An urgent need for additional prison capacity in Norway has resulted in the Directorate of Public Construction and Property Management (Statsbygg) and the Directorate of Norwegian Correctional Service (Kriminalomsorgen) developing a functional standard for prisons, along with an accompanying module-based prison concept called the M2015. By standardizing and designing for modularization, the expectation is that prisons can be planned and delivered faster, with high quality and at lower cost than with traditional building. We have performed 6 case studies, of which 4 are of prisons, in order to evaluate the extent of which the expected beneficial effects have materialized. Our findings are in line with the optimistic expectations; the concept has delivered expected benefits.

By project delivery, we include planning and construction time. In our attempt to answer the research question, we have identified the following sub-questions:

- Which benefits are expected in the process, most notably a shallow pool of capable suppliers.
- To what extent have the expected benefits materialized and how can we explain these experiences?
- How can the M2015 concept perform in different contexts?
- How do we improve the concept going forward?

Standardization and Modularization of Prisons

Andreas Økland*, Agnar Johansenb, Teresa Bestec, Endre Gjesteb
c

*Norwegian University of Science and Technology, Trondheim 7491, Norway
b*SINTEF Technology and Society, Trondheim 7491, Norway
cThe Directorate of Public Construction and Property Management, 0155 Oslo, Norway

Abstract

An urgent need for additional prison capacity in Norway has resulted in the Directorate of Public Construction and Property Management (Statsbygg) and the Directorate of Norwegian Correctional Service (Kriminalomsorgen) developing a functional standard for prisons, along with an accompanying module-based prison concept called the M2015. By standardizing and designing for modularization, the expectation is that prisons can be planned and delivered faster, with high quality and at lower cost than with traditional building. We have performed 6 case studies, of which 4 are of prisons, in order to evaluate the extent of which the expected beneficial effects have materialized. Our findings are in line with the optimistic expectations; the concept has delivered on time, cost and quality compared with earlier prison projects. Still, some challenges with the concept have been identified during the process, most notably a shallow pool of capable suppliers.

Keywords: modularization; industrialized building; sustainability
1. Introduction

The construction of prisons can be a long process; deciding on location and finding suitable plots, going through the regulation process (including potential objections of neighbors and local businesses), designing and finally erecting the buildings and putting them to use regularly take more than 10 years. A growing need for prison capacity over the last decade coupled with growing need for maintenance and rehabilitation of current prisons and a shift in political priorities have resulted in an acute need for new prisons capacity in Norway. A temporary solution has been for the Directorate of Norwegian Correctional Service to be renting prison space in the Netherlands, flying prisoners out of the country to serve their sentence. In order to provide sufficient local long-term capacity, construction of new prisons is imminent, and fast project delivery is of the essence.

To facilitate fast planning and construction of prisons, a standardized set of functional requirements have been developed by the Directorate of Public Construction and Property Management (Statsbygg) and the Directorate of Norwegian Correctional Service (Kriminalomsorgen) in the years 2014-2015 [1]. The functional requirements subsequently served as starting point for the development of the M2015 prison concept. The M2015 is based on a combination (hybrid) of traditional place building for the first floor of the prison (which is multi-purpose) and modular building for the two upper floors that houses the prison cells. The M2015 concept does not represent the single solution to fulfilling the standardized functional requirements. However, by proposing a standardized concept for the design and construction methods of prisons, hopes are that learning effects and economies of scale can provide the grounds for fast and efficient delivery of national prison capacity in the upcoming years.

Modular construction, the use of pre-assembled volumetric units that constitute the majority of the actual building (including the load bearing structure) [2] can provide for shortened construction time and increased reliability and quality. Modularization allows for parallelization of tasks in construction projects, as groundwork and module construction can be executed at the same time. Modularization also provides potential cost savings due to specialization in tasks, application of manufacturing approaches in production and increased ability for learning. Blismas, Pasquire [3] point out that evaluations of off-site construction versus on-site tend to have a narrow focus on cost, ignoring both “hidden costs” and benefits. Modularization provides potential for reducing common sources of construction waste such as waste due to design changes, leftover material scraps, wastes from packaging and non-reclaimable consumables, design/detailing errors, and waste due to poor weather [4-6]. Modularization can also facilitate planning and design, saving both time and resources, especially when coupled with standardization of projects where whole or parts of the building design is transferred from previous projects. Modularization generally provides reduced internal project uncertainty (such as lower risk of defects or damages) [7]. Modularization can also reduce external uncertainty as shortened lead times means decisions in planning and design can be made closer to the point in time when the building will be in use[8]. Prisons regularly consist of high repetitive units (many identical cells). It has also been a political view that prisons of equal security class should be equal in most aspects. These two traits combined indicate that standardization and modularization is a sensible strategy for prison construction. In this article, we investigate this further as we propose the following research question:

- Is standardization of requirements and modular construction a good strategy for quick delivery of (high security) prisons?

By project delivery, we include planning and construction time. In our attempt to answer the research question, we have identified the following sub-questions:

- What are the effects on time and costs of the M2015 concept compared to traditional prison construction?
- What are the effects of standardization and modularization on project uncertainty?

6 case studies provide the data; four of which are prisons either planned or constructed, and two of which are transit/holding facilities for the immigration authorities. Only the prisons employ the M2015 concept, but the transit/holding facilities provide a benchmark for comparison as these also consist of modules and employ comparable security measures in the building construction. In the following chapters we will discuss how standardized design and...
دریافت فوری
متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات