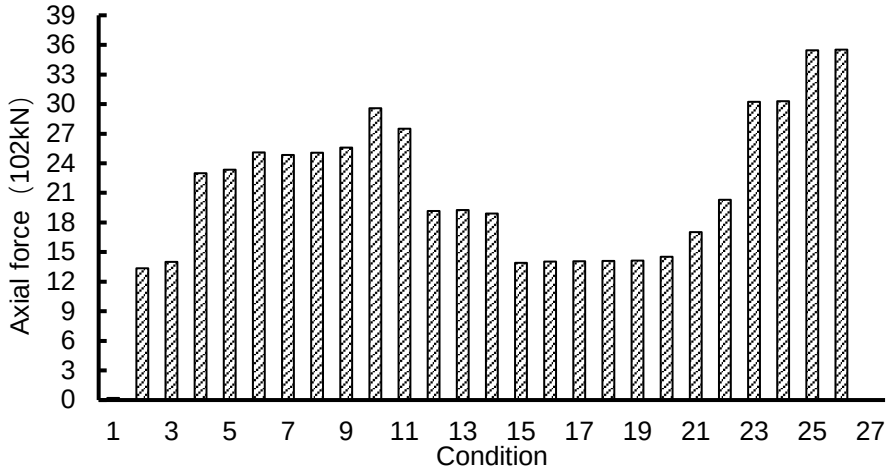

FIG. 4-6 Variation of temporary bracing axial force

4.2 The influence of different construction sequence on the most unfavorable working condition

For analyzing the impact of temporary support unloading on the structural stress, three plans are proposed for finite element analysis:

Plan 1: After the top concrete slab of zone 1 is poured and overburden is applied, the temporary support within zone 1 is unloaded.

Plan 2：After the top concrete slab casting in zone 1 is completed, the temporary support within zone 1 is unloaded, and then the top concrete slab covering in zone 1 is applied

Plan 3：After the erection of the steel beam is completed, the temporary support within the area 1 is unloaded, and then the top concrete slab of the area 1 is poured and covered with soil is applied.

For checking the security of the structure, the bearing capacity of three kinds of concrete structures is checked and the crack width at the maximum stress is calculated.

It can be seen from Table 4-1 that the stress of concrete beams in the three plans is basically the same, with the difference in stress not exceeding 2%. This is because the maximum stress of concrete beams occurs on the negative second floor, and whether temporary supports are properly unloaded has little impact on the formation structure. The maximum stress of the concrete slab occurs on the roof, so different unloading plans have obvious influences on the top concrete slab. The maximum bending moment of plan 3 is 279 kN·m compared with the maximum of the other two plans, which is about 40% of the bending moment calculated in plan 3, and the maximum shear force is 21kN compared with the maximum of the other two plans, which is about 5% of the calculated shear force in plan 3.It shows that different unloading plans have a great impact on the bending moment of the top plate, but the shear force of the plate is related to the load

distribution on the plate, so different unloading plans have little impact on the shear force of the plate. It can be seen from Table 4-1 that option 3 is more reasonable.

Table 4-1 Checking calculation of bearing capacity of concrete structure in each plan

Parameter / Plan		Calculated moment (kN·m)	flexural bearing capacity (kN·m)	Calculated moment (kN)	shear strength (kN)
Plan 1	Concrete slab	-984	2553	431	920
	Concrete beam	-8873	12189	3913	8377
Plan 2	Concrete slab	-887	2553	423	920
	Concrete beam	-8773	12189	3898	8377
Plan 3	Concrete slab	-705	2553	410	920
	Concrete beam	-8772	12189	3884	8377

As can be seen from Table 4-2, there is little difference in the stress of steel beams in the three plans. The maximum stress in plan 1 is -128.1MPa, and the maximum stress in plan 3 is -121.4, which is about 5% higher than that in plan 1.The deformation of the steel beam is 47.1mm in plan 1 and 54.2mm in Plan 3, which is about 15% larger than that in Plan 1.The maximum tensile stress on the top surface of the concrete slab in plan 1 is 1.3MPa higher than that in Plan 3, about 33% of that in Plan 3; the maximum tensile stress on the bottom surface of plan 1 is 0.7MPa higher than that in Plan 3, about 26% of that in Plan 3; the minimum crack width of plan 3 is 0.08mm; the maximum crack width of plan 1 is 0.11mm. Three kinds of plan comparison girder stress difference is not big, because the maximum compressive stress in the steel beam bottom, the maximum stress occurs at the PC1 structure column of steel beam bottom, the influence of different unloading plan of large structure column in the steel girder stress, but maximize beam stress is PC1 pillars supporting structure and different unloading plan can't clearly its stress difference. The maximum deformation of the steel beam occurred near the central patio. The earlier the temporary support was unloaded, the greater the deformation of the steel beam was. In the case of concrete, The concrete slab is unloaded, the smaller the crack width caused by the concrete stress. In conclusion, Different unloading plans have a great impact on the concrete slab. In addition, waterproofing of the top concrete slab should also be considered, and the structural cracks should be as small as possible. Therefore, the choice of Plan 3 is more reasonable.

Table 4-2 Stress, deformation, and concrete slab stress and crack width of the top steel beam after the structure is formed under different temporary support disassembly plans

Parameter / Plan	Stress of top concrete slab(MPa)		The steel beam stress (MPa)		Steel beam deformation (mm)	Crack width (mm)
	Topside tensile stress	Underside tensile stress	Top surface stress	The ground stress		
Plan 1	5.2	3.4	64.1/-70.0	101.4/-121.4	47.1	0.11
Plan 2	4.6	3.0	67.1/-75.0	106.7/-124.8	49.8	0.10
Plan 3	3.9	2.7	69.8/-82.5	106.2/-128.1	54.2	0.08

In addition, the paper also analyzed the different unloading plan without column range PC1 structure column axial compression, bending moment and the influence of lateral is small, can be seen from table 4-3 results, three different unloading plan has certain influence to the structure column stress, but the three plans on the structure of quantity is not more than 1 mm, lateral structure column axial force, bending moment has nothing to do with different unloading plan basic.

Table 4-3 Column deformation and maximum internal force of structure in column-free area of atrium under different temporary support disassembly plans

Parameter / Plan	The level of lateral (mm)		Minus one layer of axial pressure (kN)	Bending moment (kN·m)
	east-west direction	north-south direction		
Plan 1	0.36	0.46	-33219	22725
Plan 2	0.54	2.4	-33546	23433
Plan 3	0.94	3.34	-33977	24055

5. CONCLUSION

1. This paper conducts a finite element analysis of the structure of a subway station in Shenzhen, and analyzes the stress of each component in each working condition of the structure. The results show that the most unfavorable working condition is working condition 20 (covering soil within the first zone).Under working condition 20, the axial force of the structural column, the deformation of the steel beam and the stress of the steel beam all reach the maximum value, and the stress of the steel beam changes significantly before and after working condition 20. The stress of the steel beam reaches 129MPa and the deformation increases to 56mm. Compared with working condition 19, the stress increase reaches 163% and the deformation increase reaches 115%.The axial force of the structural column is 43000kN, which increases by 81%.The initial nominal tensile stress of the concrete structure with minus one layer and minus two layers is about 2.7MPa, which increases slowly with the working condition, and reaches about 6MPa after the structure is formed. The nominal tensile stress of the top concrete slab is 3.5MPa, which increases by 102% compared with the working condition of 19.The stress

of concrete beam structure increases with the construction progress, but the maximum stress state meets the requirements of flexural and shear capacity.

2. This paper analyzes the different unloading plan. Three unloading plans are considered, namely unloading temporary support after the assumption of the top steel beam is completed, unloading temporary support after the top concrete slab casting is completed, and unloading temporary support after the top concrete slab overburden is completed. Three schemes are simulated by finite element method The flexural and shear bearing of the concrete structure in the three plans are checked, and the bending moment, shear force, crack width of the top concrete slab, stress and deformation of steel beam, axial force of the structural column and bending moment of the structural column in the three plans are compared. Results show that different unloading plan of steel girder stress effect is very small, has a certain influence on deformation of steel beam, deformation of plan 3 is 15% more than plan 1, had a greater influence on the stress of concrete slab, the stress of plan 3 is 26% smaller than plan 1, the concrete slab crack of plan 3 is 37% smaller than plan 1, due to the deformation of steel beam in plan 3 is less than 6 cm, which less than the preset camber of 7 cm, so the plan comparison effect on top of concrete slab should be considered, at the same time the construction need to minimize the top concrete slab crack width, the final structure to plan 3 construction.

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