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Britten Pears Arts M&E Services

HR1, HR2, HR3

Mechanical and Electrical Design Services

Job No. 5000479

Stage 3 Report

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Appendix A – Builders Work in Connection Report

Appendix B – Redmore Environmental Odour Assessment Report

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1.0 Introduction

This Stage 3 Report has been prepared for the proposed HR1, HR2, and HR3 Workstreams at Britten Pears Arts, Snape Maltings, Suffolk. The services installations will be designed to be cost effective (in terms of both capital and running cost), with a drive on enhancing the sustainability of the systems and ultimately reducing energy usage.

This Stage 3 Report reads in conjunction with other Ingleton wood LLP Documentation that relates to separate workstreams that encompass works across the site as a whole.

2.0 HR1 – Heating Consolidation and District Heating

2.1 Developed Scope of Works

HR1 Workstream involves centralising the site-wide heating systems as far as reasonably practicable, by connecting the Britten Pears Building Plant to the Energy Centre district heating system. This involves running a new below ground district heating pipework circuit from the Energy Centre to the Britten Pears Building Plant Room, and connecting the systems via plate heat exchangers. The methodology behind this is to maximise the output of the biomass boiler, located within the Energy Centre. The new pipework circuit shall run around the path, with three access chambers located along the route.

As we are not adding additional heat input into the system, the boilers are remaining as existing. Naturally the oil-fired boilers within the Energy Centre will run concurrently alongside the biomass boiler, to assist with the additional Britten Pears Plant Room load to the system. To increase resilience, its proposed that additional thermal stores are installed, within an extension adjacent to the Energy Centre. These additional thermal stores will allow the biomass boiler to run for longer periods of time, heating up the larger water volume content within the district heating system.

As the Energy Centre heating demand is going to increase due to connecting the Britten Pears Plant Room to the district heating system, it is expected that the existing Energy Centre oil fired boilers will be activated regularly throughout the colder months. Due to an increase in heating demand, it is proposed that new larger below ground oil storage tanks are installed. This is to extend the period of time between having to refill up the oil storage tanks.

It’s proposed that the existing oil-fired boilers within the Britten Pears Plant Room are retained, to provide back-up support to the district heating system. It is expected that the existing Britten Pears oil fired boilers will be activated regularly in the depths of winter.

2.2 Britten Pears / Concert Hall Plant

The boiler plant located within the Britten Pears service yard plantroom provides heating to various areas including: Britten Pears Building and Trask Café, Riverside Café areas, Concert Hall and Hoffman Building. The plant consists of two number oil fired boilers, a small wood pellet biomass boiler, local fuel storage and accessories. Elements of this plant are at or beyond economic life expectancy, other elements of plant will exceed life expectancy within the next five year period.

The first boiler is a Hoval Euro SR350 oil boiler dated to 1998 and therefore 26 years old and beyond economic service life and due for life cycle replacement. The second boiler is an Ideal Vanguard 830kW boiler dated to around 2009 and therefore 15 years old, however currently unserviceable and disconnected. It is understood that repair works are scheduled to bring this Ideal boiler back into service. This boiler should however be considered for life cycle replacement within the next 5 years. Oil boiler replacements are heavily impacted by Energy Related Products directive.

The 60kW Gilles wood pellet biomass boiler is reported to be unserviceable due to the inability to maintain the installation, and therefore this small biomass boiler is intended to be stripped out. The currently installed total boiler plant capacity to this area is 1,240kW, reducing to 1,180kW when the local biomass boiler is discounted.

Domestic hot water production to the Concert Hall, Riverside and Britten Pears areas is by local electric water heaters, there is no heat input from the boiler plant. The Hoffman building does have domestic hot water heat input from the boiler plant.

Heating is supplied to the Hoffman building by an underground heating connection installed around 2008-2009. Heating pipework also passes externally along the BP Building behind the sprinkler tank to supply a remote plantroom, which in turn serves the Trask Café, Riverside and Concert Hall backstage.

