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DEVELOPMENT OF AN AGRITOURISM GUESTHOUSE AND ASSOCIATED INFRASTRUCTURE

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evelopment of an Agritourism Guesthouse and Associated a technical analysis of an agritourism-type building located nty. It addresses both the economic and tourism potential of architectural, geotechnical, and structural considerations t supports sustainable rural tourism development by offering e alternative to conventional tourism, leveraging the area's onstrates the application of engineering principles in creating s with national technical regulations, promotes rural tourism, ent. The study analyzes the thermal, sanitary, and electrical vable energy sources and compliance with energy efficiency romotion of rural tourism and demonstrates the integrated sustainable development of tourist infrastructure within the

l tourism, Tismana, structural design, geotechnical analysis,

on is located in Isvarna Village, Tismana Town, no. 36, ,635 m², identified under cadastral number 36714 and 6714 Tismana, property of Gruescu Neli Luminița, as 2015.

e, with the following dimensions:

North: South: 103.27 m, East: 103.93 m , West: 100.93 m

Boundaries:

- North: unincorporated area, East: private property, South: communal road DC 125, West: private property

Topographical characteristics: Gentle slope (~2%),

Reference elevation corresponding to the level of the adjoining communal road.

Building Location on the Plot

The construction is situated on the south-eastern side of the plot: 8.50 m from the southern boundary: 2.00 m from the eastern boundary, 12.50 m from the centerline of the communal road, as specified in Urbanism Certificate (CU) no. 207/01.09.2015 and the site plan (HERBEI ET AL., 2015; HERBEI & SALA, 2016).

Climatic Conditions

The area is characterized by a temperate-continental climate, with:

- Average annual temperature: 14–16°C
- Summer maximums: approximately 28°C
- Winter minimums: around −3.8°C

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- Annual precipitation: 500–750 mm
- Average precipitation days: 87–90 per year
- Snowfall days: approximately 20 per year
- Prevailing winds: from North and North-East

[redacted]Conditions

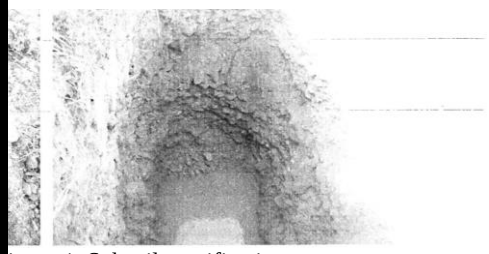
[redacted]ag = 0.12 g, IMR = 100 years, Tc = 0.7 s , Seismic

[redacted]egetal layer)

[redacted]with gravel inclusions

[redacted]d layer with gravel and boulders

[redacted]te favorable foundation conditions for low-rise [redacted]risk and good natural drainage (MIHUȚ ET AL., 2019;



[redacted]igure 1. Subsoil stratification

[redacted]s: Category: C (11 points), Importance class: IV, Fire resistance rating: II

Existing Situation

The site currently hosts an existing structure (C1) with a built area of 64 m².The original project has been technically verified for requirement A1 (structural safety).

Proposed Works

The project involves the construction of a tourist agripension with the following characteristics: Building height regime: Ground Floor (P), Maximum total height (H_{max}): 8.50 m, Cornice height (Hc): 4.50 m includes all related utility networks and infrastructure (water supply, sewerage, power supply, and access).

Description of the Proposed Construction

Function: Tourist agripension — single-storey building (Ground Floor – P) composed of the following functional spaces:

- Two terraces (one open, one enclosed);
- Main hall;
- Four bedrooms;
- Five bathrooms;

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- Living room;
- Kitchen;
- Technical room;
- Stairwell providing access to the attic;
- [redacted]ys.

