中华人民共和国应急管理部
Ministry of Emergency Management of the People's Republic of China

辽宁省盘锦市绕阳河决口封堵抢险救援行动案例交流

Case share: the emergency rescue for closure of the breach of Raoyang River in Panjin, Liaoning

应急管理部救援协调和预案管理局 颜彬

Yan Bin, Rescue Coordination and Plan Administration of MEM

2023年10月10日

October 10, 2023

中华人民共和国应急管理部
Ministry of Emergency Management of the People's Republic of China

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中华人民共和国应急管理部
Ministry of Emergency Management of the People's Republic of China

基本情况
Basic information

2022年6月1日以来，辽河流域共发生**9次强降雨**过程，累计降雨量**457毫米**，较常年同期偏多**3.3成**。受强降雨影响，辽河发生2022年第1号洪水，辽河干支流有**17条**河流发生超警以上洪水。

Since June 1, 2022, there have been **nine heavy rainfall** processes in the Liaohe River Basin, with the accumulative precipitation of **457mm**, which is **3.3%** higher than that in the same period of normal years. Affected by heavy rainfall, the Liaohe River suffered the first flood of 2022, and **17** rivers, including the main and tributaries of the Liaohe River, experienced floods exceeding the warning level.

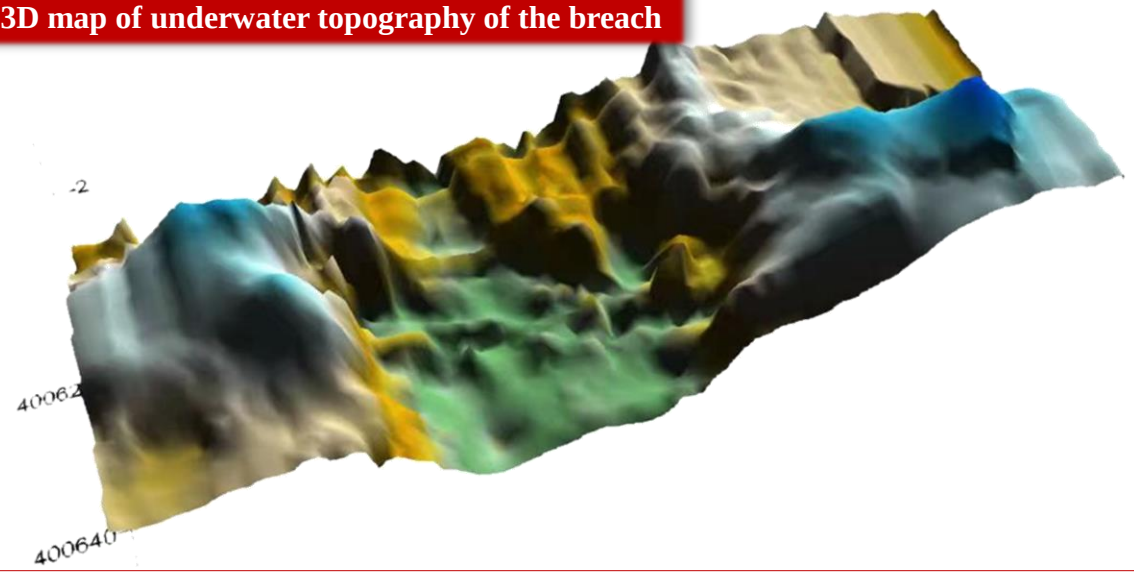
On August 1, a breach occurred in the Panjin Section of the Raoyang River in Panjin, Liaoning

- 7月30日19时，辽河支流绕阳河王回窝堡站流量**1480立方米/秒**，是1952年建站以来最大洪峰流量
  At 19:00 on July 30, the flow at Wanghuiwobao Station of the Raoyang River, a tributary of the Liaohe River, reached **1,480m^3/s**, which is the highest peak flow since the establishment of the station in 1952.

- 8月1日6时，绕阳河左岸盘锦曙四联段一处穿堤管廊出现严重透水，10时30分出现决口，**决口长约52米**，口门流速平均0.2米/秒，**水深1.5米～4.5米，内外水位差3.3厘米**。决口上游堤顶漫溢段长度约3公里，下游堤顶漫溢段长度约1.5公里。
  At 6:00 am on August 1, a serious seepage occurred in a pipe gallery crossing the embankment of the Panjin Shusilian Section on the left bank of the Raoyang River. At 10:30 am, a **52m** breach occurred, with an average velocity of 0.2m/s at the breach, **a depth of 1.5 to 4.5m, and a water level difference of 3.3cm**. The top overflow section is about 3km long at the upstream of the breach, and it is about 1.5km at the downstream of the breach.

决口航拍照片
Aerial photo of breach

决口水下地形三维图
3D map of underwater topography of the breach

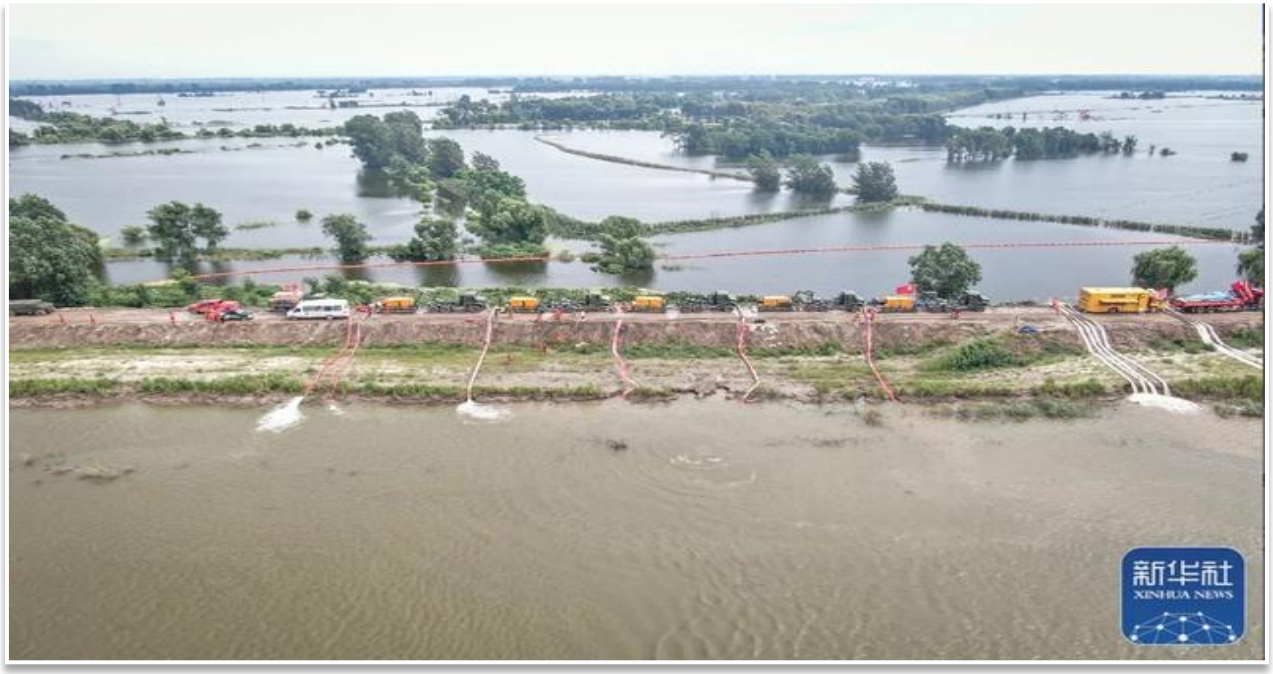


- 8月1日晚，决口封堵行动打响。各方救援力量艰苦鏖战**6天5夜**，于8月6日16时20分实现**决口合龙**，决口合龙处**加宽12米**、**加高培厚90米**，**防渗闭气70米**，于8月7日16时完成加高培厚和防渗闭气等后续工作。

  On the evening of August 1, the action to close the breach began. Various rescue forces fought hard for **6 days and 5 nights**, and achieved the **closure** at 16:20 on August 6. The closure dam was **widened by 12m, raised and thickened by 90m, and protected from seepage and air leakage by 70m**, which were completed at 16:00 on August 7.

- 8月7日凌晨，涝水强排作业展开。截至8月18日20时，累计抽排涝水**10000余万立方米**，决口下游侧淹没区排涝工作基本完成。

  In the early morning of August 7, the operation of forced drainage of waterlogging water began. As of 20:00 on August 18, a total of **over 100 million m^3** of waterlogging water have been pumped and drained, and the waterlogging work in the flooded area downstream of the breach has been basically completed.