The heating distribution installations within the Britten Pears and Concert Hall buildings are reported to suffer from poor performance, sludging and disruptive air noises. The heating distribution arrangement consists of a mixture of radiators, trench heaters, bespoke heating to Concert Hall. The system also includes air handling plant with heater batteries. It is understood that the heating system currently operates under a traditional 82degC flow 71degC return temperature arrangement. Increasing the temperature drop across the system where possible would better suit the application to district heating, this however could impact the heat output of heat emitters. It is noted in CP1 2020 that heating systems can be altered to 80dedC flow and 60degC return to assist with district heating, most importantly to reduce primary heating flow rates.

2.3 Energy Centre

The energy centre plant has primarily been set up for heating distribution to the residential areas of the site, and additionally includes some retail areas. It is understood that the plant currently serves Buildings 1, 3, 17, 18 and Iken View. There is no domestic hot water storage or generation within the Energy Centre itself, although provides heat input into the domestic hot water plant locally to the residential areas.

The Energy centre contains a Gilles HPKI-K 550 (max 550kW) biomass wood pellet boiler, a Remeha P320 (max 330kW) make up dual fuel* boiler and Remeha P420 (max 540kW) standby oil boiler. The heating installation includes two number horizontally arranged 1,500 litre buffer vessels, feed and expansion plant plus pump sets. The buffer vessels are arranged to provide water content to the heating system for the biomass plant to operate against rather than a thermal storage arrangement. The vessels are too small to form thermal storage, and the horizontal configuration does not suit the temperature stratification required for thermal stores. The plantroom also includes a cold water storage tank and booster set, mechanical control panel. The total current installed boiler plant capacity to the energy centre is 1,420kW.

*Dual fuel arrangements are noted in the archive information although it is understood that the dual fuel arrangement has not been able to work owing to the need for natural gas rather than LPG. This boiler can only operate on oil. The schematic indicates two number oil tanks are installed.

The district heating distribution leaves the plantroom at an indicated size of 100mm flow and return. Information provided by the design team indicates the below ground service running from the energy centre and between buildings 7 and 9.

All plant was installed in 2008, therefore 16 years old. Consideration should be given to the remaining life expectancy of this plant being around 4 years. Oil boiler replacements are heavily impacted by Energy Related Products directive.

2.4 District Heating

District heating distributes from the Energy Centre to Residential areas to the site via underground heating pipework. This in turn serves heat interface units to these areas, providing space heating and domestic hot water generation.

The existing district heating runs in close proximity to the cold water services distribution. This is a legionella risk and cause for concern owing to potential for heat gain from the heating pipework to affect the cold water services. The mains cold water enters the site near to Snape Bridge/the site entrance, and is understood to generally run below ground parallel to the district heating to the Energy Centre located to the rear of the site. The mains water enters the cold water storage tank within the energy centre and boosted cold water then returns back towards the site entry point, running in parallel with the district heating. This is a considerable distance for the cold water pipework to run in close proximity/parallel with the district heating pipework with potential for significant heat gain and temperature rise. There is also concern over the tank located in the biomass plantroom in terms of heat gain and dust contamination from the biomass system. However, resolution of tank issues and cold water pipework heat gains are beyond the scope of this project.

The intention is to increase the coverage of the district heating system to include the heating systems currently served from the Britten Pears plantroom. Existing total plant installation capacities for the Energy Centre and Britten Pears plantroom is 2,660kW.

2.5 Builders Work in Connection

Some builders work in connection to HR1 include:

- Energy Centre new partition wall, between the domestic cold water plant and district heating plant.
- Energy Centre extension, to house new district heating thermal stores and ancillaries.
- Energy Centre external weather louvre, in place of the existing window location to allow natural ventilation and free cooling to the domestic cold water section of the Plant Room.
- External below ground excavations for new district heating pipework.
- Energy Centre trench works for new pipework entry pit.
- Britten Pears Plant Room trench works for new pipework entry pit.

2.6 Provisional Allowances for Direct Electric Boiler Systems and Chilled Water Systems

Within Ingleton Wood's Stage 3 drawing package, there has been allowance for additional unconfirmed systems. These include:

- Direct electric boilers within the Energy Centre Extension. This is so the client can make use of the "free/discounted" electrical energy tariff that occasionally becomes available during off peak periods.
- Chilled water ASHP's, buffer vessel, pumps, and below ground pipework from the Energy Centre to the Concert Hall supply fan. This is provision for supplementary cooling to the Concert Hall, via a chilled water system serving a water coil, part of the supply fan.

