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SANDWICH PANELS TENAX

USE & MAINTENANCE

2023-01

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1. General instructions

During the use, sandwich panels are subject to different types of variable loads, including, climate (temperature, sun radiation, wind, snow, etc.), hanging objects (for example, lighting, ventilation, etc.), need to access the structure (access loads) and other environmental conditions (pollution, chemicals, etc.). All of those actions may affect the functional properties and appearance of the sandwich panels. To reduce the negative effects of the external factors on sandwich panel quality, they should be frequently inspected, maintained, and repaired if any defects are found.

2. Annual sandwich panel inspection

Assessment of the general condition of sandwich panels should be carried out every year. The results of the inspection and completed measures should be recorded. The annual sandwich panel inspection and, if necessary, repair works are carried out in accordance with Table 1. Any defects and damage found in sandwich panels should be fixed immediately.

Table 1. Annual inspection objects and maintenance works

No	Inspection Objects	Required Maintenance Works
1.	Stains and dust on the surface of sandwich panels	<ul style="list-style-type: none"> • surface cleaning
2.	Cracks or scratches on the surface coating, corrosion products on the surface, faded polymer coating	<ul style="list-style-type: none"> • surface polishing • restoration of the polymer coating (painting)
3.	Surface dents	<ul style="list-style-type: none"> • surface polishing • dent filling • restoration of the polymer coating (painting)
4.	Facing delamination	<ul style="list-style-type: none"> • cleaning of the adhesion surface • gluing of the facing to the core
5.	Insulation (core) damages	<ul style="list-style-type: none"> • removal of the damaged core parts • restoration of the empty space in core with polyurethane foam
6.	Corrosion on cut edges of the flashings and other profiles	<ul style="list-style-type: none"> • surface cleaning • restoration of the polymer coating (painting)
7.	Corrosion of the fastenings for flashings and other profiles (inspect the condition of the fastening by screwing out some of them) ^{a)}	<ul style="list-style-type: none"> • if corrosion is not visible, replace the inspected fastening with a new one (for example, screw in new, larger diameter screw) • if there is corrosion on the fastening, inspect the fastenings in various places of the structure and evaluate whether it is necessary to replace them
8.	Free movement of panels and profiles	<ul style="list-style-type: none"> • loose fasteners must be tightened up • if the loose fastener may not be tightened up, it must be replaced with a new fastener with a larger diameter
<p>NOTES</p> <p>a) Inspection should be carried out on fasteners of various flashings and profiles. Pay a particular attention to fastenings that are exposed to atmospheric impacts the most (for example, drip-noses).</p>		

3. Sandwich panel damage prevention and repair works

3.1. Scratches and cracks on steel coating

Scratches and cracks on steel facing shorten the service life of sandwich panels and deteriorates the appearance of the building. If the face sheet is cracked or scratched, these areas may boost accumulation of dust, moisture, and substances accelerating steel corrosions. If the repair works are not performed on time, the new defects caused by corrosion are much more complicated to repair. Therefore, it is necessary to repair any damage in surface coating as early as possible by grinding the damaged areas and restoring the protective coating.

It has to be noted that the paint colour applied during repair works most likely will slightly differ from the panel. The larger is the area to be repaired, the easier it is to notice it. Therefore, it is easier and more effective to repair all the defects right when they are spotted.

3.2. Facing delamination

The steel facing may debond from the insulation core due to transportation, installation, or improper cutting of the sandwich panels. Small delaminated areas usually may be covered with flashings. If a large are of face sheet has debonded, it has to be glued to the insulation core. It is recommended to use single component polyurethane adhesive. After fixing the facing, it has to be firmly pressed onto the core by using cover plates or other suitable loading aid.

3.3. Facing dents

To repair a dent, remove any dirt from the damaged surface. Then use sandpaper or grinder to grind off the paint and corrosion products. Do not use a grinder (for example, angle grinder) that is destroying (burning out) the zinc layer on the steel. After that repeatedly clean the surface and remove any fat from it.

Then apply anti-corrosive primer and filler suitable for galvanised surfaces on the cleaned sandwich panel by using a rubber putty trowel. Fill deep dents in two or several layers. Fill dents in accordance with the usage instructions of the selected filler.

