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DESIGN PROCESS OF A CRUISE SHIP CATERING SYSTEM

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RISTEILYALUKSEN CATERING JÄRJESTELMÄN SUUNNITTELU

Tämä opinnäytetyö luotiin Seaking Oy:lle. Sen tarkoituksena on tarjota uudelle suunnittelijalle helposti lähestyttävä katsaus yhtiön suunnitteluympäristöön.

Suurin osa nykyään rakennettavista suurista risteilyaluksista rakennetaan täyttämään Vessel Sanitation Program Guidelinesin asettamat vaatimukset. Nämä ohjeistukset on suunniteltu takaamaan terveellinen ympäristö risteilyaluksilla.

Suunnittelun lähtökohtana Seakingilla on, että nämä vaatimukset täyttyvät. Layout ja läpivienti suunnittelu toteutetaan mahdollisimman tehokkaasti, ja kaikki tuotteet tehdään helposti puhdistettaviksi, kestäviksi, käyttäjä- sekä huolto ystävällisiksi.

ASIASANAT:

Design, layout, shipbuilding

BACHELOR´S THESIS | ABSTRACT

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DESIGN PROCESS OF A CRUISE SHIP CATERING SYSTEM

This thesis was created for Seaking Oy. Its purpose is give a new designer an easy overview and understanding of the company design environment and process.

Most of the large cruise ships built today have to fulfil the Vessel Sanitation Program Guidelines. These guidelines ensure healthy environment on board of cruise ship.

Goal of the design at Seaking is to ensure these guidelines are met, layout and precoordination designs are efficient and equipment produced are easily cleanable, durable, user- and service friendly.

KEYWORDS:

Design, layout, shipbuilding

TABLE OF CONTENTS

ABBREVIATIONS AND NOTATION

Furniture	General Term for a shop drawing
Layout	Layout is an accurate overview of an area, in which equipment are placed.
Precoordination	Drawing with penetration locations and details
USPHS	U.S. Public Health Service
VSP	Vessel Sanitation Program

INTRODUCTION

This thesis will go through the very basics of a cruise ship catering system design process. The purpose is to give the reader a general understanding of different phases of the design process of catering systems and of their purpose in the Seaking Finland design environment. It can be used to make new designers familiar with Seaking Finland design environment. Design at Seaking is split between organisations in Finland and Poland. Seaking Finland focuses on functional design and production design takes place in Seaking Poland.

Seaking is a supplier of functional and efficient cruise ship catering systems. The company is a market leader with experience of over 30 years and of over 130 completed cruise ship projects. Delivery of a cruise ship catering system covers the whole process starting from the design by Finland based sales and design departments to installation at the shipyard, depending on what is agreed with the customer. Catering systems are not limited to only company's own stainless steel products but also includes the equipment from large network of suppliers. Seaking offers both standard and highly customizable products to meet any customer needs. The company has its own production facility located in Poland.

DESIGN PROCESS

2.1 Vessel Sanitation Program

The Vessel Sanitation Program was established in 1975 by The Centers for Disease Control and Prevention. It was created to protect the health of passengers and crew of cruise ships by helping the shipbuilding and cruise line industry to develop and implement comprehensive sanitation programs. The VSP 2018 Construction guidelines provide framework for consistent construction and design, and compliance with these guidelines is meant to ensure healthy environment on board of a cruise ship. The VSP guidelines do not prevent introduction of new designs, solutions, materials or technology, and VSP can be requested to review these new proposals. (U.S. Department of Health and Human Services, U.S. Public Health Service & Centers for Disease Control and Prevention 2018, 1-2.)

Any ship entering an U.S. port needs to be in compliance with these guidelines, and in general most of the new large cruise ships built are built to meet the VSP requirements.

2.2 Design process

Design process of a catering system is, by default, straightforward but the increasing complexity, shorter lead times and late modifications constantly put more pressure on the design. This process overview does not capture concept design, but it is talked about later on.

In a completely new area first phase of design is usually a preliminary layout and a specification based on it. At this point changes are easy to do, and there may be several different proposals with different equipment and arrangements.

