Cannock Chase District Council

Planning Control Committee

13th May 2020

Officer Update Sheet

Application No:	CH/20/090
Received:	04-Mar-2020
Location:	Land off Haling Way, Cannock, WS11 OFB
Parish:	Bridgtown
Description:	Full application for a 4m High Heatshield Fence to replace existing 2m High wooden acoustic fence along the boundary of Haling Way/Axil Integrated Services & removal of 2 No.Parking spaces.
Application Type:	Full Planning Application

Subsequent to the production of the Officer Committee Report comments have been received from the applicant in respect to report produced by Tenos on behalf of the Council.

The Council has commissioned Tenos to appraise the comments made by the applicant and respond on each point. In looking at the issues raised it should be borne in mind that Tenos's sole role was to provide a view as to whether the heatshield fence would exacerbate fires at the Axil premises which was an issue raised by Axil Integrated Services. Tenos was not requested to look at the effectiveness of the heatshield fence in respect to the protection of property and life on Haling Way.

It is noted that it is common ground between the applicant and Tenos that

(i) the heatshield will not have a negative impact on the safety of Axil, and
(ii) Tenos has not evaluated the safety of the occupants at the unexposed side, and access for the fire service.

It should also be noted that the purpose of the heatshield fence is to allow for egress of occupants at the unexposed side of fence and allow emergency services to safely access the area.

A full copy of the response from Tenos in the form of a technical paper is attached to this update.

Officers would conclude that the response form the applicant and the subsequent technical note from Tenos do not alter the recommendation contained within the officer report and approval is recommended.

Technical Note

tenos

Project:	Axil, Cannock	Date:	11/05/2020
Client:	Cannock Chase Council	Author:	W. Serwatka
Ref:	TS200286-N01-ISSUE01	Checked by:	A. Hay
Re:	Communication with Locker Ltd.		

Introduction

The purpose of this Technical Note is to present the summary of the communication with Daniel Simpson (Locker Heatshielding Ltd.) post issue of the Report TS200286-R01-Issue01 concerning the effect of the heatshield on the safety on Axil site.

Locker Ltd. has queried the assessment conducted by Tenos, in the email exchanges between 1st and 5th of May 2020:

- From Daniel Simpson to Richard Sunter on 1st of May 2020, at 3:48 PM
- From Wojtek Serwatka to Richard Sunter on 4th of May 2020 at 11:29 AM
- From Daniel Simpson to Richard Sunter, Mike Walker and Matthew Vale on 5th of May 2020 at 11:30 AM

These queries are addressed below, the using the numbering system adopted in the emails. A summary of the discussions is presented in Table 1 below with a more detailed description in the following section.

Summary

Table 1 – Summary of discussion between Locker Heatshielding Ltd. and Tenos.

Party	Opinion
1 – Effect of the fence on safety at Axil site and at the housing development	
Tenos	The proposed heatshield fence will not have a detrimental effect on the safety on Axil site. However, the fence is significantly lower than the conceivable height of flames, thus offering little additional safety for life and property protection at the housing development in the event of a large fire.
Locker	Locker agrees that it is impossible to protect the housing development against the higher/taller fire scenarios. Locker explains that the purpose of the heatshield fence is to allow for egress of occupants at the unexposed side of fence and allow emergency services to safely access the area.
Outcome	Both parties agree that the heatshield will not have a negative impact on the safety of Axil plant. Tenos has not evaluated the safety of the occupants at the unexposed side, and access for the fire service.
2 – Mode of heat dissipation by the heatshield	

Locker	Locker questioned Tenos' assumption that the heatshield reflects a significant portion of the radiant heat flux, describing different modes of heat dissipation likely to occur in the proposed build-up.
Tenos	Tenos acknowledges modes of heat dissipation other than reflection. However, it was not possible to quantify all possible modes of heat dissipation in this assessment. Therefore, a conservative assumption was made that all of dissipated heat is by reflection.
Outcome	Both parties agreed; minor amendments to wording will be made in further issue of the report.
3 – Performance of the proposed build-up	
Tenos	The performance of Mini-ES heatshield with ImagePerf layer cannot be confirmed due to lack of testing performed for this build-up.
Locker	Mini-ES heatshield with ImagePerf is principally identical to Ladder-type protection tested in TE83290, with respect to the number of layers and matching percentage of open area.
Tenos	Subject to the percentage opening area and distribution of opening being very similar Tenos would agree that the performance of the proposed build-up is likely to be similar to that of the build-up tested in TE83290. However, we do not have details to confirm (or deny) the similarities and cannot, therefore, confirm the performance. It is assumed that Locker can provide this confirmation.
Outcome	Agreement between the two parties was not reached.
4-6 – Heat flux reduction coefficient	
Locker	Locker has challenged Tenos' claim that the data presented in the test report TE83920 is incorrect.
Tenos	The raw test results are not questioned. However, results of data analysis data presented in TE83290 are unhelpful in this assessment, thus Tenos undertaken own analysis and arrived at a dimensionless reduction factor coefficient.
Outcome	Both parties agreed; minor amendments to wording will be made in further issue of the report.
7 – Wording in conclusion	
Locker	Locker has raised concerns regarding the wording in the Conclusions, treating on the impact of the heatshield of the range of fire scenarios on Axil site.
Outcome	Tenos agrees that the wording of this paragraph was misleading and will be amended in further issue of the report.
8 – Data in Annex 2	
Locker	Locker has raised concerns regarding the presentation of the data used in the preparation of the assessment without an appropriate description.
Tenos	Annex is used as a data log only, and the methodology is outlined in the relevant section.
Outcome	Both parties agreed – the wording shall remain unchanged.

