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Environmental Isolation Must Be Carried out before the Construction

Abstract: Building isolation took care of the groundwater's constant level if it dropped, resulting in building cracking and even collapsing. Objective: without building isolation, ground subsidence causes cracks and befallen workers. The survey case study of houses near the project showed that the engineer did not understand mechanics. Novelty: Without building, isolation caused crashes in several homes near theproject. Previous studies focused on human error, not usingpersonal protective tools and lack of warning signs. Analysisof soldier piles without water-retain walls so that the dewatering process caused reduced groundwater and cracked divisions. Conclusion: The building was uninsulated during Construction, so groundwater was unstable, and the wall collapsed, befalling workers.

Keywords: Environmental, Mechanics Structure, Isolation Project, Construction, Collapsed.

1. Introduction

Environmental isolation had to be carried out in buildings that require basements, primarily urban areas. Therefore, case studies of construction accidents during the Implementation of the basement building were carried out by research, and the authors hope that this did not happen again in other facilities. Environmental isolation had to be understood by all engineers involved during reconstruction, Construction, operation, and maintenance. If not isolated, construction or building failure occurs sooner or later. Many cases of cracks, slants, and even collapses. Construction and building failures, in which many uncomplicated buildings occur, are relatively simple but merit little attention to environmental isolation, especially against vibrations and groundwater subsidence. The water well had decreased, and the ground had subsided or tilted, so it was not just being repaired as seen, for example, cracked, land cavity, broken. Part of the environmental solution land was considered and worked on first. This had to be analyzed as the leading cause of the warning, and the groundwater sign fell because there was a change in groundwater falling material, falling cranes, and dust [1]. When lifting, attention had to be paid to the crane, both the lower structure and the upper structure of the tower crane, and the lifting ropes, including ties, should also be connected to the existing column or cast beforehand so that it is 28 days old. Every project should have zero accidents, include the project environment, and avoid water and soil pollution. Objective: Without location isolation, underground structures cause cracks and collapse of neighboring buildings, resulting in material loss, lives, and injuries, indicating that construction engineers do not understand mechanical analysis [2]. Soil test data, groundwater level, and environmental structure data must be analyzed during design, reconstruction, Construction, and operation [3]. The project construction manager had to understand the mechanics of structural mechanics, soil mechanics, and fluid mechanics. Without this understanding, cracks collapses, and damage to neighboringbuildings and the building being worked on often occurred.In discussing this land, the wall collapsed while building the basement, hitting four workers, and two died. This had alsohappened in several underground building projects in Indonesia that had cracked, titled/deformed buildings so thatthey had been temporarily stopped. Novelty: the collapse isviewed from the mechanics, not just procedures, processes, and documents [4]. Research Gap: So far, discussions on methods, techniques, and the lack of technological devices to support the smoothness and speed of information have been stated.

2. Experimental investigation

2.1. Basic Information

Collapse/ accident surveys did not quickly obtain direct access onsite with design drawings from site plans to detailed drawings [5]. However, the survey team went straight to the houses of residents who had an impact on the back side of the hotel so they could see the effect [6]. On the project, look straight from the front fence. However, the survey team interviewed residents, supervisors and represented owners directly. It was enough to analyze sharply [7].

At the time of the wall's collapse with a fallen height of 6 meters, pile cap work was being carried out at the location in the middle of the POP Hotel's dividing wall. Wall collapse occurred in the old fence and was followed by the POP Hotel dividing wall (the side of the hotel under study) [8].

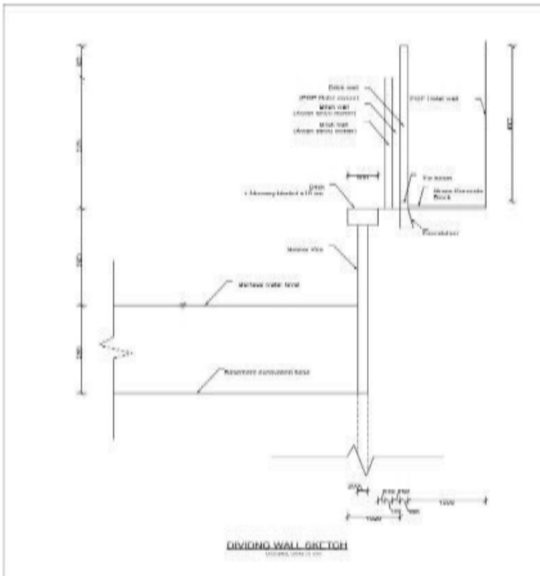

Figure 1. The fence wall collapse (source: Supervisor document)

Figure 1 Description:

1) The walls of the POP Hotel fences and the fence walls of residents' houses. The border was U-shaped with a height of 3.2 - 4 meters, surrounding the rear, left and right sides of the Awan Hotel building project. The fence wall of the POP Hotel consists of 3 layers two layers of the old wall, one brick thick without practical columns, and one layer of the POP Hotel guardrail wall half brick thick with functional columns.