2.7 Utilities

The existing incoming cold water gas supplies to the building shall be retained and left in situ. A new water and gas utility supply is not required for the HR1, HR2, HR3 Workstreams. The existing site is to remain as per the existing agreement. A new electricity utility supply is not required for the HR1, HR2, HR3 Workstreams.

2.8 Electrical

The existing incoming electrical switchgear is to remain as existing. The lighting installation will be in accordance with CIBSE Lighting Guides and SLL Code for Lighting 2012. The lighting will be LED linear bulkhead luminaires and will be controlled via manual switches in accordance with regulations and standards.

Room	Lux Level	Lighting control
Plant rooms	200 lux	Manual switch

Emergency lighting shall be provided throughout the area of works comprising integral LED manual/self-test emergency luminaires in accordance with BS5266. Batteries will have autonomy of at least three hours. The testing of emergency luminaries will be key-switched facility where required manually.

Distribution boards and mechanical power supply boards shall remain as existing. IP rated double switched socket outlets will be provided for general maintenance use. These will be fed directly from the existing boards. Additional services in the extension block are to be supplied using steel conduit similar to existing distribution system. The new installations will be in accordance with BS7671:2018.

The existing conventional fire alarm system shall be modified to suit the new layout with a minimum category L1 fire detection and alarm system to BS5839-1:2017. This shall be confirmed in line with the Fire Consultant's recommendations as the design proceeds.

The existing CCTV system shall remain as it exists with all of the work to be completed and the CCTV to remain functional during the works.

3.0 HR2 – Biomass Flue

HR2 Workstream involves upgrading the existing Energy Centre biomass flue to mitigate the boiler emission disturbance, in particular to the residents nearby. Redmore Environmental carried out dynamic modelling for various different scenarios, including the existing set up, flue height of 1m, and a flue height of 3m above the roof level.

Existing flue system

Based on the existing flue and fan, based on a flue height of 0.335m above the existing building (5.335m above ground level) and the diameter of the fan located at the termination point of the flue. The height of 0.335m above the building is based on the drawing attached, as well as the attached datasheet for the Exodraft fan. In regards the diameter of the flue outlet, we have set this at 0.385m within the model in order to reflect the Exodraft dimensions. However, we have calculated an efflux velocity of 7.34m/s for use in the model based on the approximate area of free air movement at the outlet to the fan taking into account the blanking plate on the top of the unit.

The results of the modelling indicate that predicted odour concentrations are above the odour benchmark of 3.0ouE/m3 for 'moderately offensive' odours, as well as the more precautionary benchmark of 1.5ouE/m3 for 'most offensive' odours at the nearest sensitive location to the site. Therefore, a flue extension is required.

Upgraded flue system

Stack height analysis was undertaken using incremental increases of 1m in order to determine the release height required to reduce predicted odour concentrations to below the benchmarks. The results of the analysis indicate that the stack would need to increase by 1m (6m above ground level) in order to remove exceedance of the 3.0ouE/m3, and by 3m (8m above ground level) to remove exceedance of the more precautionary 1.5ouE/m3 criteria.

Ken Baines / BPA advised that the 1m above roof level flue would be preferred. Therefore, Redmore Environmental's Odour Assessment Report reflected this.

The flue design is a specialist design portion and will be carried out by a specialist flue designer, in conjunction with Redmore Environment's Odour Assessment Report.

4.0 HR3 – Site Wide BMS and Red House Boiler

HR3 Workstream involves upgrading the building management systems (BMS) across the Snape Maltings site and the Archive Building on the Red House site. The scope of works includes simplification of the existing controls, while offering additional control leverage from a new remote head end, that can be accessed via a web-link, IP address, or similar. The new head end shall be fully automated and all BMS systems shall be fully controllable via this access location. A draft schedule has been produced, to outline the BMS upgrade works. The BMS upgrade works detailed design shall be carried out by a specialist design contractor.

The existing Trend controls to the Snape site have generally become unreliable, obsolete in terms of support, and parts difficult/ impossible to source. In addition changes to Microsoft Windows support is also affecting the control systems and security. Many control panel touch screen controllers no longer function, leaving the control systems difficult to investigate and operate. The existing BMS controls are to be replaced across the Snape site with a new sitewide system providing a new head end interface. The intention is to provide improved visibility, control and energy efficiency.

