# **Study on Longitudinal Temperatu**<br> **Cable Tunnel Near Wall 1**<br> *Zhenpeng Bai, Xiaohan Zhao, Hengjie Qin, Huaitao Song, Mabstract*<br> *Abstract*<br> *Abstract*<br> *Abstract*<br> *Abstract*<br> *Abstract*<br> *Abstract*<br> *Abstract*<br> *Abstra* **Study on Longitudinal Temperature**<br> **Cable Tunnel Near Wall Fir**<br> *zhenpeng Bai, Xiaohan Zhao, Hengjie Qin, Huaitao Song, Haov***<br>** *Abstract***—This paper evaluates the influence of natural the development of flam<br>
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Study on Longitudinal Temperature Decay in<br>
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ventilation on the longitudinal temperature attenuation of<br>
cable tunnel wall fires. It took into account th *Abstract***—This paper evaluates the influence of natural the development of flament cable tunnel wall fires. It took into account the effects of entrainment, and heat transdifferent fuel quantities, cable types, cable la** *Abstract***—This paper evaluates the influence of natural the development of flame ventilation on the longitudinal temperature attenuation of emtrainment, and heat transf different fuel quantities, cable types, cable laye** *Abstract***—This paper evaluates the influence of natural the development ventilation on the longitudinal temperature attenuation of entrainment, and header their quantities, cable types, cable layers, and the continuent** *Abstract***—This paper evaluates the influence of natural<br>
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different fuck under natural ventilation** on the longitudinal temperature of natural temperature of the conduction of entimation on the longitudinal temperature attenuation of entimal feedback of the generator different fuel quantities, cable types, **the centrature in the ceiling was proposed to address the effects of the central central feedback of the generative such in a cable tunnel well fires. It took into account the effects of the combustion number of cables pe** Exame the wall ines. It took much account the effects of heat release rate (HRR) and ventilation of a cable tunnel. Results indicated that under natural feedback of the out in a cable tunnel. Results indicated that under n uncern tue quantumes, cause vigos, cause and the system and free that and the mail feedback of the out in a cable tunnel. Results indicated that under natural restriction of air entrainment varies under different condition **previous previous exerch results. Finally, this paper established a**<br>**previous results.** The state of the state are served in a cable tunnel. Results indicated that under natural<br>**Previous results index** of smoke after hi out in a calculation the calle burns well. The cale total mass loss rate of smoke after hitting<br>varies under different conditions. Moreover, under natural different due to the diffe<br>ventilation, cable combustion was affect **Provided** the cable burnts well. The capte but in the capter of the different conditions. Moreover, under natural different inclusion was affected by many factors. Imitations of the different condition was affected by man varies under unferent conditions. More<br>ventilation, cable combustion was affect<br>This paper analyzed the effect of na<br>longitudinal dimensionless temperatur<br>mathematical model was proposed<br>dimensionless temperature attenuati Index Terms—Near wall fire, Cable tunnel, Longitudinal<br>Index Terms<br>
Internatical model was proposed for longitudinal<br>
International content entermation under natural Chen et al. [4]<br>
Intilation cases. In addition, a predic maintenantal model was proposed for integral<br>dimensionless temperature attenuation under natural Climensionless s. In addition, a predictive model for maximum<br>temperature rise below the ceiling was proposed to address the<br> Fraction,a predictive model for maximum<br>
and diffusion, a predictive model for maximum<br>
and ventilation on cable<br>
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Temperature Decay in<br>Vear Wall Fire<br>e Qin, Huaitao Song, Haowei Yao<br>greater [2]. Wall limitations are important factors affecting<br>the development of flame space, smoke plume air<br>entrainment, and heat transfer. In cable tun Temperature Decay in<br>Vear Wall Fire<br>eqin, Huaitao Song, Haowei Yao<br>greater [2]. Wall limitations are important factors affecting<br>the development of flame space, smoke plume air<br>entrainment, and heat transfer. In cable tunn Temperature Decay in<br>
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Chen et al. [4] studied the main factors affecting the<br>
