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Leonardo Paris
Architect, Ph.D, associate professor of Sapienza University of Rome, director of the Master in Green Bim and Architectural Engineering. He focuse on the study of shape and geometry in architecture, engineering and design. He deal with descriptive geometry, digital survey with 3D acquisition and modeling advanced technologies and visual communication applied to the enhancement of cultural heritage.

Maria Laura Rossi
Engineer, Ph.D and researcher of Sapienza University of Rome. Since 2018 she has been a teacher at national and international second level university degree and master courses. She carries out research activities in the field of integrated digital surveying and parametric digital modeling in BIM/HBIM environment, coordination and validation of integrated information processes.

Archival Documentation and Informed Modeling. New Opportunities for Knowledge and Enhancement of Architectural Archives

The history of the Universal Exposition in Rome, known as “E42,” is connected to a period of significant political, social, cultural, and economic transformations at both national and international levels. It also coincided with profound changes in architecture, urban planning, design, and the emerging construction industry.
Like other major building projects of that era —such as the University City, the Foro Italico in Rome, and the new foundation cities at the national level— E42 represents a new way of understanding architecture, both from a design perspective and in terms of the entire construction process.
The relevant historical documentation is now preserved at the Central State Archive, a building whose location is an integral part of the original E42 project. A substantial portion of this documentation relates to architectural plans and projects.
The archive not only contains graphic documentation but also includes all the records that document the entire construction process—often complex, layered, and evolving over time. This documentation is essential for understanding a cultural heritage recognized as both material and immaterial.
The study therefore focuses on representing architecture as a visual language and a synthetic expression of ideas related to space and aesthetics. It considers new forms of digital representation —such as informed, parametric, and virtual perceptive models— that are crucial for an innovative use of archival materials. These tools can enhance our knowledge and understanding of this important historical asset.

Keywords:
Informed Modeling; State Archive; EUR42; Rationalist architecture; Ex *Bonifiche*

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INTRODUCTION

The architecture archive constitutes a locus of knowledge, memory, and conservation. Recognized as a form of cultural heritage [1], it manifests itself architecturally as a dedicated physical structure while simultaneously serving as the custodian of the architectural heritage it safeguards. Within its scope converge a multiplicity of functions: the conservation and safeguarding of materials, the facilitation of consultation and advanced research, the dissemination of knowledge, and the promotion of architectural culture. This convergence necessitates the involvement of diverse professional competencies, ranging from those strictly concerned with archival science and material preservation, to those responsible for user assistance and public engagement, as well as those involved in curatorial practices and the organization of exhibitions and commemorative events. Among the heterogeneous corpus of materials typically preserved —comprising institutional and private correspondence, project reports, technical and cost estimates, sketches and annotations, photographs, slides, and physical models— the architectural drawing emerges as the object of greatest scholarly interest, particularly within the field of modern architectural historiography. [Menchetelli, 2016] Architectural drawings represent an extensive iconographic repertoire with autonomous documentary and interpretive value. They provide critical testimony to the evolution of representational techniques and graphic communication practices over time and across cultural contexts. As such, they serve as a privileged instrument for reconstructing the development of architectural language, offering insight into the relationship between architectural thought and its historical, artistic, and socio-cultural milieu. [Garagnani *et al.*, 2012] In recent decades, scholarly attention toward the archives of modern architects has intensified, reflecting a broader historiographical shift toward the critical analysis of the design process. This methodological orientation has placed the architectural drawing at the center of academic inquiry, recognizing it as a foundational component of the creative process —both in its temporal dimension, as a precursor to construction, and in relation to the intellectual trajectory of the designer. [Capanna, 2006] Within this framework, the digitization of architectural drawings and their associated documentation assumes a role of fundamental importance. The digital reproduction of such materials ensures the preservation of both their physical integrity and informational content, mitigating the risks associated with direct handling of fragile, light-sensitive, and physically unstable supports. Moreover, digital archives facilitate more efficient access to archival resources, bypassing administrative barriers and reducing consultation delays —particularly relevant in cases where archival materials are stored in geographically or environmentally distinct locations due to specific conservation requirements.

Fig. 1 - Territory of the abbey complex on the outskirts of Ostia, used until then almost exclusively for subsistence agriculture and small pastures (Central State Archive - ACS, Photographic miscellany)

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Crucially, the digital transposition of drawing materials —while retaining the analog qualities of the original medium— also promotes broader dissemination of knowledge within the academic and professional communities. This is made possible through enhanced access and the potential for integration within digital platforms dedicated to research and knowledge sharing. The present study proposes an innovative methodological approach aimed at advancing the understanding of modern architectural heritage through the interconnection of heterogeneous yet complementary data sources —archival documentation, metric and material surveys, and interpretative mathematical models— within a unified digital environment. This integrated framework seeks to foster a more comprehensive and systematic comprehension of the architectural artifact. The research is situated within a broader university-led project dedicated to the construction of digital models for the knowledge, conservation, and management of Italian Rationalist architecture, with particular reference to the design and construction phases associated with the planned 1942 Universal Exposition in Rome.

THE UNIVERSAL EXPOSITION OF ROME E42

In 1936, the Bureau International des Expositions in Brussels approved Italy's request to host a First Category General International Exhibition in Rome in 1941. Consequently, the Autonomous Body for the Universal Exhibition of Rome was established, under the direction of industrialist and senator Vittorio Cini. The Universal Exhibition of Rome [2] formed part of a broader cultural and political program inspired by the ideal of "Romanity," envisioned as a means to garner international consensus by emphasizing the cultural supremacy of imperial Italy. The preliminary program, drafted in June 1937, scheduled the inauguration of the event for 21 April 1942 —a symbolic date uniting the founding of Rome (*ab urbe condita*) with the celebration of the twentieth anniversary of the Fascist era. Following an evaluation of various possibilities, the Autonomous Body responsible for organizing the event selected as the site for the new universal exhibition an area adjacent to the Cluniac abbey complex (11th century), later Cistercian, of Tre Fontane, located on the outskirts of Ostia toward the south/southeast [3]. This choice was guided both by the new urban layouts expected to arise from the project's development and by the physical characteristics of the area itself, which consisted of largely flat terrain elevated approximately thirty meters above sea level. However, the site presented hydrographic challenges, as it had traditionally been used for subsistence farming and small-scale grazing. (Fig. 1)

Fig. 2 - Historical photographs that testify to the frequent flooding that affected the site chosen for the exhibition event in the southern peripheral area of Rome (ACS, Photographic miscellany).

