

Looking from the stage down into the side of the orchestra pit in Copenhagen showing the need for steps and clear headroom when the pit is not at a low level
 Photo: Arup Acoustics

With a low pit, you cannot hear the strings; the balance is not very good between the strings and the brass. So then you are forced into what we know most pit managers hate having to do, which is creating steps within the pit. If you do not put steps in the pit you cannot get the players underneath the overhang and you cannot get the eye contact between the conductor and the musicians. You have to accept the laws of physics; if you want a flat floor and a big band, you have got to play with the floor very low and that makes it difficult for the players who are sitting down close to the conductor who get neck strain.

sitting downstage in a a motorway-style noise of the pit and the between them and the are sitting in the front don't hear them at all.

of the entry to the pit when you start moving the down you create big

problems of how you get into and out of the pit. Some sort of variable access has to be incorporated such as steps or ramps and there is often very little space off stage of the orchestra pit. When you are playing *Electra* or something else that requires the largest orchestras you can try and placate everyone by saying that they can use the areas at the side of the pit. But you may find when you have set the pit at a particular height that everybody is happy with, you cannot use the sides at all because they are actually being used for access steps. I guess the pit height issue is certainly technically more complex, and philosophically just as interesting as the question of the size of the opening to the auditorium!

Panellist: Neil Morton

In Copenhagen there are a number of elevators which all provide the different floor levels and which can also be used for lowering instruments into the pit. One of these elevators is adjacent to the stage edge and can be used to create a forestage. This was another facility that was driving the access lower at the sides, because we needed to construct a floor level over the off-stage sides of the pit to connect with the raised forestage elevator. This makes the access level lower than is ideal for a high pit. To achieve this we needed head room under the stage at the sides and this meant that we had to develop adjustable steps for the musicians from the understage corridor level up to the height at which the pit was



positioned. When there is a desire to have the pit at a high level, it also raises quite a number of access issues. As Rob has pointed out, a high pit can reduce the available playing area if steps up to it have to be accommodated within its plan area to ensure headroom.

Panellist: Andy Lerpiniere

Bringing in the question of environmental conditions, I should just mention the problem of ventilating any areas under the overhang. The overhang is a particular issue because it potentially creates an area at the back of the pit which is difficult to get the air out of because there is often no space for ducts. The air can become trapped in there and will recirculate and become stagnant, hot and unpleasant. So the overhang is actually something far more difficult to deal with than a fully-open pit, at whatever level it is used.

Pit variability
 Flexibility and construction cost
 Flexibility and complexity
 Adjustability and space used

Panellist: Rob Harris

As we have seen, designing pits is difficult, so we may think we can solve the problem by making them very adjustable. We could consider making all the surfaces adjustable so you can alter, for example, the pit rail, whether it is solid or perhaps acoustically transparent in sections. You might decide to make the walls movable so they can come in and out, and you can adjust the height by having as many elevators or lifts as you can

This illustrated debate on orchestra pit design is led by acoustician Rob Harris, theatre consultant Neil Morton and services engineer Andrew Lerpiniere, with contributions from orchestra director Hazel Province and many delegates.

Andrew Lerpiniere
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 CEng is an Environmental Services Engineer and Associate Director with Arup. He has worked in London and Cardiff, designing many different types of building. He led the services team on the design of the auditorium and rehearsal rooms at the Wales Millennium Centre. He is currently involved in the concert hall design at the new Kingsplace development in London. He is committed to *total* building design, achieving full integration of architecture and engineering.