

## The utility model relates to a new type of steel bar connection of fabricated concrete structure

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### Abstract

Since entering the 13th Five-Year Plan, China's economy has maintained a medium-high growth rate. According to statistics, the energy consumption of the construction industry is one third of the total energy consumption of the whole society, and the energy consumption of the construction stage accounts for one half of the total energy consumption of the building. Industrialized precast component transport to the construction site assembly directly, so that the assembly structure of the industrialization degree is high, short construction period, good overall performance, building high quality, environmental pollution and high resource utilization [1], but to enhance the overall performance of the prefabricated buildings and seismic performance, design reasonable perfect node connection mode is of great significance to promote the development of prefabricated structures. Therefore, this test is intended to adopt a new type of steel bar joint mixed with steel plate, bolt and structural glue to conduct the test and explore its bearing capacity through theoretical analysis and experimental research. This paper proposes a new type of steel bar connection which is suitable for precast reinforced concrete members, and establishes a reasonable technique and design method of steel bar connection for the new type of precast reinforced concrete members.

### Keywords

Reinforce bar connection, Fabricated technique.

### 1. Introduction

In recent years, the practitioners of the construction industry have realized the disadvantages and deficiencies of the traditional production mode and are making great efforts to move forward to the industrial production mode. Prefabricated structure is one of the effective ways to solve these problems, which makes the design and production of components more standardized, building production more streamlined, construction management more explicit. At present, the reinforcing bar connection methods adopted in China include lap connection, welding connection, traditional mechanical connection, sleeve connection and gray-anchor connection [2]. The purpose of this study is to develop a new type of steel bar connection with steel plate, bolt and structural glue.

### 2. Description of different reinforcement connection forms

Binding lapping refers to two rebar have a certain length of overlap with each other, the two sections of rebar will be connected together with the connection method of iron wire binding, generally used for the reinforcement reinforcement network in concrete. This is a kind of traditional reinforcement connection, which mainly relies on the bond anchorage between reinforcement and concrete in the lap section to transfer the stress of reinforcement. Binding lap can be divided into manual binding lap and mechanical binding lap.

Rebar mechanical connection originated from Europe and the United States and other countries. After the 1980s, China began to introduce foreign advanced connection technology, and constantly improved and innovated on this basis. Since the 1990s, the superiority of rebar mechanical connection joints has been gradually recognized, thus rebar mechanical connection has developed rapidly [3]. According to the way of mechanical connection, mechanical connection can be divided into sleeve

extrusion connection, taper thread connection, straight thread connection. Sleeve extrusion connection is a method of inserting the ends of the two ribbed steel bars to be connected into a specific steel sleeve, compressing the steel sleeve with external pressure (usually a hydraulic extrusion machine is required), making the steel sleeve produce plastic deformation and then tightly cling to the two ribbed steel bars, so as to connect the two steel bars, as shown in figure 4.



Fig.1 Reinforcement lap connection

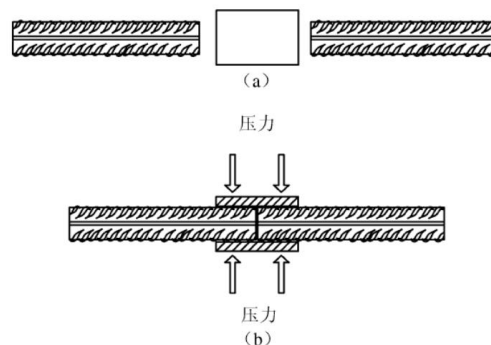


Fig.2 Sketch of sleeve extrusion connection

Cone-thread reinforcement connection is a method that can take advantage of the fact that the thread can withstand two forces of tension and pressure as well as the principle of good self-locking, and process the connecting end of the reinforcement into thread, or add cone-thread sleeve at both ends of the reinforcement, and after the two cone-thread are tightened together, two rebar can be connected into an integral whole [4]. The disadvantages of reinforcing bar connection with taper thread are that the reinforcing bar thread sleeve machine and torque wrench are required, the reinforcing bar section cannot reach the same strength, the joint is easy to slip and the fracture quality is not easy to guarantee [5-7].

The connection mode of straight screw reinforcement is relatively late in development. Straight screw reinforcement connection is to process the end of the steel bar to be connected into the straight screw thread. When two steel bars need to be connected, the straight screw thread part of the two steel bars should be screwed into the sleeve with the straight screw thread in order to connect the two steel bars. Straight rolling thread is the thread formed by rolling, and the reinforcement material has not been cut away [8]. But the steel bar rolling straight thread connection needs to use a special hydraulic machine tool to roll the steel bar end.

### 3. Objectives

A new type of steel bar joints connected by steel plate, bolt and structural glue are tested. This paper proposes a new type of steel bar connection which is suitable for precast reinforced concrete members, and establishes a reasonable technique and design method of steel bar connection for the new type of precast reinforced concrete members.

#### 4. Content

The concrete content includes taking steel plate, bolt and structural adhesive mixed connection component's connecting bar diameter and the number of fixed bolts used as the main parameters to study the stress performance of the reinforcement connection technology, conduct the reinforcement connection performance test and explore the failure form and failure condition of the connection specimen. On the basis of ensuring that the shear strength of the bolt of the member is greater than the yield strength of the steel bar, the minimum amount of bolt that causes the steel bar yield of the member is found. It provides a basis for theoretical analysis and connection design. Finally, ABAQUS finite element modeling was used to analyze the steel bar members mixed with steel plate, bolt and structural glue, to determine the stress of the steel bar when the external load level makes the steel reach the yield strength, and to calibrate the correctness of the design formula.

#### 5. Test plan

The cross section size of the test member is 150mm×80mm. Concrete grade C30, anchorage strength grade HRB400, diameter of 16mm, 18mm, 20mm. Specific parameters are shown in table 1:

Table 1 The experiment's plan

Number	Dimension (mm)	Bar Diameter (mm)	Bolt Number
1	150×80	16	2
2	150×80	16	4
3	150×80	16	6
4	150×80	18	2
5	150×80	18	4
6	150×80	18	6
7	150×80	20	2
7	150×80	20	4
8	150×80	20	6

Set the test loading scheme as:

Unidirectional stretching: start with zero load, then load to 0.6  $f_{yk}$ , repeat for many times, and then continue to load until the specimen fails.

Unidirectional tensile property is the basic property under static load.

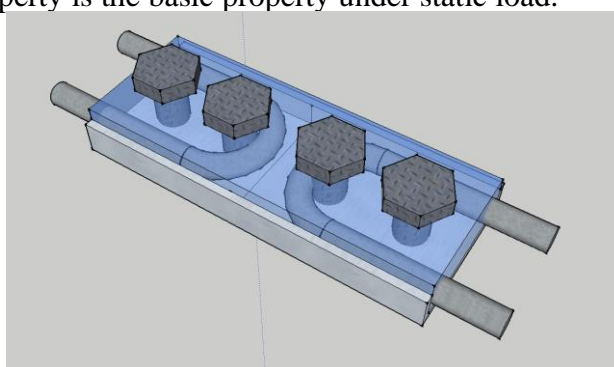


Fig.3 Connect node 3d perspective

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