Table 1

[redacted] Urban Planning Indicators

	Existing	Proposed
	1.635 m²	—
	64,00 m²	178,60 m²
[redacted]	—	178,60 m²
	2,90%	20,37%
	0,029	0,204

[redacted]a laminated frame system with a monolithic reinforced

[redacted]nforced concrete footings beneath load-bearing walls,

[redacted]rated brick masonry, insulated with 10 cm expanded

[redacted]ed brick masonry;

[redacted]of), thermally insulated and covered with ceramic tiles,

[redacted] metallic gutters and downpipes, discharging into the sewerage network.

Exterior Arrangements: Perimeter protection walkway: monolithic concrete sidewalk, minimum 1.00 m wide, laid on a sand bedding layer.

Interior Finishes: Walls and ceilings: washable emulsion paint;

Floors: Ceramic tiles in hallways, bathrooms, and kitchen; Laminate flooring in bedrooms;

Terraces: Ceramic tiles (open terrace); Laminate flooring (enclosed terrace);

Interior joinery: wood;

Exterior joinery: PVC with double-glazed windows.

Exterior Finishes: Base (plinth): cladded with natural stone imitation;Façades: finished with decorative plaster and polystyrene ornamental profiles; Roof covering: dark-colored ceramic tiles.

Interior Installations

Heating system: solid-fuel (wood) central heating unit, located in the technical room;â

Domestic hot water: produced by the central heating system and supplemented by solar panels connected to the thermal circuit;

Water supply: from the public network and an existing drilled well;

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Electrical installation: connected to the public power grid, supplemented by roof-mounted solar panels (Toderas, M., 2008).

Functional Description and Construction Characteristics

The proposed building functions as a tourist agripension, designed as a ground-floor structure (P) with maximum plan dimensions of 9.90 m × 18.90 m and a total height of 8.50 m).

Organization:

Room	Net floor area (m²)
Bathroom 4	2,77
Stairwell	5,88
Terrace1	27,69
Terrace 2	13,09
Total	157,36 m²
Total Net floor area (Su)	113,36 m²

connected to: The public electricity network, ystem installed on the roof;The existing water supply vided through a sealed, vacuumable tank, with the possibility of future integration of a BIO CLEANER BC10 biological treatment plant (capacity: 10 persons).

Fencing and Boundaries

The land will be enclosed as follows:South side: concrete block masonry fence with monolithic concrete foundation and reinforced belt, topped with metal elements (rectangular pipe); Remaining perimeter: galvanized wire mesh mounted on metal posts.

Rainwater Management System

Through site grading and vertical systematization, rainwater will be collected and directed toward the green spaces, and any excess runoff will be safely discharged into the sewerage network.

Green Spaces and Pathways

A pedestrian walkway made of prefabricated concrete slabs will be arranged leading to the main entrance, while the remaining areas will be landscaped as decorative green spaces.

Outdoor Lighting

The facades and courtyard will be equipped with solar-powered lighting fixtures, contributing to the energy efficiency of the property.

Investment Characteristics

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- Built-up area $S_{(c)}$ (m^2) 178.60
- Usable area $S_{(u)}$ (m^2) 113.36
- Built volume,V (m^3) 580.00
- Height to parapet H_a (m) 4.50 (max.)

[redacted]

max.)

nd Floor)

0 persons (8 guests + 2 staff)

tance Grade II and a low fire risk, in accordance with ated on the ground floor in a ventilated technical room, ases. The design complies with access, evacuation, and cilities.

Tismana, on curtilage–construction-type terrain, situated lat relief.

be removed);

;

lders (good bearing layer).

Groundwater level: 1.8–2.2 m below surface;Frost

round acceleration: ag = 0.12 g; Geotechnical risk: 8

risk).

n the gravel layer, below frost depth (≥0.95 m);

- Avoid using the upper clayey layer as bearing soil;
- Use continuous strip footings or rigid raft foundations with perimeter drainage;
- Ensure compaction and verification of the bearing layer.
- Foundation and Bearing Layer Parameters
- Bearing layer: gravel with boulders, within a sandy–clayey matrix.