EXAMPLE. First, apply two-component polyester filler that contains aluminium particles or glass fibres. Dry off the surface with an air flow at 20 °C temperature. Grind the dry surface with sandpaper or grinder (P40 - P80 grit), clean it off and remove any fat. Afterwards apply a universal two-component polyester filler. Dry off the surface again with an air flow at 20 °C temperature. Polish the dried surface with sandpaper or grinder (starting with P80 - P120 grit and finishing with P120 - P240 grit). Clean the surface from dirt and fat allowing the solvent to dry off. Apply fine polyester filler with sufficient scratch resistance as the final filler layer. Dry off the surface once again, prime it and coat it with a matching colour paint.

In case of very large dents, evaluate whether they are not affecting mechanical properties of the sandwich panel. This in particular applies to wall panels with large apertures as well as ceiling and roof panels.

3.4. Core damage

Sandwich panel core may be damaged during transportation, handling and installation. Panels with mineral wool core are damaged most often. In case if a sandwich panel with mineral core needs to be repaired, it only may be done in respect to the panels that are not subject to any fire safety requirements. Cut out the damaged areas of core and fill the empty space with polyurethane foam. Such small volume fillings do not significantly affect mechanical properties of the sandwich panel.

3.5. Cuts and crossings

If you need to create a cut in the sandwich panel that is longer than 200 mm, evaluate the effects of such cut on durability of the sandwich panel.

If any kind of equipment or engineering communications must be built into a sandwich panel structure, which is subject to fire safety requirements, the crossing solution must meet the same level of safety requirements as applied to the panel.

3.6. Distribution of the loads acting on ceiling and roof panels

Sandwich panels that are often subject to access loads must be protected from mechanical damages. Panels at the access area must be covered with mineral wool boards topped by rigid boards for load distribution. The loads must be dispersed towards the load-bearing frame. The access loads and any other additional loads are not permitted for the panels with crossings and cuts. Take into account the design load.

4. Cleaning recommendations for sandwich panels

4.1. Cleaning Snow and Dirt on the Roof

Roof sandwich panels need to be cleaned from any tree leaves and dirt at least once per year. Do it very carefully in order not to damage sandwich panel surface. Roof sandwich panels should be cleaned with tools that have a soft rubber or polymer coating and that do not have any sharp edges. The worker who is performing cleaning must wear shoes that are not damaging sandwich panels and conform to the occupational safety requirements.

Damaged sandwich panels deteriorate the appearance of the building but also facilitate corrosion of steel facing. After cleaning is completed, do not leave any tools or other objects on the panels that may corrode or cause corrosion of the steel facing.

Rainwater pipes and drainage channels must be cleaned at least once per year.

4.2. Cleaning sandwich panel surface

To wash the sandwich panels, it is recommended to use a high-pressure water jet with pressure not exceeding 4 MPa. By using a high-pressure water pump, direct the water jet no closer than 50 cm from the surface of the sandwich panel in a skew angle. When washing joints of the sandwich panels, make sure that the water is not entering into the joints. The water jet may not be aimed directly on the joints. Water temperature may not exceed +30 °C. If there are fats or grease on the sandwich panels, the water temperature may temporarily be increased to +50 °C.

The surface may be treated with cleaning agents with pH level from 5 to 10 that are not containing organic solvents. Stubborn stains may be cleaned with isopropyl alcohol or white spirit.

Warning. Environment protection measures must be taken into account when using cleaning agents and solvents.

After application of cleaning agents, the surface of the sandwich panels immediately must be washed off with clean water. Sandwich panels are cleaned from the bottom towards the top by carefully washing off cleaning agents from the top to bottom. Rainwater pipes and drainage channels have to be rinsed as well.

To make sure that the cleaning method and agents are not damaging the panel, perform a test cleaning on a less visible and smaller area. Evaluate the test cleaning results under sufficient amount of natural lighting after the panels have dried off.

It is not recommended to clean the sandwich panels with steam. Surfaces may not be washed with water if the ambient air temperature is below or equal to 0 °C.

