

Company:



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Project: **CITY WALLS OF DUBROVNIK**

Products: 1. Scan data
2. 3D model
3. Plane drawings - full documentation of current state

1. ABOUT CITY WALLS OF DUBROVNIK

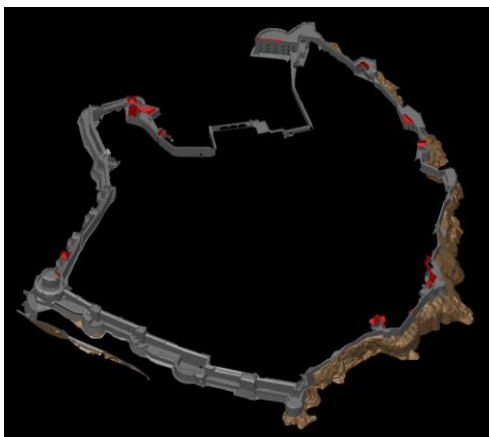
HYSTORIC FACTS



The town fortifications, ramparts and towers outside the walls were built, reinforced and reconstructed in the period from the 12th to the second half of the 17th century. A number of constructors were involved in those works (Nicifor Ranjina in 1319, Michelozzo di Bartholomeo in 1461-1464, Juraj Dalmatinac or George the Dalmatian in 1465-1466, Paskoje Milicevic in

1466-1516, Antonio Ferramolino in 1538, Mihajlo Hranjac in 1617, etc.). The main wall is 1,940 m long (following the ring-corridor), 4-6 m wide on the mainland side and 1.5-5 m wide on the sea side, and up to 25 m high. It was reinforced by three circular and 14 quadrangular towers, five bastions (bulwarks), two angular fortifications and a large fortress called Sveti Ivan (St. John). Among the towers, the most monumental is the circular tower of Minceta, on the north-western corner of the ramparts. The reinforcement, along the main wall on the mainland side, includes one larger and nine smaller semicircular bastions, and the casemate fortress Bokar, the oldest preserved fortress of that kind in Europe.

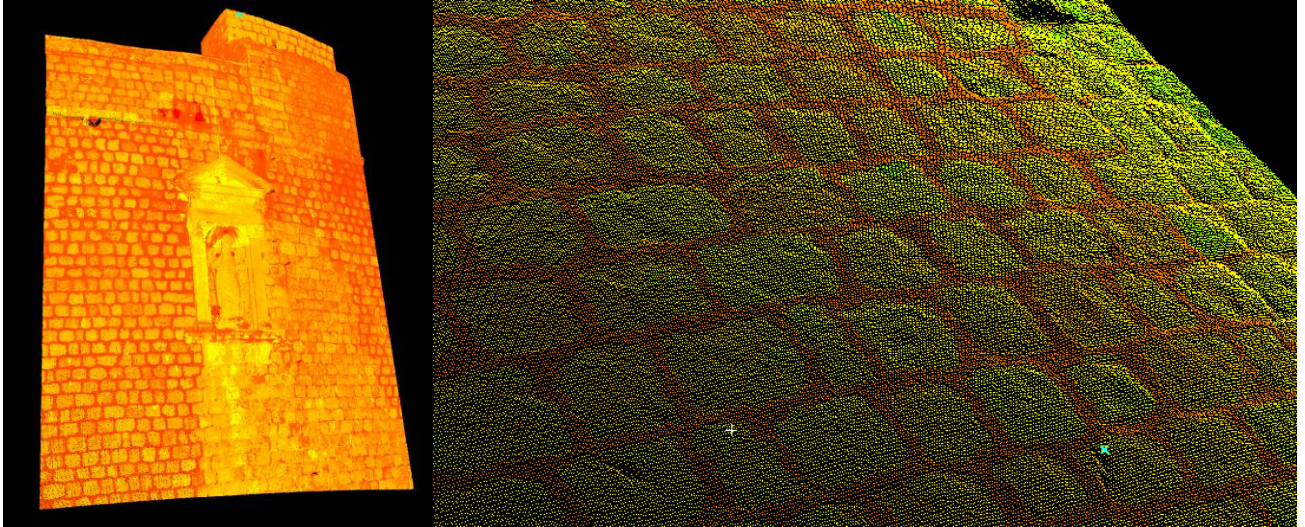
TECHNICAL PROJECT DATA



- Total perimeter (including both sides) of The Walls is 4,300 meters.
- Total scanned area is 120,000 square meters.
- Scanning time is about 240 days with one scanner and two operators.
- Scanning was completed mainly with HDS 2500, and lately with Scan Station.
- Total project time is 4 years with two persons on the field and three persons in the office.