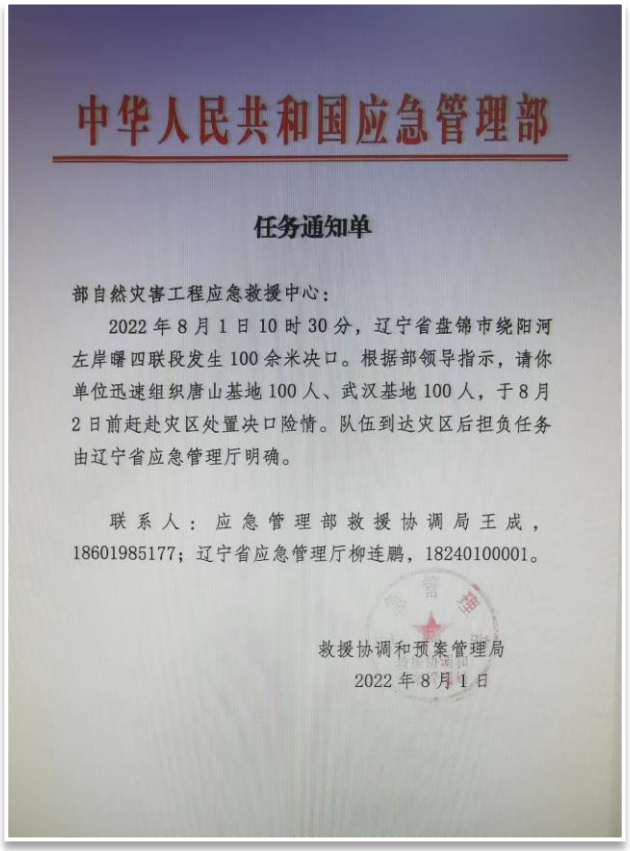
二
II

主要做法
Main practices

（一）快速反应，精准调派力量
（I） Quick response and precise deployment of forces

制定**跨区域救援力量调动方案**，派出3名工作人员紧急赶赴一线，协助辽宁省绕阳河抢险救援现场指挥部、国家防总工作组**调派跨区域应急资源**，指导做好抢险救援工作。

Develop a **trans-regional rescue force mobilization plan**, dispatch three staff members to the front line to assist the Raoyang River Rescue Scene Headquarters in Liaoning and the National Defense Work Group in **allocating trans-regional emergency resources**, and guide the rescue work.



中华人民共和国应急管理部

任务通知单

部自然灾害工程应急救援中心：

2022年8月1日10时30分，辽宁省盘锦市绕阳河左岸曙四联段发生100余米决口。根据部领导指示，请你单位迅速组织唐山基地100人、武汉基地100人，于8月2日前赶赴灾区处置决口险情。队伍到达灾区后担负任务由辽宁省应急管理厅明确。

联系人：应急管理部救援协调局王成，18601985177；辽宁省应急管理厅柳连鹏，18240100001。

救援协调和预案管理局

2022年8月1日

（一）快速反应，精准调派力量
（I） Quick response and precise deployment of forces

按照**就近用兵**、**专业用兵**、**快速行动**的原则，紧急调派工程救援力量、航空力量跨区增援。其中，部工程救援中心连夜从**唐山、武汉、成都**等**8**个方向调集**11名水利、工程、地质技术专家**，**200余名抢险队员**，**64台套专业装备**紧急千里驰援，**24小时**内全部机动到位。

Urgently dispatch engineering rescue forces and aviation forces for trans-regional reinforcement in accordance with the principles of **nearby deployment, professional deployment and rapid action**. The Ministry's Engineering Rescue Center mobilized **11 water conservancy, engineering, and geological technology experts, as well as more than 200 rescue teams and 64 sets of professional equipment from 8** directions including **Tangshan, Wuhan, and Chengdu** overnight for emergency rescue, all of which were in place within 24 hours.

（一）快速反应，精准调派力量

（I） Quick response and precise deployment of forces

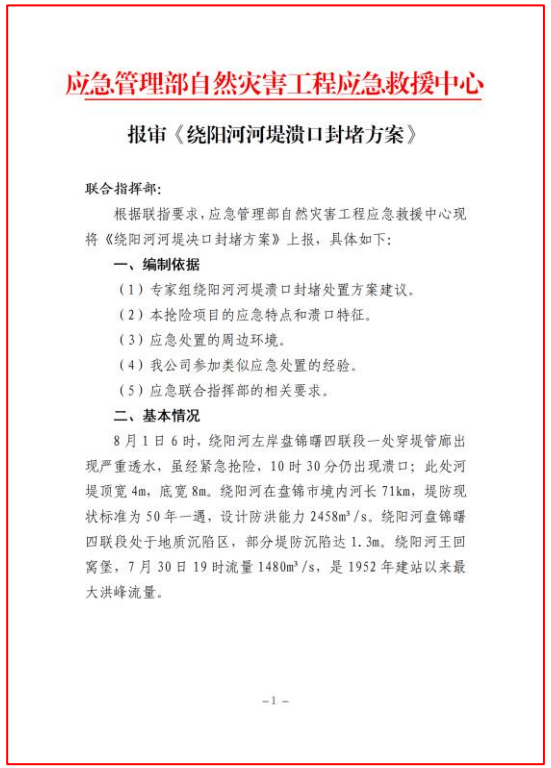
2架驻**内蒙古海拉尔、扎兰屯**航站Mi-171大型直升机从计划申请、航线审批到飞抵任务区，仅用**8个小时**，成为应急管理部门运用**航空、高铁**快速投送力量的**典型战例**。

