If the main problem with sound intelligibility is room noise, if it cannot be reduced (or is not easy or is extremely costly for it to be reduced), speech intelligibility can be improved significantly in this situation by simply improving the signal/noise ratio via electronic sound reinforcement techniques, raising the sound pressure level by at least 25 *dB* over the background noise level, for all listeners (if possible). Speech clarity/speech intelligibility only needs sound reinforcement in the mid-range frequencies, *i.e.* frequencies in the $500 \le f \le 4000\ Hz$ range.

If, however the main problem is associated with a poor ratio of direct to reverberant-only sound (often found e.g. in the centuries-old cathedrals of Europe), a sound reinforcement system should use loudspeakers with high *Q*-directivity factors to solve this problem – otherwise, both the reverberant-only and direct sound will be reinforced, thus not improving the *S*/*N* ratio.

Sound Power Considerations For A Listening Room:

If sound reinforcement is needed for a listening room, the power capacity that is required for a sound reinforcement system can be determined using the formulae:

$$SPL_{direct}(r) = L_{Pwr} + 10\log_{10}\left(Q/4\pi r^2\right)\ (dB)$$

$$SPL_{\substack{rvb\\only}}(r) = L_{Pwr} + 10\log_{10}\left(\frac{4}{A}\right)\ (dB)$$

$$SPL_{\substack{direct\\+rvb}}(r) = L_{Pwr} + 10\log_{10}\left(\frac{Q}{4\pi r^2} + \frac{4}{A}\right)\ (dB)$$

since these relations are valid for ***any*** sound source in a room. The figure below shows the relation between $L_p - L_{Pwr}$ (and/or L_p) *vs.* $r/\sqrt{Q}$ for the ***free-field*** and ***reverberant field*** regions: