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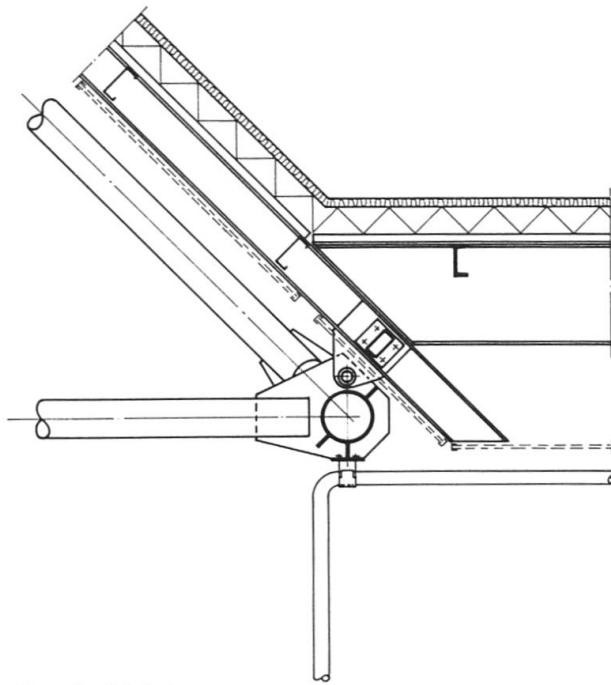
## 7. Bottling Plant at the Carlsberg Breweries, Copenhagen (Denmark)

**Client:** United Breweries  
**Main Consultant:** Danbrew  
**Architect:** S. Højby Rasmussen  
**Structural Engineers:** Cowiconsult  
**Structural Steel Contractors:** HEAS AS  
 Christiani & Nielsen AS  
**Construction time:** 12 months  
**Service date:** 1984

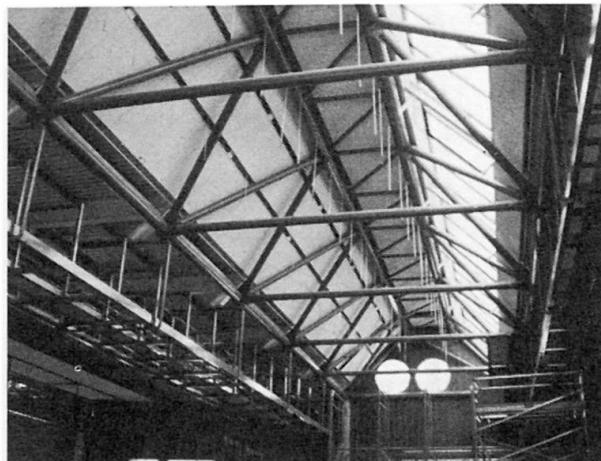
### Introduction

As part of a major modernisation programme for the Carlsberg Breweries, a new bottling plant has been designed and is now under construction. The plant will have a capacity of 78,000 Pilsner per hour and is based on the most advanced technology. Great emphasis has been placed on creating the best environmental conditions possible for the employees and for the residents neighbouring the site.

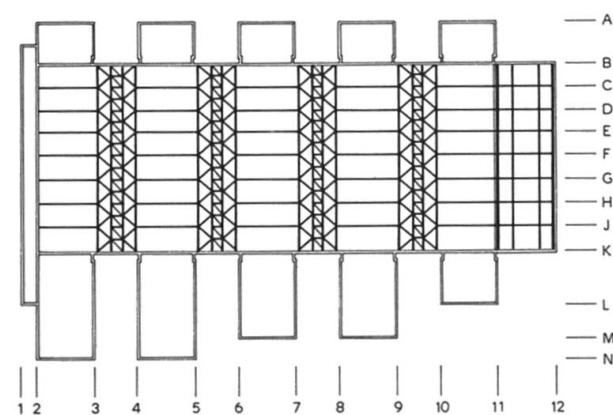
The building layout comprises a main building body with ten smaller buildings projecting from the facades. The bottling plant is located in the main building and is designed with the production area free from columns and obstructions from mechanical and electrical services. The supplies are provided from pipebridges suspended from the roof structure. Furthermore the main building contains a section for the continuous unloading and loading of trucks. The smaller buildings house service functions such as locker rooms, offices, stores and workshops. Gardens are situated between the buildings. Ventilation plants and mechanical equipment are located in the basement.



*Detail of joint*



*Interior view*



*Building layout*

### Technical Data

|  |  |
|--|--|
| Total floor area:  | 10,000 m <sup>2</sup>  |
| Free span in bottling hall:                                    | 44 m   |
| Substructure:  | Reinforced concrete  |
| Roof structure:  | Main building – structural steel                             |
|  | Service buildings – prestressed reinforced concrete elements |
| Facades:   | Double leaf masonry walls                                    |
| Structural steel weight (for roofs, facades, and pipebridges): | 500 t  |

### Steel Structure

The roof of the bottling hall forms a shed roof with four steel trusses comprising the main structure, each of which are supported by four reinforced concrete columns.

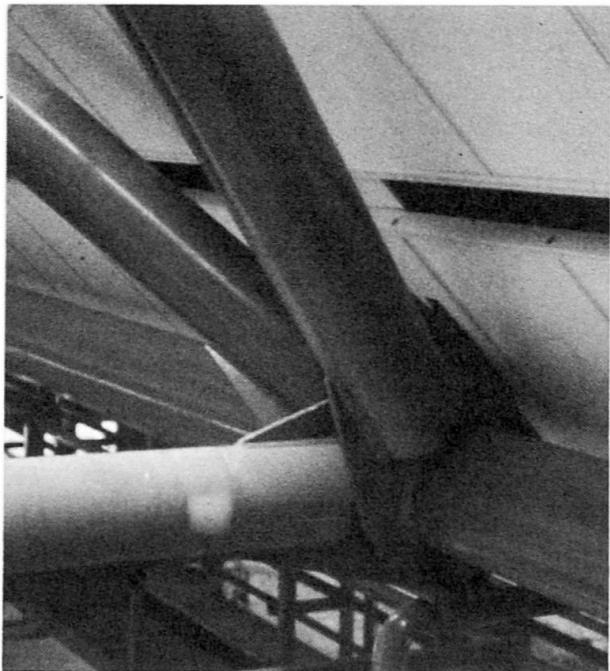
The trusses have a trapezoidal cross section with a maximum width at the bottom of 8.6 m and a height of 3.5 m. Bracing members are arranged only in the top level and the sloping sides of the trusses. As there is no bracing in the bottom level of the trusses, unsymmetrical loads are catered for by providing bracings between neighbouring trusses which restrains the bottom chords.

All members in the trusses are circular hollow sections of steel grade St. 52.3. The joints are designed with gusset plates that form a saddle over the top and bottom chords. This design has been chosen primarily for esthetical reasons but the contractor has found the solution to be also economically favourable.

The secondary roof structures consist of standard sections that allow for arbitrary suspension of services etc. These structures are supported by the trusses at the bottom joints only and are arranged in such a way that only the main trusses are visible from below the suspended ceiling.

### Erection of the Roof Structures

In order to achieve the specified quality a careful quality control system has been carried out by the consultants' supervision. Due to transportation the



*Bottom joint*

main trusses were manufactured in sections at the workshops and assembled on the site under the cover of two large tents. Only shop priming was applied before arrival at the site. The trusses were completed inclusive of the final paint at ground level i.e. before erection.

*(A. G. Frandsen)*



*Building under construction*