

2020

Temporary Roofing and Scaffolding Design for Gelati Main Church  
(Church of Virgin)

Ordering customer [NNLE Georgian Arts&Culture Center]  
Performer [NNLE Georgian Heritage]

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## Explanatory Note

### Introduction

Within the framework of the design, arrangement of working scaffold and segmental temporary roofing are planned in order to eliminate the defects at Gelati Monastery Church of Virgin

The design is based on the following documents:

- Application of NNLE Georgian Arts&Culture Center (design assignment)
- Letters N19/1123 of March 19, 2020 and N09/1662 of May 27, 2020 of the LEPL National Agency for Cultural Heritage Preservation of Georgia.
- Architectural design of Gelati Church of the Nativity of the Virgin;

Arrangement of working scaffold and temporary roofing at Gelati Monastery Church of Virgin is needed in order to eliminate (by the request of the National Agency) the defects identified in the Church in 2020, stop the process of water infiltration into the interior and damaging the wall painting until all the identified defects are eliminated.

Scaffolding and segmental temporary roofing are designed for the period required for rectification of revealed defects. The timing of remedial actions should be determined in conjunction with the National Agency. At this stage, it is difficult to say exactly how long it will take to rectify all identified defects, and therefore for how long it will be necessary to use the structures specified in this design, although by preliminary estimates, it is likely to take two calendar years. However, as the condition of roofing has not yet been thoroughly inspected due to lack of scaffolding, the categories of works to be performed through the scaffolds specified in the design have not been determined. To the best of the knowledge of NNLE Georgian Heritage, the negotiations between LEPL -National Agency for Cultural Heritage Preservation of Georgia and NNLE Georgian Arts&Culture Center are underway. Based on preliminary data, the LEPL - Georgian National Agency for Cultural Heritage Protection requested, by letter N19/1123 of March 19, 2020 and its annex, to perform the following works for the purposes of elimination of identified defects:

*„Recommendations:*

*The following measures should be taken to address the problematic issues related to roofing:*

- Considering that spring is a rich in precipitation period in Gelati, arrange temporary roofing on the sections of the roofing where the tiles are damaged, as well as on the western arm (completely), in order to prevent further infiltration of water;
- Determine the cause of tile damage. For this purpose, it is advisable to conduct laboratory research of the tiles in order to determine and evaluate their physical and mechanical properties;

- Considering the severity of damage, complete replacement of the tile made of white ceramics (preferably with tiles made of red ceramics which have already been tested and used on the upper parts of the Church); first of all, it is necessary to carry out a laboratory test of the new, replacing tile and obtain an expert opinion on its durability and the possibility of arranging it on a lime mortar solution; as well as the consent of the design author group concerning compliance with the tile characteristics specified in the design; upon submission of these documents, replacement of tile coating should be initiated in stages (damaged tiles should be removed in such a way that the works do not cause vibration and in case of drilling, it is inadmissible to use the so-called perforator mode); in addition, the works should be carried out under the supervision of the wall painting conservation specialist);
- Re-filling of failed mortar at the tile joints, as well as filling the opened tile joints. It is necessary to discuss the alternative filling method/material for the joints in advance;
- Replacement of the green-painted fillings applied on the joints located in the areas of tile binding;
- Cleaning the roughly applied fillings of joints located in the areas of tile binding;
- Replacement of rusted tile securing nails with noncorrosive nails;
- Correcting improperly arranged slugs in accordance with the design, and adding in the lacking areas;
- Replacement of improperly applied fillings at the wall/roofing abutment sites;
- In order to completely eliminate water-related problems and determine the source of wetting of walls (exterior and interior) and cornices, conduct relevant studies (including geophysical surveys, determination of salt typology, etc.), resulting in identification of further steps,
- In addition, the facade sections covered with white deposit (presumably salt) should be reduced by stone conservation specialists in order to avoid further damage of stone surfaces;
- Prepare a scaffolding design (for exterior and interior), based on which an operational scaffold will be arranged in accordance with labor safety standards with an appropriate amount of decking, railings and protective nets to perform the above works.
- On the roofing of the apses, at the spots of tile abutments, special dome-like adapters should be arranged.

*Following recommendations should be considered for **damaged wall painting**:*

- *Identify the source of deterioration (salt-related studies: micro core-sampling (distribution of salt according to stratigraphic section); identify the salt through ion tests and chemical analysis. Possible sources of salt origin: e.g. original technology; previous restorative intervention/roofing material (e.g. tile, insulation layer, solution); atmospheric precipitation.*
- *Determine moisture content of original technology according to stratigraphy*
- *Determine create a baseline data for assessing rates of detrimental change in order to establish whether or not the problem is active. study of physical history of the church and regular photo monitoring*
- *Determine the activation mechanism of deterioration by monitoring the environmental conditions.*

- *Ensure dry mechanical removal of crystallized salt located on the wall painting, with the relevant documentation attached. The intervention should be done by a wall painting conservation specialist. (The above-mentioned monitoring and salt removal works will be carried out by the Georgian National Agency for Cultural Heritage Preservation)*
- *Arrange the operational scaffold in accordance with labor safety standards in the western arm, with an appropriate number of decking, railings and protective nets for performing the works listed above. The scaffold should completely go to the south wall of the west arm so that it can reach the west wall as well; in addition to the cupola level floor, it is desirable to arrange a second floor beneath it. "*

Due to the specifics of the above works, it is not necessary to supply a large amount of materials on site (lime mortar, tile, tin or copper elements); on the contrary, this process is dynamic; during the works, the obtained materials are quickly expended and then the supply of new ones from the winch shafts located on both sides of the Church is ensured.

### **Description of the main structure of the scaffold envisaged by the design**

The metal scaffold segments are connected to each other by stairs. Working personnel in some cases uses the decking arranged on the main segments of scaffold. Since the access to virtually every point of the roof is necessary to correct existing defects, the relevant personnel mostly has to move along the existing tile lining. Railings arranged on scaffold ensure safe work on roofing slopes.

The scaffold supports are mounted on a corresponding elastic node arranged on the flat tiles on tile coating (see note). It should also be noted that resting the scaffold supports on the existing flat tiles and walking on them carries the risk of breaking those tiles, although given the current situation it is otherwise impossible to eliminate the defects. Therefore, possibility of damaged tile replacement after dismantling the scaffold should be considered.

At the ridges, the upper parts of scaffold are connected to each other; therefore, in case of correctly performed works, their sliding is excluded. In addition, the scaffolds arranged on the single slope roofing are fixed to the walls with self-expanding galvanized anchors, eliminating the risk of their possible sliding.

The metal structure depicted in the design consists of 48 mm pipes and system of factory fasteners with the appropriate profile. Accordingly, in the case of works performed under the submitted design (all the specified characteristics must be observed), its sustainability complies with the requirements set by the construction norms.

Scaffold arrangement locations are given in the attached graphic documentation.

### **Description of temporary roofing to be arranged on the main design structure**

The design team, along with Ikorta 2007 Ltd., considered several alternative roofing options and selected the fastest and most financially viable one. The approximate financial

value of the options under consideration, which provided almost 100 percent protection from the expected precipitation, exceeded, or almost equaled to, the amount already spent on rehabilitation of the Church roof. Accordingly, the presented design solution was selected, with understanding the real picture and finding a quick executable decision.

Arrangement of temporary roofing on the design structure is envisaged as follows: roof decking (which will be later covered with the tin sheets) similar to the scaffold ones should be placed segmentally on the existing structure. However, in the areas with uneven planes it will be necessary to use polyvinylchloride fabric (so-called fabric tent). Also, the fact that after the commencement and in the course of the works, the above-mentioned roof decking will often be dismantled and installed, should be considered. In such places it is desirable to use polyvinylchloride fabric (so-called fabric tent). (For distribution diagrams, see the graphic part of the design).

It should be noted that the roofing method proposed by the design does not guarantee protection of tile and wall abutment and other conjugated nodes from expected precipitation, although it will play an important role in terms of prevention.

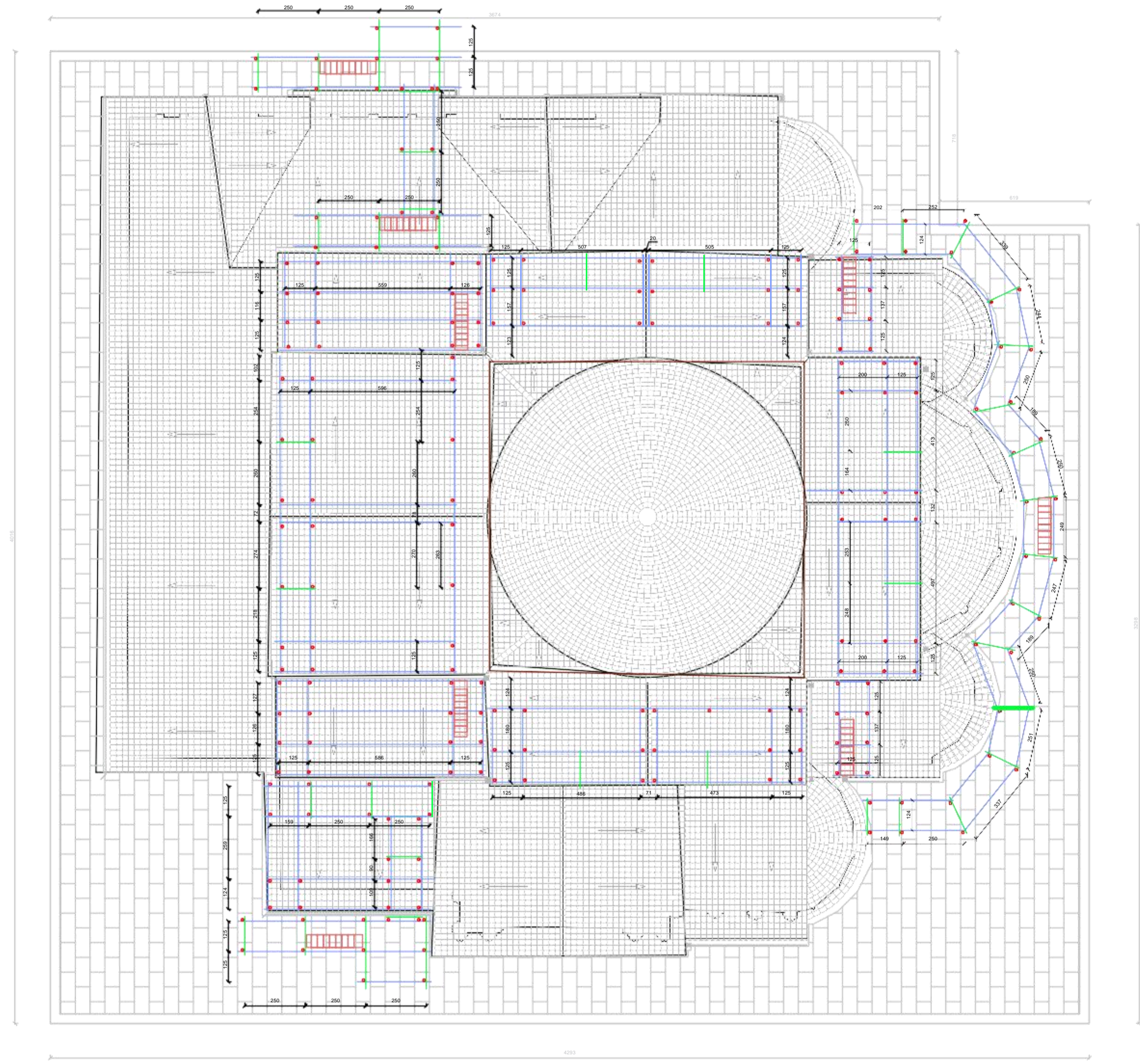
The wind load on the roofed segments is high, so in the previous design presented by us, only partial roofing of the slopes was envisaged in order to reduce the wind load on the structure and minimize the likelihood of water getting into the tile/wall abutment areas, which is the greatest threat in terms of water infiltration. The Letter N09/1662 of May 27, 2020 of the National Agency for Cultural Heritage Preservation of Georgia additionally requests to ensure full roofing of the west arm's south slope and roofing of southwest chapel. Given the large loads, it is advisable to use polyvinylchloride fabric for roofing the south slope of the west arm, and as we know, the relevant on-site arrangement process is already underway.

As for the roofing of south-west chapel, the design envisages arrangement of roofing on this section.

The locations of temporary roofing are given in the attached graphic documentation.



Church of Virgin  
 Plan for arranging a temporary  
 scaffold on the roof  
 S. 1:100

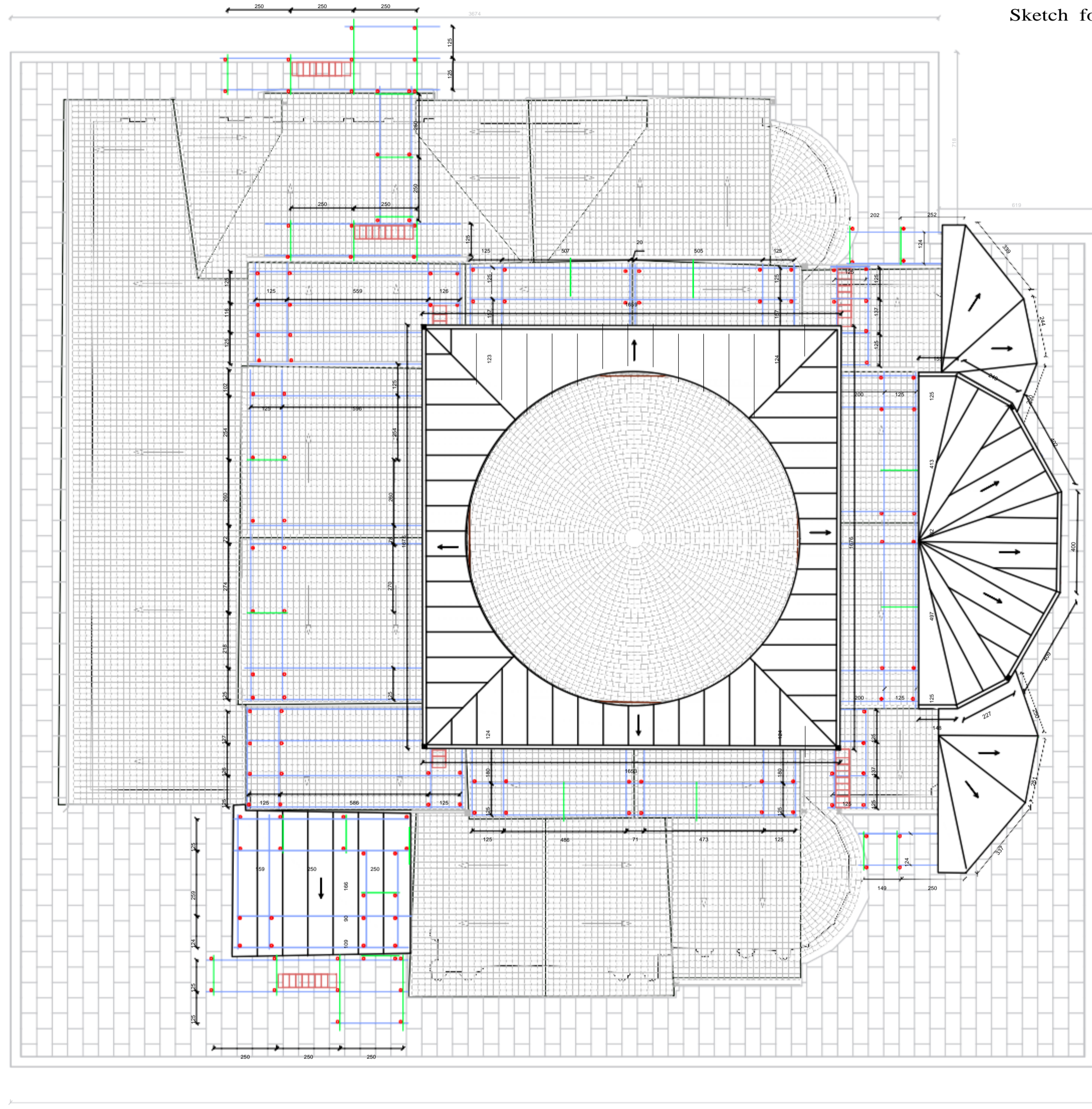
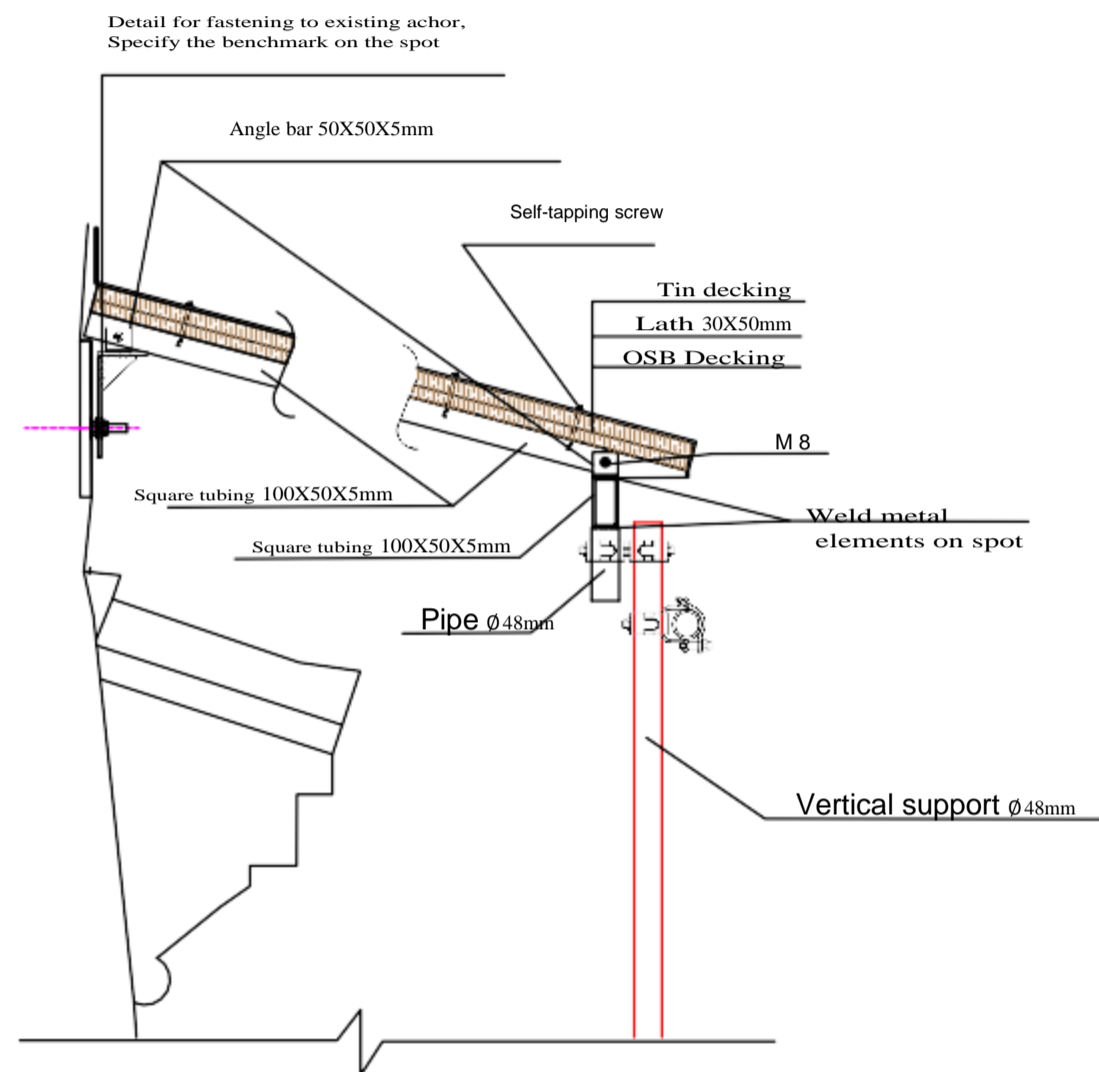


- Vertical supports —
- Horizontal connection —
- DIAGONAL CONNECTION —
- Conjugated connection —
- RAILING —
- Stairs ▨





Node for arranging the support on the tiles  
S 1:10



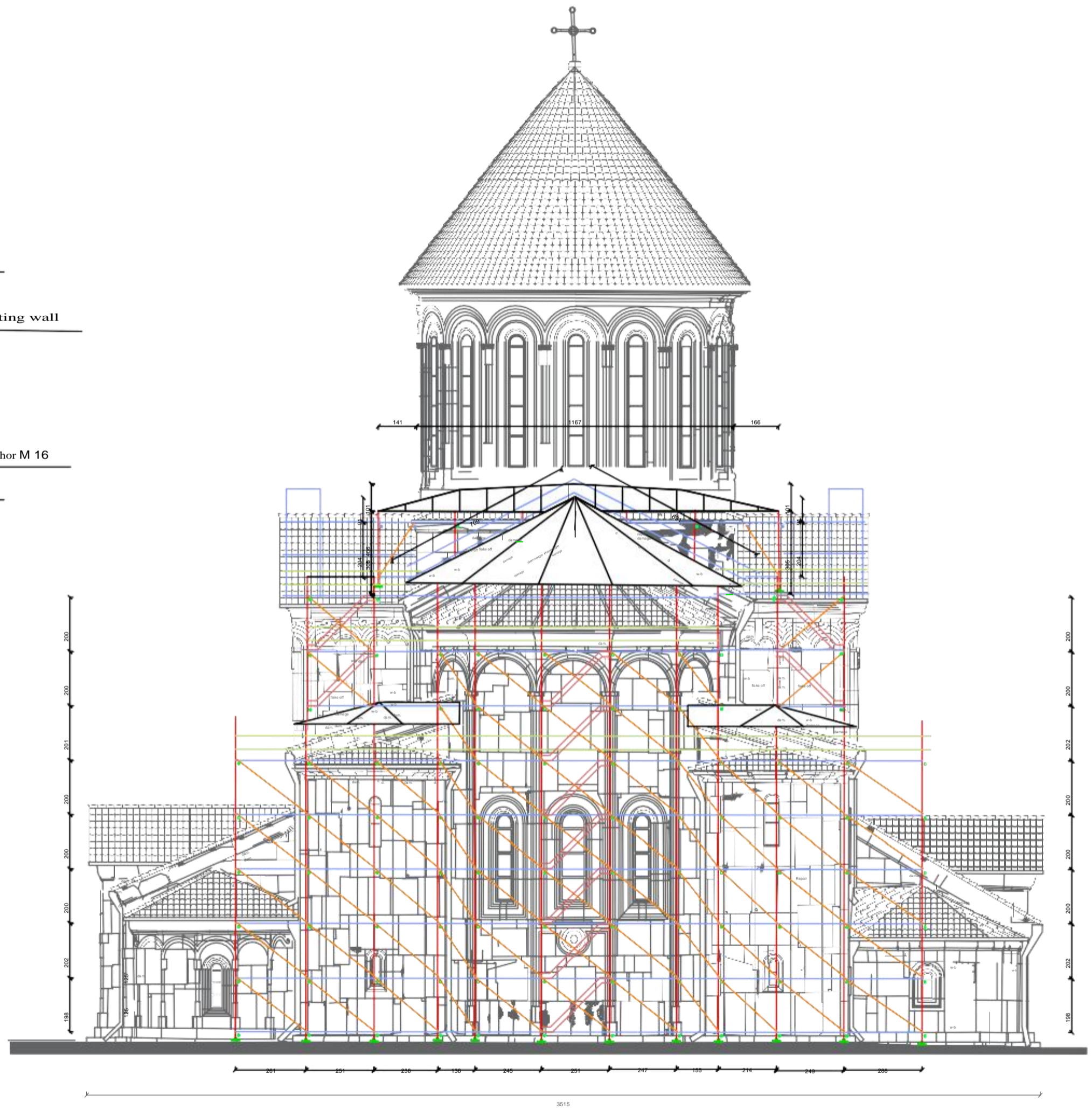
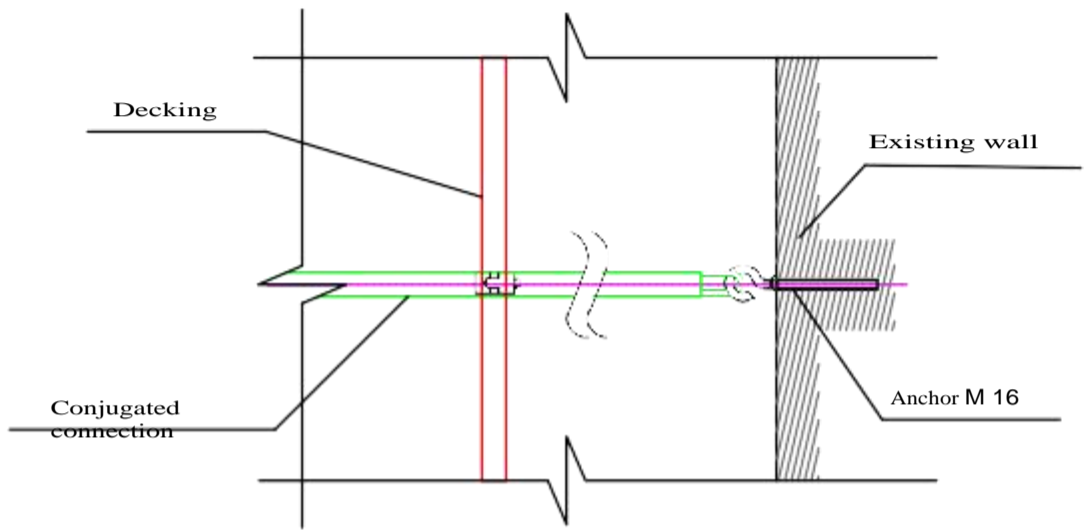
- Vertical supports —
- Horizontal connection —
- diagonaluri 4avSiri —
- Conjugated connection —
- RAILING —
- Stairs —
- Water drain pipes ■