From plan application, route approval to arrival in the mission area, two Mi-171 large helicopters stationed at **Hailar and Zhalantun terminals in Inner Mongolia** only took **8 hours**, becoming a **typical example** of emergency management departments using **aviation and high-speed rail** to quickly project power.

（二）严密组织，高效展开救援
(II) Strict organization and efficient rescue

明确由**应急管理部自然灾害工程救援中心**担负决口封堵**主攻任务**，应急管理部自然灾害工程救援中心围绕决口封堵，连夜研究制定**《绕阳河河堤决口封堵方案》**。

Clarify that the **Natural Disaster Engineering Rescue Center of the Ministry of Emergency Management** was responsible for the **main task** of breach closure. The Natural Disaster Engineering Rescue Center of the Ministry of Emergency Management focused on the closure of the breach and worked out the ***Closure Plan for Raoyang River Breach*** overnight .



应急管理部自然灾害工程应急救援中心

报审《绕阳河河堤溃口封堵方案》

联合指挥部：

根据联指要求，应急管理部自然灾害工程应急救援中心现将《绕阳河河堤决口封堵方案》上报，具体如下：

一、编制依据

（1）专家组绕阳河河堤溃口封堵处置方案建议。

（2）本抢险项目的应急特点和溃口特征。

（3）应急处置的周边环境。

（4）我公司参加类似应急处置的经验。

（5）应急联合指挥部的相关要求。

二、基本情况

8月1日6时，绕阳河左岸盘锦曙四联段一处穿堤管廊出现严重透水，虽经紧急抢险，10时30分仍出现溃口；此处河堤顶宽4m，底宽8m。绕阳河在盘锦市境内河长71km，堤防现状标准为50年一遇，设计防洪能力2458m³/s。绕阳河盘锦曙四联段处于地质沉陷区，部分堤防沉陷达1.3m。绕阳河王回窝堡，7月30日19时流量1480m³/s，是1952年建站以来最大洪峰流量。

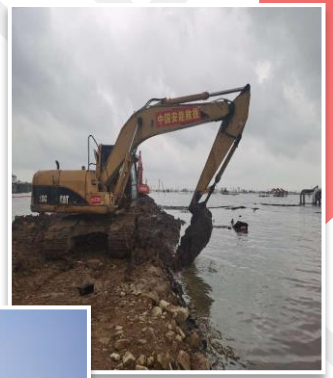
-1-

Resolution map for the breach closure site of Raoyang River in Panjin, Liaoning

（二）严密组织，高效展开救援
(II) Strict organization and efficient rescue

科学运用“**疏堵结合**、**抢修道路**，**稳固堤头**、**双向进占**，**快速合龙**、**防渗闭气**”的机械化立堵战法有序展开抢险救援各项工作。

Scientifically apply the mechanized vertical closure method of "**combining dredging and blocking, repairing roads, stabilizing embankment ends, advancing in both directions, quickly closing, preventing seepage and air leakage**" to carry out emergency rescue work in an orderly manner.



（二）严密组织，高效展开救援
(II) Strict organization and efficient rescue

救援协调局会同应急管理部自然灾害工程救援中心将所属**唐山、武汉基地救援力量**分别配置在决口上、下游，将救援人员编成2组实行24小时轮班作业，做到**人歇机不停**，快速展开**道路修整**、**会车平台修筑**和**决口封堵**三大任务

The Rescue Coordination Bureau, together with the Natural Disaster Engineering Rescue Center of the Ministry of Emergency Management, allocated **the rescue forces of Tangshan and Wuhan bases** respectively upstream and downstream of the breach, and organized rescue personnel into two groups to implement 24-hour shift work, so that **the machines keep working 24 hours a day** to quickly carried out the three major tasks of **road repair, meeting platform construction and breach closure.**

（二）严密组织，高效展开救援
(II) Strict organization and efficient rescue

任务机组开展**现场勘查**、**空中测量**，会同部工程救援中心制定报批投放沉箱方案，2架直升机飞行**5架次**，**抛投沉箱5组**。

The mission crew conducted **on-site survey and aerial survey**, and jointly developed and submitted a plan for the dropping of caissons with the Ministry's Engineering Rescue Center. Two helicopters flew **five times and dropped five groups of caissons**.