2) At the time of the wall's collapse with a fall of 6 meters, pile cap work was being carried out at the location in the middle of the POP Hotel's dividing wall. Will collapse occurred in the old fence and was followed by the POP Hotel dividing wall. Cracks in the walls and columnar structures of the residents' houses on the right side and the back wall of the project fence during the execution of drilled piles and soldierpiles. Information from the groundwater monitoring consultant in the borehole is discarded.

3) The soldier piles were spaced apart so they were hollow, and no watertight walls were installed, causing the neighboring groundwater to drop.

4) Groundwater was continuously dewatered because therewas a source of water. On the other side of the building, a neighboring well near the Awan Hotel project had dried up.

5) The ground level between the wall of the fence and the POP Hotel wall was 1.5 meters wide, down to 10 cm, and a cavity occurred.

The drawbacks of the project were as follows: A retaining wall above the pile cap and an L-shaped tie beam corner to

Concrete 20 cm thick had been cast on the back until the corner adjacent to the POP Hotel fence wall collapsed along with the collapse of the old wall. A partial collapse of the tie beam structure followed the destruction of the POP Hotel fence wall [9].

The cracks and damage occurred due to making a semi-basement without an isolated environment. Hence, the groundwater around the basement dropped, causing cracks and collapse of the fence wall that borders neighbors. This was a photo of cracked/damaged three houses at the back of the project and the fence wall with neighbors [10].

The cause should be analyzed before the fence wall collapses its borders on the next-door neighbor due to groundwater dropping.

Figure 2 Back fence of the project, the boundary of the 1st resident's house (Source: Author document)

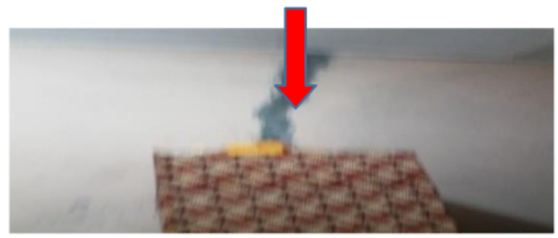

Figure 3. Cracked wall of the 1st resident's house(Source: Author document)

Figure 4. Slide floor of 1st resident's househouse (Source: Author document)

Figure 5. Wall-cracked restroom of the 1st resident's house (Source:Author document)

Figure 6. The wall of the 2nd house cracked, covered with plaster(Source: Author document)

Figure 7. The wall of the 3rd house cracked(Source: Author document)

Figure 8. The floor of the 3rd house cracked(Source: Author document)

3. Materials and Methods

In analytical research, on the other hand, the researcher must use facts or information that is alreadyavailable and analyze it to evaluate the material critically. Studying the case of the collapse of the landboundary fence, the author directly observed the failure and conducted interviews with residents on theback and sides who were very close to the project. Residents' houses during the Implementation of the drill pile were cracked and cracked again after dewatering, the groundwater structure of the residentswas dry, and the resident's groundwater was originally -3 m and dropped to -6 m.

4. Literature Review

4.1. Standards of Security, Safety, Health, and Sustainability, Service Users

Law 2 of 2017 Ministry of Public Works and Public Housing of the Republic of Indonesia. Chapter Vi Article 59 Standards For Security, Safety, Health, andSustainability As the requirement of the Standards of Security, Safety, Health, and Sustainability, Service Users and Service Providers must provide validation or approval of the following:

a. results of assessment, planning, and design;
b. technical plan for the process of development, maintenance, demolition, and rebuilding;
c. Implementation of a process of development, maintenance, demolition, and rebuilding;
d. use of materials, equipment, and technology; and
e. results of construction services.

Standards for Security, Safety, Health andSustainability cover the least:

a. Standard procedure for implementing Construction
b. Occupational safety and health standards
c. Equipment Quality Standards;
d. Material Quality Standards
e. Quality Standards For The Implementation Of Construction Services;
f. Operation and Maintenance Standards;
g. Environmental Management Standards
h. Guidelines for social protection in the workforce implementation of following the provisions of thelegislation

The safety of new buildings against hazards can be increased by reviewing basic construction safety regulations and formulating new building regulations to provide safe Construction of new and existing buildings in hill towns[11].