To manage the periodic flooding of large sections of the area, reclamation works were required—similar to those previously carried out in the Pontine Marshes. The natural elevation differences in the area immediately suggested the creation of an artificial basin to accompany the new urbanized zone. (Fig. 2) The selected area lay along the route connecting Rome's archaeological core to the Lido of Ostia, thereby symbolically reaffirming the maritime origins of Italic civilization.

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Fig. 3 - General aerial view of the E42 construction site, 1941. The neighborhood is clearly set in its pentagonal plan (Historical Photographic Archive EUR SpA - n.2682).

Fig. 4 - Among the many, Vittorio Cini (in white), president of the Ente Autonomo Esposizione Universale di Roma, and Gaetano Minnucci (to his right), in the room with models of the works.

This axis began at the square adjacent to the Baths of Caracalla, where the Obelisk of Axum was erected in October 1937, and extended along a broad, tree-lined boulevard to the new urban pentagon of the Exposition. Unlike previous expositions, which were centered around technological innovation, E42 was notable for its emphasis on a humanistic and classicist architectural idiom. The Central State Archives (ACS) [4] preserves extensive photographic documentation of classical antiquities (from the archaeological area of Ostia Antica and various Roman sites), which was used as reference material for the planning and conceptualization of E42. These records also demonstrate the great enthusiasm of architects and construction firms eager to contribute to the initiative. The interpretation of the new architectural language sparked intense debate among the consultants involved —Giuseppe Pagano, Marcello Piacentini, Luigi Piccinato, Ettore Rossi, and Luigi Vietti— during the drafting of the master plan. This collaboration yielded early versions of the plan, based on rationalist architectural principles, already by spring 1937. The plan was formally adopted in March 1938 under the direction of Marcello Piacentini. It spanned approximately two hundred hectares and introduced several formal modifications compared to the 1937 draft. The overall project, in keeping with its classicist orientation, was structured around a main axis—the decumanus maximus—which linked an artificial lake, public squares, monumental buildings, and future structures dedicated to Civilization and Congresses, positioned along an axis perpendicular to the main one. (Fig. 3) Responsibility for the Architecture, Parks, and Gardens Services —including the Project Development Office— was entrusted to Gaetano Minnucci. (Fig. 4) The ACS itself, established in 1875 as the Archive of the Kingdom [5], is now located in today's EUR district and constitutes an integral component of the original E42 plan. It occupies the central block and the northern wing of the monumental complex facing *Piazzale degli Archivi*. Like many other buildings in the EUR area, it is protected by the Regional Superintendence for Cultural Heritage and Activities of Lazio, owing to its recognized architectural significance. The first structure erected —the so-called *Palazzo degli Uffici*, currently the headquarters of EUR Spa— was the only one to be completed before the outbreak of the Second World War. The building of the State Archives, originally designed in 1938 to house the Exhibition on Autarchy, Corporatism, and Social Security [6], was completed in the late 1950s under the supervision of Virgilio Testa, who served as extraordinary commissioner of the EUR Authority. (Fig. 5) During construction, the building was modified as needed to accommodate its revised function. Further alterations for functional purposes were carried out in the early 1990s on the occasion of the 40th anniversary of the Archive's establishment, under the direction of architect Giulio Savio, and again in 2013 to commemorate its 60th anniversary. On that occasion, the Hall of Italian Architecture and Design Archives was inaugurated [7]. Dedicated to Prof. Mario Serio (1938–2012), Superintendent of the Archives from 1982 to 1994, the Hall was designed to house and preserve the archives of architects and engineers, as well as industrial and design archives [8]. The section dedicated to architecture, engineering, and design has played a pivotal role in fostering an archival culture centered on documentation —primarily graphic and photographic— of inestimable value to the history of architecture and urbanism, and dispersed among numerous institutions and private collections.

SPECIALIST LEXICON AND UNIVERSALITY OF INFORMATION

This research is part of the broader framework of Information Technology applied to the building and cultural heritage sectors, in alignment with Goal No. 11 of the UN 2030 Agenda, which aims to make cities and human settlements inclusive, safe, resilient, and sustainable. In this context, the digitization of built heritage —both in terms of architectural artefacts and documentation— as well as of all the processes related to the construction sector, plays a crucial role. The mandatory implementation of BIM, gradually introduced by Italian legislation [10] in accordance with ISO and UNI standards [11],

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Fig. 5 - Historical photograph under construction: Central State Archives under construction. (ACS, Ente Autonomo Esposizione Universale di Roma – Eur fund (E42 from 1937 to 1940), Ente Eur photographic archive – Part I 1938 – 1942, identifier IT-ACS-AS0001-0005310, CD125 [9])

Fig. 6 - View from Via dell'Aeronautica of the two twin buildings and the break with the lake system created by the skyscraper (taken from Rome EUR, Istituto Geografico De Agostini).

promotes an interdisciplinary and interoperable approach, encouraging a digital workflow for data collection and exchange using non-proprietary formats [Abanda *et al.*, 2025]. A fundamental prerequisite for digitization activities is the collaborative and synchronous integration of information, in order to manage the building's entire life cycle—from design through to demolition [Paris *et al.*, 2024]. At the core of this process lies the creation of a dynamic digital archive and the adoption of a universal language capable of ensuring the exchange of information without data loss or distortion. This premise, however, often clashes with substantial and recurring challenges, especially in the context of digitizing architectural archival collections. Each archive has its own organizational structure which, in order to facilitate access for users and non-specialists, is typically represented through an inventory. While the use of a highly technical and specialized lexicon is understandably avoided in consideration of the intended non-specialist audience, consistency in the contracted codification of documents and in their unambiguous physical arrangement within the archive space nonetheless requires rigorous study—not only of individual terminologies but also of the overall structure of the inventoried information. "Consider, for example, the seemingly simple term 'title', which in common usage refers to the name of a literary or cinematic work, whereas in archival science it denotes not only the name of a document or group of documents, but also a categorization of files grouped by subject matter" [Grassi, 2010, p.111]. Based on a recent scientific collaboration agreement between the Department of Civil, Building and Environmental Engineering at Sapienza University of Rome and EUR Spa [12] —owner of some of the most important buildings constructed under the E42 project— it was possible to experiment with an innovative methodological approach that directly connects the fundamental role and significance of architectural archival documentation with the emerging needs of data-informed digital modelling. The case study presented in this paper refers to the building formerly known as *Ex Bonifiche*, originally designed as the Exhibition Building for Agriculture and Land Reclamation [13], now owned by EUR Spa and currently housing the headquarters of Acea ATO2. Located in the southeastern sector, near the lake and behind the ENI skyscraper, the building is one of two mirrored structures facing via dell'Aeronautica. (Fig. 6)