Church of Virgin

East facade  
S. 1:100

Scaffold fastening knot  
S 1:10

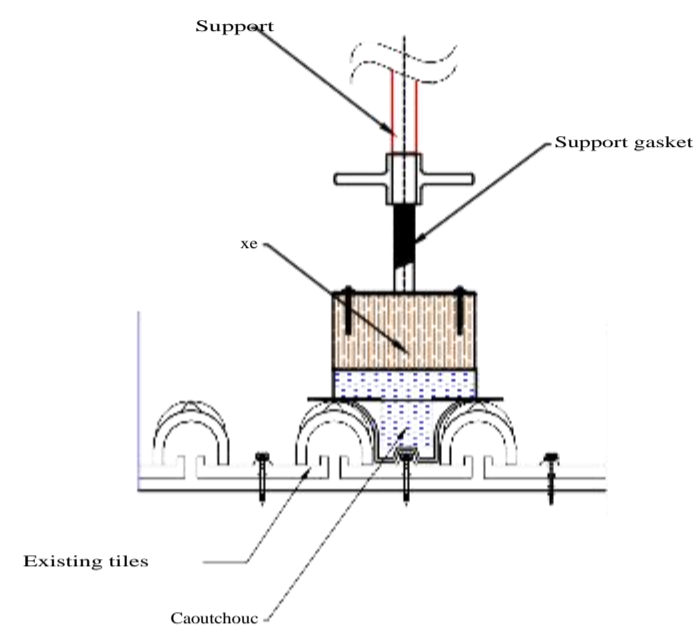


- Vertical supports —
- Horizontal connection —
- Diagonal connection —
- Conjugated connection —
- Railing —
- Stairs —