（三）创新战法，提升救援效率
（III） Innovating tactics to improve rescue efficiency

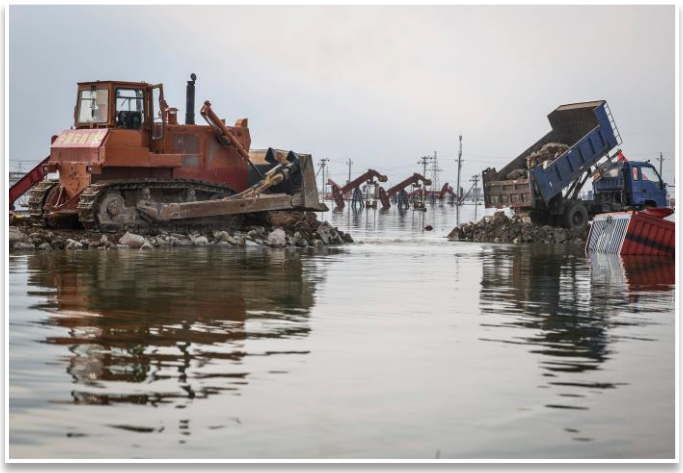
绕阳河盘锦曙四联段处于地质沉陷区，大型装备无法上堤，临时征租农用自卸车运送封堵石料。堤身顶宽4米，不能满足双向通行，需在堤顶间隔100～200米修筑会车平台，满足会车要求。

The Panjin Shusilian Section of the Raoyang River is located in a geological subsidence area, and large equipment cannot reach the embankment, so agricultural dump trucks were temporarily rented to transport stones for closure. The top of the embankment is 4m wide, which cannot meet the requirements of two-way traffic. A meeting platform needs to be built at an interval of 100-200m at the top of the embankment to meet the meeting requirements.

（三）创新战法，提升救援效率
（III） Innovating tactics to improve rescue efficiency

运用**空地配合**、**投放沉箱**创新战法助力决口封堵，动用大型直升机将**5组沉箱**抛投至**决口上游**侧裹头处，**有效减缓了水流流速**、**保护了裹头**，为决口封堵创造了良好条件，大大提高了救援行动效率。

The innovative tactic of **air-ground cooperation and dropping caissons** was used to assist in the breach closure, and large helicopters were used to drop **5 sets of caissons** onto the wrapping head at the **upstream side of the breach**, **effectively slowing down the water flow rate and protecting the wrapping head**, which created good conditions for the breach closure and greatly improved the efficiency of rescue operations.



（四）强化协调，有效衔接任务
(IV) Strengthening coordination to effectively link all tasks

针对**戗堤道路保通难**、**保障多元融合难**、**堤防风险研判难**、**车辆众多指挥难**等不利因素，研究道路疏通、保通方案，保证**封堵石料及时到达决口部位**；制定排涝工作方案和力量增援方案，实现**决口封堵与排涝工作接续展开**、**无缝衔接**，把确保人民生命安全放到第一位落到实处。

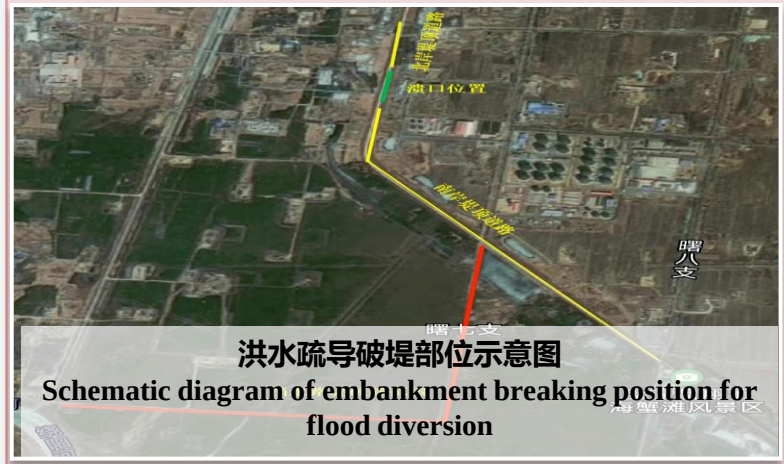
In view of unfavorable factors such as **difficulty in guaranteeing the passage of berm roads**, **ensuring multiple element integration**, **judging the risk of dikes**, **and commanding due to many vehicles**, implement studies on the road dredging and passage guarantee scheme to ensure **the stones for closure can reach the breached part in time**; develop drainage work scheme and force reinforcement scheme to realize **that the breach closure and drainage work will be carried out continuously and seamlessly**, to implement the principle of putting the safety of people's lives first.