BMS panels to the Energy Centre, Hoffman Building were installed 2008, also with a Trend upgrade to the existing Britten Pears Building control panel in 2008. These systems are now 16 years old (the BP Building control panel is older). The Concert Hall has control panels of varying dates of installation.

Ingleton Wood, with assistance from BPA and the wider design team, shall set the general extent and scope of works, employers requirements and description of operations for the specialist design contractor to adhere to.

Location	Upgrade Scope
Energy Centre	Trend IQE View and panel, 2008 (Replace BMS intelligence and accessories. Allowance for 150 points). To include district heating systems and domestic cold water systems.
Britten Pears Plant Room	Trend, 2008. Existing panel (Replace control panel and accessories. Allowance for 150 points). To include new heating and new ventilation systems within Britten Pears Building.
Concert Hall Ventilation Plant Room	Trend, 1999 (Replace control panel and accessories. Allowance for 150 points). To include ventilation systems, LTHW heating pumps and actuators.
Hoffmann Ground Floor Plant Room	Trend IQE View and panel, 2008 (Replace BMS intelligence and accessories. Allowance for 150 points). To include ventilation systems and LTHW actuators.
Hoffmann Ground Floor Underfloor Heating Plant Room	Unbranded control panel. (Replace BMS intelligence and accessories. Allowance for 50 points). To include LTHW underfloor heating systems).
Hoffmann First Floor Underfloor Heating Plant Room	Unbranded control panel. (Replace BMS intelligence and accessories. Allowance for 50 points). To include LTHW underfloor heating systems).
Hoffmann Roof Plant Room	Trend IQE View and panel, 2008 (Replace BMS intelligence and accessories. Allowance for 150 points). To include Roof Level ventilation and domestic hot water systems.
Building 1 Retail Plant Room	Trend IQE View and panel, 2008 (Replace BMS intelligence and accessories. Allowance for 150 points). To include ventilation systems and LTHW heating systems.

Riverside Café	Trend IQ4. (Replace BMS intelligence and accessories. Allowance for 150 points). To include associated heating pumps, domestic water heater and associated trace heating, rainwater pumps, and roof light actuators for ventilation.
Red House Plant Room (off site at Aldeburgh)	Domestic timeclock control (New BMS control panel, including new casing, intelligence and accessories. Allowance for 100 points).

Refer to the appendices for further details. A detailed mechanical control panel schedule shall be produced during RIBA Stage 4 of the design.

HR3 Workstream also includes the replacement of the existing Red House boiler plant at the Red House site. It is currently proposed that the existing natural gas boiler is replaced like for like. However there has been consideration for a direct electric boiler replacement instead. Direct electric boilers would offer far higher running costs (around x4 higher) than a natural gas boiler would offer. Based on the current fuel costs, it is recommended that a gas fired boiler is installed like for like. However if a direct electric boiler is a preference, this could be achieved via extensive electrical supply upgrades to the Red House building, which would most likely involve a new upgraded below ground electrical supply being brought into the Red House Plant Room from one of the other buildings on the Red House site, such as the Archive Building or Library Building.

5.0 Project Risks

The table below outlines the current project mechanical and electrical design risks. These items below should be noted by BPA and wider design team. An M&E designers risk assessment register shall also be produced in due course.

Risk Ref	Overview of work/risk	Risk Item	Detailed Explanation of Risk	Risk owner	Stage 2 Mitigating Measures	Reference Document	Residual Risk	Persons at Risk E - End User C - Contractor P- Public ENV - Environment FM - Facilities	Status (High, Medium, Low,
HR1 Heating Consolidation and District Heating									
HR1-M1	BP1 oil boiler replacement	Hoval Oil boiler Euro SR350 dated 1998, beyond economic service life	The oil boiler is beyond economic service life, likely to fail within next few years. Risk of reduced heating capacity/loss of heating, affecting Hoffman, Concert Hall, Riverside and Britten Pears buildings	Client	Allow within costing to replace boiler and accessories		Medium	E, P, FM	Medium
HR1-M2	BP1 Oil boiler	Ideal Vanguard 830kW oil boiler out of	Main boiler to this area, out of service. Risk of reduced heating	Client	Understood maintenance will be completed prior to construction works		Medium	E, P, FM	Closed