4.2 Risk Management, and Process Construction

A thorough investigation of the OSH of the green building construction sector was carried out. Critical risk analysis identified comprehensive risk management calculated through the developed HZRMF (Holistic Z Number Based Risk Management Framework), including urgent safety risk assistance that threatens GBCWS (Green Building Construction Worker). Critical risk analysis as appropriate[12].

Particular attention should be paid to the Construction of building retaining walls. Sometimes, displacement related to mounting poles or cast panels in place can be greater than the displacement due to excavation [13].

The causes of delay identified are not clearly statedin most of the articles reviewed, there is no agreementon the classification of causes of hesitation, the number of causes of delay varies widely, and the term'delay' is not clearly defined in most of the articles [14].

4.3 Protective Equipment

The highest safety construction is falling from the roof/floor, followed by "personal protectiveequipment". the obligation to wear a safety hat, not usea seat belt at a height, falling from roof/floor (scaffold failure)", the scaffold is not tight, there are no warning signs, safety signs, or worker monitoring systems in place, and no potential assistance safety hazard falling from the roof/floor (without the use of a protection system, the maximum RII value of 0.812 indicates the most consideration of the factor of safety, whereas "the personal factor of theworker's bad temper)" has a minimum RII value of 0.564, which indicates the least consideration[15].

4.4 Low-quality material

In material testing and neglecting the best aggregateand batching practices, variations in material properties can pose a high risk to concrete quality [16].If a suitable moisture content has been determined and used, the compressive strength can be increased by 26-100%. Poor aggregate sites, concrete production, and construction practices are largely responsible for this defect[17].

4.5 Disruption Technology

Innovation in Construction is a disruptive condition in construction operations. construction Industry. The factors that influence technological disruption are the level of awareness of the disruptive technology that is built environment, the main driver of the disturbance innovation in the construction industry,and its functions [18].

4.6. Advanced Technology

The global construction industry has always advanced safety planning. building safety awareness on the subject of safety, improving safety inspections, providing effective safety training, and optimizing hazard identification [19]. The most populartechnologies for safety management are network camera systems, digital signage, building informationmodeling (BIM), onsite mobile devices, and the Internet of Things (IoT) [20].

5. Results and discussion

There was a collapse of the fence wall, which befell 2 workers because the basement floor was not isolated,so the groundwater was reduced, which resulted from the foundation in the fence hanging down the floor basement

The position of the fence wall was at a distance of 1 meter from the soldier piles. The structure of the soldier piles was reinforced concrete measuring 25x25cm with a length of (6 + 3) meters in a cavity of 25 cm.The soldier piles functioned only as retaining walls forthe basement excavation, but they did not isolate the basement floor. The depth of the basement excavationwas 4.5 meters. The groundwater table was at – 2 meters from the ground surface above the soldier piles. When groundwater drops below the basement, it causes the foundation of the fence walls to hang.However, there was no indication of cracks or tilt on the top of the fence wall because it was layered. The crack was very visible only in the structural and architectural cracks of the people's houses. However, the cracks in the walls of the neighboring houses weresolved by carrying out plastering repairs. However, this indicated land subsidence, which endangered the buildings around the project site

At the peak of the incident, the old fence wall and the fence wall of the POP hotel experienced Instability, so they collapsed on the workers. A result of the lowering of the ground level is triggered by thelowering of the groundwater table due to dewatering. Dewatering that is not followed by a watertight isolation wall plus Borepiles foundation work can alsotrigger a lowering of the groundwater level in a neighboring location. Even though there was no vibration from the heavy excavators on the project, the fence wall collapsed easily.

The cause of the collapse of the fence wall was the lowering of the groundwater level from -1 m to below-4 m which had the potential to trigger the release of fine soil particles so that the neighboring soil was hollow that the soil's carrying capacity was reduced orthere was no. In addition, planning a basement structure using a soldier pile that was not covered withimpermeable wall water so that groundwater in neighboring locations did not isolate and enter the basement area, Implementation of basement structure work did not monitor the decrease in the groundwater level outside the basement and did not specifically usemonitoring wells Supervision of basement work did not quickly take action to request isolation waterproofon soldier piles. analysis and control (potential failures) of various existing buildings around the basement work site were not carried out carefully,

Information on geological conditions from the Municipal Government of Semarang that the project location was an area of coastal sediments and seawaterflows indicated the vulnerability of the soil structure.

