

Work Package: Characterization of historical surface finishing and execution techniques. Study of materials and their mixing ratios. Definition of specific interventions.

NUMBER: 1

TITLE: Characterization of historical surface finishing and execution techniques. Study of materials and their mixing ratios. Definition of specific interventions.

RESPONSIBLE: MARCO ZERBINATTI

STARTING MONTH: 1

ENDING MONTH: 36

DESCRIPTION: The research will be conducted on exemplary case studies selected on the wide regional heritage, in relation to their relevance according to historical matter documents and to artistic opera. Among the case studies chosen there are some chapels of Sacro Monte of Varallo Sesia, included in the register of the heritages protected by UNESCO. The recurrent kinds of mural decorations (inside and external) will be analyzed in relation to historical context, to environmental conditions and to the nature of the supports; the screening of analytical data deduced by investigations, conducted above all with innovative techniques and methodologies, will be the starting point for the interpretation of maintenance conditions and the individualization of possible problems list and incoming damages. The full accessibility to these monuments, constitute a relevant starting point for the on field studies and for continuous monitoring of critical situations in yards. Moreover, the possibility to install in situ positions of data survey (remote controlled), will be very useful to identify the zones onto which conduct the necessary constitutional investigations and to define some subsequent solutions of intervention. For the aforesaid constitutional analyses, in particular, we propose the use of the following analytical and characterization instruments:

- a) scanning electron microscope (SEM) with EDX for samples observations and semiquantitative determination of which elements different part of a sample contain;
- b) X-ray diffraction, to individuate the crystalline phases and the eventual crystallised alteration products present;
- c) Thermal analyses, such as TGA-DSC on some tens of mg of powdered samples to identify binders compositions and eventual alteration products;
- d) Mercury porosimetry intrusion (MPI), on about 1-2 g of sample to determine the open porosity in percent and pore size distribution;
- e) Standard colorimetric kit for salts recognition on some grams of powdered samples; Moreover, other non destructive techniques will be used:
- f) Portable colorimeter, to evidence (also) eventual chromatic alterations on finishing layers;
- g) Portable conductimeter, which, by a simple measurement of the electrical conductivity of the substrate.
- h) Set-up of low expensive qualitative tests having a low impact on the finishing layers to quickly estimate the quality of a protective layer.

The above cited techniques allow a quasi complete compositional and morphological investigation on building materials and their eventual alteration products, even though the acquisition of a FTIR analyser would be very useful for the research project.

The results of this WP cannot be seen apart from the constant comparison with the experts of others disciplines in others WP: in fact, the interactions between the wall paintings or other types of decorated surfaces and the underlying building apparatus as, particularly, in case of presence or formation of discontinuity among them (as among the various layers of the finishing system) will be underlined through constant on site monitoring by ultrasonic techniques, in a dedicated WP. As a consequence, the fruits of this interdisciplinary work of reading and interpretation of all results from diagnostic investigations, will bring to the set-up (or to the redefinition) of procedures of investigation and intervention with useful practical repercussions on conservation (and enhancement) of historical artistic heritage.

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OBJECTIVES: WP1 has the following main objectives:

- studying the state of conservation and the chemical-physical decay of historical finishes taken as subject of investigation, with respect to their constitutional characteristics, environmental conditions during all seasons, different historical know-how (maniera) and/or previous restoration;
- studying the investigated subjects from the constructional vicissitudes point of view, comparing the data collected from the subject itself with the ones available from iconographical and archive documentation;
- supplying indications regarding materials properties, compatibility and availability for maintenance and restoration interventions;
- supplying indications on traditional working techniques employed in the construction of the case study by means of laboratory tests and in situ tests (in this specific case in *corpore vili*) aimed at the set-up or at the updating of conservative interventions methodologies for specific contexts and recurrent problems; preparing experimental restoring yards intended for the validation of the mentioned investigations and interventions methodologies.

ATTENDED RESULTS: The expected results by this WP mainly concern: the set-up of investigation and correct intervention procedures to use on decorated manufacts having historical, artistic and documentary relevance, for Public Bodies, Private Institutions or other interested subjects who will be interested in making use of interdisciplinary competences of a net of laboratories able to give technical and scientific answers to the complex problems in restoring and preservation of the decorated surfaces heritage in Piedmont;

- Coordination of investigation activities, results interpretation and of intervention methods which will be defined in accordance to the current restoring criticism point of view;
- Preparation, with other WP, of a book with the reached intermediate results;
- Realization of a data basis containing information on construction materials, constructive techniques of historical buildings and of decorated surfaces, as well as the recurrent phenomena of decay and their forms in relationship to the environmental conditions (or rather, in relationship with oneness of every single case study);
- Wide spreading of research results through seminars and international conferences;
- Organization of an international conference at Polytechnic of Turin on the subject matter of the research program,
- Wide spreading of the results for Public Bodies and for other Corporations of the Piedmont Region.

Participant to the Work Package: Characterization of historical surface finishing and execution techniques. Study of materials and their mixing ratios. Definition of specific interventions.

AGENCY PARTICIPANT: RISERVA NATURALE SPECIALE DEL SACRO MONTE DI VARALLO

STARTING MONTH PEOPLE ACTIVITIES: 1

ENDING MONTH PEOPLE ACTIVITIES: 36

PEOPLE/HOURS ACTIVITIES FOR PARTICIPANT: 100

AGENCY PARTICIPANT: (Politecnico di Torino) Politecnico di Torino, Dipartimento di Ingegneria dei Sistemi Edilizi e Territoriali

STARTING MONTH PEOPLE ACTIVITIES: 1

ENDING MONTH PEOPLE ACTIVITIES: 36

PEOPLE/HOURS ACTIVITIES FOR PARTICIPANT: 292

AGENCY PARTICIPANT: (Politecnico di Torino) DISMIC

STARTING MONTH PEOPLE ACTIVITIES: 1

ENDING MONTH PEOPLE ACTIVITIES: 36

PEOPLE/HOURS ACTIVITIES FOR PARTICIPANT: 515

TOTAL PEOPLE/HOURS OF ACTIVITY Characterization of historical surface finishing and execution techniques. Study of materials and their mixing ratios. Definition of specific interventions.: 907