

Nowadays, every piece of Personal Protective Equipment [PPE] is certified or carries an “EC Declaration of Conformity” according to the PPE Directive 89/686/EEC. Intensive testing and specified performance requirements are given in the relevant product norm confirming the protection level of the PPE. In practice, however, it is clear that some PPE is improperly used or modified in the supply chain or by users. Practice shows that different PPE is often combined, without testing, for interference or change of protective performance when worn in combination. In this process PPE can lose its certified protective performance, without the user being aware of it. This whitepaper details practical examples of head, face, respiratory and hearing protection at workplaces on construction and industrial sites.

In many industrial workplaces head, eye, face, respiratory and hearing protection, or a combination of them, is required. Looking at most construction or large industrial sites one can find workers who have **decorated their helmets with stickers and permanent marker**. It's understandable that many workers note their name with a permanent marker on the helmet they wear every day, just to ensure that for hygienic reasons they wear the same helmet day by day. Users also place stickers from their favourite football teams or stickers from first aid and other works courses on helmets. This can compromise the safety performance of the helmet. Under EN 397 the helmet manufacturer has to define what stickers may be used, as the sticker glue or solvent from a marker could progressively damage the shell material, no matter the material (HDPE, PC, ABS...).

In most helmet manufacturers user manuals externally procured stickers are prohibited. Other helmet manufacturers offer an enviable “flexibility” they allow the use of adhesives that are compatible with the helmet material – with the proviso that manufacturer of stickers has to confirm this compatibility. Taking into account the myriad of helmet/material mixes on the market a label manufacturer can hardly test or confirm for all. MSA allows users own labels on its helmets as long they use water-based glue. MSA's own helmet stickers are designed to resist the most severe conditions (heat, humidity, chemical splashes etc) and pass the hot and cold (+50°, -30°) conditioning mandatory for EN 397 helmet penetration and shocks tests. The solvent free glue and colorants used ensure they have no long term effect on the shell materials.

Stickers and markers that are not tested and offered by the helmet manufacturers should be treated with caution! As the use of alternative stickers/markers can lead to the loss of the helmet's approval, it is advisable to check when selecting a helmet whether the manufacturer provides any required stickers and helmet printing options. MSA offers full-colour printing options and a name label service for all helmet users.

If **lamp attachments** are needed these often have to be ordered with the helmet, as lamp attachments are usually fixed on shells during production and the combination has to be tested and certified. Users drilling holes in a shell to add a lamp bracket will invalidate the approval!

Let's come to outdoor application examples. In winter, understandably, users like to wear hats for warmth, and as helmets are compulsory, users sometimes wear their own **winter warmer** underneath their helmet and in summer sometimes **baseball caps** are worn under the helmet. Unfortunately, users are not generally aware that these caps change the helmet positioning and tightness on the head, compromising the protection performance and also increasing the risk that the helmet can fall off the head. The safest solution is to select a helmet with matching helmet winter liners where their combination has been tested to the relevant protection standards. All MSAs winter liners have been tested with all MSA helmets in combination. For the summer MSA offers cooling inserts for its helmets, providing a cooling effect for up to 10 hours and optionally to protect the neck from UV radiation.

In **confined spaces and on scaffolding** chin straps are often required to keep the helmet on the head during movement. EN 397 requires that helmets and chin straps are tested in combination. So it's not permitted to use an untested combination i.e. a chin strap from a different manufacturer to the helmet. EN 397 requires that all helmet accessories and options are listed in the manual. It's advisable to consider when selecting a helmet if the manufacturer offers all required accessories such as winter liners, cooling inserts, chin straps etc.

85 dB (A) is the European safe working level for noise and is often exceeded at construction sites so hearing protection has to be worn. Incidents have been reported where the helmet is not worn so that headband mounted ear muffs can be worn. This is of course not recommended as there is still a risk of falling objects! Some users simply wear the headband ear muffs in the neckband position. If the ear muff was not designed or certified as a neckband, the ear cup tightness or contact pressure will not be maintained and then the protective performance will be lower than certified. The recommendation is to use helmet mounted ear muffs which are certified with the specific helmet, only this ensures that the certified attenuation level of the ear muffs can be achieved!

Attaching helmet mounted ear muffs to a helmet for which they are not certified may change the pressure due to shell size and shape. According to EN 352, the hearing protection manufacturer has to decide which helmets they are going to certify in combination with their muffs. Consequently, you should always check when selecting a helmet that there is a certified hearing protection combination and that both suit your uses. Users also need to check that the correct helmet mounting adapters are used for their helmet.



On many construction sites **eye protection** is mandatory at all times for all workers. When a user takes off eyewear because they do not fit in combination with ear muffs, a chin strap or respiratory mask, they risk eye injury and even their eyesight! Using a classic spectacle with standard temple arms in combination with ear muffs can cause a gap in the ear muff sealing cushions and lead to reduction of attenuation value. To prevent this, users should look for spectacles with a head band or very thin, tight-fitting temple arms.

Within some construction applications additional **face protection** is necessary. EN166 requires that a visor is always certified with its matching visor frame, unmatched combinations are not allowed, even if it is possible to fit the pieces together. Frequently visors/frame sets are combined with a helmet from another manufacturer. Although this is not absolutely prohibited in EN 166, the exact protective performance of the visor cannot be confirmed and may be easily dislodged and fail to meet the standard. If visor mounting to the helmet or changing is difficult, the risk increases that the visor will not be worn at all! Therefore it is critical that visor, frame and helmet are developed and certified in combination and can be quickly combined or disassembled as the situation changes.

Filtering **respiratory protection** is needed for specific construction/industrial applications. When wearing masks and goggles in combination it is important to check that temples and nose pads don't create any leaks. When combining masks and visors the wearer should consider the adjustability of the distance between the visor and face as the mask needs to fit behind the visor. Users should also consider when wearing full face masks and helmets that adjustment of the helmet height is critical to ensure that the mask harness fits under the helmet and both remain securely on the head.



In summary, there are many examples of PPE combination which can lead to compromised protective performance for PPE. When head, eye, face, respiratory and / or hearing protection are required simultaneously, the wearer should consider their compatibility. The possibility to combine them should be ideally demonstrated through joint testing or approval to ensure that the protective performance is not compromised. MSA considers the compatibility of all reasonable combinations during its product development processes and can provide more detailed information.



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