DREAMERS

Design REsearch, implementation And Monitoring of Emerging technologies for a new generation of Resilient Steel buildings

Report on the erection of the building and the main construction phases

Deliverable D5.1.2

WP 5 - Task 5.1: Building Construction and site supervision

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1. INTRODUCTION

This chapter provides a comprehensive overview of the site selection and initial site-context analysis for the new building realized at the University of Salerno. In this chapter, every stage of the building's realization-from the initial excavation works, through structural assembly and enclosure, to the final fit-out and commissioning-culminating in a fully operational facility ready for research activities have been documented.

2. ERECTION OF THE BUILDING AND MAIN CONSTRUCTION PHASES

2.1 Location of C3 Building in the Campus Area

Figure 6.1 presents an aerial and close up photograph that situates the future building within the broader campus environment. This aerial photograph presents the full University of Salerno campus, with the FRCS-funded building site highlighted in red. From this vantage point you can see how the new facility will integrate into the broader academic environment. The marker shows the exact footprint of the upcoming construction, providing a clear sense of scale against the surrounding university infrastructure.

Figure 6.1 – Location of the building in the general area

In close-up image of Figure 6.2, the future building site sits at the heart of three key campus amenities: directly to the east is the main student canteen, ensuring easy access for both staff and visitors; to the north are the student residence halls, facilitating quick transit between living quarters and research spaces; and to the south, the covered parking lot equipped with photovoltaic panels, underscoring the project's commitment to sustainable energy. This perspective illustrates not only the site's immediate neighbors but also the strategic placement that maximizes convenience, social interaction, and environmental performance.

Figure 6.2 – Location of the building in the local area

2.2 Excavation Phase

The initial phase of construction involved excavating soil for the the realization of the retaining wall and for the building's foundations (Figure 6.3). As can be seen from Figure 6.4 part of the ground coming from the excavation has been stored near the site.

The possibility of storing the ground near the site provides several advantages. In fact, the on-site storage strategy not only significantly reduces earth-moving distances—thereby cutting fuel consumption, equipment wear, and labor hours—but also drives down overall backfill costs behind the retaining wall and within the foundation trenches. By minimizing haulage, we achieve both economic savings and a smaller carbon footprint, supporting the project's broader commitment to resource efficiency and environmental sustainability.

Figure 6.3 – Excavation Phase

Figure 6.4 – Ground stored near the construction site

2.3 Realization of the retaining wall

2.3.1 The Foundation

Upon completion of the excavation phase, the construction started with the realization of the foundation of the retaining wall. Figure 6.5 and illustrates the placement of the reinforcement and the subsequent pouring of the foundation.

Figure 6.5 – Positioning of the rebars for the foundation

Figure 6.6 – Concrete casting of restraining wall

2.3.2 The Wall

Once the foundation was complete, the reinforcement for the retaining wall was installed (Figure 6.7). Self-climbing formwork was used for the concrete pour. The use of this system speeded up the operations and entirely eliminated the need for disposable formwork (Figure 6.8).

Due to the use of the climbing formwork, it was impossible to realize the staircase and the cantilever slabs at the same time of the retaining wall. Their casting was so postponed, in Figure 6.9 the starter bars of the slabs and the reinforcements of the staircase are clearly visible when the retaining wall was completely casted.

Figure 6.7 – Positioning of rebars of the retaining wall

Figure 6.8 – Self-climbing formwork

Figure 6.9 – Staircase and cantilever slabs realized on the retaining wall

2.4 The Foundation of the Building

Once the lean-concrete blinding layer was poured, it became necessary to precisely position the structural columns. To that end, temporary bracing was installed to maintain the correct mutual spacing of the columns.

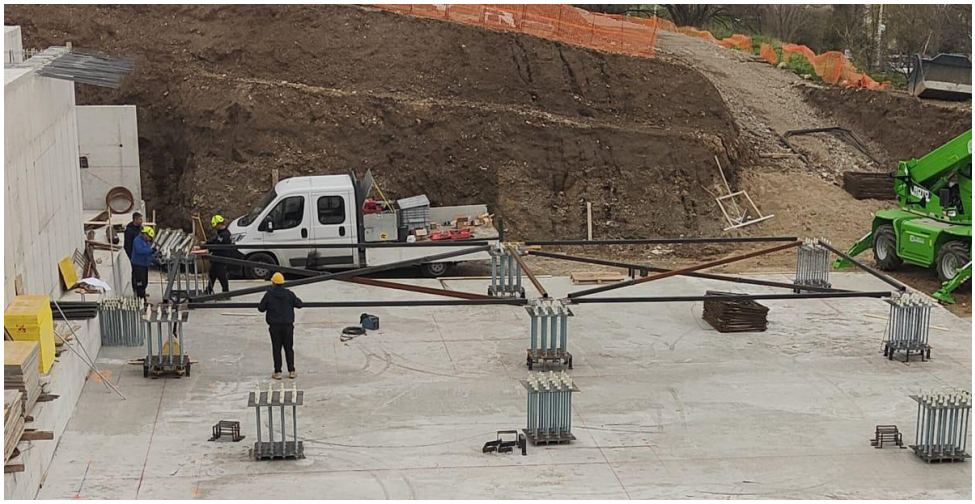

Figure 6.10 – Positioning of the base of the steel columns

The threaded rods - onto which the steel columns would later be connected - were then held in place by dedicated base plates, suitably anchored into the blinding concrete (Figure 6.11).