5.1. Discussion

The project always made a table of Hazard identification, risk assessment, and determination of risk control, with item

a. Activities
b. Description of Potential Product Defects
c. Potential Causes
d. Description of Risks and Opportunities
e. Legislation
f. Initial Risk
g. Hierarchy
h. Existing Controls (According to the Hierarchy of Controls)
i. Responsible for Control
j. Impact/Risk Control Measure

Cracks in the walls of houses and fences around theproject due to excessive settlement resulted in cracks in tiles and plaster. This was due to decreased groundwater volume. In addition, the residents' well water has gone down

$\Delta H = \Delta Hi + U \quad \Delta Hc + \Delta Hs$ (1)

ΔH = total settlement, ΔHc = consolidation settlement,ΔH = secondary compression, U = average degree of consolidation.

This was an example in the table of hazard identification, risk assessment, and determination of risk control when excavation work was not performed. Activities Monitor groundwater decline and Risk Impact Control Measures groundwater level outside the basement had to be constant

This showed that the construction engineer did not understand the mechanics and that the impact of groundwater going down caused cracks, damage, tilt Groundwater flow theory Bernoulli law $h = z + U / \gamma w$

(2)

h = total pressure height at one pointz = height of elevation power.
U = pore water pressure.
Ɣw = unit weight of water $H = \frac{A_g IT - A_s K}{A_w}$ (3)
A_g = Extent of area g
A_w = Area of the well (m2)
H = Height of water in a well (m)I = Rain intensity (m / j)
K = soil permeability coefficient (m / j)P_w = circumference of the well (n)
T = Duration of rain/flow (j)Ka= tan ^{2}(45 –Ø) (4)
$P = 1/2 x Ka x \omega x (h_c)^2$ (5)
$Pw = Ɣ h^2/2$ (6)
Pl=q x h (7)
P total = P+Pw +Pl (8) Ka=coefficient of active earth pressure
Ø = angle of internal friction angle of shearingresistance of a soil
Ɣ = weight of soil volume density soil volumeh= height in general=hydraulic head
hc=vertical distance from the ground surface ofcohesive soil to a point of zero stress
$Ɣ_w$ = unit weight of waterq= load

P total was the pressure against the soldier pile due to the added groundwater pressure (8), and the active soil pressure and loads around the base were environment car access roads.

From the formula Groundwater flow (h), Height of water in a well (H). The active soil pressure (P) had animpact on the basement structure and the nearest neighbor's house. If the groundwater outside the basement was not monitored, it had an impact on damage, dry well water for living, and even accidentsfor workers.

This was an example in the hazard identification table, risk assessment, and determination of risk control when excavation works did not prevent subsidence of groundwater outside the basement, monitor groundwater levels outside the basement, andgroundwater solutions so that the level remained constant.

Table 1. The Hazard identification

Activity	Hirarki	Existing controls(according to the Hierarchy of controls)	Responsibility	Risk Impact ControlMeasures
Excavation workactivity	EL	Cannot be removed		If there is bloating on theside, do the chipping in excavations.
Project location	SB	Cannot be replaced		
Equipment: Grab the Excavator	Civil Eng	Create work methods and work instructions	Site Manager	Do a D-Wall head cut ifthe elevation is too high. - Casting is carried out toincrease the elevation of the D-Wall head elevation is below
Tools			Site Op Manager	
Material :			Site OpManager	
	ADM	Did a pit test Using bentonite when excavating		
			HSE	
			SOM, HSE	
		Construction work teamWorker Induction Tool Box meeting Checklist Helm, vest, and Shoes	SOM, HSE	
	APD Do a D-Wall head sleep if the elevation is too high. - Casting is carried out to increase the elevationof the D-Wall head elevation is below		SOM, HSE	

Source: Prepared by the author,(2023).

Table 1. This was an example of an underground project with high groundwater conditions connected to a heritage building without prevention, monitoring, and groundwater solutions.

Evaluation of cases of collapse, tilting, and subsidence during Implementation and even being installed showed the civil engineer's weakness in understanding mechanics. Various mechanics including engineering mechanics, soil mechanics, materials mechanics water/fluid mechanics, all civil engineering mechanics. The basic knowledge of mechanics, not arithmetic or mathematics. Currently, many software tools can simulate the shape and load that exists and occurs. Software that helps to calculateand simulate any model. Software is only a tool, so themain thing is the ability of civil engineers to make structural systems meet the requirements for strength, stiffness, and stability. The structural system had to beright, and the model was made in the software according to the designed drawings and following thereal thing to be installed. The modeling of joints and supports must match what will be drawn and applied. Basic mechanics must be good and correct for civil engineering work in the fields of transport, construction management, water, geotechnical and structural.

