

# 连续刚构桥梁悬臂施工快速合龙技术

## Rapid Closure Technology of Long Span Continuous Rigid Frame Bridge

### 项目简介:

目前，连续刚构桥施工技术比较成熟，一般按“对称悬臂浇筑——边跨合龙——中跨合龙”的顺序进行施工，但是长期运营后存在跨中下挠过大、主箱梁腹板斜向开裂、底板纵向开裂和顶板纵向开裂等问题。由于多跨连续刚构桥跨径大、连续孔数多及高次超静定等因素，最终成桥需经历漫长、复杂的体系转换过程，为了避免在施工期间和服役期内发生上述病害，且能够快速合龙，本项目采用多跨一次合拢，避免了漫长而复杂的体系转换过程。结构在成桥前都属于静定状态，混凝土收缩徐变这个不确定因素在结构中不产生次内力，各工况条件下的挠度计算值与实测值容易吻合，克服了常规逐跨合龙时超静定结构的计算值与实测值容易出现一些偏差的缺点，因此一次合龙对于挠度控制十分有利。此外，采用一次合拢，可以使合龙段的荷载同时作用在最终结构上，使内力更趋均匀，比逐跨合龙相继产生的次内力随超静定次数的增加，结构形式的不断改变所带来的复杂内力计算相对简单。因此，采用多跨连续体系一次合龙可以达到线形正确、受力合理、成桥快的目的。

### Brief Introduction:

Nowadays, continuous rigid frame bridge construction has become a matured technology, which typically carries out the construction in a "symmetrical cantilever concrete pouring—side span closure—central span closure" sequence. However, the downside of this practice includes excessive mid-span downward deflection, diagonal cracking of the main box girder web plate, and longitudinal cracking of the main box girder bottom and top plates, etc. that may occur after a long period of service. Due to the large span, multitude of continuous spans, and higher-order hyperstaticity, and other factors associated with a continuous multiple-span rigid frame bridge, it needs to go through a long and complicated process of system transfer before the spans are bridged (referred to as bridging). To avoid the previously described distresses during construction and service periods and for the purpose of securing a quick closure, this project employed the practice of multi-span closure in one operation, which precluded the long and complicated system transfer process. Before bridging, the structure is in a statically determinate status, concrete shrinkage creep, which is an indeterminate factor, does not produce secondary internal force in the structure, and the calculated deflection under various working conditions tends to agree with measured one, solving the problem of discrepancy between calculated values and measured ones of hyperstatic structure for conventional span-by-span closure practice. Therefore, closure in one operation is very useful in deflection control. In addition, with closure in one operation, the load of the closed sections may act on the ultimate structure at the same time, the internal force tends to be more uniform, and the situation is simpler than

the complicated internal force calculation involved in span-by-span closure in which the secondary internal force increases progressively and the structure type keeps changing along with the number of hyperstatic orders. Hence, one-operation closure of multi-span continuous system helps achieve the objective of correct alignment, proper stressing, and quick bridging.

### **技术成熟度：**

本工艺技术成熟，项目已经通过陕西省科技成果鉴定，在多个项目上已得到应用，并受到高度评价。

### **技术创新点：**

- (1) 采用最小二乘法自编程序优化合龙顶推力；
- (2) 研发了“分级顶推、同时锁定、一次合拢”的技术；

### **市场前景：**

多跨同时合拢施工总用时（自合龙准备至合龙段预应力施工完成），比采用先边跨再中跨最后次边跨进行合拢节约时间 15 天，因合龙施工处于关键线路，总工期同时缩短 15 天，保证线路早日通车，实现经济效益 33 万元。

2013 年 7 月 28 日本项目依托工程——沮河特大桥右幅合龙，标志着铜黄高速全线贯通，沮河特大桥顺利合拢后，中央电视台新闻联播、晚间新闻、陕西电视台等多家媒体对沮河特大桥合龙进行了报道，取得了良好的社会效益。

多跨连续刚构一次合拢可以节约工期、节省成本，对成桥后内力分布有利，值得在以后的连续刚构桥施工中进行推广应用。

### **合作方式：**

技术咨询、合作开发等。

### **联系方式：**

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