The inventory at the Central State Archives (ACS) [14] follows a tabular structure, comprising the

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CENTRAL STATE ARCHIVE (ACS) - GUIDE TO CONSULTING THE FUNDS
EXTRACT

Fund complex	ARCHIVES OF PUBLIC AND PRIVATE BODIES, AND COMPANIES					FAMILY, PERSONAL AND PROFESSIONAL FIRM ARCHIVES ARCHITECTS AND ENGINEERS ARCHIVES				
Fund	AUTONOMOUS BODY OF THE UNIVERSAL EXHIBITION OF ROME - EUR (E 42 from 1937 to 1940)					MARCONI PLINIO				
Series	ID	NAME	CHRONOLOGICAL EXTREMES	CONSISTENCY	NUM. INV.	ID	NAME	CHRONOLOGICAL EXTREMES	CONSISTENCY	NUM. INV.
	0003934	General Commissioner, Presidency, General Secretariat *(from b.1 to b.156)*	1937-1951	156 bb.	52/025,I	0004284	Documentation	1923-1978	16 bb.	48/252
	0003939	Financial and administrative services *(from b.157 to b.347)*	1937-1943	191 bb.	52/025,II	0005291	Drawings		10 folders	
	0003940	Technical services *(from b.348 to b.970)*	1937-1950	623 bb.	52/025,III	0000845	Photographic plates		38 plates	
	0003941	Architecture parks and gardens services *(from b. 971 to b. 1053)*	1937-1944	83 bb.	52/025,IV					
	0003942	Artistic services *(from b.1054 to b. 1114)*	1935-1948	61 bb.						
	0003943	Exhibition organization *(from b. 1115 to b. 1194)*	1937-1943	80 bb.						
	0003944	Propaganda services *(from b. 1195 to b. 1271)*		77 bb.	52/025,V					
	0003945	Hospitality services *(from b. 1272 to b.1332)*		61 bb.						
	0003946	Original Drawings Archive *(out of consultation)*		3664 drawings	52/025,VI					
	0005310	Ente Eur Photographic Archive - Part I	1938-1942	2454 images	CD125 52/025,VII					
	0004868	Protocols, personal files, magazines, index cards, mixed material	1937-1951	143 of which 112 regg. and 31 scc.						

18: PRO/18
Project of the buildings for the Museums of Agriculture and *Bonifiche* at E42, Rome
1/04/1940 – 25/05/1942

Fig. 7 - How to consult the inventory at the Central State Archives ACS: identification of the funds of interest and organizational structure (Online digitalized inventory file:///D:/GUIDA-ACS_giugno2024.pdf or https://search.acs.beniculturali.it/OpacACS/)

following extended fields: ID code, name, chronological reference, extent, and inventory number. This consultation led to the identification of two archival collections: Archives of Public and Private Bodies and Company [15], and Family, Personal, and Professional Archives [16]. Both are further organized into collections and series, and contain envelopes, files and subfiles, index cards, volumes, registers, sheets, photographs, drawings, and films [17]. (Fig. 7) Regarding the first collection, the 3,664 original drawings held in the Autonomous Body of the Universal Exhibition of Rome – EUR archive (E42, 1937–1940)[18] are currently unavailable for consultation due to conservation issues, and have yet to be digitized owing to insufficient funding and staff resources. In the second collection, attention turned to the Plinio Marconi fund [19], which fortunately is accessible and suitable for digitization. This archive contains 106 boards, 121 drawings, and 23 sketches related to the entry 18: PRO/18 Project for the Buildings of the Museums of Agriculture and Land Reclamation at E42, Rome / 01/04/1940 – 25/05/1942 [20]. This collection made it possible to identify with certainty the architectural drawings of the building under study, designed by architects Plinio Marconi, Giuseppe Samonà, and Guido Viola. In order to fully restore the fundamental role of drawing practices, and in keeping with the study's objective of reconstructing the building's design process, a significant sample of drawings was selected for digitization. The selection criteria considered the type of information and the scale of representation, while also avoiding the need for multiple scans of large-format drawings [Menchetelli, 2016]. The digitization process proceeded methodically and was integrated into a broader coordination framework aimed at developing an interactive virtual database—rather than a mere static digital repository. This system was designed to visualize and interrogate heterogeneous digital data, brought together to form a comprehensive cognitive framework of the building.

CASE STUDY: THE EX BONIFICHE BUILDING

Although fairly modest in its parallelepipedal dimensions when compared to other more monumental buildings constructed immediately after the end of the war, the structure exhibits a rationalist style that, while non-classical, remains

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aligned with the architectural principles of the Piacentini program. Beneath its apparent simplicity lies a complex design history that has been partially reconstructed through careful archival investigation. The two twin buildings in question are, in fact, a small fragment of a far more ambitious project aimed at arranging the eastern bank of the artificial lake, culminating in a monumental hemicycle 225 meters in diameter and approximately 40 meters in total height, which was to descend scenographically towards the lake via a wide staircase and a dramatic waterfall feature. According to the design, this semi-circular structure was to be connected, on the side opposite the lake, to two rectangular buildings measuring 79 meters in length and spaced 44 meters apart along a west-east axis (now Viale dell'Agricoltura), intersecting a north-south axis (now Via dell'Arte), approximately 30 meters wide. (Figs. 8, 9, 10, 11)