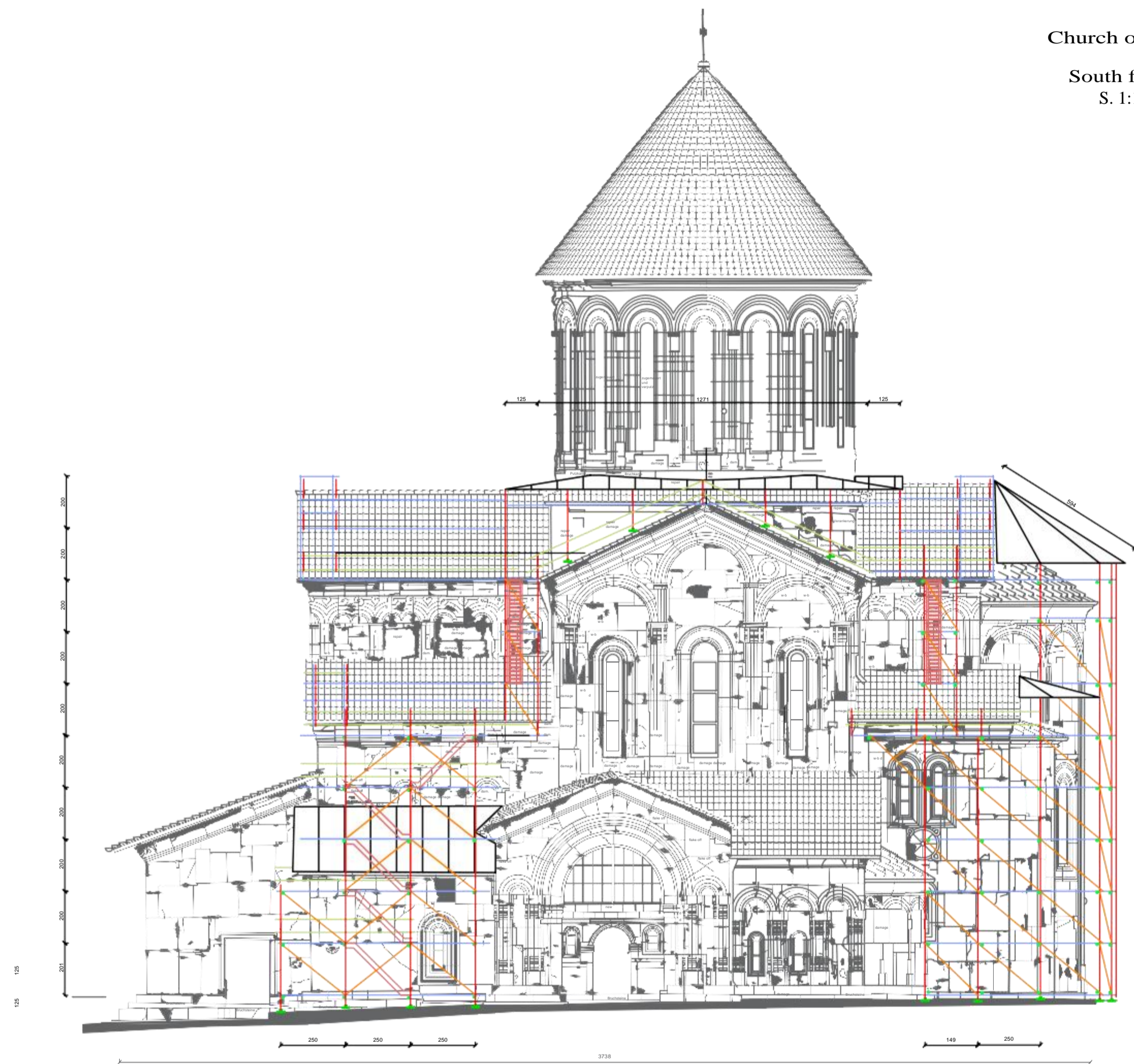
Node for arranging the support on tiles

S 1:10



Church of Virgin

South facade  
S. 1:100

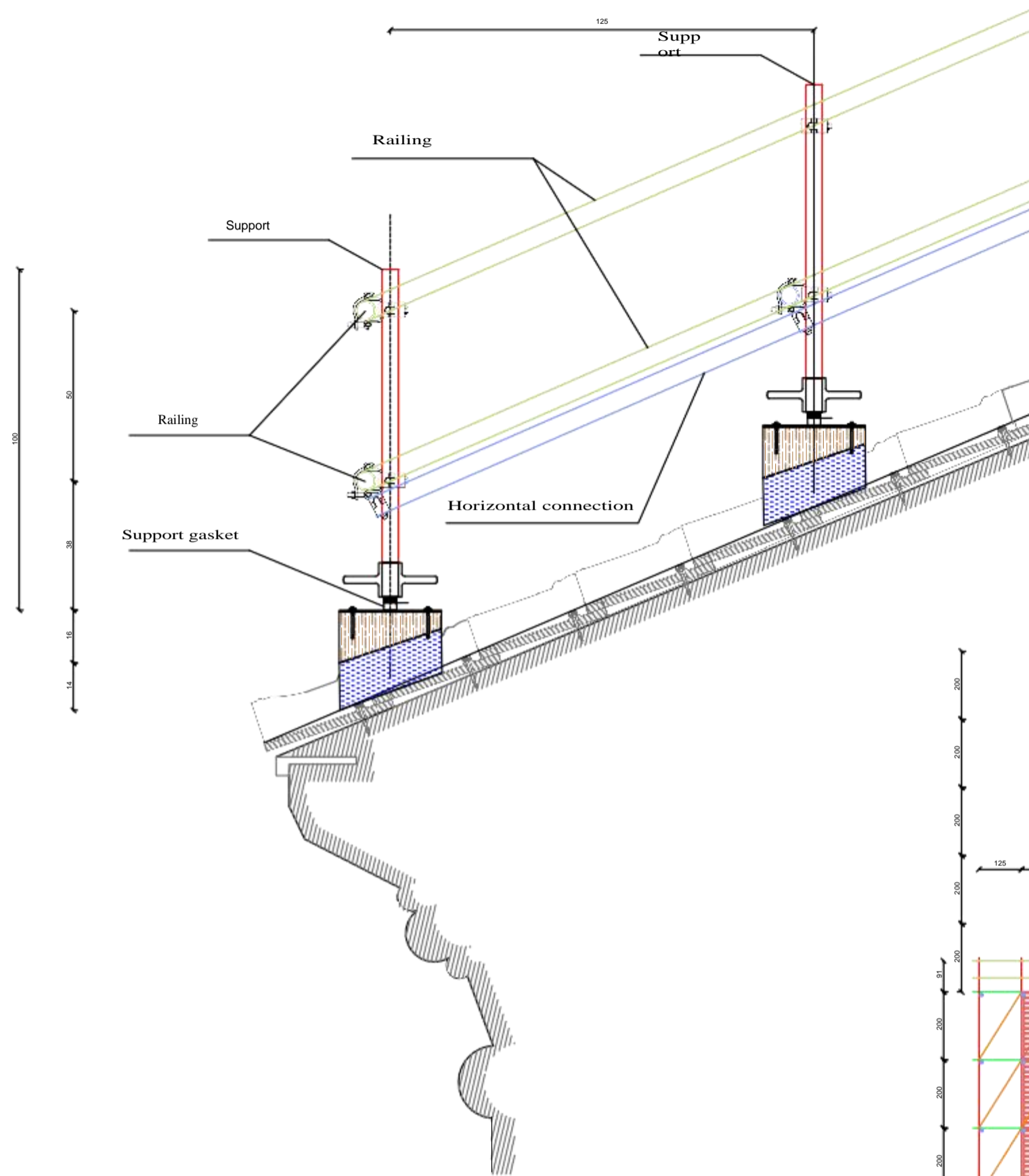


- Vertical supports —
- Horizontal connection —
- Diagonal connection —
- Conjugated connection —
- Railing —
- Stairs —

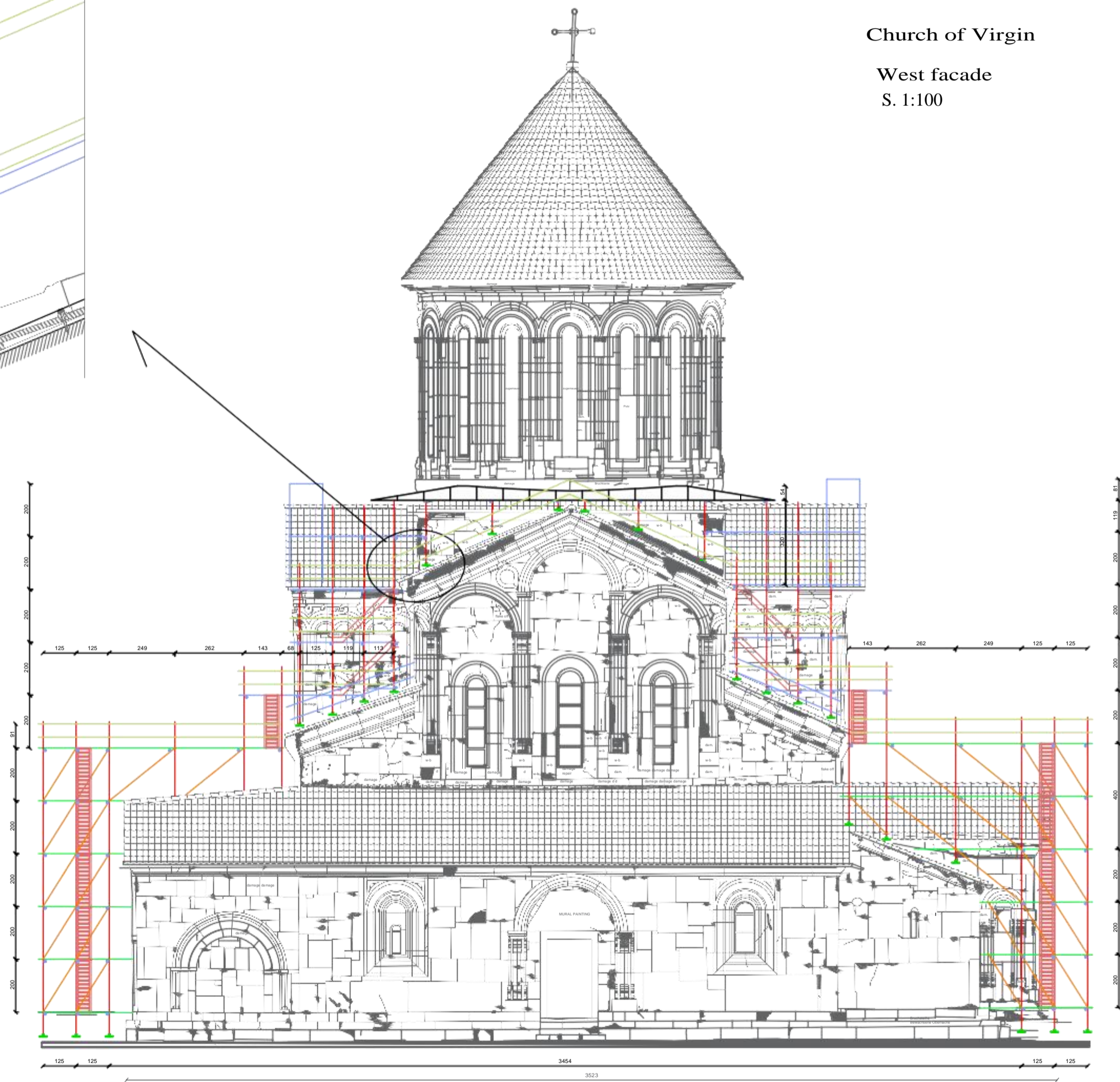




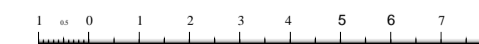
Node for arranging a scaffold  
on the Church arms  
S 1:10