三

应对过程
Handling process

（一）决口封堵前作业准备
(I) Operation preparation before the breach closure

挖除堤坝分洪
Excavating dams for flood diversion



洪水疏导破堤部位示意图
Schematic diagram of embankment breaking position for flood diversion

为加大洪水分流速度，将决口下游署七支与河堤交叉口至绕阳河河道附近约2公里L型道路路堤挖除。

To speed up the flood diversion, the L-shaped road embankment about 2km from the intersection of the Shuqizhi at the lower reaches of the breach and the river bank to the vicinity of the Raoyang River was excavated.

抢修进场道路
Emergency maintenance of access roads

间隔100～200米修筑会车平台，设专人指挥，并配置专职安全员，确保人员及设备能顺利进场进行抢险作业。

A passing platform was built at intervals of 100~200m, equipped with special personnel to command and full-time safety officers to ensure that personnel and equipment could enter the site smoothly for emergency operations.

稳固加宽堤头
Stabilizing and widening of embankment ends

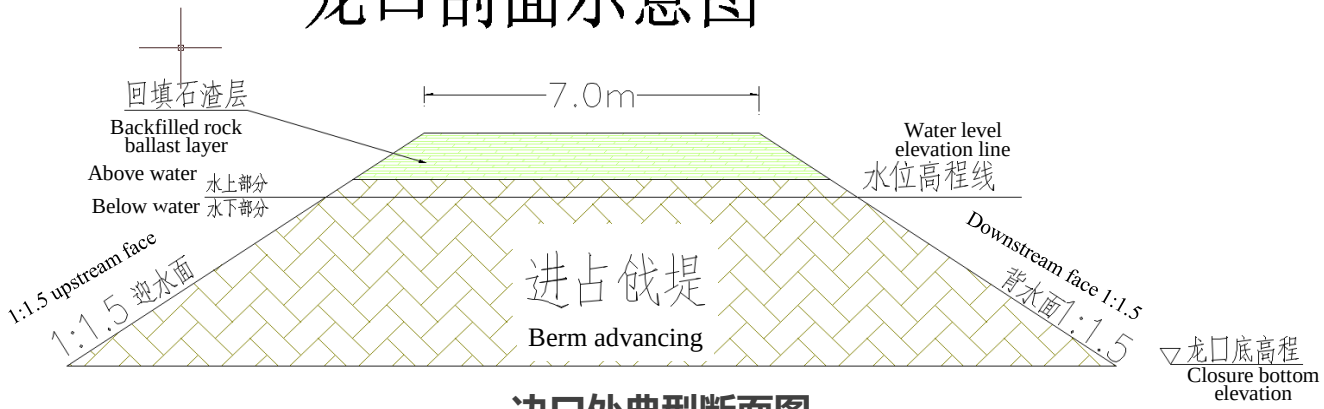
在堤头迎水面抛填大块石、钢筋石笼或铅丝石笼，抵挡水流对堤防正面冲刷，增强堤头稳固性。

Large stones, steel bar gabions or lead wire gabions were dumped and filled into the upstream face of the embankment ends to resist the erosion to the front of the embankment by water flow and enhance the stability of the embankment ends.