Conventional bearing pressures (for B = 0.50 m, Df = 1.10 m, relative to finished ground):

- Gravel with boulders: p_conv=350 kPa
- Marly clay (foundation active zone) p_conv=300 kPa
- Clay cover layer: p_conv=250 kPa
- Recommended minimum foundation depth: Df ≈ 1.30 m (in gravel–boulder layer).
- Frost depth: 0.90 m (SR 6054/77) — foundation depth to remain below this level.
- Geotechnical category (structure–soil system): 1 (low risk).

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- Width/depth corrections: according to STAS 3300/2–85, as determined by the structural engineer.

Note: The p_conv values are reference values for the standard dimensions (B = 0.50 m; Df = 1.10 m). Actual foundation design must apply correction factors per STAS 3300/2–85.

Climatic and Seismic Actions

[redacted]= 0.12 g, Tc = 0.70 s; indicative intensity MSK ≈ VII.

[redacted]): 2.0 kN/m² (reference snow weight).

[redacted]/s (1-min mean velocity at 10 m height), reference [redacted]depth: 0.90 m.

[redacted]Load-Bearing Walls

[redacted]ce under gravitational and horizontal (seismic) actions,

[redacted] (tie-columns) at corners and wall intersections;

[redacted]rete tie beams (rings) at each floor level, forming a

[redacted]rs or meshes in masonry joints to ensure interlocking

[redacted]ns – Specifications

[redacted]ctions, and highly loaded zones;

[redacted]; cross-sectional area ≤ 900 cm²;

[redacted]C16/20 used in design for main elements);

[redacted]6Ø14 PC52 steel ($\rho_l \leq 0.8\%$ of concrete area);

[redacted]

- In foundation: ≥1.20 m (or 80Ø for single-storey P+1 buildings);

- Stirrups: Ø8 OB37 spaced at 15–20 cm, densified to 10 cm in lap and end zones;

- Bonding with masonry: through direct adhesion and steel meshes embedded in mortar joints.

3) Reinforced Concrete Tie Beams – Specifications

- Location: at each floor/roof level; continuous and closed layout; add intermediate tie beams if wall stability requires it.

- Dimensions: Width = wall thickness (min. 30 cm); Height ≥ slab thickness.

- Thermal protection: exterior insulation on outer walls to prevent thermal bridging.

- Longitudinal reinforcement: PC52 steel; Ømin = Ø10 (PC52) or Ø12 (OB37).

- Anchorage: lap ≥80Ø, with max. 50% spliced in one section; spacing between splice zones ≥1.0 m; corner anchorage ≥80Ø.

- Stirrups: Ø8 OB37 @ 15–20 cm; densified to 10 cm over 50 cm near columns.

4) Horizontal Reinforcement in Joints

- Purpose: tensile resistance and spatial interconnection at corners and intersections;

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- Details: independent bars or steel meshes (OB37 Ø8), placed ≥4 cm from wall edges;

- For infill masonry: dowel bars Ø6 mm, L ≥ 50 cm from RC elements; anti-corrosion protection in mortar M50Z.

5) Load Bearing Steel Reinforced Concrete Slab

/m²;

n²;

m²;

daN/m².

xample (Central Column)

daN

21,000 daN

city: pconv = 250 kPa (silty clay foundation)

N/cm² (< allowable pcalc);

< 1,150 mm (central/perimeter footing), to be adjusted

STAS 3300/2–85 and actual test results (for pconv = ratum).

sioning Examples

C16/20 concrete, section 30×30 cm, 6Ø14 PC52 steel < 0.3 OK).

Beams: Height H ≈ (1/8…1/12)·Lg, selected example: 25×40 cm.

Moments: M_ef ≈ 8.500 daN·m, Q_ef ≈ 5.300 daN; Beton C16/20 (R_c ≈ 125 daN/cm² compresion; R_t ≈ 9,5 daN/cm²), Longitudinal reinforcement: 3φ16 + 3φ16 (p%_ef ≈ 1,60; p%_ef.inf ≈ 0,65);

Shear strength: Q/(b·h_0·R_t) = 0,46 ⇒ Minimum transverse reinforcement (stirrups usedØ8/15–20 cm OB37).