Before entering/inputting into the software, it had to be correct, and according to civil engineering rules, it must meet the requirements for strength, stability, and rigidity. After checking that the structural system is correct, the loads are entered according to the latest SNI, the connections and supports will be modeled according to the drawings, and the real ones will be installed.

Cases that occurred during Implementation or had been installed show that there were several cases:

1. The structural system had to meet strength, stability, and rigidity, but one did not meet them.
2. The structural system has less rigidity, when it is just installed, it collapses for a while.
3. The scaffolding system was not accounted for in an integrated manner (only partially so that vibrations due to the use of pumps and vibrations above the construction support were not taken into account)
4. Merit attention must be paid to the pump pressure when casting at a long distance when used atclose range, it must be reduced so that the scaffold is strong.
5. The mount for heavy equipment, including the mixer car, had to be strong and stable so that when thetool moved or worked it did not dive or sway.
6. Scaffolding and reinforcement are less stable and less rigid
7. There was a decrease in groundwater because the initial level of groundwater was lowered according to the floor tiles to be installed. The room was not properly isolated so the groundwater outside the building also decreased.
8. Likewise, it is not the main structure, for example, the façade, cladding, and installation had to be tightlybound and firmly attached to the main structure. In structural modeling, for example, the facade had to beaccording to the pedestal design.
9. The structural solution is used following complete soil data (not bulged) and as possible, channels some of the surface water and groundwater so as not to burden the structure to be installed.

Civil Engineer's assessment had to be based on Mechanics capability analysis. All Civil Engineering work even though Construction Management applied to transportation building structures, buildings, waterworks, and earthwork structures. If the Implementation was not following themechanics, it failed when lifting or laying a position, usually less the unity structure and mechanics. the science of force that pushes or twists moment to cause collapse. Civil engineering is related to the science of forces. Sometimes if you had studied specificities, for example, construction management, transportation management, operational management & maintenance, you have to explore mechanics so that you can prevent it before it happens. If you understandmechanics, you will analyze if there was a change in the shape of the building so that the correct solution was immediately taken to anticipate it. Before a building collapses, tilts, or collapses, there had to be deformation and a changing shape, althoughsometimes it was not realized. By understanding the real mechanics, of course, engineers will realize and provide solutions

7. Conclusion and Suggestion

The results of the investigation and analysis showedthat the construction engineers in the building project showed a lack of or no understanding of mechanics, the cause of the cracks was unknown, so solutions did not prevent land subsidence but repaired the cracks. This showed that the construction engineers did not understand mechanics. Other previous research analyzing human error and self-protection tools was not tied to the strong structure. Completeness, safety signed, personal protective tools, communication tools. Human error Rafieyan Aet personal protective equipment". the application of safety technology, Yap, J.B.H, Critical risk analysis as appropriate. evaluation strategy to handle Saeed X, Z. Mohandas R, Technology infusion, development, and integration Lekan A. , no warning signs, no worker monitoring system in place, no site plan safety signs, and no signs of a potential safety hazard. There was nothing to the understanding of mechanics in construction engineers.

In this case, because the construction engineers didnot understand or less the mechanic's structure, they did not take steps to prevent the subsidence of groundwater, which resulted in the collapse of the project's fence wall which hit workers in addition to the residents' well water (daily needs dropped drastically). The project needs to make an isolation wall to prevent the groundwater outside the basementfrom dropping drastically.

The project party needs to make monitoring wells inside and outside the basement area or at least outsidethe basement in three rear locations, right side and leftside, and make a recharge hole to stabilize the groundwater level (if there was an infiltration well outside the basement, it could be used as a recharge location), Project areas had to anticipate isolating the environment from vibrations and groundwater decline, especially in buildings below the groundwater level, in addition to the environment being isolated from falling materials, falling cranes, and dust. The potential for accidents was very large if groundwater and vibrationwere not isolated and in many cases, resulted in lives that must be avoided. Suggestion: Construction engineers, consultants, supervisors, and contractorshad to understand mechanics. Therefore, existing indications could be understood after being analyzed and anticipated before they occur by providing the right solution. Formulate recommendations to the parties involved in building Construction. Must study planning documents, soil test results, and soil geology around the site. Prevention must be discussed and solutions must be given during reconstructionmeetings and shop drawings.

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