Church of Virgin  
West facade  
S. 1:100

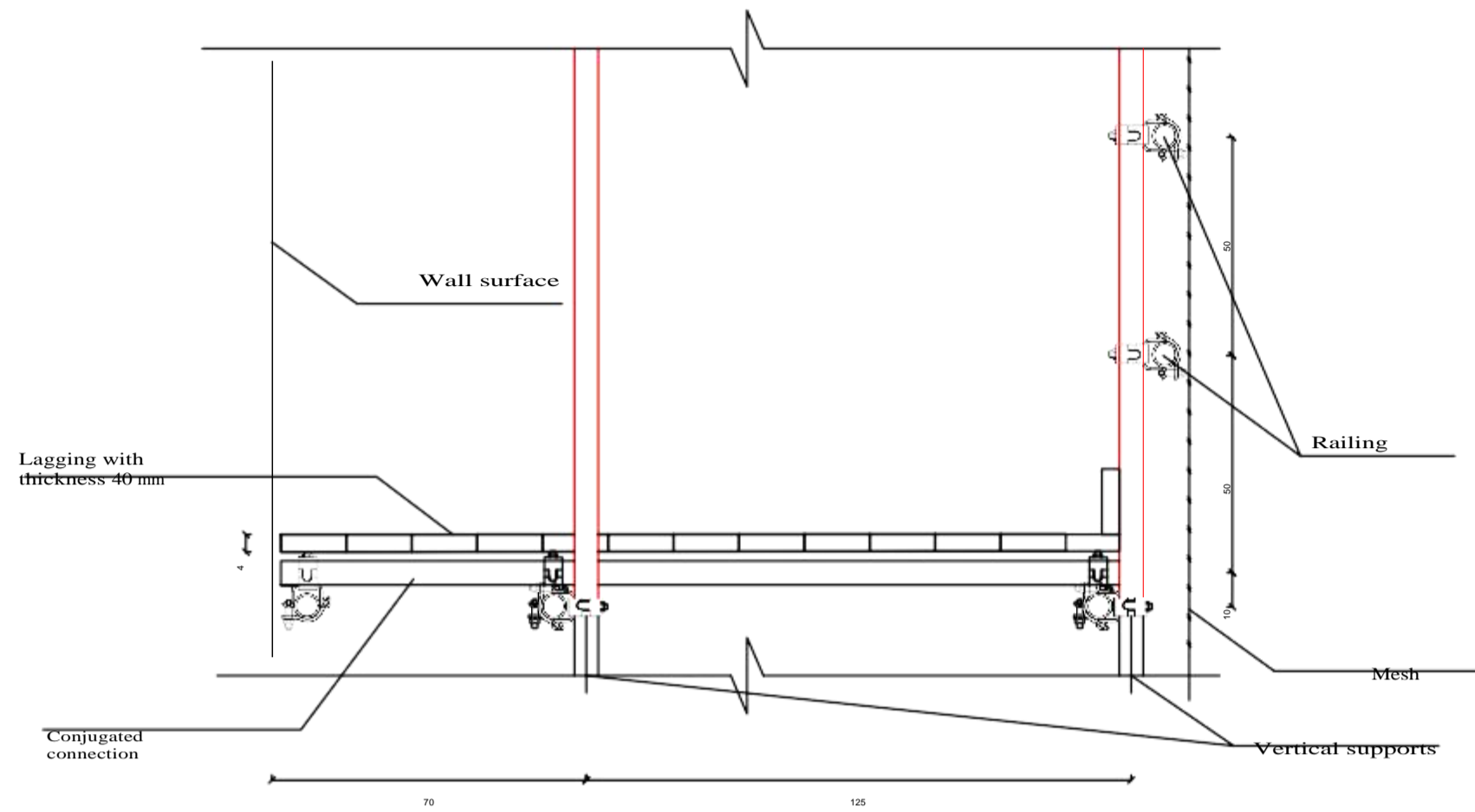


- Vertical supports ————
- horizontaluri kavSiri ————
- Diagonal connection ————
- Conjugated connection ————
- Railing ————
- Stairs ————