Table 2

Concrete structures calculation

Typical floor slab	
Live load	280 daN/m2
Self-weight of concrete slab	330 daN/ m2
Plaster and floor finish load	120 daN/ m2
Load on beams	110 daN/ m2

Table 3

Fundations calcutions

Foundation area of the central column	Saf = 2,25 m2
Column base loads from upper and ground floors	N1 = 21 000 daN
Self-weight of the column	N2 = 250 daN
Self-weight of the foundation	N3 = 5 000 daN
Total	N= 26250 daN

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Load on beams	450 daN/ m2

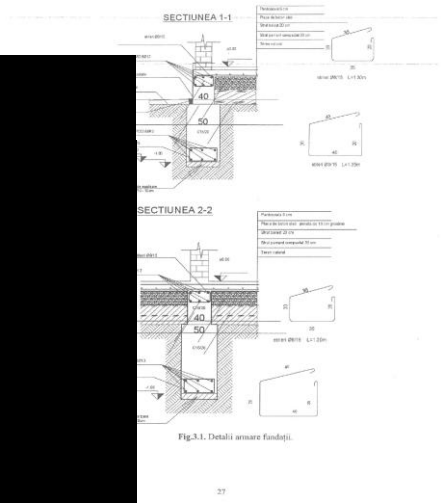

Fig.3.1. Detalii armare fundații.

. Foundation reinforcement sections

— Principles

rdening are slow; at –10…–15 °C, mortar can freeze
on in strength.

rs; wet/frozen masonry units; the use of salt as an

≤ 2% of cement mass (for cement mortars).

- Methods: heat conservation (pre-heating materials + insulation) and/or execution inside protective enclosures.

9) Execution Technology

Applicable codes (selection): P10–86 (foundations), C112–86 (bituminous waterproofing), C140–90 / NE012–99 (concrete/RC), P2–85 (masonry), C16–84 (concreting in winter).

Quality control:

- Acceptance of foundation subgrade and foundations; records for concealed works.

- Concreting in the presence of site technical supervision (CTE); concrete logbook; avoid unintended construction joints (or place them in low-stress zones).

- Curing and protection of concrete (moisture/temperature control); formwork removal per NE012–99 (rev. 2005).

- Masonry: full joints; proper ties/anchors at corners, intersections, and to frames.

- Design discipline: any design change only with the designer's written approval.

- Phasing & legal: notify City Hall/ISC at start; hold points per Law 10/1995, GD 766/1997, C56/1985; do not proceed to the next phase without signed inspection records.

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- Project verification: certified checkers for requirements A1 and A3.

Occupational Safety & Fire Protection

- Comply with Law 319/2006, applicable NTS norms, P118/1999 (fire safety), and site-specific instructions.

[redacted]ask-specific training for all workers; mandatory PPE.

[redacted]ger prevents accidents; PSI procedures posted; egress

[redacted]ly compliant materials with certificates; equipment

[redacted]cealed works; no progress to next phase without phase

[redacted]erior masonry (Porotherm + ETICS); PVC joinery with $Q_h \approx 15.2$ kW, Q_DHW ≈ 15.4 kW, Boiler nominal

[redacted]ation boiler (with 60 L buffer/boiler), or alternative 30 water 90/70 °C; low-level distribution (ground floor s with air vents.

[redacted]iping; anti-scale and impurity filters on supply/return; es/protection at wall penetrations.

[redacted]on by licensed personnel; cold test, then hot test and equired.

[redacted] double-wall stainless steel, insulated; Ø150 mm ht and ΔT; natural ventilation of the boiler room.

[redacted]ty, watertightness, fire safety, thermal and energy

Fire safety (PSI): proper boiler placement, natural ventilation, compliance with fuel/ventilation codes; fire extinguishers and signage provided.