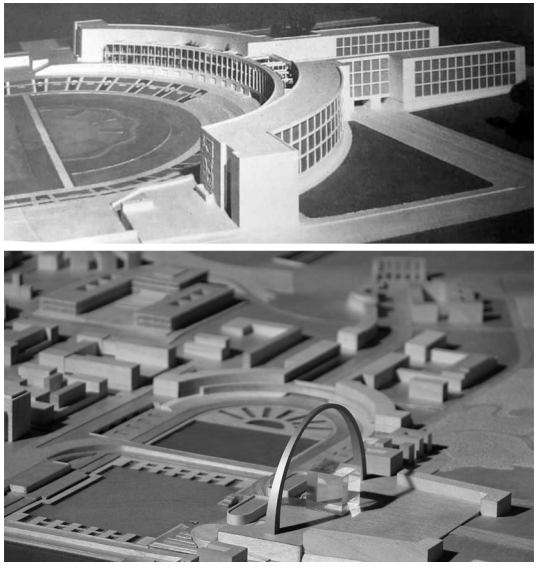
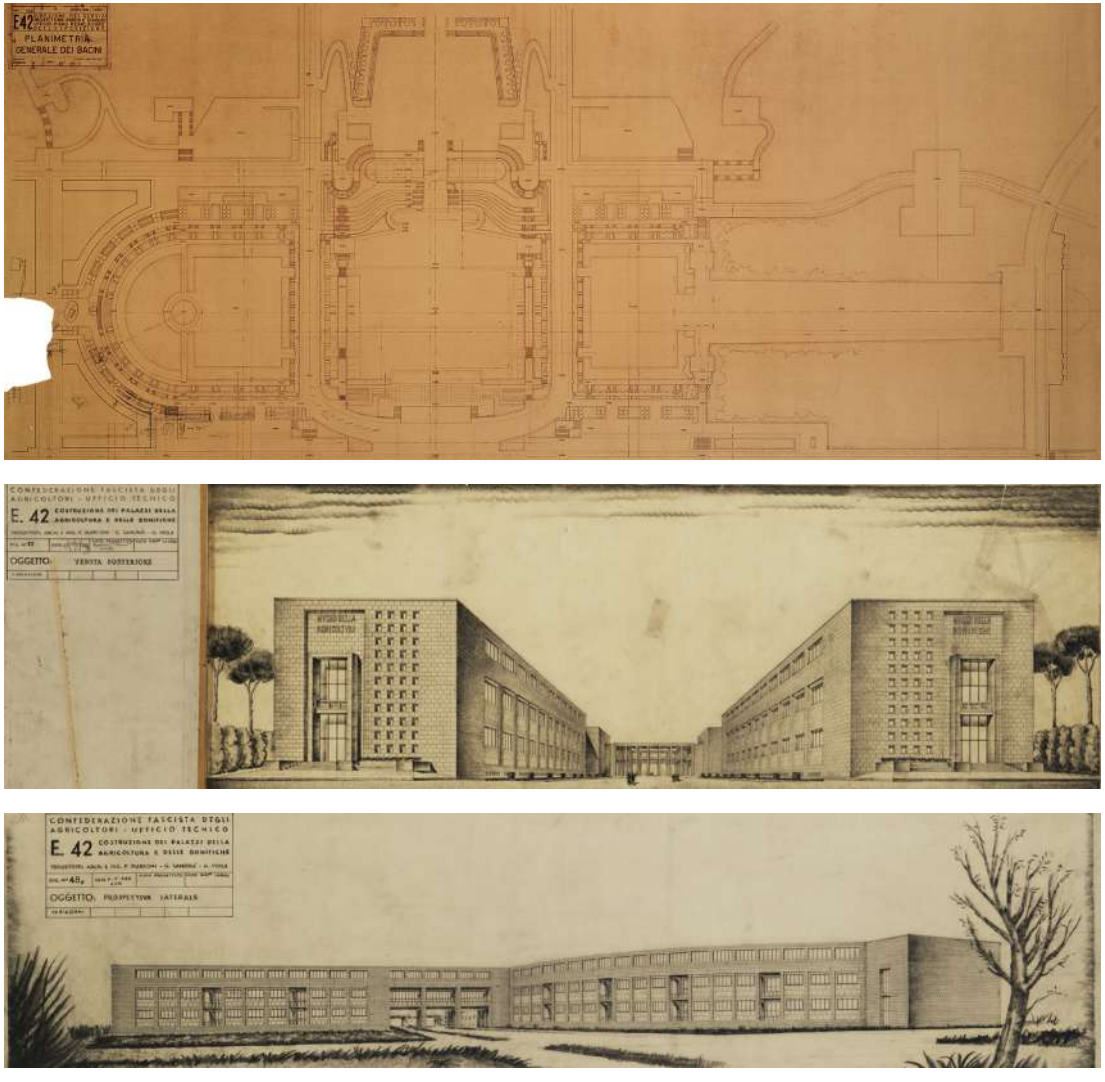


Fig. 8 - Models of the Agriculture and Land Reclamation buildings, architects Plinio Marconi, Giuseppe Samonà and Guido Viola, circa 1940. (ACS, Miscellanea fotografica)



Figg. 9 - 10 - 11 - Project drawings. From top: general plan of the basins (fig. 9); construction of the Agriculture and Bonifiche buildings, rear view (fig. 10 in the center) and side elevation (fig. 11 below).

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The overall complex was intended to house the pavilions of the Museum of Agriculture in the southern portion and the Museum of Land Reclamation in the northern part. The two rectangular buildings were to be dedicated to exhibitions concerning horticulture, floriculture, viticulture, olive cultivation, and fruit growing. The exedra structure was to include, in addition to the headquarters of the Federation of Agricultural Consortia, exhibitions related to textile crops, cereal production, livestock breeding, as well as thematic displays dedicated to land reclamation and soil improvement techniques. At either end of the semicircular building, two grand halls of honour were planned, equal in height to the rest of the structure, and designated to host conferences and institutional gatherings. (Fig. 12) The chronological study of documents preserved in the Central State Archives —including correspondence between administrative bodies and construction firms— made it possible to reconstruct the complex historical trajectory that led first to the commencement and then to the eventual abandonment of this monumental original project. Of that grand design, only the rear portion —the two rectangular twin buildings— was ultimately realized. Although the executive project was submitted and approved in May 1939, and construction began shortly thereafter with earthworks, foundation excavation, and infrastructure development, it was "during the course of the works" that a major obstacle emerged: the preexistence of a substantial infrastructural system —namely, the main drainage and water collection conduit for the Cecchignola area— which passed directly through the designated construction zone. (Fig. 13) This discovery triggered a dispute between the competent authorities: on one side stood the Works Division for the 1941 Exhibition – Division V [21], responsible for the general infrastructure; on the other, the Project Development Office within the Architecture, Parks and Gardens Services, directed by Gaetano Minnucci, responsible for the architectural implementation. The situation was further complicated by the fact that construction had already commenced and would have required a major design revision to be approved mid-execution,