Surfaces with coating that is intended for use in contact with food (for example, FoodSafe coatings) may be cleaned with cleaning agents not containing solvents with pH value from 5 to 8. To keep the sandwich panels clean every day, this type of coating may be washed with a soft brush. This type of coating may also be washed with a water jet with pressure up to 50 bar. Water temperature may not exceed +60 °C. Coatings that may be used in contact with foodstuffs may not be in environment where air humidity exceeds 80% RH. These types of coatings may be wet no longer than 6 hours per day. Wet surfaces may be wiped with a soft cloth or dried off with air flow in room temperature. Sandwich panel joints have to be dried off with particular care.

Dirt must be sucked off from sandwich panels with an acoustic (for sound damping) facing. Afterwards, the surface may be wiped with a wet cloth.

If it is necessary to wash sandwich panels often, use additional sealing for locks and joints in order to prevent water from entering into the insulation core. If water enters into the insulation core, it not only affects the thermo-dynamic and mechanical properties, but also may cause facing corrosion. It is recommended to use

sealing that is made from EPDM, silicon, PIB (“butyl”), or polyurethane. Sealing must be inspected frequently and replaced in case of any damage.

5. Repairing surface coating

5.1. Coating damage

Air pollution, ultraviolet radiation, and temperature fluctuations may eventually cause significant changes in the coating of the steel facing.

If the air temperature in shade is +28 °C and sandwich panels are subject to direct sunlight, the surface temperature for light colours may exceed +60 °C or even reach +80 °C for dark colours. The higher the coating temperature, the easier it is to damage it. For example, if rain drops fall on heated steel, the coating may microcrack. In increased temperature, hardness of polymer decreases and it is easier to scratch it.

Due to effects of climate, the polymer coating most often fades out, meaning the top layer degrades and the surface becomes matted. In case of larger damage in coating, the cracks or even corrosion as well as peeling and bubbling paint may occur.

Depending on the colour of coating, installation conditions, and climate, the original paint may show no signs of aging even from 25 to 50 years. Usually panels with lighter colour face sheets serve longer. Coating damages caused by climate usually cover large areas, meaning, these are not local damages. They are evenly spread out throughout the whole plane. Usually this is fixed by completely repainting the respective parts of the structure (plane).

In short term, the main cause for damage in the organic coating is mechanical impact that results in scratches, dents, and other types of damage. These repair works are usually covering fairly small area.

5.2. Repainting aged surfaces

If the surface is damaged throughout a large area, it is necessary to repaint the whole particular plane.

Even if damage is not visible on the exterior of a building, sandwich panels with polyester coating (SP) must be repainted every 15 - 20 years, while polyvinyl fluoride (PVDF) coating must be repainted every 20 - 30 years. The repeated repainting must be carried out after a shorter period, meaning, 10 - 25 years. By performing frequent maintenance works, including, repainting, it is possible to extend the sandwich panel service life to up to 50 years. SP and PVDF coatings should be repainted with acrylate polymer based paints.

Follow the paint manufacturer's instructions.

Preparing and painting the surface:

- clean off any dirt, fats, and lubricants and allow the surface to dry off completely;
- clean off the paint residuals and corrosion with sandpaper;
- level out dents with filler (in one or several layers);
- apply primer;
- check consistency of the selected paint colour;
- paint in one or several layers.

5.3. Repairing local damages

If the surface is damaged throughout a small area, it is necessary to repaint only the particular place. The coating should be repaired similarly as to described above. Pay additional attention to matching the paint colour, painting direction as well as transition from the painted area to the original paint.

The damaged spots should be painted with a thin paint brush, while the rest of the area should be sprayed (for example, with an aerosol).

If the damage is exposing the metal layer, it is recommended to apply coating in several layers. Follow the paint manufacturer's instructions.

6. Replacing sandwich wall panels in horizontal installation

If a sandwich panel is significantly damaged and it may decrease its functional properties, i.e. mechanical durability, fire resistance, environmental resistance, or thermal insulation (for example, unacceptably large

curve, steel sheet deformation, surface coating damage covering large area, etc.), the damaged sandwich panel must be replaced with a new one.