（二）戗堤进占
(II) Berm advancing

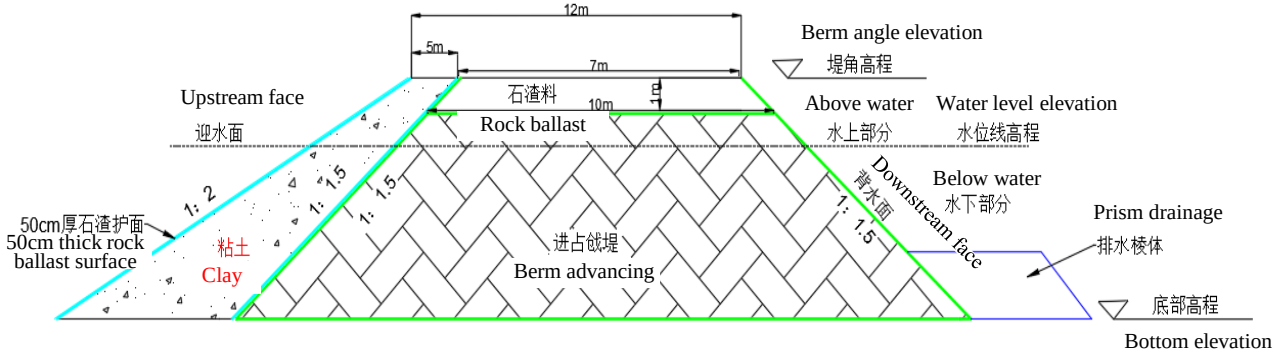
Schematic diagram of closure section

龙口剖面示意图



决口处典型断面图

Typical section of breach



戗堤典型断面图

Typical section of berm

采取水下抛填法：进占从决口两端按原堤线向中间方向进行，顶宽由12米逐渐收窄至7米、两侧为自然坡比（1:1.5）的进占戗堤，高度控制高出水面1米左右。遇水流流速过快时，配合抛填少量大块石或钢筋石笼。

Underwater dumping fill method adopted: the advancing was carried out from both ends of the breach to the middle direction according to the original embankment line, forming an advancing berm with top width gradually narrowed from 12m to 7m, natural slope ratio (1: 1.5) at the two sides, and height controlled to be about 1m higher than the water surface. When the flow velocity was too fast, a small amount of large stones or reinforced gabions were dumped and filled.

（三）突击合龙
(III) Closure with concentrated efforts

决口随着堵口戗堤的进占逐渐束窄，龙口处流速逐渐增大，待口门收缩到8米左右时，密集抛填大块石、钢筋石笼或铅丝石笼等截流材料，两端一起迅速进占，直至两端堤头顺利合龙。

With the advance of berm advancing, the breach was gradually narrowed, and the flow velocity at the closure gradually increased. When the entrance shrank to about 8m, the closure materials such as large stones, reinforced gabions or lead wire gabions were densely dumped and filled to rapidly advance from both ends simultaneously until both the berm ends were successfully closed.

（四）培厚加固
(IV) Thickening and reinforcing

合龙后，采用碎石混合料加宽至戗堤设计断面

After the closure, gravel mixtures were adopted to widen the berm to its design section.

（五）防渗闭气
(V) Anti-seepage and sealing

采用抛填法，向堤内侧抛投40厘米厚反滤料和40厘米厚粘土做防渗铺盖，予以压牢实现封堵口闭气。

By damping fill method, 40cm thick filter-resistant materials and 40cm thick clay were dumped to the inner side of the berm as anti-seepage blanket, which was pressed firmly to realize the closure and sealing.

四
IV

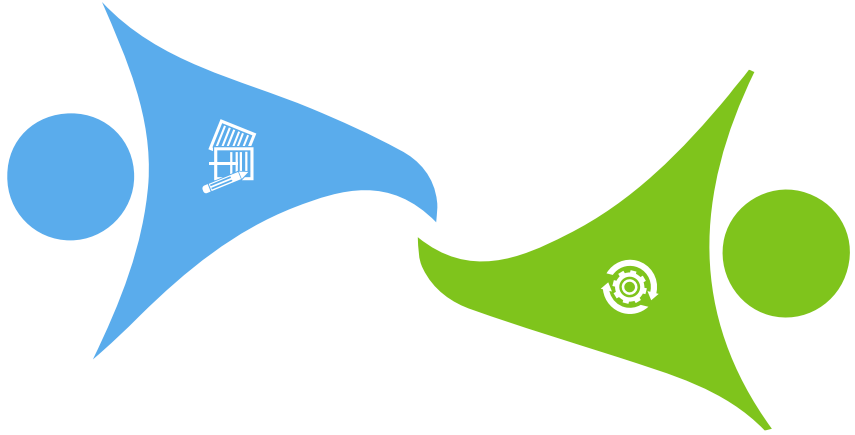
经验体会
Experience

（一）强化应急准备是快速抢险救援的基础
(I) Strengthening emergency preparations is the foundation of rapid emergency rescue

修订完善行动方案
Revise and improve the action scheme

针对河流水位长期超警的汛情险情，及时修订完善了**七大流域的抗洪抢险行动预案**，明确了**力量编成**，重点准备了消防、军队、工程等应急力量

In view of the dangerous flood condition that the river water level exceeds the warning line for a long time, **the action plan for flood fighting and emergency rescue in seven major river basins** was revised and improved in time, clearly indicating the **force composition**, focusing on the preparation in emergency forces such as fire protection, military and engineering.



