factors-for-a-good-lorawan-signal-range/						