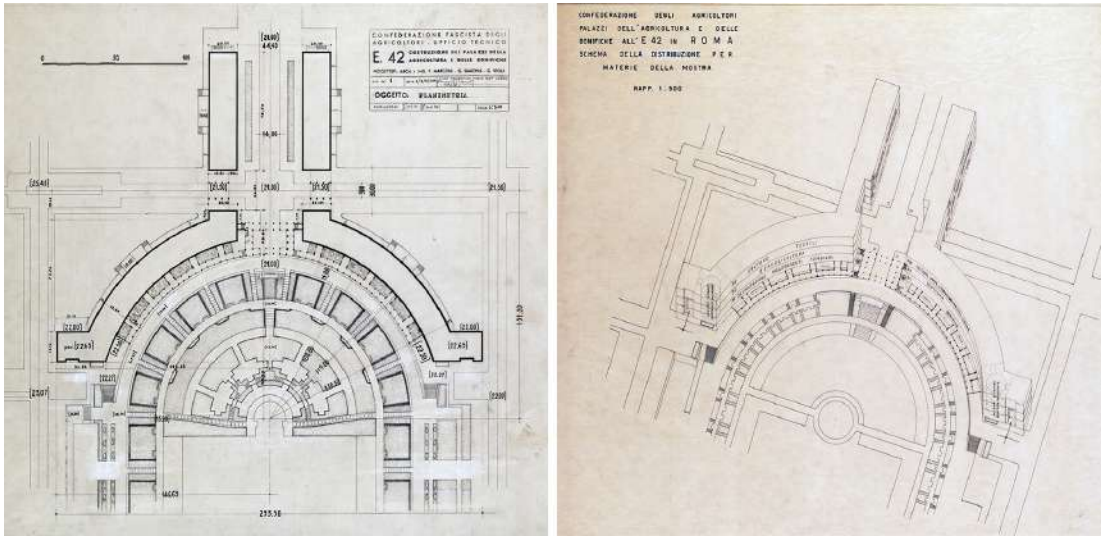

Fig. 12_ On the left: general plan; on the right: axonometric diagram of the hypothesized uses of the museum building. (ACS: Marconi collection "18:PRO/18")

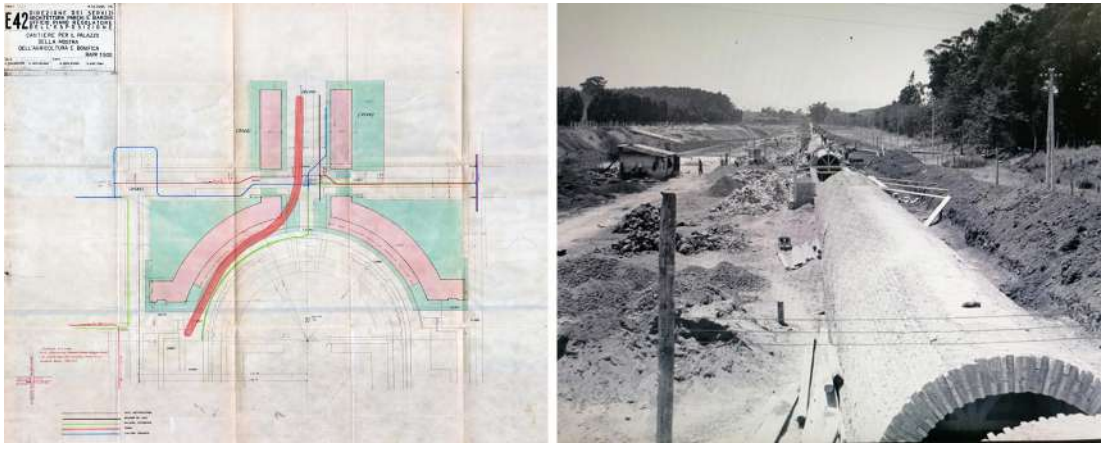

Fig. 13_ On the left: general plan of the project and position of the collector (ACS: Marconi collection "18:PRO/18"); on the right: historical photo of the collector during the excavations for the foundations of the exedra (Historical Photographic Archive EUR SpA).

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Fig. 14_ Zenithal aerial photo of the neighborhood, circa 1965. At the two ends of the lake it's possible to see the Eni skyscraper and the former Banco di Roma skyscraper. No more trace of the exedra.(Historical Photographic Archive EUR SpA).

compounded by Italy's entry into World War II and the resulting suspension of the E42 project. In the aftermath of the war, the monumental plan for the Museums of Agriculture and Land Reclamation was definitively abandoned, while only the two rear twin buildings were modified and brought to completion. (Figs. 14, 15)

BUILDING INFORMATION MODELING AND DATA-SHARING PLATFORMS

The development of digital technologies and data processing methodologies applied to the creation of cognitive models of existing built heritage has, in recent years, entered a new phase in which multiple opportunities have emerged to support processes of preservation and management. To complete the cognitive framework of the building under investigation, significant digital data were acquired through integrated technologies, including static and mobile laser scanners and aerial photogrammetry [22].

