

Expert Review of Design Documentation for Projects in the Chernihiv Region

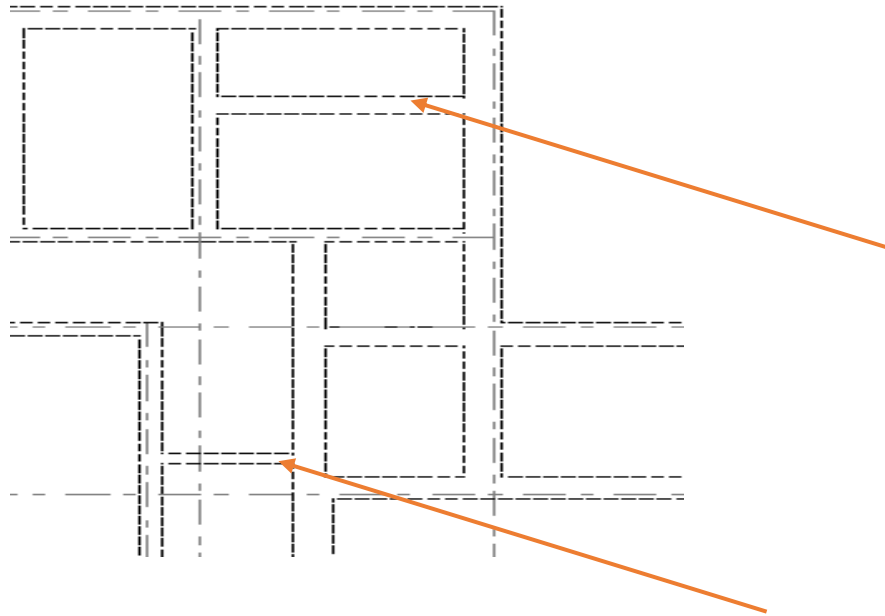
Tasks of the documentation review:

1. **Verification of compliance with regulatory requirements.** During the analysis of each project, primary attention was paid to those solutions that may contradict the applicable building codes, standards, and fire safety requirements.
2. **Identification of logical inconsistencies and risks of increased scope of works.** All key aspects of the documentation that may lead to additional works or necessitate adjustments during the project implementation process were obligatorily identified and highlighted.
3. **Assessment of weak or inadequate solutions.** Particular attention was paid to solutions that may potentially require changes during the construction process and may complicate project implementation at various stages.

New Construction of a Civil Protection Shelter – a Dual-Purpose Facility with Protective Properties of a Radiation Shelter for the Needs of Oleshnianskyi Lyceum named after S. F. Rusova of the Dobrianka Settlement Council, located at 4-A Shkilna Street, Oleshnia Village, Chernihiv District, Chernihiv Region

General

1. **The project as a whole is very weak and poorly thought out from a structural point of view, insufficiently documented, and contains violations of regulatory documents in the design part.** The project lacks a significant amount of information required for the execution of works; the applied materials are incompatible with each other; construction technologies are violated; and initial input data have not been provided.
2. **Title pages of the project sections are missing, or are not signed by the project author and not approved by the Client.**
3. **Drawing title blocks do not contain dates or signatures of the project authors.** The title block contains an unusual code including the word “ORDER” (“ZAMOVLENNIA”).
4. **The project volumes do not contain the following mandatory sections:** table of contents, project composition, list of acts for concealed works, list of designers with signatures (participants register), and explanatory notes to the project sections.
5. The axis setting-out plan (AR 03) does not comply with the requirements of DSTU 9243.4:2023 “System of Design Documentation for Construction.” In particular, some structural elements do not have designated axes, which must be defined using numerical or alphanumeric indices with decimal notation (for example, 1.2 or A.1).



6. **AR 07.** During the installation of waterproofing, the construction technology has been violated. Specifically, Ceresit CP 43 waterproofing was applied onto the surface of extruded polystyrene insulation. Moreover, it was applied over bitumen-polymer primer Ceresit CP 41, which makes proper adhesion between layers impossible. It is proposed to replace all layers installed over the insulation, including the protective adhesive layer with reinforcing mesh. It is recommended to install one layer of bonded waterproofing made of roofing felt on the concrete wall structures. Over the insulation, a protective layer consisting of a studded membrane with geotextile should be applied.
7. **AR 07.** On the foundation slab, a waterproofing layer made of bitumen-polymer material Ceresit CP 43 is specified. It is proposed, for cost optimization, to replace this solution with roofing felt installed with welded seams.
8. **AR 07.** On the foundation slab, a cement-based coating waterproofing system is specified in two layers, extended onto the walls by 200 millimeters. This layer is excessive, as a waterproofing layer has already been provided beneath the slab preparation. Therefore, the additional coating layer is unjustified.
9. **AR 07.** An extruded polystyrene insulation layer (XPS, flammability class G1) is specified beneath a reinforced screed with a thickness of 45 millimeters. Based on practical experience and considering the mechanical properties of insulation under screed, it is recommended to increase the screed thickness to 60 millimeters.
10. **AR 07.** It is proposed to completely eliminate the self-leveling polymer floor layer applied over the screed.

11. The structural concept of the shelter is highly questionable. Based on experience in strength and stability calculations and in accordance with the recommendations of DBN V.1.2-6:2021, shelters located at such an elevated position above ground level require perimeter counterfort walls to compensate for loads from blast waves. In the presented project, the shelter effectively represents a rigid box located on the ground surface without adequate lateral load compensation.
12. Additionally, the adopted foundation depth of 660 millimeters from ground level is questionable. Considering the calculated soil freezing depth of 1.2 meters, this solution significantly affects the structural stability of the dual-purpose protective structure.
13. **AR 09.** The door type DZ1 is changed twice on the same sheet, being alternately designated as blast-resistant airtight doors and external protective doors, which creates inconsistency.
14. No installation details or assembly nodes for door installation are provided.
15. The door specification is extremely limited: opening dimensions are not indicated, and there are no requirements or details regarding thresholds.
16. A marking plan is missing from the project documentation.
17. The room finishing schedule does not specify the construction composition of finishes for each individual room.
18. **AR 11.** The sheet is structured in an extremely irregular manner and contradicts the requirements of DSTU 9243.4:2023.
19. The architectural solutions section provides very limited detailing and an insufficient number of construction nodes, including parapet caps, porches, canopies, drainage systems, threshold pits, wall opening plans, masonry instructions for partitions, floor construction, and façade installation guidelines.
20. The structural design section (KB) is very poorly developed. It lacks reinforcement plans, reinforcement specifications, construction nodes, and joint details. Floor plans should be included in the architectural section; however, in the structural section it is impossible to identify floor locations due to the absence of room marking.
21. The specified design of the boiler room parapet caps is shown schematically without any supporting substructure.
22. The project documentation applies different types and diameters of fire hose cabinets (Ø19 / Ø25 / Ø50) with varying configurations. Inconsistencies have been identified between the explanatory note, drawings, and specifications, which contradicts the requirements of DBN V.2.2-5:2023 regarding the consistency of design solutions. To eliminate this violation, it is necessary to unify the solution by adopting a single type of fire hose cabinet consistently across all sections of the documentation.
23. Different sections of the project contain inconsistent initial data regarding the number of persons to be sheltered (112 persons versus 213 persons), which leads to discrepancies in calculations of water reserves and in the selection of tanks and pumping equipment, thereby violating the requirements of DBN V.2.2-5:2023. The shelter capacity must be unified across all sections, followed by recalculation of reserves, pumps, and storage tanks.
24. Firefighting parameters (flow rate of 31 liters per minute, operating duration of 30 minutes, number of jets and fire hose cabinets) have not been verified for compliance with the actual layout and the requirement to ensure coverage of every point, which does not meet DBN V.2.2-5:2023. It is recommended to clarify the number of simultaneously operating fire hose cabinets, perform a hydraulic calculation, and confirm the principle of “each point covered by at least one jet.”

25. Ambiguities have been identified in the air exchange tables: different supply and exhaust values are specified for the shelter zone, while the overall balance is formally reduced to zero without explanation of system operating modes, which contradicts the requirements of DBN V.2.2-5:2023. It is necessary to balance air exchange for each system and each room, supported by calculations and explanatory notes.
26. A conflict has been identified in the concept of electricity metering (separate versus shared metering unit), which is inconsistent between the explanatory note, diagrams, and specifications and does not comply with DBN V.2.5-23:2010. One principal solution must be adopted and synchronized across all sections of the documentation.
27. Backup power supply for Category I consumers is declared; however, the project lacks detailed solutions for automatic transfer switch systems, switching logic, and protection selectivity, in violation of DBN V.2.5-23:2010. It is necessary to add an automatic transfer switch diagram, define the list of consumers connected to backup power, and justify protection selectivity.
28. Power supply and backup for communication and alert systems are not coordinated with the electrical design solutions: power sources, reliability category, and protection are not defined, which does not comply with DBN V.2.5-23:2010. It is recommended to define connection points in the communication systems section and allocate dedicated lines, protection, and backup in the electrical section.
29. Accessibility solutions are not supported by verification of compliance between routes for persons with reduced mobility and actual door and corridor widths, nor are they coordinated with the calculated evacuation time. This does not ensure compliance with accessibility requirements. It is necessary to verify dimensions on plans, develop threshold and platform details, and link tactile solutions to actual axes and elevation levels.
30. The calculated evacuation time is valid only under unchanged initial conditions. Given discrepancies in the number of occupants (112 versus 213) and or changes in layout solutions, the evacuation time calculations require updating. It is recommended to unify shelter capacity and evacuation route geometry and perform a control recalculation after revisions.
31. The civil protection water supply section lacks clear coordination with the water supply and ventilation sections regarding emergency water reserves, sewage, and sanitary facilities, which prevents confirmation of facility autonomy. The section must be supplemented with references to water supply and ventilation solutions with appropriate confirmation.
32. The project does not define the operational mode of the sewage system during prolonged occupancy of the shelter (presence of storage tanks, sanitary restrictions), which does not comply with DBN V.2.2-5:2023. An emergency or autonomous sewage operation mode must be designed and described.
33. The design assignment does not contain a complete list of civil protection systems (ventilation, water supply and sewerage, electrical systems, communication systems, fire protection systems), which contradicts DBN V.2.2-5:2023. It is recommended to update the design assignment to include all mandatory systems.
34. The design assignment does not define requirements for accessibility and accommodation of persons with reduced mobility, in violation of DBN V.2.2-40:2018. Mandatory accessibility requirements must be added.
35. The design assignment does not specify the requirement to ensure shelter readiness for use within no more than 24 hours. It is recommended to include this requirement in the design assignment.

36. The general site plan after expert review does not contain clear linkage between shelter evacuation exits and movement routes, complicating evacuation safety assessment. Evacuation routes must be clarified and shown on the general plan.
37. The project does not verify or show slopes of pedestrian routes for persons with reduced mobility. It is recommended to indicate slopes, curvature radii, ramps, and their geometric parameters.
38. Zones of potential flooding of the shelter have not been identified, and no drainage measures are provided, creating operational risks. Engineering measures for surface and subsurface water drainage must be designed.
39. The project documentation does not include a description of shelter operation procedures during peacetime and wartime. The relevant section should be expanded to describe operational modes.
40. Connection points of external utility networks are not coordinated with the general site plan solutions. Appropriate coordination must be performed and reflected in the project documentation.
41. Power supply for temporary consumers from existing networks and the YARV-50 unit is not detailed: protection schemes, grounding, residual current devices, cable cross-section selection, and fire safety of temporary networks are not specified. It is recommended to establish minimum requirements, including a temporary distribution board with protective devices, grounding or neutralization, cable class selection, installation method, and mechanical protection measures.

Conclusions based on the results of the analysis of the design documentation

Project: *New construction of a civil defense protective facility – a dual-purpose structure with the protective properties of a radiation shelter – for the needs of Oleshnyanskyi Lyceum named after S.F. Rusova of Dobrianska Settlement Council, at: 4-A Shkilna Street, Oleshnia village, Chernihiv District, Chernihiv Region.*

Based on the performed expert review and the identified comments (Items 1–41), it has been established that the design documentation contains a significant number of deficiencies, inconsistencies, and violations that affect the completeness, correctness, feasibility, and regulatory compliance of the proposed design solutions.

1) Overall assessment of the documentation readiness

The design documentation, in its current form, **cannot be considered ready for implementation and procurement**, because:

- the project is **insufficiently developed and poorly prepared** (lack of initial data, lack of required explanatory notes, missing sections such as contents, composition of the project, lists of hidden works acts, list of designers with signatures, etc.);

- the documentation is **improperly formed** (missing title pages approved by the Client and signed by the authors; drawing title blocks without dates and signatures; non-standard and unclear drawing code with the word “ORDER”);
- there are **systemic inconsistencies** between the explanatory note, drawings, and specifications, which violates the principle of unified project solutions and creates risks of contradictory interpretation during construction and tendering.