Exchange between Locker and Tenos

1 – Effect of the fence on safety at Axil site and at the housing development

Locker Ltd (01/05/2020):

Page 3 states " The Results suggest that the proposed fence will have no detrimental effect on the safety at the Axil site" but they go on to say that based on the most critical fire scenario, the flames would be higher than the wall and the Heatshield fence would offer little or no protection to the housing development. This is because the most critical fire scenario has a flame height of 62.5m, whereas the fence height is only 4m. The impact of the fence would clearly be more effective for smaller fires.

It is my understanding that the Heatshield wall is to allow for personnel behind the wall to escape to a safe distance, whilst also allowing emergency services to safely access the area. Due to the flame height, the Heatshields are not there to protect the buildings themselves, as this would require a much higher fence.

Tenos (04/05/2020)

Agreed. For small fires, although the percentage increase in reflected heat flux back towards the site is significant (approximately 20%), it is considered that this will not detrimentally impact on life safety at the Axil site. Accordingly, for small fires at the Axil site, the heatshield fence will protect the housing development and will not significantly increase the life safety risk at the Axil site.

For larger fires, the fence offers little protection to the housing development and does not, in Tenos' opinion, cause any additional safety concerns at the Axil site – owing to the large heat release rate.

As we understand, the purpose of the heatshield is twofold:

- To protect Axil from a potential fire occurring at the housing development (as this was not in our appointed scope and has not been assessed, we cannot comment on the heatshields effectiveness);
- As a compensatory safety measure for the protection of the housing development. However, as shown by our analyses, a much higher fence would be required and would be subsequently be subject to additional analysis to determine its adequacy.

Locker (05/05/2020)

Principles agreed – we note the mitigation against higher/taller fires but this as discussed is unavoidable. The primary task of the heatshield fence was to allow for the safe escape of the occupants/public in the event of a potential risk posed from the chemical waste treatment storage unit without inadvertently causing any detriment to the plant itself through constructing our alternative boundary treatment. I think all reports confirm this is the case. Whilst it does provide a form of protection to Axils unit from the development side, I think we both agree a higher fence would be impossible to achieve given the suggested height of any catastrophic fire/flame (65m-70m approx.). The 4m height was a suggested limit as part of CCDC's original committee report comments and so we have followed this parameter as part of our assessments.

Tenos (11/05/2020 in lieu of email)

Our assessment did not include the evaluation of safety of occupants on the unexposed side of the fence. Therefore, we are not in position to make a claim whether the heatshield allows for the safe escape of occupants/public in the event of a fire at Axil plant.

We agree that an installation of a higher fence to protect from the effects of the largest conceivable fire is not feasible.

2 – Mode of heat dissipation by the heatshield

Locker (01/05/2020)
Page 10 section 2.13 – "Locker Heatshielding Ltd States that the proposed product will dissipate the Heat Flux upwards", I believe that this is taken from the technical report where I have stated that the "Heatshield is designed to dissipate the radiant heat on either side of the Heatshield through, up and over the top of the wall and is not designed as a containment wall", this statement clearly does not only say that heat flux will only be dissipated upwards. The main function of the Heatshield is to dissipate the radiant heat through the shield, however as a consequence of some of the radiant heat being reflected by the Heatshield this will naturally be forced up and over as shown in the Flaresim image that we provided in page 4 of our technical document.

I therefore feel that this statement should be reworded by Tenos. Please feel free to include any of the below to aid with this re-wording:

Locker Heatshielding is manufactured using a stainless steel frame, covered with one or two "skins" of radiant mesh, or perforated plate. This "skin" reduces nominal heat flux using a combination of material properties.

