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Chapter 75. Perpendicular Lines

~ Kivamus ~

~ Baron's Manor, Tiranat ~

The next day around dawn, Kivamus was standing outside the manor house with others while looking at the caravan getting ready to leave. Even without any wind, the air was chilly, and the warmth of the flickering fire in the brazier kept next to them was very much welcome. There was another brazier kept on the side of the caravan, where some of the guards were warming their hands, before they left the manor to brave the cold of the journey. This time only six wagons were leaving the manor, but Hudan had still provided twelve guards with them, not including Pydaso and his own guard, so that the repaired wagon would also have two guards on it on their return journey. The wagons were covered with an oilcloth, with each wagon driver having a spear next to him.

Yesterday, Cedoron had come through on his promises to make the spears, and they had been able to provide seven spears to the escorting guards this time - one for each wagon on the return journey, even though their shafts would need to be replaced in the future with better quality wood. The blacksmith had actually made two more spears, but Hudan had told him that he was going to use them to train the rest of the new guards.

Soon, Pydaso and Feroy walked towards him. The ex-mercenary looked alert and ready for the coming journey, with no trace of his binge drinking two nights ago on his face. Hudan seemed to be correct about Feroy when he said that the ex-mercenary was a trustworthy guard, and only drank when he was sure that his fighting skills wouldn't be needed. That was good enough for now.

"We are ready to leave, milord," Feroy said.

"Good. May you have a safe and successful journey," Kivamus wished them.

"I hope so, milord," Pydaso said. He looked up at the early morning sky. "With the weather already getting so cold, it won't be long before it starts to snow." He added, "Because of a shortage of time before the road gets blocked, we have been pushing the horses very hard, since we have been completing the journey from here to Cinran within two days every time, even though it's normally a

three day journey at a relaxed pace. I just hope there is no injury to any horses because of that, since a delay would cause difficulty for me when I return back towards my home."

Kivamus nodded. Without access to any satellite providing live weather updates, they had no way to know when the snowfall would actually start. He still hoped that they might be able to squeeze in a third trip before Pydaso had to return back, but it seemed increasingly unlikely now. Giving an inward sigh, he said, "We can only hope that everything goes well."

Pydaso gave a nod in reply, and with a quick bow, returned back towards the caravan along with Fero. Soon, the horses started to move after a quick whip, and the caravan lurched into motion. The sound of creaking axles and leaves crunching under the wheels filled the air as the wagons exited the gates of the manor one by one.

Kivamus looked at the servants who were moving the brazier towards the shed, before they returned to their duties. He pointed at the brazier burning next to them. "Tell one of the servants to move this brazier to the north of the village, for the workers to use there. Cedoron should provide us with more braziers by evening, so we can put them in the places we discussed earlier."

With a nod, Duvas gave the orders to the servants, and they returned back to the warmth of the manor house.

A few hours later, Kivamus decided to take a look in the north of the village again to see how everything was going there. Something had been nagging him since yesterday, and he wanted to talk with the carpenter about that. With Hudan and other guards accompanying them, he and Gorsazo walked to the northern area. Reaching there, he saw that a good amount of space had been cleared there by now, and now the workers were hard at work cutting the trees further away from the village. Many of them were digging the trench for a new village wall, while Taniok was overseeing the debarking of logs nearby. He saw that the trenches for the foundations for the first longhouse block were already in the process of being dug.

He sent a servant to call over the carpenter. Once Taniok was there, he asked, "I was curious about something. How are you making sure that the walls of the longhouse block would be perpendicular to each other?"

Taniok looked at the workers digging the trenches. "Oh, that?" He said, "Give me a moment, milord," and he jogged towards where he had been cutting the planks on the left earlier. Soon he returned with something in his hands.

"I use this try-square, milord," Taniok said, and handed him a small wooden tool, which had two pieces of wood connected to each other at a right angle. Although this tool was still used on Earth sometimes, the try-square that Taniok had given him was made completely of wood, with a small hole at the end of each piece of wood.

"I can see its use when you are making tables, chairs and such things," Kivamus said, "but how are you using this to keep the foundations of the block perpendicular?"

Taniok shrugged. "It's easy enough. I just tie a thin string or a rope on these holes, and put the try-square at one corner, and then I tell someone else to pull the ropes straight. This way I get two long ropes which are more or less perpendicular to each other. Then I make marks on the ground along these ropes, and we get perpendicular walls."

"Hmm..." Kivamus muttered. "That would work, more or less, but the people who are pulling the ropes straight could easily move away from the proper angle when they walk further to make the rope taut. It would still be close enough to a right angle, but there can certainly be errors."

"Well... I don't know of any other way to do this, milord," Taniok said curiously.

Kivamus thought about it for a minute, and remembered a primitive way by which the Romans used to project right angles and straight lines on the ground. He told the guards who had come with him to bring to him one long stick of wood, and a few smaller ones, which were as straight as they could find them. Then he sent another guard to bring a small length of thin rope, and four small stones. "Call Yeden here too."

It took a few minutes, but soon, the foreman, Yeden and the guards returned with straight wooden sticks and the other things in their hands. He told a guard to untwist the rope into separate strings. Then, he held the long stick in his hands, and told one of the guards to tie the stones with strings, and another to tie two small sticks together while making sure they were more or less perpendicular to each other.

Gorsazo observed him carefully, as he started to explain.

"Okay, here is a better way to do this," Kivamus began. "I am showing you the concept of how it would work, but you will need to make the same thing with completely straight pieces of wood to make it work properly." He took the long stick and tried to firmly insert it into the ground like a pole. It didn't really go into the ground far enough to make it stand under its own weight though, so he told a guard to hold it vertically. "This vertical staff will allow the actual mechanism to be put above it. It needs to be made strong enough, but it only needs to be around five or six feet tall. The bottom of this staff also needs to be made sharp enough to be easily inserted into the ground."

Seeing Taniok's nod, he explained, "Then every time when you want to make sure that you are making foundations accurately at right angles, you should insert this staff around a foot away from the actual point where you want the corner to be. Now above this," he continued as he held a small stick above the staff horizontally, "you will join a small piece of wood which connects to the top of the staff on one side, and the wooden cross on the other side." He told another guard to hold it like he had described, while he tied one end of it to the top of the staff.

"Now, this is the main mechanism," he said, as he pointed to the two sticks which had been tied together into a cross. He took the stones which had been tied to strings which were around a meter long, and tied the other end of those strings at the four ends of that cross, so that each stone was hung at nearly the same length from the cross.

Finally, he took that cross, with four stones hung on a string on each of its corners, and put it at the other end of the small piece of wood that was connected to the top of the staff. He looked at another guard who was holding a piece of string in his hands, and then took that string to tie the center of the cross with the end of the horizontal piece of wood. It was shoddy work, but it should work well enough to demonstrate the purpose.

He explained, "This is a very rough approximation, but you can see how it works right now. He told others to move back to one side, and then he told Taniok to look at two strings on the opposite ends of the cross, in a way that they were completely aligned with each other. "Now the line on the ground which is shown by these strings gives you one side of your square."

"I can see that," Taniok nodded.

"Good, now move to this place," Kivamus said as he pointed to the other two strings. "Try looking from here. Again, the line on the ground which is covered by these two strings is the other side of the square."

As long as the wooden cross is made properly with right angles between both of its arms, this line and the line you saw earlier will be perpendicular to each other. The walls of a building will be along these lines and at the reference point - where these two lines intersect, you can make the corner of a building. This way you can tell a worker to mark places on the ground - while you observe through these strings to ensure that the marks are made correctly along them, and so you will get an accurate set of perpendicular lines, where you can dig the foundations later."

It took a moment for Taniok to think about it, but Yeden spoke first while running a hand on his bald pate. "That's... that's really clever, milord!"

Taniok stood up and shook his head slowly. "It would certainly work. But... but it's so simple... I don't know how I never thought of it myself!"

Kivamus smiled, and said, "That's alright. You know about it now."

"But what is this tool called?" Taniok asked.