Once preliminary layout is agreed of, next step is to capture the possible modifications required and update the drawing to be ready for approval. Usually the next layout will also have more details than the simplified proposal layouts had, although it still is not the final layout. Often scupper positions are designed at this stage to give the shipyard the opportunity to review them with the layout and ask for possible modifications before layout is approved.

After layout has been sent to the customer for approval and possible comments have been received, work starts to make it ready for use. Any required details that may have been missing in previous stages are now added. Precoordination and foundation design starts, as the layout should not receive any more changes. In theory, it would be good to already make 3D model of the equipment at this stage to ensure compatibility between equipment, precoordination and foundations. Often this is not possible due to the amount of work it requires, but design is constantly moving to that direction.

Often furniture drawings are left last to be made. This may cause problems for the furniture designer as the possibilities to make changes are limited, but in other hand furniture drawings are not that vulnerable to the modifications driven by the cruise line or shipyard. Most of these modifications are captured in layout before furniture drawing is made, which saves a lot time as the layout is simple enough to modify whereas 3D furniture drawing may be difficult to modify. In some cases, easier solution is to completely redesign the furniture.

2.3 Concept design

Every new shipbuilding project starts with a concept design phase. During concept design phase main focus is to determine the general flow within the ship; how the food is brought on board, how it is distributed and stored on board, where it is being prepared and cooked. Seaking sales department is usually involved in early phase of the concept design, which are often discussed in close cooperation with the cruise line and shipyard representatives. Initial design may start even before shipyard is involved. The role of Seaking at this phase is to provide consultation over the catering areas and solutions and to create rough layouts, with support from Seaking Design department. Often not even the design of ship hull structure is finished at the point of initial designs, which means early layouts are mainly for study purposes and there may be several versions of layouts with different setups. This is to give an idea of the space and equipment needed to reach the requested capacity, and layouts continue to evolve as the design moves forward and limitation set by the ship structure become clearer.

2.4 Specification

Once the concept and space requirements of catering areas have reached sufficient level and there are no longer major changes to be expected, Seaking will create a specification with all the catering area equipment in the company scope included. This means the specification will not only hold equipment produced by Seaking, but also all of the subcontractor products supplied through Seaking. Typically these subcontractors are contacted during concept design phase to get up-to-date information regarding the equipment. Especially for larger equipment such as dishwashers and ovens, it is important to have latest information available. Depending of the customer, additional equipment and information may also be added in to the specification. This may be anything from equipment that ship owner delivers themselves to safety related equipment that are not part of catering contract as they are, but are in a way or another connected to catering equipment.

The specification usually is used by the shipyard to ask quotes from several catering system contractors, including Seaking. Contract is then based on this specification, and the project will move from sales department to design- and project departments that will handle the project until the ship is delivered to the cruise line.

LAYOUT DESIGN

Layout drawing in consists all the details shown in the layout drawings. These details include the layout drawing itself but also foundation and precoordination that are drawn in the same drawing. All of these details are drawn in different levels within the drawing, making it possible to separate them into their own entities.

3.1 What is layout?

In Seaking environment, layout can be split into different entities. Layout is an accurate overview of the area, in which equipment are placed. Each of these equipment can be understood to have a layout of its own. Subcontractor equipment in layouts are usually just space reservations, but for example a cooking counter has a layout of its own where the counter structure and cooking equipment within the counter are accurately drawn. This furniture layout is used to ensure the furniture has enough space to fit all the required features and to be functional in use. Furniture layout is the base on which the furniture design will be based later on, and the final product has to fulfil requirements set by the layout. Level of detail shown in furniture layouts varies greatly, but usually the idea is to keep it as simple as possible and only show details that are connected to other parts of the layout or matter for the usability of the furniture or the area layout, and leave the small details for furniture designer to decide.

Area layout consists of these smaller layout entities, such as furniture and equipment that are placed within the area. In a large cruise ship, there are a lot of variation between area sizes; smaller areas such as cleaning lockers might only contain a single mop sink whereas ship main galley may contain hundreds of items. Goal of the layout is to give reader a proper idea of the functionality of the area – How people move within the area, where food is prepared for cooking, where does the cooking happen and where is it being served. A good layout design attempts to minimize the amount of unnecessary movement and uses the available space efficiently. It clearly shows the flow of the area as well as different work stations. When equipment that work together are also placed close to each other, the galley is more pleasant environment to work at and saves time, energy and money.