2. PRODUCTS

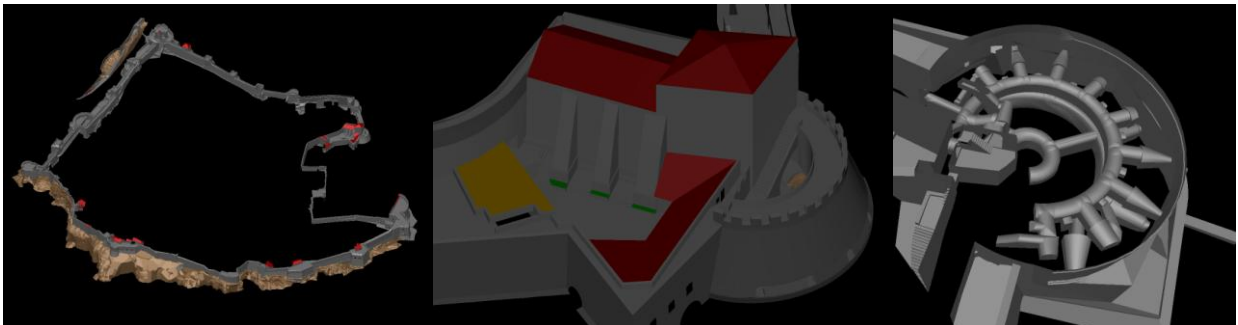
SCAN DATA



Since one of the products are plane drawings of current state of The Walls which includes drawing of walls structure, scans had to be very dense. Therefore all The Walls were scanned with resolution under 1 cm, mainly it was 5-8 mm depending of the shape of stones. Only interior of fortresses was scanned with resolution of 2,5 cm.

This makes the scan data very important part of final product because it will be used in future for precise measurements in the process of preservation.

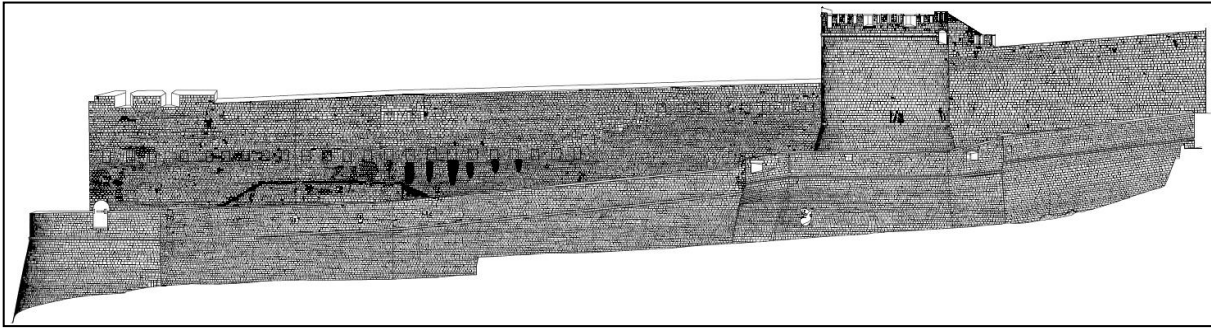
3D MODEL



3D model is created as simplified representation of The Walls and fortresses but it contains all main construction parts of The Walls. It is used for general planning in various projects, fast overview of parts of interest, calculations of quantity and expenses in preservation works, presentations etc.

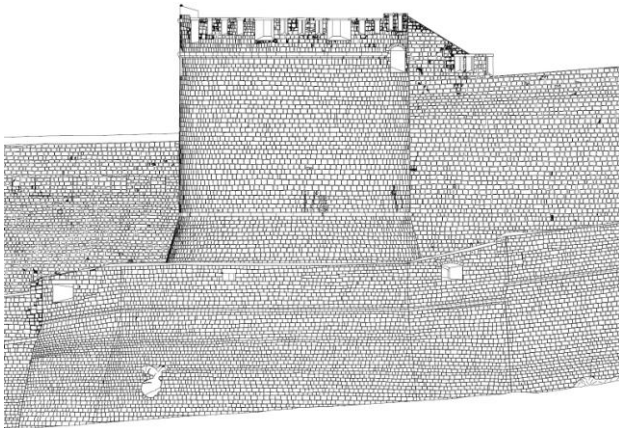
The model was created in two steps. First step was edge extraction. It was done with Cyclone by converting the edges of scan data in lines and polylines. Second step was surface generation from extracted edges. Surfaces were generated in CAD environment so the whole model is suitable for wide application and range of users.