Installation & checks: falls for drainage/air release, minimum clearances at radiators (10 cm above floor, 5 cm from wall), visual/dimensional checks of pipes/fittings; full QA documentation and, where applicable, concrete logbook.

Chimneys & Ventilation

Active height (draft): Solid fuel: ≥ 4.50 m (exception: ≥ 3.50 m at top storey; no reverse draft; no two fireplaces on the same flue). Gas/liquid fuel: ≥ 2.50 m.

Inactive height (cleaning access): ≥ 1/10 of active height, but ≥ 50 cm.

Duct routing: maximum one offset, ≤ 30° from vertical; total plan deviation ≤ 1 m; smooth surfaces; constant section, circular or rectangular with side ratio ≤ 1.5.

Thermal insulation: mandatory above the top floor and for flues on exterior walls; grouping ducts reduces losses. Location: preferably inside, in non-load-bearing walls; if in load-bearing walls, not at intersections and with stability measures.

Minimum wall thickness: 11.5 cm (masonry), 10 cm (prefabricated), or equivalent lining/insulation.

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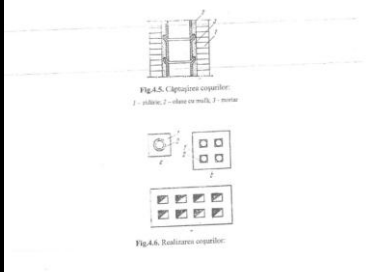
Combustible/metal elements: separate with solid masonry (≥ ½–1 brick) and 10 cm air gap at the roof; no bearing on the chimney.

Stability at height: thicken to 24 cm and/or provide reinforcement/anchors.

Cap & access: well-fixed protections that do not hinder cleaning.

Ventilation ducts: individual or manifold, similar materials; may be grouped with [redacted] ≥ 11.5 cm (masonry) / ≥ 6 cm (prefab); ensure fresh air [redacted]



[redacted]ure 3. Construction of chimneys

[redacted]ms

[redacted] the public street network; PEHD/PP pipes (water) [redacted]uried joints (only in manholes); isolation/drain valves, [redacted]

[redacted]2–110 mm, vented stacks, cleaning fittings, floor traps; [redacted]

[redacted]D Ø160 mm, sand bed +15 cm below and above pipes, [redacted]s per standards; sealed wall penetrations; installation [redacted]-tightness tests.

[redacted] PVC downpipes Ø110 mm; calculated flow ≈ 1.84 l/s (~6.8 m³/h).

Wastewater: Discharge to septic tank (or alternatively to BIO CLEANER 10 mini treatment plant); in compliance with NTPA 002/1997.

Sanitary Fixtures: Porcelain or stainless steel; ball-type faucets; reinforced flexible connections.

Quality, Safety & Occupational Protection

Key Regulations: Law 319/2006, Law 10/1995, NTS/PSI standards; mandatory safety training and PPE use.

Execution: Certified materials, testing (cold/hot for installations), phased inspections, official acceptance reports; site signage, trench shoring.

Fire Safety: Double-wall stainless steel chimney for solid fuel; natural ventilation of the technical room; no structural support on the chimney.

Waste Management: Concrete platform with euro-bins/containers and a valid sanitation contract.

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CONCLUSIONS

The analyzed project complies with all technical, functional, and legal requirements for the proposed construction. The adopted structural solutions — reinforced concrete frame, thermally insulated masonry walls, and direct foundation — ensure strength, stability, and durability under the site's geotechnical and seismic conditions. The heating, water supply, and [redacted] ized according to national standards, ensuring adequate [redacted] ility.

[redacted] egrates comprehensive occupational safety and fire [redacted] ditions during both construction and operation phases. [redacted] been designed in accordance with draft and safety [redacted] ion of solid-fuel or electric systems. Overall, the project [redacted] ble technical solution that meets all the requirements of [redacted] ity, ensuring safety, efficiency, and environmental [redacted] ed comfort and the extended lifespan of the building.

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