Every ship designed at Seaking is designed to be in compliance with United States Public Health Service rules and VSP Construction guidelines. This means that all the equipment are designed to be user friendly and easily cleanable and layout provides enough space for cleaning and service access. The layout design focuses on area flow in order to minimize the risk of cross-contamination.

3.2 Layout

Seaking Design department usually starts the layout design with the preliminary layouts created at concept design phase. The level of detail of these layouts may vary, main focus at concept phase being at the functionality of the layout. Some areas may be intentionally filled with simple space reservation models that are to be re-designed once concept of the area has been finalized, while some may be nearly ready to use as they are. Layouts always go hand-in-hand with specification, which also is based on the concept phase and kept up-to-date as layouts evolve.

Preliminary layouts go through review round with USPHS inspector. While the layout designer will start off with a previously made layout, it is their responsibility that the layout and all of its details fulfil USPHS and VSP requirements, and that the possible comments given during the USPHS review have been taken care of before releasing the final layout.

Amount of details and data required in finished layouts varies between different cruise lines and shipyards. At one shipyard it may be crucial to draw all the structures inside Seaking technical space in order to provide enough information for the shipyard to design location of pipe and cable connections, while at other shipyard this precoordination may be handled by Seaking as well which makes the additional details in familiar products less important. Layout may include information about ceiling- and wall support structures required for installation, as well as of hoods and canopies above the equipment.

Everything in the layout is drawn on same scale, and this drawing will be used as base for construction of the area. Furniture drawings will be created according to furniture layout, hood and canopy drawings will be created based on the sizes requested in the layout and eventually the installation on board will be based on the dimensions measured in the layout.

3.2.1 Layout workflow

Layout revisions usually follow customer's system. In theory, every layout sent out to customer is a new revision, but occasionally exceptions to this rule are made. Also the way different customers want to revision layout drawings may differ.

Layout might return under work nearly immediately after it is sent to a customer. The layout sent to customer, however, needs to remain as latest valid drawing even if changes are made on it by Seaking.

3.3 Precoordination

Precoordination means planning the location and size of the scuppers and of all the connections that the catering equipment require. All the required deck, ceiling and bulkhead penetrations of the area will be visible in one single drawing. The location of these penetrations is based on the layout drawing and are created in cooperation with the shipyard. Shipyard will make their piping and electrical diagrams based on the locations requested in precoordination drawing. Amount of data shown in precoordination drawings varies depending of the scope of the project, and in some projects precoordination is done by the shipyard based on the Seaking layout.

Connections shown in precoordination may include, for example:

- Drains
    - Ships may have several drain systems
- Catering management system
- Hot water, potable
- Cold water, potable
- Cooling water (non-potable)
- Cooling liquids
    - Brine
    - Freon
- Waste vacuum system
- Compressed air
- Steam
    - Inlet

    - Outlet
- Electricity
    - Different voltages
    - Uninterruptible power supply
- Data
    - Point of sale
    - Phones
    - Printers
- Multiflow
    - Soda
    - Juice
    - Beer

Consumption data of the equipment is given in the specification, and then brought in to the precoordination drawing. In precoordination drawing the location of the penetration is designed according to the equipment locations and ship structure. Typically the pre-coordination drawing has to give its reader at least the following data:

- Location of penetration
    - Bulkhead
        - Height on bulkhead
        - Dimensions given from ship structure
    - Ceiling
        - Dimensions given from ship structure
    - Deck
        - Dimensions given from ship structure
- Type of penetration
    - Each ship has its own standard for different types of penetrations
        - Potable water
        - Electricity
        - Cooling liquids
        - Steam
        - Etc.
- Size of penetration

- Has to meet ship standards for informed consumption

Usually the shipyard will create the penetration on board and Seaking will continue from there to connect it to the equipment. As the penetrations are created before equipment are present, it is crucial that any modifications required in layout or specification are also captured in precoodination drawings, and vice versa. However, it is important to notice that depending of the project, the drawings are not necessarily linked to each other and may exist in different revisions.

Like layout, also the precoordination goes hand-in-hand with specification. Any consumption data given in specification has to be found in precoordination drawing as well. As shipbuilding industry moves forward and ships are being built more efficient than ever before, the amount and quality of data required is also growing.