Fig. 15_ Historical construction site photos of the two buildings with the exedra branch under construction in 1941 and, in the lower right corner, the resumption of works after the war (years 1952-60). Work by "Bassanini" Construction Company, the same company that took care of the construction of the Palazzo dei Congressi. (Historical Photographic Archive EUR SpA)

Although the three types of point clouds differ substantially —some based on active and structured technologies, others on passive and unstructured methods [23]— they were integrated using a shared absolute coordinate reference system, allowing the different models to be scaled and rototranslated into a single, coherent, georeferenced position. (Fig. 16) The composite point cloud, optimized to minimize noise resulting from the superimposition of data of different origins, was subjected to interpretive analyses focused on reconstructing the shape of the various architectural components. The metric accuracy of the survey data was critically compared with the information provided by the original architectural drawings which, for much of the building, net of post-war alterations and modern interventions related to new functional and distributional requirements, were widely confirmed. The definition of the cognitive framework and the identification of the evolutionary phases of the Ex

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Bonifiche Building —used here as a pretext for applying a methodology suitable for investigation of other buildings in the EUR district and, more broadly, of rationalist architecture from that period— represents the first step in a workflow designed to enhance the interoperability of digital interpretive models of architectural artefacts. This approach ultimately promotes greater information sharing among the various stakeholders involved in the process to varying degrees. The recent regulatory mandate for the adoption of BIM procedures now compels professionals in the construction sector to engage with and adapt to this 'new' digital environment, not only in terms of technical and cultural competencies but, perhaps more critically, with respect to the digital infrastructure necessary to support the entire process. To respond to this need, several open cloud platforms [24] —conceived both as digital archives for heterogeneous data (raster, vector, textual, discontinuous and continuous 3D models, etc.) and as dynamic, interactive digital environments [Paris *et al.*, 2024; Di Filippo *et al.*, 2024; Musella *et al.*, 2021]— provide users with a Common Data Environment (CDE) that ensures access to information and digital objects in simultaneous, real-time mode, improving data consistency and reducing interdisciplinary conflicts [Seyis *et al.*, 2024]. Informed parametric modeling was carried out at multiple scales —from territorial to architectural and detail levels— through various GIS, LIM, and BIM applications. (Figs. 17, 18)

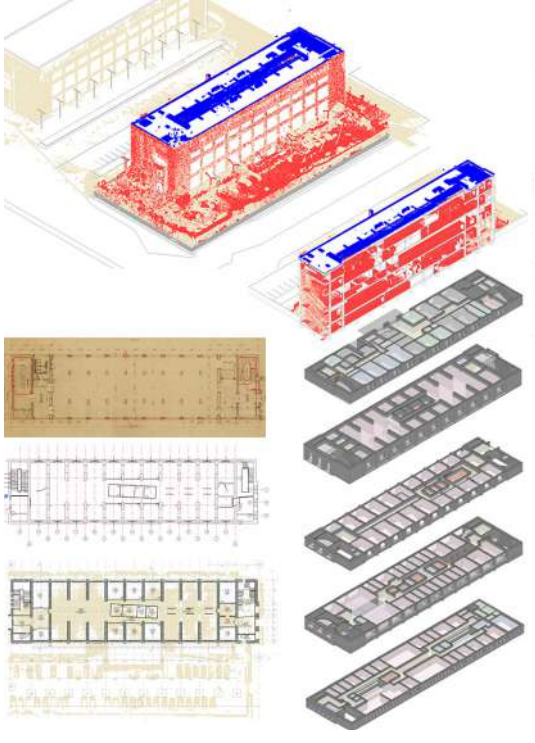

Fig. 16_ Integration of point clouds from TLS (in yellow, for the exteriors and the stairwells connecting the various internal levels), aerial photogrammetry (in blue, for the roofing), and SLAM (in red, for the exteriors and interiors). Systematization of point data with archive documents for a critical interpretation of alignments and dimensions, and construction of the parametric model.

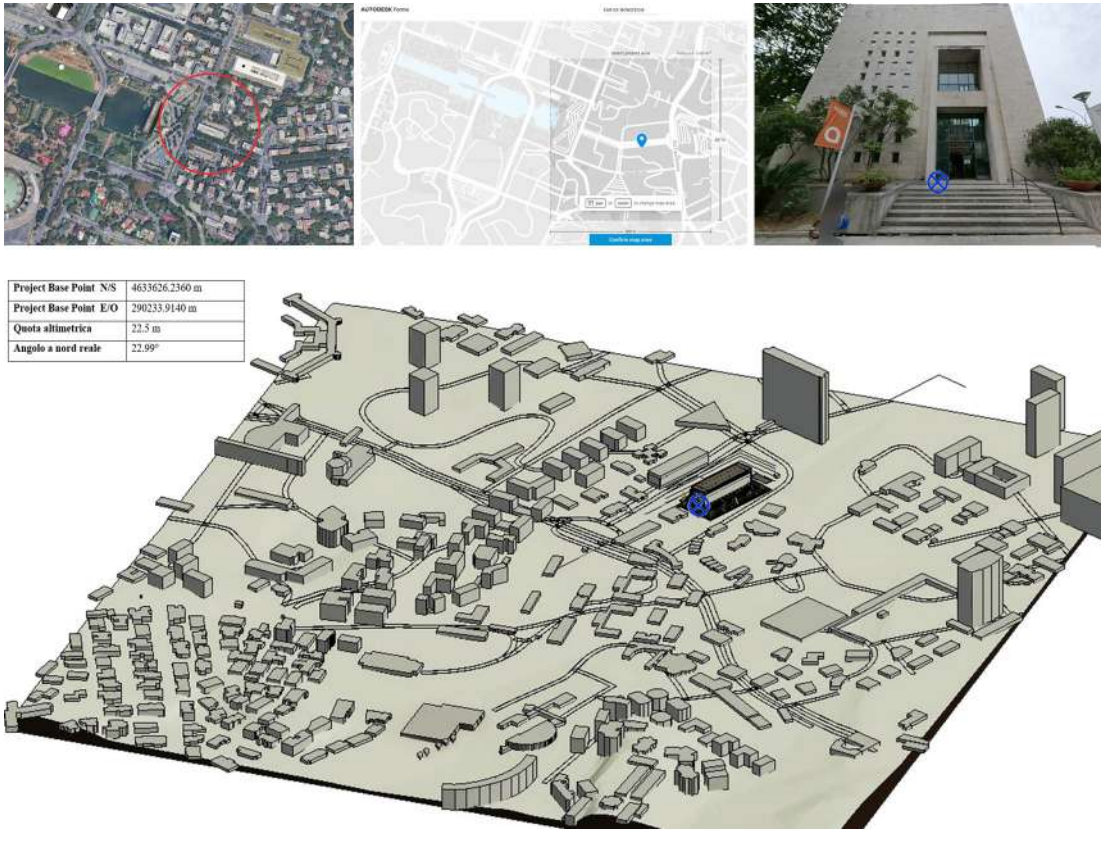

Fig. 17_ Extrapolation of the digital model of the building context (LIM Autodesk Forma application). Verification of the coherence of the geographic reference system with the absolute coordinates of the point cloud and the parametric BIM model.