2) Key technical and technological violations

A number of solutions have been identified that indicate **violations of construction technology and incorrect compatibility of materials**, in particular:

- waterproofing solutions are designed with a **violated application technology** (application of Ceresit CP 43 onto XPS and onto Ceresit CP 41 primer, which prevents proper adhesion of layers), which creates a high risk of early failure and water penetration;
- the foundation slab waterproofing system contains **redundant layers** and technically unjustified duplication (additional cement-based coating waterproofing above a waterproofing layer already installed below), resulting in unnecessary cost without proven benefit;
- a number of solutions require optimization and clarification (proposals regarding screed thickness, elimination of self-leveling polymer floor layer, replacement of expensive systems with technically acceptable and more economical alternatives).

3) Structural stability and safety risks

The adopted structural concept requires **mandatory verification** and raises serious concerns, because:

- the shelter is designed as a “box” located above ground level without clearly justified measures for compensation of blast loads (counterfort walls), which is inconsistent with the expected approach referenced to DBN V.1.2-6:2021 recommendations;
- the foundation depth of 660 millimeters, compared to the calculated soil freezing depth of 1.2 meters, creates risks for the long-term stability of the structure and may negatively affect the reliability of the dual-purpose protective facility.

4) Incompleteness of architectural solutions and detailing

The architectural documentation contains a **critical lack of detailing**, which makes accurate execution and quality control impossible, including:

- absence of door installation details, incomplete and insufficient door specification (missing opening dimensions, thresholds, installation requirements), inconsistent designation of door type DZ1 on the same sheet;

- absence of mandatory plans and schedules (marking plan, room finishing details per room, opening plans, and key nodes for parapets, porches, canopies, drainage, threshold pits, façade solutions, and partition masonry guidance);
- deficiencies in compliance with DSTU 9243.4:2023, including improper axis breakdown and incorrectly structured sheets.

5) Engineering systems and civil defense functionality

The project demonstrates **system-level inconsistencies and incompleteness** affecting civil defense functionality, including:

- inconsistent initial data on shelter capacity (112 vs 213 persons), resulting in incorrect selection and calculation of water reserves, storage tanks, and pumps, and requiring recalculation after unification of capacity;
- firefighting solutions are not confirmed by a coordinated hydraulic and functional verification (flow rate, operation duration, number of jets/PKK and actual coverage of each point), requiring clarification and confirmation of the principle “each point covered by at least one jet”;
- ventilation air exchange data is inconsistent and not transparently balanced per system and per room; operating modes and calculations must be added;
- electrical design contains unresolved conceptual conflicts (separate vs shared metering), and backup power supply is declared but not detailed (absence of ATS diagrams, switching logic, list of Category I consumers, and protection selectivity);
- lack of coordination between power supply and the communication/alert systems (no defined power sources, reliability category, protections, or reserved lines);
- lack of confirmation of accessibility solutions for persons with reduced mobility and their linkage to evacuation calculations; evacuation time must be recalculated after correction of capacity and planning data;
- absence of defined operational modes for sewage during prolonged sheltering and lack of clear autonomy confirmation between sections.

6) Risks for procurement and construction

If the documentation is used in its current state, it will lead to:

- high probability of **additional works**, scope growth, and **increase of project cost** during construction;
- ambiguous interpretation by contractors during tendering due to incomplete and inconsistent requirements;
- significant difficulties in site supervision, quality control, acceptance of works, and commissioning due to missing details, nodes, and coordinated solutions.

Final conclusion and recommendation

The design documentation **requires mandatory revision and completion** by the designer, including:

- restoration of completeness and correct formalization of documentation (title pages, signatures, dates, required sections, and explanatory notes);
- unification of initial data (shelter capacity) across all sections and subsequent recalculation of reserves, equipment, ventilation, and evacuation parameters;
- elimination of technological violations and replacement or correction of incompatible or unjustified material layers;
- development of missing architectural and structural nodes, reinforcement plans, specifications, and all necessary working drawings;
- synchronization of engineering systems (firefighting, ventilation, water supply and sewerage, electrical systems, communication/alert systems) with clear calculations, operating modes, backup logic, and coordinated design solutions;
- updating the design assignment to include the full list of civil defense systems, accessibility requirements, and the requirement for shelter readiness within ≤ 24 hours.

Expert recommendation: submit the documentation to the designer for revision and re-check. **Until the identified deficiencies are eliminated, it is not recommended to proceed with procurement and construction**, due to high risks of cost escalation, delays, and non-compliance with regulatory requirements and safety criteria.