The following procedure for replacement of a damaged horizontal wall sandwich panel (let's assume that sandwich panel B is damaged) may be applied (see images below):

1. Unscrew flashings that are covering the panels A, B, C, D, E.
2. Screw in additional fixation screws in panels A and E.
3. Connect panels A and B with sheet steel in both corners at the far end (Figure 2 and 3). Choose binding points in a way that eventually it is possible to cover them with flashings. The maximum permissible load per screw is 25 kg.
4. Remove the lower fixation screws from panel B. After removing the screws, panel B is only holding on to panel A as well as the panels on both sides.
5. Screw panel D onto E in the same way as in case of panels A and B in clause 3.
6. Fix safety ties or stopper profiles (Figure 3) at both ends of panel D to make sure that when panel B is removed, the inner surface of panel D would be around 5 cm away from the wall surface. Length of the tie or profile = panel width + 15 cm. Remove fixation screws from the panel D.
7. Remove the upper fixation screws from panel B and pull the panel outwards. Fix the special gripping mechanism to the panel B and remove it.
8. Fix the gripping mechanism to the new panel. Apply sealant in the female lock of the panel C.
9. Place the new panel (panel C) on the male lock of the tilted panel D.
10. Apply sealant in the female lock of the panel A. Join panels D and C (the new one) by connecting the female lock of panel C to male lock of panel D.
11. Take of the gripping mechanism from the new panel (C).
12. Press the panel onto the column and check whether they are connected correctly (panel must fit well onto the column and the sealant must be applied throughout the connection).
13. Fix panels onto the columns with new screws. Remove all safety fastenings (steel sheets, safety ties or stopper profiles).
14. Screw back all the flashings.

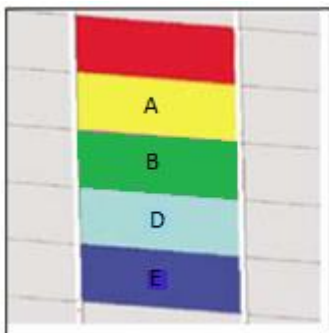


Fig.1

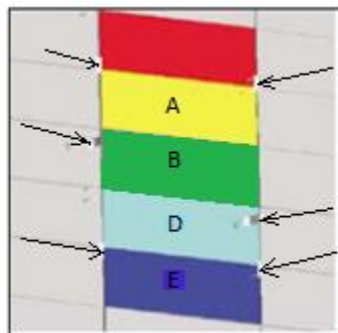


Fig.2

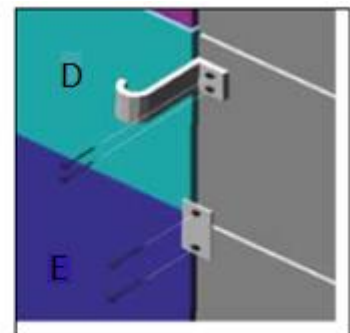


Fig.3

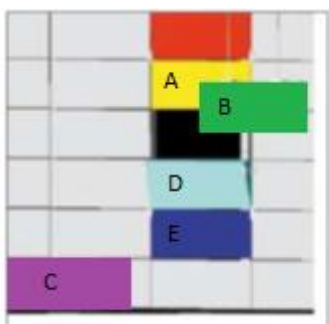


Fig.4

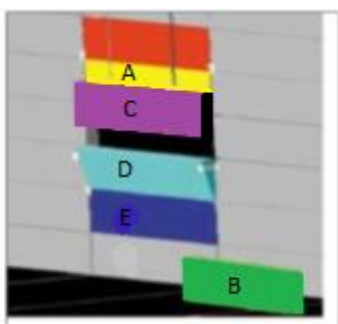


Fig.5

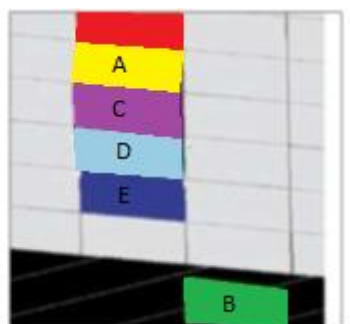


Fig.6

7. Handling of substituted panels and the demolition waste

7.1. General

Follow the national legislation and the ILO (International Labour organization) code of practice for safety and health in construction has a dedicated chapter on demolition (chapter 14) and one on personal protective equipment (chapter 18).