掌握排涝设备分布
Master the distribution information of drainage equipment

摸清了国内重点地区大流量排涝设备**500余台套分布情况**，切实做到未雨绸缪，确保遇有险情快速反应、高效应对

The **distribution of more than 500 sets** of large-flow drainage equipment in key areas in China has been clarified, realizing plan ahead in practice to ensure rapid response and efficient response in case of any danger.

（二）强化现场指挥是有力抢险救援的保证
(II) Strengthening on-site command is the guarantee of effective emergency rescue

国家防总
National Flood Control and Drought Relief Headquarters

第一时间派出由总工程师带队的工作组赴一线指导救援，救援协调局熟悉救援力量的有关同志加入工作组协调调派工程和航空救援力量增援

A working group led by the chief engineer was dispatched to the front line to guide the rescue at the first time. Relevant comrades familiar with the rescue force work of the Rescue Coordination Bureau joined the working group to coordinate the dispatch of engineering and aviation rescue force for reinforcements.

市级政府
Municipal Government

盘锦市委市政府主要领导每天蹲守现场指挥

The main leaders of Panjin Municipal Party Committee and Municipal Government commanded on the site all the days.

省级政府
Provincial Government

辽宁省主要负责同志赴现场指导救援工作，一线亲自指挥，部署抢险救援任务

The main responsible comrades of Liaoning went to the site to guide the rescue work, personally commanded and deployed the rescue tasks.

救援力量
Rescue forces

消防、军队、中国安能等相关负责同志一线指挥，确保抢险救援任务按时完成

Relevant responsible comrades from departments such as fire protection, military and China Anneng commanded at the front line to ensure that the rescue tasks would be completed on time.

（三）强化现场组织是高效抢险救援的保障
(III) Strengthening on-site organization is the safeguard for efficient emergency rescue

抢险救援行动组织、现场管控是抢险救援的关键环节

Emergency rescue operation organizing and on-site control are the key links of emergency rescue

决口封堵任务由中国安能全面负责
China Anneng is fully responsible for the task of breach closure

封堵决口物料保障、决口3公里以外的进场道路保通由盘锦市负责
Panjin Municipal Party Committee and Municipal Government are responsible for guaranteeing the materials for closing the breach and ensuring the passage of access roads 3km away from the breach

上游溃口封堵物料保障由盘锦市一名负责同志负责
A responsible comrade from Panjin is responsible for guaranteeing the closure materials for upstream breach

下游溃口封堵物料保障由盘锦市一名负责同志负责
A responsible comrade from Panjin is responsible for guaranteeing the closure materials for downstream breach

现场交通管控由盘锦市公安局交警支队负责
The Traffic Police Detachment of Public Security Bureau of Panjin is responsible for the on-site traffic control

大型设备、物料运输自卸车由辽河油田负责
Liaohe Oilfield is responsible for large-scale equipment and material transportation dump trucks

（四）规范力量调派是有序抢险救援的关键。
(IV) Standardizing the deployment of different forces is the key to orderly emergency rescue.

01

针对不同阶段、不同灾害险情**精准调派力量**

Based on different stages and different disasters and dangers, **accurately dispatch different forces**

02

决口封堵阶段，部迅速从中国安能紧急调派**工程救援力量**、**航空力量**执行跨区增援任务

At breach closure stage, urgently dispatch engineering rescue force and **aviation power** from China Anneng to carry out cross-regional reinforcement tasks

03

涝水强排阶段，从中国安能紧急调派**21台大流量排水设备**，从国家安全生产应急救援中心调派**31台套大流量排水设备**紧急驰援，实现了决口封堵与排涝工作接续展开、无缝衔接

At drainage stage of flooding water, urgently dispatch **21 sets of large-flow drainage equipment** from China Anneng and **31 sets of large-flow drainage equipment** from the National Safety Production Emergency Rescue Center for emergency assistance, realizing the continuous conduction and seamless connection between breach closure and drainage work

04

在力量调派上，从**上报请示**、**下发任务通知单**到**回撤请示**、**组织回撤**等工作，做到了**力量调派的全流程管理**

In terms of force deployment, **the whole process management of force dispatching has been realized in terms of report for instructions, issuing a task notice to request for withdrawal, organization withdrawal and the like**

谢谢大家！
THANK YOU!