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Fig. 18_ Civil reconstruction model (Autodesk Revit BIM application) managed together with other information models and documentation in the open platform (Dalux).

For each of these, the consistency of the geographical reference system was ensured, so that within the sharing platform, each model could be examined independently but, most importantly, in relation to the others. Although a point cloud is millimetrically accurate, it merely conveys surface-level information about built geometries, offering no insight into the material or structural nature hidden beneath the external finishes. Therefore, historical photographic material from the construction phase (Fig. 19) proved essential for developing an HBIM model capable of fully expressing its informative potential —moving beyond the now-outdated concept of Level of Detail (LOD) in favor of the more flexible Level of Information Need.

Analyses revealed unexpected construction features relative to the apparent simplicity of the building's geometry, and installation techniques characteristic of the period were identified, including those attributable to patented construction systems. Based on these findings, the level of development of the structural digital components was harmonized with that of the 'visible' architectural elements. Finally, from the standpoint of information enhancement, the modeled objects —which find their rationale in this heterogeneous documentary structure— also include, among various parameters, the updated location or directory of the corresponding digital file within the CDE (Fig. 20).

Fig. 19_ Historic post-war construction site photos. (Historical Photographic Archive EUR SpA).

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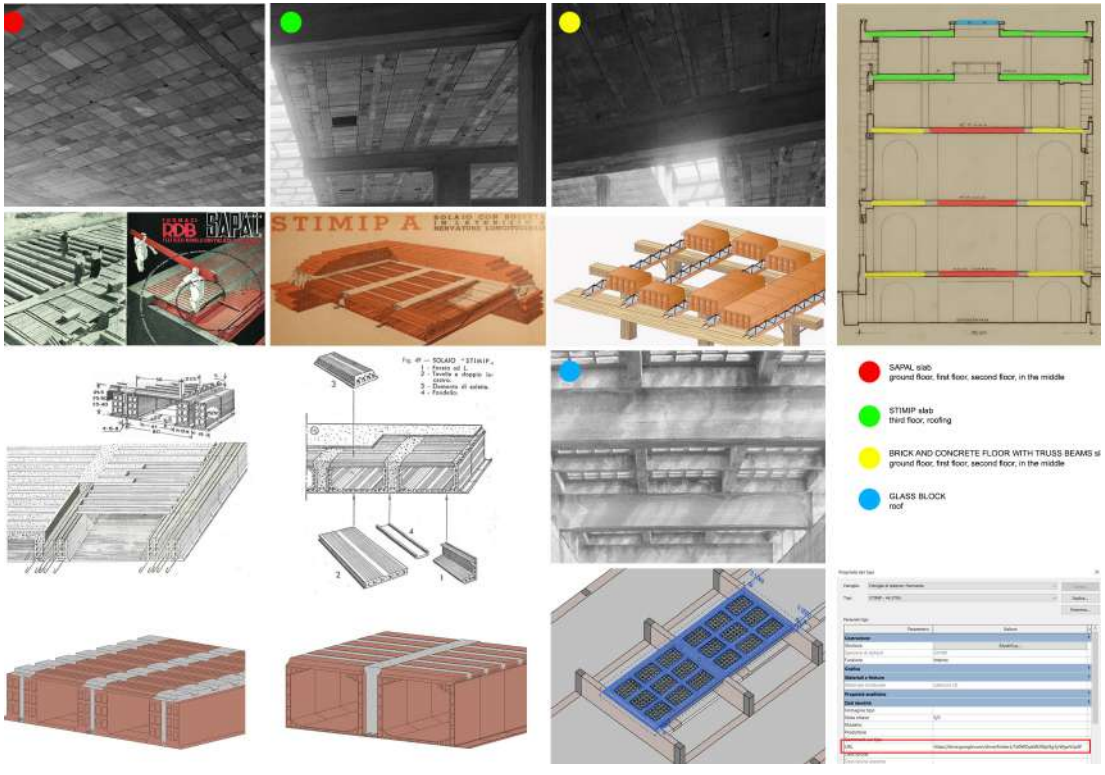

Fig. 20_ Construction details deduced from patents, transposed into digital version. Each structural component is associated with an information parameter that reports the documentary source so as to have, in the overall model, a mapping by construction typology and the direct link to the patent/document/photo.

CONCLUSIONS AND FUTURE DEVELOPMENTS

The experimentation conducted on the case study has highlighted the significant potential for enhancing the archival heritage of Architecture, Engineering, and Design, particularly when it is closely linked—as in the case of historically significant existing buildings—to the actual characteristics and specificities of BIM-GIS-LIM-informed modeling. This context thus raises the issue of developing models in which historical documents become an integral component of a multi-scale, multidisciplinary, interactive, and continuously updatable process of knowledge creation. The study of Italian Rationalism, also thanks to the availability of architectural archives, lends itself particularly well to this renewed approach to knowledge. It stands as a testament to a historical period marked not only by profound cultural transformation, but also by technical and construction innovation, amounting to a veritable revolution in building practices.

NOTE

[1] The archive reflects, in its conservation, the criteria and values of a given culture and a given producing entity.

[2] Italian original name E*nte Autonomo Esposizione Universale di Roma.*

[3] The 1931 master plan placed this area outside the building perimeter, preventing subdivisions for construction work. The EUR Authority, not being a subdivision company, requested royal decree no. 1567 of 14 January 1937 (converted into law the following year) to declare the Exposition interventions and the subsequent urbanizations towards the Roman coast ('Salatino perimeter') to be of public utility, defining the expropriation perimeters and the obligation of detailed plans within two years of the occupation of the land, in order to avoid privatizations.