Always contact the waste sorting companies before the panel dismounting or demolition. It is recommended to delaminate of steel facings from the insulation core as close as possible to the waste sorting place. Delamination of steel from the core (especially, for mineral wool core) at the demolition site can lead to extensive dusting.

Mineral wool and rigid polyurethane are not classified as dangerous according to EU Directives 67/548/EEC and 1999/45/EC and its amendments (Regulation (EC) No 1272/2008) on classification, labelling and packaging of substances and mixtures.

7.2. Steel

Steel facings are always recycled. Contact the local sorting company for more information.

7.3. Mineral wool¹

Mineral wool core is usually landfilled. To evaluate the recycling possibilities, please contact the local mineral wool manufacturer.

When heated to approximately 200 °C for the first time, release of binder components and binder decomposition products can occur which, in high concentrations, may irritate the eyes and respiratory system.

Mineral wool, when removing might generate dust. As for the deconstruction or demolition of any building, it is recommended to reduce exposure and discomfort by applying simple measures such as: spray mist water before removing products, clean with vacuum cleaner and not with a broom, cover the skin with long sleeves and wear a face mask (typically FFP2 type). Use preferably a knife for mineral wool cutting. If a power tool is used, it must be equipped with efficient air suction.

The mechanical effect of fibres in contact with skin may cause temporary itching.

Provide the operators at demolition site at least with following information.

- Cover exposed skin. Use gloves to avoid itching in conformity with EN 388
- Ventilate working area if possible
- Rinse in cold water before washing
- Waste should be disposed according to national regulations
- Clean area using vacuum equipment
- Wear goggles when working overhead. Eye protection to EN 166 is advised

¹ See more information on safe use of mineral wool on website www.mineralwool.eu.



Cover exposed skin. When working in unventilated area wear disposable face mask



Ventilate working area if possible



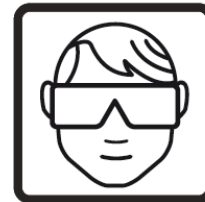
Rinse in cold water before washing



Waste should be disposed of according to local regulations



Clean area using vacuum equipment



Wear goggles when working overhead

Table 2. First aid measures when handling the mineral wool waste

No	Exposure route	First aid measures
1.	Inhalation	Remove from exposure. Rinse the throat and blow nose to clear dust
2.	Skin	If itching occurs, remove contaminated clothing and wash skin gently with cold water and mild soap
3.	Eye	Rinse abundantly with water for at least 15 minutes.
4.	Ingestion	Drink plenty of water if accidentally ingested.

The mechanical effect of coarse fibres in contact with throat, skin or eyes may cause temporary itching/inconvenience.

If any adverse reaction or discomfort continues from any of the above exposures, seek medical professional advice.

Use water, foam, carbon dioxide (CO₂), and dry powder for firefighting measures. Workplace exposure limit (WEL) must not be exceeded .

7.4. Polyurethanes (PUR & PIR)

Polyurethane waste is usually sent to energy recovery. Contact the local sorting company for more information.

Sandwich panels TENAX with polyurethane core do not contain ozone depleting substances.

When heated the delaminated core over 170 °C, release of polyurethane components and decomposition products can occur which, in high concentrations, may irritate the eyes and respiratory system.

Avoid unnecessary cutting of polyurethane core at building site as the cutting can generate more dust. If cutting is necessary, wear a face mask (typically FFP2 type). Use preferably a knife for polyurethane cutting. If a power tool is used, it must be equipped with efficient air suction.

Provide the operators at demolition site at least with following information.

- Use gloves
- Ventilate working area if possible
- Waste should be disposed according to national regulations
- Clean area using vacuum equipment
- Wear goggles when working overhead.

Table 3. First aid measures when handling the polyurethane waste

No	Exposure route	First aid measures
1.	Inhalation	Remove from exposure. Rinse the throat and blow nose to clear dust
2.	Eye	Rinse abundantly with water for at least 15 minutes.

If any adverse reaction or discomfort continues from any of the above exposures, seek medical professional advice.

Use water, foam, carbon dioxide (CO₂), and dry powder for firefighting measures. Workplace exposure limit (WEL) must not be exceeded .