Figure 6.11 – Staircase and cantilever slabs realized on the retaining wall

Once the base plates and threaded rods intended to receive the steel columns were anchored into the blinding concrete, the temporary bracing was removed, and all of the foundation reinforcement was installed (Figure 6.12 and Figure 6.13).

Figure 6.12 – Foundation reinforcement

Figure 6.13 – Foundation reinforcement

The foundations were cast in three successive pours: first the larger base of the inverted foundation beams were formed (Figure 6.14); next, the beams were poured up to the level of the plates designed to receive the steel columns (Figure 6.15); and only in a final stage - as shown later - was the remainder of the foundation beams cast, fully enveloping the bases of the steel columns.

Figure 6.14 – Concrete casting of the larger base of the inverted foundation beams

Figure 6.15 – Concrete casting of the upper part of the inverted foundation beams

At this stage, it was necessary to fill the space between the foundation beams. For this operation, the soil previously stockpiled during the excavation phase was used (Figure 6.16 and Figure 6.17).

At this point, it was possible to realize the slab forming the base for the positioning of the iglù fromwork (Figure 6.18).

Figure 6.16 – Filling of the spaces between the foundation beams with the soil coming from the excavation phase

Figure 6.17 – Filling of the spaces between the foundation beams with the soil coming from the excavation phase

Figure 6.18 – Realization of the concrete slab constituting the base for the iglù formwork

2.5 Erection of Steel Columns and Steel Beams

At this stage of the construction, only the bars for the steel columns and the bars for completing the upper part of the foundation beam protrude from the foundation. So that the steel column can be easily positioned (Figure 6.19). Once all the vertical steel parts have been placed, the steel beams could be positioned as reported in Figure 6.20 and Figure 6.21. Finally, in Figure 6.22 there is the wiew of all steel columns and steel beams of the structure.

Figure 6.19 – Erection of steel columns

Figure 6.20 – Erection of steel beams

Figure 6.21 – Erection of first steel beam equipped with Freedam connections

Figure 6.22 – Erection of first steel beam equipped with Freedam connections

2.6 Realization of the Upper Part of the Foundation and Positioning of Iglu' Formwork

At this stage there is the need of completing the foundation. First of all, the additional reinforcements have been placed as reported in Figure 6.23, and then the Iglù formwork have been positioned for the realization of the crawl space (Figure 6.24 and Figure 6.25). In this way the upper part of the of the foundation and the crawl space can be realized together, with the same concrete cast (Figure 6.26).

Figure 6.23 – Additional reinforcement for the completion of the foundation

Figure 6.24 – Positioning of the Iglù formwork

Figure 6.25 – Positioning of the Iglù formwork

Figure 6.26 – Concrete casting of upper part of the foundation and of the crawl space

2.7 Realization of the First Floor

2.7.1 Assembly of Cofradal for the first floor

The assembly of the Cofradal panels was very straightforward because, as shown in Figure 6.27, it can be moved without mechanical equipment. Such equipment was only used to lift the Cofradal panels from the ground floor to the first floor (Figure 6.28).

Figure 6.27 – Assembly of Cofradal panels for first floor

Figure 6.28 – Handling of Cofradal Panel from ground floor to first floor

2.7.1 The slab in correspondence of the Freedam connections

At the Freedam connection, particular care was taken to decouple the slab from the steel beam. In particular, attention was paid to executing the construction detail exactly as it had been carried out during the laboratory tests (Figure 6.29). This can assure that in case of seismic events the damages of the slab are negligible and that the behaviour of the Fredam connection is not influenced by the presence of the slab.

Figure 6.29 – Comparison between the specimen tested in lab and the connection realized in situ

2.7.1 Concrete casting of the first floor

When al Cofradal panels and all the additional reinforcements have been positioned, the concrete casting of the first floor has been realized in one day without any interruption (Figure 6.30).

After some days from the concrete cast, according to the design provision, the screed has been realized (Figure 6.32).

Figure 6.30 – Concrete casting of the first floor

Figure 6.31 – Realization of the screed

2.8 Realization of the Second Floor

The second floor is the same as the first floor. In Figure 6.32and Figure 6.33 some photos related to this step have been reported.

Figure 6.32 – Realization of second floor

Figure 6.33 – Realization of second floor

2.9 Realization of the Third Floor

The third floor is the same of first two floor except for the additional presence of the parapet wall. In Figure 6.34 and Figure 6.35 some photos related to this step have been reported. Furthermore, the specified thermal insulation and waterproofing were installed on the roof as shown in Figure 6.36.

Figure 6.34 – Realization of third floor

Figure 6.35 – Realization of third floor

Figure 6.36 – Thermal insulation and waterproofing of third floor

2.10 Realization of Staircase

As provided in the final design, the staircase was constructed in reinforced concrete and is arranged around the steel elevator core. Reinforcements and concrete cast are reported in Figure 6.36 and Figure 6.37, respectively.

Figure 6.37 – Staircase reinforcements

Figure 6.38 – Concrete casting of staircase

2.11 Realization Building Services, External and Internal Finishes

Once the structural elements have been completed, electrical installations for power and lighting, plumbing systems for water supply and drainage, installations for heating, ventilation and Air-Conditioning have been togheter with internal and external partition walls have been realized. Some photos related to these steps are reported in Figure 6.39 - Figure 6.42

Figure 6.39 – Installation of building services

Figure 6.40 – Installation external and internal partition walls

Figure 6.41 – Windows installation

Figure 6.42 Installation of the suspended ceiling and painting of the interior and exterior walls

Figure 6.43 Installation of the external sunshades