		service during survey	capacity/loss of heating, affecting Hoffman, Concert Hall, Riverside and Britten Pears buildings						
HR1-M3	BP1 Oil boiler	Ideal Vanguard 830kW oil boiler is dated 2009	Plant will be close to end of economic service life when works commence.	Client	Not currently within project scope or budget.		Medium	E, P, FM	Closed
HR1-M4	Energy Centre biomass and oil boiler plant age	Existing plant is already 16 years old	Plant will be close to end of economic service life when works commence.	Client	Consideration should be given to remaining service life vs expenditure.		Medium	E, C, P, FM	Medium
HR1-M5	Energy Centre limited heating oil capacity	Limited fuel capacity may result in loss of back up and/or top up heating	Oil boilers currently only provide back up/top up to residential heating plant. Limited oil tank size may result in loss of heating, particularly due to limited tank level indication	Client	Allow within costing to upsize tanks to increase resilience		Medium	E, P, FM	Closed
HR1-M6	Existing buried heating and cold water pipework	Existing buried district heating pipework is close to cold water pipework, risk of warming up cold water	Risk of elevated cold water service temperatures. Increased legionella risk potential	Client	None possible		Medium	E, P, FM	Medium

HR1-M7	Existing cold water tank in biomass plantroom	Risk of elevated temperatures, dust contamination	Risk of elevated temperatures, dust contamination	Client	It has been proposed that a stud partition wall shall be built between the cold water and heating plant. The existing window shall be replaced for a fixed weather louvre to provide free cooling and natural ventilation. The existing cold water tank shall be wrapped in new insulation to provide additional thermal protection.		Low	FM	Closed
HR1-M8	External works for new district heating	Road closures, disruption to site access/traffic flow	Road closures required to allow excavation works.	Contractor, Client	No alternative service routes possible		Medium	E, C, P, FM	Low

HR2A Biomass Flue									
HR2A-M1	Energy Centre biomass boiler plant age	Existing plant is already 16 years old	Plant will be close to end of economic service life when works commence.	Client	Not currently within project scope or budget.		Medium	E, P, FM	Closed
HR2A-M2	Boiler flue height	Height of flue to be determined by specialist	Height of flue may be different to that anticipated. May involve structural implications. Environmental Heath may require alternative	All	Not currently within project scope or budget.		Medium	E, C, P, FM	Medium
HR2A-M3	Boiler flue works	Biomass boiler out of service during works	Biomass boiler will need to be taken out of service during flue works	Client	Potential temporary boiler		Medium	E, C, P, FM	Medium
HR2 PV									
HR2PV	Listed building constraints	Unable to install PV	Objections to the installation of PV on listed buildings.	Client	Design team Planner, Architect and Engineers to provide details of PV systems for review.		Low	E, C	Low
HR2PV	Structural engineering constraints	Unable to install PV	Weight of new PV systems may have an impact on the existing structure requiring additional structural interventions.	Contractor, client	Structural engineer to review PV details and advise of any concerns.		Medium	E, C	Medium

HR2PV	Electrical Infrastructure constraints	Unable to install PV	Existing electrical infrastructure may require additional works.	Contractor, client	Electrical mains monitoring to take place to advise of any concerns.		Low	E,C	Low
HR2PV	Utility Company Refuses Export	Unable to export	Existing utility infrastructure not suitable for PV export.	Contractor, client	Utility company to confirm that export is possible.		Low	E, C	Low
HR3A BMS									
HR3A-M1	Loss of service	Loss of existing system services during control works and knock on effect to buildings	Where control panels are being worked on, inevitable loss of plant and services.	Contractor, Client	Consider temporary services to reduce impact		Medium	E, C, P, FM	Medium
HR3A-M1	Advances in IT and software systems, future support of BMS	Future support of BMS is vulnerable to technological advances, third party support and market influences	Potential upgrades, changes in software market, operating systems, security protocols, third party support and policies etc may render obsolete	Client	None possible		Medium	E, C, P, FM	Medium

HR3B Red House Boiler									
HR3B-M1	Condition of existing installation	Additional works required to resolve fire stopping, gas meter housing defects		Client	Allow within costs to resolve		Low	FM	Low