- Reflection – a percentage of the radiant heat will be reflected, as is the case with any surface. All materials reflect radiant heat to a certain degree. Thin metals reflect a large amount of radiant heat, which is why aluminium foil is not hot to touch after coming out of an oven. The key to the percentage of reflected radiation is the surface area of the material. In Locker Heatshielding, the material surface area is lower than the overall installation area, as the shield has a percentage open area.
- Transmission – a percentage of the radiant heat will be transmitted through the shield. This is inevitable due to the open area.
- Conduction-Convection – a percentage of the radiant heat will be absorbed into the metal. This heat will conduct through the panel fairly quickly due to the thermal conductivity properties of stainless steel. The design of the mesh is to facilitate air flow, which will dissipate this heat, effectively converting radiant heat into convective heat, which will quickly move away from the panel in a naturally ventilated environment.

Tenos (04/05/2020)
Agreed. The paragraph will be reworded in a future update to the report to reflect that a portion of the radiant heat will be directed upwards.

Agreed regarding the note about reflection.

Agreed regarding the note about transmission. I would like to add that another mode of transmission is re-radiating heat on the unexposed side as a black body when the shield heats up. This is, however, beyond our appointed scope as it would require a detailed CFD analysis of every fire scenario coupled with a finite-difference method analysis of conduction through the heatshield and an evaluation of conduction-convection.

We agree with conduction-convection mode of heat losses. However, there is an existing 2m high concrete wall impeding the free flow. Furthermore, the conduction-convention effects are highly dependent on the weather conditions, consideration of which is beyond our scope.

On the basis of the information above: part of the heat is transmitted, part of it reflected, and part of it is lost due to conduction-convection. As the conduction-convection term is not quantified, and a higher reflection term is conservative for our analysis, we can only conclude that the heat that is not transmitted through, has been reflected back.

Locker (05/05/2020)
Principles agreed – we note the amendments to the Tenos report are to be made but confirm the strategy is coherent.

Tenos (11/05/2020 in lieu email)
Amendments to the report will be made.

3 – Performance of the proposed build-up

Locker (01/05/2020)
Sections 2.16 – 2.23 discuss the proposed make up of the Mini ES Heatshield with image perf in comparison to the Ladder Heatshield test data. 2.22 states "if the information given by Locker representative is correct, the proposed build up of Mini ES shield primary mesh and image perf secondary mesh should match the performance of the ladder shield" qualifying what we are stating, however 2.23 then goes onto recommend the testing of the build up or that an assessment is provided by the test laboratory to confirm the performance of the system.

We have already done a lot of work regarding the possible testing of the Heatshields with BRE, and we can move forward with this if required. We could ask BRE to provide a statement but as the testing was done by the company they took over " The Loss prevention Council" I am not sure whether BRE would make this statement as the tests were undertaken before their ownership and they may insist on a test.

The Locker Heatshielding range utilises the same radiant mesh within its construction, which has the same radiant heat reduction properties. It can be safely assumed that the sub-frame has negligible impact on the performance of the Heatshield.

Tenos (04/05/2020)
We understand that the products are similar, but we would not be comfortable making a statement regarding the performance of a product without testing.

In this case, a comparative study between the two products is acceptable for a high-level assessment (as in this study). However, an independent third-party testing for the intended build-up should be done before commissioning.

Locker (05/05/2020)
As we have noted already, the T83290 independent testing report is against the product Locker Heatshield. In our proposal we are looking to install the Mini ES shield and whilst the report does not reference this as a product we have agreed that the results would be identical as the physical build up of the product remains the same. The only change would be the secondary mesh is to be replaced by the imageperf mesh, providing the secondary mesh to the system, and therefore the performance is replicated by matching the open area/perforations of that of the Locker shield. On this basis, I am not sure what impact this would have on the application as it is identical? Nevertheless, the principle is agreed that the erection of this specific product would not hinder the reasoning for its purpose in allowing for the escape of residents, provide protection to the fire authority to combat a fire and to not impact upon the neighbouring premises by introducing the shield as a mitigation measure. Can you confirm no further info is required to inform your decision based on the application proposals as it stands?

Tenos (11/05/2020 in lieu of email)
On the basis of what Locker have stated, we recognise that the products are similar and subject to the percentage opening area and distribution of opening being very similar Tenos would agree that the performance of the proposed build-up is likely to be similar to that of the build-up tested in TE83290.

However to date, we have only received an un-annotated section of the proposed heatshield fence ("Heatshield fence external works plan Rev04 drawing issued by Corstorphine+Wright Architects on 02/03/2020), and the further information contained in this email exchange. Tenos is not in a position to confirm the similarity between the systems but assume that Locker will be able to do so.