[4] Mario De Renzi, Luigi Figini and Gino Pollini, 1939-1952

[5] The Archives of the Kingdom were established to preserve the originals of laws and decrees, the civil status of the House of Savoy, the heraldic register and the documentation of the ministries no longer necessary "for the ordinary needs of the service" (Regio Decreto 2552/1875, art. 1). For a long time, the Archives remained an institution without complete autonomy. With the birth of the Republic in 1946, the reorganization of the Institute and its placement in a definitive and autonomous location was decided: in fact, the need arose to find a suitable location for the archives of the central administrations transferred to northern Italy during the Republic of Salò and recovered at the end of the Second World War, as well as for the archives of the bodies of the previous fascist regime. The full autonomy of the Institute was established in 1953 with the Law of 13 April n. 340 which made the new name of Central State Archives official, made the distinction from the State Archives of Rome, and placed the Institute in charge of its management. official with the highest rank in the archive administration. At the same time, the long-standing problem of the location was also solved, identified in the monumental building in EUR that was to host the exhibition of corporations as part of the Universal Exhibition in Rome. The transfer to the new location was completed in 1960, with the opening of the study room to scholars on April 1 of the same year.

[6] Italian original name *Mostra dell'autarchia, del corporativismo e della previdenza sociale.*

[7] Italian original name S*ala degli archivi di architettura e del design italiano.*

[8] Around sixty archives of the most important Italian architects and engineers are preserved there: highly significant archive funds, often with unpublished materials, which complete and integrate the sources for the history of architecture and urban planning present in the other funds preserved by the Institute.

[9] See Fig. 7

[10] Italian references, *Nuovo codice degli appalti, D.lgs. 36/2023.*

[11] ISO 19650 Series - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling; UNI 11337-5:2017 - Digital management of construction information processes - Part 5: Information flows, roles, and requirements for information management.

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[12] Eur Spa is a public company established by Legislative Decree No. 304 of 17 August 1999 as a transformation of the previous Ente Eur. The Ministry of the Treasury, Budget and Economic Planning holds 90% of the shares and the Municipality of Rome holds the remaining 10%.

[13] Original Italian name: *Edificio per la Mostra dell'Agricoltura e Bonifiche.* Client: Confederation of Farmers. Designers: P. Marconi, G. Samonà, G. Viola. Use during the Exposition: Agriculture and Land Reclamation Exhibition. Planned use after the Exposition: Agriculture and Land Reclamation Museum.

[14] The inventory of the Central State Archives can be consulted on the file site:///D:/GUIDA-ACS_giugno2024.pdf

[15] Original italian name, *Archivi di Enti Pubblici, Privati e Società.* This sector includes the archives of institutions, in whatever form constituted, subject to State supervision and in any case of interest to public finances, suppressed because the purposes that had determined their creation have ceased or are no longer pursueable. Identifier: IT-ACS-AS0001-0003785; consistency: 219213 bb., fascc., regg., voll., ff., photos, drawings and films. Online digitalized inventory file:///D:/GUIDA-ACS_giugno2024.pdf pg.414 or https://search.acs.beniculturali.it/OpacACS/guida/IT-ACS-AS0001-0003785.

[16] Original italian name, *Archivi di Famiglie, di Persone e Studi Professionali.* The Central State Archives preserves more than two hundred and fifty archives of personalities who have held roles of national importance in the public administration and in the political, professional and cultural life of the country. A reasoned reading of the list of all the personal archives preserved today allows us to reconstruct the dynamics of the acquisitions and allows us to glimpse a slow but coherent legislative evolution, also allowing us to reconstruct the cultural debate that has developed in relation to personal archives and in particular those of politicians. Online digital inventory file:///D:/GUIDA-ACS_giugno2024.pdf pg.460 and pg.488 or https://search.acs.beniculturali.it/OpacACS/guida/IT-ACS-AS0001-0005571.

[17] Main archival abbreviations: fd.= *fondo*/fund; s.= *serie*/series; bb= *buste*/envelopes; fascc.= *fascicoli*/files; scc= *schedari*/index cards; voll= *volumi*/volumes; regg= *registri*/registers; ff= *fogli*/sheets.

[18] Online digital inventory file:///D:/GUIDA-ACS_giugno2024.pdf pp. 431-432 or https://search.acs.beniculturali.it/OpacACS/guida/IT-ACS-AS0001-0003933. consistency: 15143 files. photos, drawings.

[19] Online digital inventory file:///D:/GUIDA-ACS_giugno2024.pdf pp. 497 or https://search.acs.beniculturali.it/OpacACS/guida/IT-ACS-AS0001-0005290.

[20] Original italian name, *18: PRO/18 Progetto dei palazzi per i musei dell'agricoltura e delle bonifiche all'E42, Roma /1/04/1940 – 25/05/1942.* For brevity, the archive graphic works reported below will refer to ACS: Marconi fund "18:PRO/18"

[21] Original italian name, *Divisione lavori esposizione 1941 - Ripartizione V.*

[22] The survey operations of the building involved the use of three instruments: TLS FARO FOCUS X 130, IBM with DJI Mavic drone and GEOSLAM Zeb Horizon.

[23] The point clouds obtained separately with laser scanner and photogrammetry are substantially non-homogeneous because the former, which are metrically reliable, are based on an active technology (the laser beam directly hits the surface of the detected object) and structured (the resolution of points obtained depends on the instrument settings, the geometric properties of the detected surface and the positioning of the instrument), while the latter, appreciable from the point of view of geometric but not metric rendering, are based on a passive procedure, i.e. on the post-processing of photographs, and not structured because the points are obtained by applying SIFT and SURF algorithms for reading the pixels of digital images and recognizing homogeneous points between multiple photographic images of the same portion of the detected surface. An element that distinguishes and further characterizes the two procedures concerns the so-called projection center: in the first case the projection center corresponds to the center of the laser scanner instrument – generally well positioned on the ground -, in the second case it corresponds to the center of the lens which is in motion. Also different is the point cloud obtained through SLAM technology which, although using a Lidar modality that is already widely used, also associates the laser sensor with an IMU inertial platform capable of recording the movement of a sensor along a trajectory in real time and mapping the main geometric characteristics of the environment in which the sensor is moving.

[24] The Dalux platform was chosen for the experiment conducted at the Palazzo delle Ex Bonifiche. https://www.dalux.com/it/

[25] Common Data Environment (UNI EN ISO 19650-1:2019).

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CREDITS

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