3.4 Foundation

All the equipment that are not portable need to be fixed on board. VSP construction guidelines give specific rules on mounting the equipment that is installed on legs to be continuously welded on stainless steel pads or plates on deck (U.S. Department of Health and Human Services etc. 2018, 34). Typically this means easily cleanable stainless steel foundation slightly higher than the finished floor level.

For equipment not mounted on legs, VSP construction guidelines require a sealed-type of stainless steel foundation. This foundation needs to be high enough to leave at least 100 millimetres between finished floor level and the bottom of the equipment, the equipment cannot overlap the foundation by more than 100 millimetres and the equipment mounted on top needs to be fully sealed to the foundation. (U.S. Department of Health and Human Services etc. 2018, 34.) The foundation either needs to have coving or raised floor tiles need to be installed against it to prevent 90 degree angle between floor and the foundation in order to keep it easily cleanable.

Foundations are always designed according to the layout. Depending on how the equipment is designed on the layout, either high or low foundation needs to be designed for it. In some cases, such as roll-in refrigerators, equipment is installed on a low foundation without legs. Heights of the foundation always depend on the standards agreed per project, as well as of the standards set by the cruise line. By default, there are usually few standard heights agreed for each project.

Floor plan for the area plays big part when designing foundations. Foundation always needs to be adjusted according to the floor level. Mainly these differences come in special cases, such as floating floors. Low foundation always needs to be slightly over the floor level. If it is too high compared to the floor, there will be difficult-to-clean angle between the floor and foundation. If lower, any water will stand on top of the foundation as the floor around it prevents it from getting out. In case of a high foundation, the foundation will always need to fulfil the minimum height requirement from finished floor level, and the coving will need to be adjusted on floor level to prevent difficult-to-clean angles.

FURNITURE DESIGN

In Seaking environment, “furniture” is general term for a shop drawing. The term as it is does not describe the product itself, but a furniture drawing can be created for anything from a wall shelf to grease filter canopy. Design of the equipment is split in half, where the design department in Finland makes the functional design for customer approval and design department in Poland makes the production drawing out of the approved drawing. All the furniture, however, should be designed to be easily produced already in Finland.

4.1 Furniture design process

Furniture design process always starts with a layout, or at least with specific details provided. Starting point of furniture design is that all the equipment made by the company need to be compliant with USPHS rules, easily cleanable, user- and service friendly. It needs to be in accordance with the layout and precoordination drawings, as well as the specification. Furniture drawing should follow the furniture layout in size and location of the equipment, but any details not shown in the layout remain for the furniture designer to decide in order to make the furniture as functional as possible. If furniture does need to be designed in a different way compared to layout, this information also needs to be updated in layout and any other drawing it might have effect on, such as precoordination and foundation drawings. It is important to notice that the furniture design often takes place when ship is already being built and any major modifications may be difficult to implement. This is the case especially in ship series where only small parts of the areas are changing from previous.

Shop drawing created by design department in Finland needs to be easily readable and understandable and should not present any information not important for the functionality of the equipment or for coordination purposes with for example the decoration attached to it on board. In case something needs to be out of production standard, it is of course important to note in the drawing for the designer who prepares the production drawing.

4.2 Furniture approval process

Furniture drawings are checked by Manager of the Design department or alternatively by the project chief designer prior being sent to the customer. Usually furniture drawings go through one approval review where they are sent to the customer.

If the review results in to comments, these comments are updated to the drawing or refused before releasing the drawing for production.

Drawing that is released to production is often also shared with the customer, who then can share it with for example companies that are responsible for designing decorative parts connected to the Seaking stainless steel furniture. At this point, no further comments usually are accepted but they have to come in as official change request instead.

FINALLY

The purpose of this thesis was to give a designer who is new to catering systems and its phases a quick overview of the design process. There haven't really been any kind of guides that would open up the design process as a whole, in simple and easily understandable way. Obviously design process has a lot more factors than captured here, but hopefully this thesis gives a good first step in their career with catering systems.

Writing this thesis has forced me as a designer to have critical look in to design process and to really try understand why different phases are created the way they are and what are their connections between each other. It has helped me to gain a better understanding of the design environment.

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