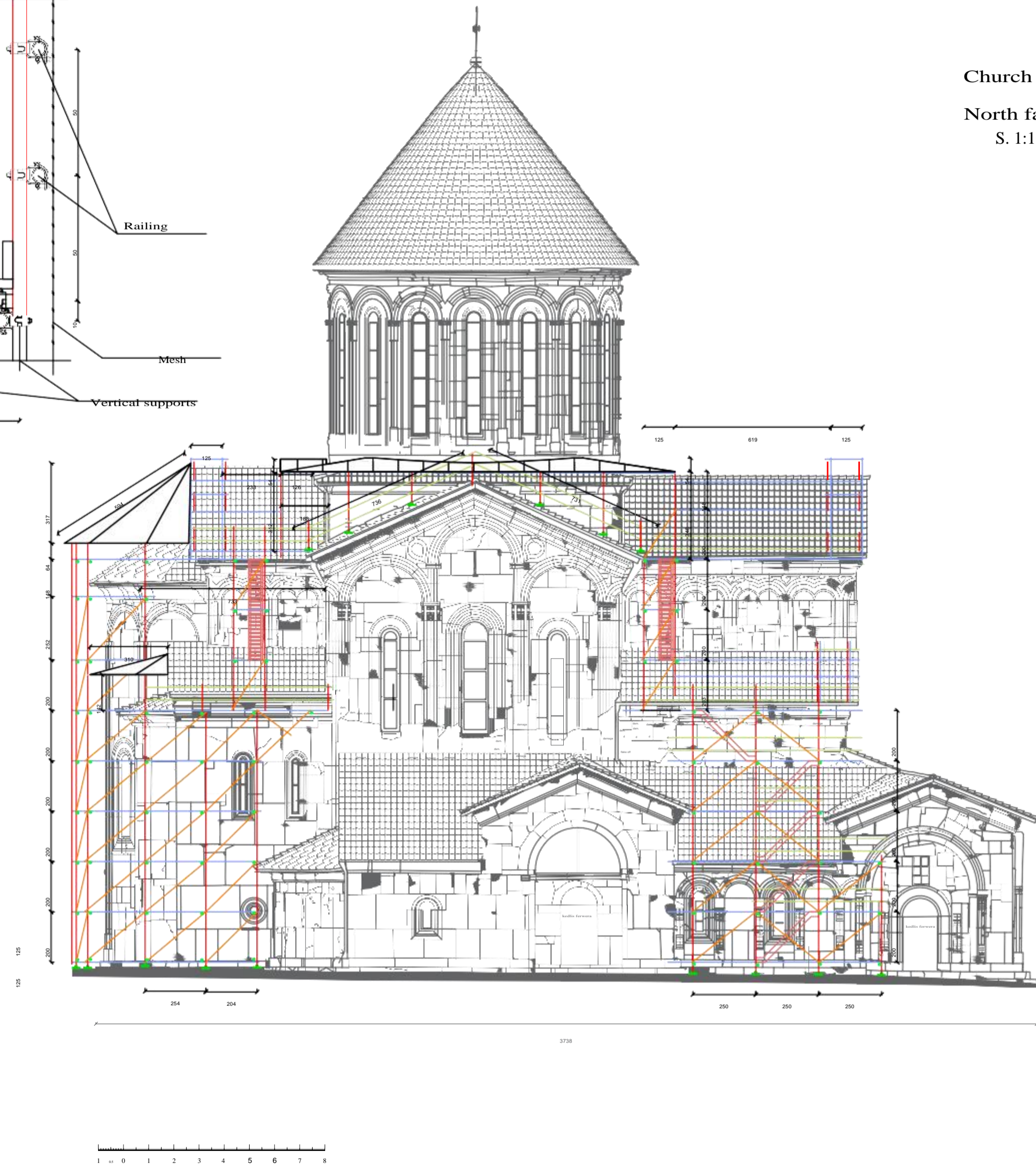




Working scaffold  
Section S 1:10

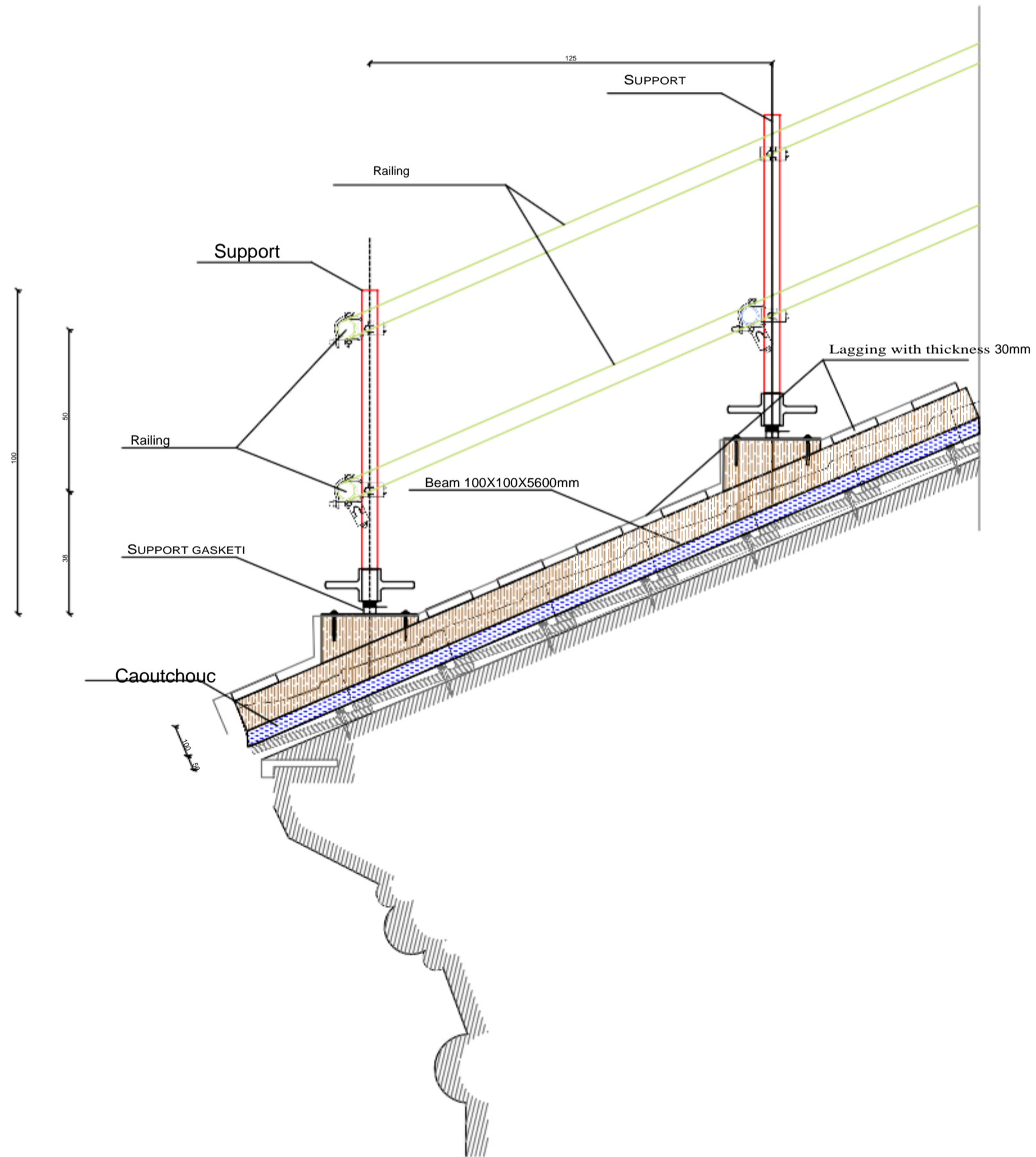


Church of Virgin  
North facade  
S. 1:100

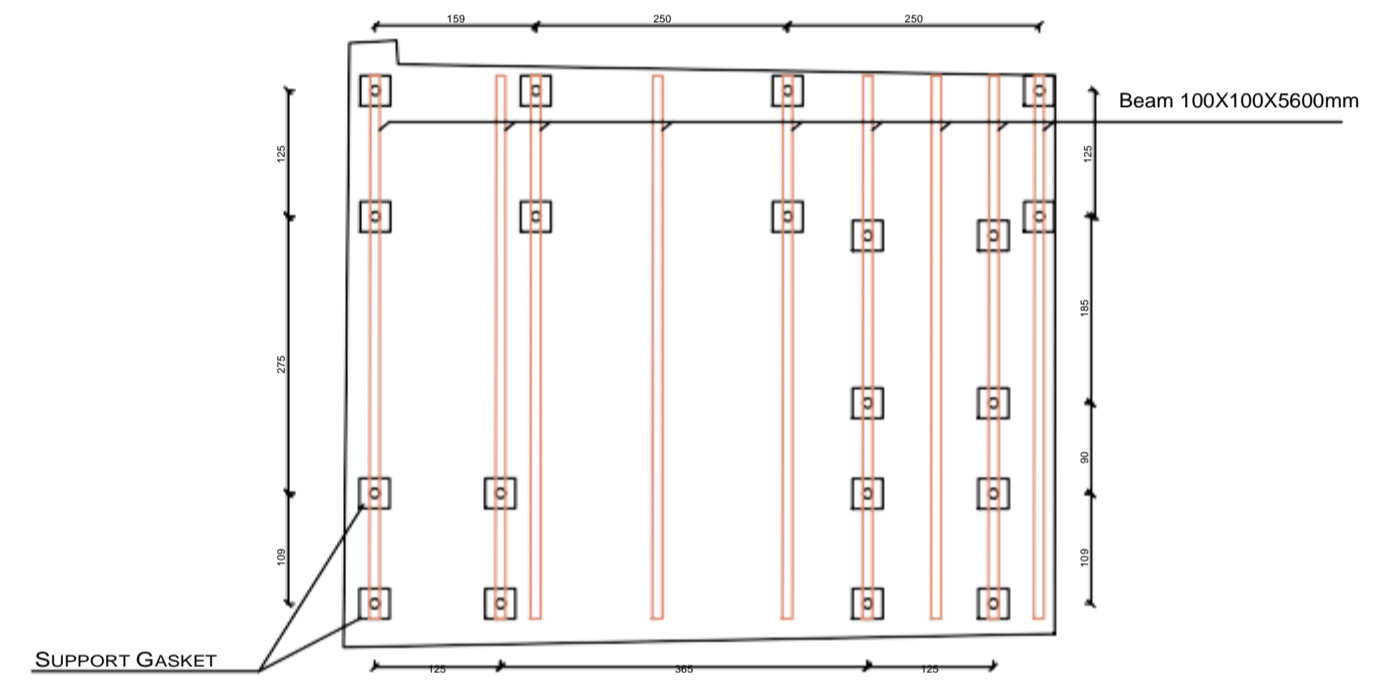


- Vertical supports
- horizontaluri kavSiri
- Diagonal conneciton
- Conjugated connection
- Railing
- Stairs

Sketch of temporary roofing and placement of supports on the Church south extension  
S 1:10



Sketch of arrangement of wooden beams on the Church extension S 1:50



## **Scaffolding and Temporary Roofing Construction Executive Management Project**

### **Description of the site and facility**

The site is located in Tkibuli municipality, Gelati Monastery Complex. Within the framework of the project, scaffolding and segmental temporary roofing are planned to eliminate the gaps in the Church of Virgin in Gelati.

### **Rules, methods and instructions for carrying out the construction**

Arrangement of scaffold and construction of temporary roofing in Gelati Church of Virgin as well as future restoration works must be carried out in compliance with the current construction norms and rules.

The design organization NNLE Georgian Heritage will provide consultations during the construction process.

Listed below are the current construction norms and rules, resolutions and other normative documents that should be followed by the construction organization during the construction and installation works:

- Resolution N 62 of the Government of Georgia of March 28, 2007 On Approval of Construction Safety Rules;
- Order N449 of the Minister of Internal Affairs of Georgia of March 27, 2007 On Approval of Fire Safety Rules in Force in Georgia;
- Law of Georgian on Protection of Cultural Heritage;
- All the normative standards of construction norms and rules that apply to various ongoing works.

### **Engineering preparation for construction and separate stages of construction management**

The presented Construction Project is developed on the basis of Construction Norms and Rules 3.01.01-85 Construction Operations Arrangement and Resolution of the Government of Georgia N57 of March 24, 2009 On Issuance of Construction Permits and Permit Conditions.