4-6 – Heat flux reduction coefficient

Locker (01/05/2020)
Section 2.24 – "The method for calculating an irradiance reduction within the test report TE83290 was found to be incorrect" – Our test report measures the radiant heat at distances of 150mm, 300mm, 600mm, 1200mm and 1800mm and the results provided are the actual measured results. There is a natural reduction of radiant heat due to distance from the heat source i.e. at a radiant heat of 6.8kW/m²

the radiant heat reduces to 4.9kW/m² at a distance of 150mm (28%), which is increased to 80% reduction with the Heatshield. We state that with a specific front face radiant heat flux, that at a distance of 150mm behind the Heatshield, the radiant heat reduction is 80%. We do not state that an additional 80% reduction is achieved over what would naturally occur. I do agree that the column description in the test report should read "Reduction in irradiance with shield in place" as opposed to Reduction in irradiance due to shield but again this is just the wording, as with a shield in place the radiant heat recorded at 150mm behind the shield is 1.3kW/m² which is a reduction of 80.1% from the heat source of 6.8kW/m². Therefore, I think this section should be reworded as it suggests that we are making improper claims.

I do not agree with the statement in section 3.3 as the radiant heat reduction values are actual measured results obtained from a physical test undertaken and is an interpretation of how the results are presented.

Section 5.2 Table 1 on page 20/39 "average reduction with heat shield" has significantly lower reduction percentages shown than within our own independently verified test data.

The reason for this appears to be caused by the test report isolating the Locker Heatshielding from the natural reduction of radiant heat that would occur within the distance specified as per point 4.

While one could argue that the reduction in radiant heat specifically and only caused by the Locker Heatshielding corresponds to the values listed, it would be incorrect to state that the "average reduction with heat shield" from point A to point B with Locker Heatshielding in place corresponds to the values in the table listed.

The key fact in our data is that from the front of the Heatshield with a radiant heat flux value of X, to a point 150mm behind our Heatshield, the radiant heat will be 80% lower. This is an independently verified fact.

The fact that there would be a natural reduction in radiant heat over the specified distance is slightly irrelevant.

The main point for calculation purposes is that the radiant heat will reduce by 80%, which it will. We suggest the data in this table is corrected or the heading is modified to state "reduction in radiant heat due to Heatshield"

Tenos (04/05/2020)

The output data provided in the test report does not assist an engineer trying to establish the reduction of radiant heat flux behind the heatshield – e.g. a combined reduction due to the heatshield and naturally occurring reduction of heat flux over distance, as detailed in the test report, is not representative of the performance of the heatshield itself.

In certain applications, the test report information would be useful: "a radiant heat flux value of X, to a point 150mm behind our Heatshield, the radiant heat will be 80% lower".

However, our analysis did not evaluate the heat flux at a specific point for a specific HRR that coincided with one of the tested nominal heat fluxes. Accordingly, the dimensionless reduction factor due to the heatshield was calculated.

Should the analysis be used by other parties, or further analysed by us for other scenarios, having a single 'reduction factor' number is useful in both performing the calculations and for the readers to understand the output.

The caption above the table will be changed to "Reduction in radiant heat due to Heatshield".

Locker (05/05/2020)

Agreed principles – we note the amendments to the Tenos report are to be made but confirm the strategy is coherent.

Tenos (11/05/2020 in lieu of email)

Amendments to the report will be made.

7 – Wording in conclusion

Locker (01/05/2020)
Section 6.5 – “While the analysis tools used are likely to overestimate the severity of the fire, it is very likely that a spill pool fire will result in flame height much higher than 4m, and potentially pose a higher level of risk to the housing development if the heat shield is constructed as proposed.” – This statement suggests that a large fire would result in a higher risk with the Heatshield in place, which is incorrect. The Heatshield will allow a means of escape and access for emergency services if the flame height is above 4m.

Tenos (04/05/2020)
Agreed, the paragraph will be rephrased to: “While the analytical tools used are likely to overestimate the severity of the fire, it is very likely that a spill pool fire will result in a flame height higher than 4m. A flame height higher than 4m will pose an unacceptably high risk to the housing development.

Locker (05/05/2020)
Principles agreed - we note the amendments to the Tenos report are to be made but confirm the strategy is coherent.

Tenos (11/05/2020 in lieu of email)
Amendments to the report will be made.

8 – Data in Annex 2

Locker (01/05/2020)
Annex 2 – These tables are based on the difference in radiant heat reduction with and without the Heatshield and do not indicate the overall radiant heat reduction achieved. This is not fully explained so could be misleading to the reader.

Tenos (04/05/2020)
The methodology is discussed in the relevant chapter. Data is the Annex is only a log of all results of the testing report TE83290, and results of our analysis.

Locker (05/05/2020)
Principles agreed

Tenos (11/05/2020 in lieu of email)
N/A.

Important information