3. PLANE DRAWINGS - DOCUMENTATION OF CURRENT STATE



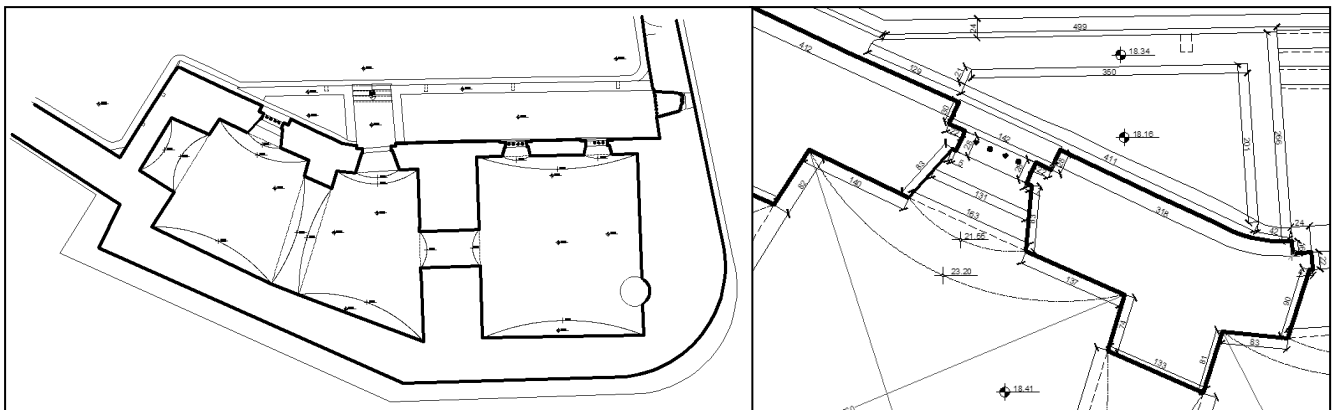
Eastern part of north facade

It was the most demanding, and time consuming part of the project. According to Croatian laws of preservation of cultural heritage this documentation have to be prepared for plot in scale 1:50 and have to contain ground views, horizontal and vertical sections and facade (elevation) views with stone structure. Every drawing have to be dimensioned with plane and height dimensions.



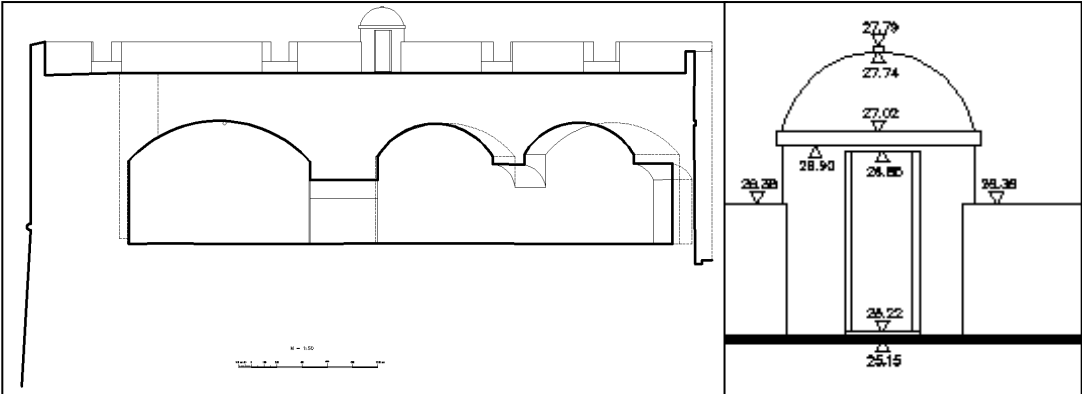
Drawings were created in CAD environment using CloudWorks for AutoCAD. This drawings are very detailed and contains all the segments of The Walls including every stone drawn separately.

Number of drawings is not given in advance. There have to be enough to represent every part of The Walls and every segment of its construction. According to this documentation it have to be possible to reconstruct The Walls in case of disaster.



Horizontal section of fortress of St. Margarita with dimensioning detail

Such a drawings are also used for detailed planning in preservation and restoration, studying The Walls history and phases of building, everyday preservation works on the field and so on.



Vertical section of fortress of St. Margarita with dimensioning detail