The project is based on the following documents:

- Application of NNLE Georgian Arts&Culture Center (project assignment)
- Various normative documents;
- Architectural design of Gelati Church of Virgin

The Construction Project is performed in accordance with current construction norms, rules and state standards. Immediately upon the reception of design documentation approved by the ordering customer, the construction organization will elaborate the



Work Execution Design which will be drawn up in accordance with decisions envisaged by the Construction Arrangement Design.

Commencement of construction will be allowed upon obtaining a construction permit from the relevant authorities. Construction should be carried out in accordance with the calendar schedule.

The facility construction works may be commenced only after arranging the necessary fencing of construction site.

During the facility construction, the observance of construction norms, rules and standards, special instructions of the working design and technical conditions are ensured. It is prohibited to carry out the construction and installation works without the Construction Arrangement Design and the Work Execution Design. It is not allowed to deviate from the approved design without the agreement of their design and approving organizations.

During the construction process, the following documents must be prepared according to the typical forms:

- Work log;
- Scaffolding and temporary roofing arrangement report;
- Instruction log on construction safety rules;
- Technical supervision log.

The construction site must be timely cleared from the temporary buildings and structures. In addition, special attention should be paid to the timely shutdown and dismantling of temporary networks.

### **Duration and deadlines of works**

Since, according to the classifier, the type of work does not fall under the category of standard construction works and we are dealing with the World Heritage Site, aiming to arrange a scaffold and temporary roofing to correct the identified defects, we do not use the current norms to determine the duration of construction; it is defined by comparing it with other works of similar nature.

Depending on the complexity and scale of production as well as considering the local climatic conditions, the construction duration will be 120 (one hundred and twenty) calendar days.

### **Sequence and stages of construction process**

The construction process is divided into the stages and sub-stages. Depending on the planned duration of construction as follows:

### First Stage - Preparatory works

- Preparatory work, procurement, logistics;
- Tracking and specifying on-site measures;

### Second Stage – Main works

- Arrangement of scaffold with metal structure and appropriate profile fasteners
- Arrangement of temporary so-called tent and solid decking roof on the structure;
- Connecting the facility with the temporary technical network;

### Third Stage - Documenting and reporting to the relevant agency

- Preparation of documents and submission of report to the relevant agencies;

### **General safety instructions**

- Presence of strangers, as well as the people not employed in construction operations is not allowed on the construction site.
- The staff should be instructed on construction safety issues; the tests are held as well.
- Occupational safety measures for the employees must be observed at all stages of construction and installation works in accordance with Construction Norms and Rules III-4-80 Occupational safety in Construction and in accordance with the instructions of other normative legal documents.
- Workplaces should be provided with collective protection and alarm equipment, taking into account working conditions and technology.
- Working personnel should wear overalls, respirators and headgear if necessary.
- The engineer responsible for complying with safety regulations should be assigned to the construction site. The workers as well as engineering and technical personnel must wear helmets while on the construction site, and special works must be conducted using appropriate equipment.
- All construction facilities should have the first aid facilities.
- Arrangement of construction site and area should ensure prevention of potential injuries.

### **Construction site and safety of construction process**

- Prior to the commencement of major construction works, the construction site and its surrounding area shall be arranged;
- The construction site area and its boundaries are defined by the construction document;

- The boundaries of construction site should be within the boundaries of the land plot;
- In case if the boundaries of construction site are not sufficient for conducting the construction activities and there is a justified need for this, the use of the adjacent land or public space that is not owned by the construction permit holder shall be determined by an agreement between the construction permit holder and the owners of the land plots, public spaces or territories. Local self-government bodies establish the rules for temporary use of public space;
- In case of reasonable necessity, the owners of the adjacent land do not have the right to restrict the construction activities of construction permit holder;
- Arrangement of the construction site should be carried out in compliance with the requirements of construction activities regulations;
- All areas on the construction site where third parties may be injured due to construction activities should be demarcated and marked with warning signs;
- Measures carried out on the construction site must comply with the requirements of the regulations on relevant construction activities, including:
  - a) Ensuring its cleanliness and prevention of contamination of surrounding land plots and streets, as well as damage to the pavement of these streets;
  - b) Protection of major and public engineering communications facilities on the construction site;
  - c) Fire safety;
  - d) Observance of proper occupational hygiene conditions;
  - e) Safety of works;
  - f) Prevention of environmental pollution (including streets and public spaces) by industrial waste, wastewater and air dustiness;
  - g) A notice board perceivable from public spaces shall be placed on the construction site in accordance with the requirements of this resolution.

### **Operation of technical equipment and tools**

- All technical equipment and tools used during construction must be in working condition, they must be operated in accordance with the rules specified by the manufacturer;
- It is not allowed to use non-factory (homemade) parts or spare parts during the operation of technical equipment and tools,
- Disc construction tools must be equipped with protective casing.



### **Loading-unloading works**

- Fastening of load for lifting must not be performed with improvised fastener or special load fastening device. The fastening method should exclude the possibility of the load falling or slipping.

### **Installation works**

- Presence of technical personnel or workers on the elements of structure and equipment during their movement is strictly prohibited;
- The elements installed in the design condition must be removed after their temporary or permanent reliable fastening;
- It is not allowed to perform installation works at height in open places if wind speed is 15 m/s or more, during thunderstorms and fog when visibility within the working front is limited. Movement and installation of panels and metal load-bearing structures as well as similar structures shall be stopped at wind speed of 10 m/s and above;
- It is not allowed to leave construction materials and equipment in a suspended position during the termination of works;
- If the presence of workers under the equipment is necessary during its installation, social measures should be taken to ensure the safety of workers;
- During installation works, the operating power supply must be switched off;

### **Electric installation works**

- Appropriate measures must be taken to prevent unintended switch-on (circuit breakers must be removed) or shut-off during any electric installation works;
- It is necessary to observe the relevant rules when supplying electricity for testing the electrical circuit and equipment;
- When laying cable lines, it is necessary to follow the rules for cable-laying.

### **Fire safety instructions**

All fire safety measures must be observed at all stages of construction and installation works

General requirements:

- All buildings and structures within firefighting distances must be removed from the construction site prior to construction. Otherwise fire-fighting measures must be elaborated for them.

- The layout of warehouses as well as industrial and ancillary buildings on the construction site must comply with the master plan approved in accordance with the established procedure, these rules and the requirements of design norms.
- Construction and fire protection plans shall be posted at the entrance to the construction site, indicating the location of ancillary buildings and structures, entrances, accesses, water sources, fire extinguishers and communications facilities.
- Free access should be provided to all buildings, open storages of construction materials, structures and equipment.
- The area occupied by the open warehouses of combustible materials as well as the warehouses, manufacturing and auxiliary facilities built of combustible and flash-resistant materials should be cleared of dried grass, weeds, bark and slivers. Combustible building materials designed for storage in open areas (sawn timber, roofing felt, Ruberoid, etc.), goods and structures made of combustible materials as well as equipment and loads placed in combustible packaging, shall be kept in stacks or in groups not exceeding 100 m<sup>2</sup> area.
- It is not allowed to arrange temporary warehouses (storerooms), workshops and administration and amenity facilities in the buildings constructed with metal load-bearing structures not protected from fire as well as combustible polymer heat insulated panels.
- Prior to the commencement of major construction works, construction shall be provided with fire-fighting water supply from fire hydrants or reservoirs installed in the water supply network.

### **Instructions on environmental protection measures**

During the production process on the construction site, it is necessary to carry out environmental protection measures and works in accordance with the current legislative acts and normative documents concerning environmental protection and anti-air pollution measures.

General requirements:

- Commencement of works will be allowed after issuance of a permit by the relevant service. The works must be carried out in compliance with environmental protection and anti-air pollution measures.
- It is not allowed to contaminate existing sewage wells with construction waste.
- When performing facade works, the facades should be covered with the curtain to prevent dust from scattering in the residential zone.

**Notes:**

- The Calendar Scheduled Plan of Intended Works is attached to the design in form of annex.
- The design does include additional scaffolding and roofing sketches, as the mentioned design includes the same type of information.