ventilation effect Wang et al. [3] explored the flame propagation and<br>extinguishing of horizontal power cables in utility tunnels.<br>Chen et al. [4] studied the main factors affecting the<br>ventilation effect of cable tunnels. Tang et al. [5]<br>in extinguishing of horizontal power cables in utility tunnels.<br>Chen et al. [4] studied the main factors affecting the<br>ventilation effect of cable tunnels. Tang et al. [5]<br>investigated the effects of cable tray spacing on the Chen et al. [4] studied the main factors affecting the ventilation effect of cable tunnels. Tang et al. [5] investigated the effects of cable tray spacing on the fire characteristics of mining cables. Yu et al. [6] invest ventilation effect of cable tunnels. Tang et al. [5]<br>investigated the effects of cable tray spacing on the fire<br>characteristics of mining cables. Yu et al. [6] investigated<br>thermal control and smoke control strategies in a investigated the effects of cable tray spacing on the fire<br>characteristics of mining cables. Yu et al. [6] investigated<br>thermal control and smoke control strategies in a tunnel. Liu<br>et al. [7] studied the maximum ceiling characteristics of mining cables. Yu et al. [6] investigated thermal control and smoke control strategies in a tunnel. Liu et al. [7] studied the maximum ceiling temperature in a tunnel. Tao et al. [8] revealed a correlati thermal control and smoke control strategies in a tunnel. Liu<br>et al. [7] studied the maximum ceiling temperature in a<br>tunnel. Tao et al. [8] revealed a correlation study on the<br>prediction of smoke rise time caused by fires et al. [7] studied the maximum ceiling temperature in a<br>tunnel. Tao et al. [8] revealed a correlation study on the<br>prediction of smoke rise time caused by fires in longitudinal<br>ventilation tunnels. Wang et al. [9] studied tunnel. Tao et al. [8] revealed a correlation study on the prediction of smoke rise time caused by fires in longitudinal ventrilation tunnels. Wang et al. [9] studied the effects of cable inclination and longitudinal wind prediction of smoke rise time caused by fires in longitudinal<br>ventilation tunnels. Wang et al. [9] studied the effects of<br>cable inclination and longitudinal wind on the flame<br>propagation behavior of cables in utility tunne ventilation tunnels. Wang et al. [9] studied the effects of cable inclination and longitudinal wind on the flame propagation behavior of cables in utility tunnels. Zhao et al. [10] studied the effect of fire location and a cable inclination and longitudinal wind on the flame<br>propagation behavior of cables in utility tunnels. Zhao et al.<br>[10] studied the effect of fire location and air volume on the<br>forced ventilation single end tunnel fires. propagation behavior of cables in utility tunnels. Zhao et al.<br>[10] studied the effect of fire location and air volume on the<br>forced ventilation single end tunnel fires. The author has<br>made extensive research on fire and v [10] studied the effect of fire location and air volume on the forced ventilation single end tunnel fires. The author has made extensive research on fire and ventilation [11-15]. Some scholars have studied the diffusion a forced ventilation single end tunnel fires. The author has<br>made extensive research on fire and ventilation [11-15].<br>Some scholars have studied the diffusion and temperature<br>distribution patterns of flue gas [16-18]. They c environment. me scholars have studied the diffusion and temperature<br>stribution patterns of flue gas [16-18]. They considered<br>fferent natural ventilation intensities. The near wall<br>stance at which cable tunnel fires occur is different, distribution patterns of flue gas [16-18]. They considered different natural ventilation intensities. The near wall distance at which cable tunnel fires occur is different, and the degree of air entrainment by the fire plu different natural ventilation intensities. The near wall distance at which cable tunnel fires occur is different, and the degree of air entrainment by the fire plume and the flow of smoke after hitting the ceiling and side distance at which cable tunnel fires occur is different, and<br>the degree of air entrainment by the fire plume and the flow<br>of smoke after hitting the ceiling and sidewalls are also<br>different. The combustion of cables is onl The fire in cable tunnel is getting serious [1]. It stems<br>
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<span id="page-0-0"></span>(2021BSJJ048), Henan Province Central Leading Local Science and uterinan radiation generation (2021BSJJ048), Zhengzhou University of Light Industry Science and Technology Innovation Team<br>
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Laboratory of Electric Zhenpeng Bai is a lecturer in the Department of Zhengzhou Key<br>
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X Laboratory of Electric Power Fire Safety, College of Building Environment<br>
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Vaiohan Zhao is a lecturer in the Department of Fina Engineering, Zhengzhou University of Light Industry, China (E-mail: the longitudinal center in Xiaohan Zhao is a lecturer in the Department of Financial Management, involved the distributed manili xiaohanzhaol 226@163.com) the degree of air entrainment by the fire plume and the flow<br>of smoke after hitting the ceiling and sidewalls are also<br>different. The combustion of cables is only affected by the<br>environment of the cable tunnel and the par of smoke after hitting the ceiling and sidewalls are also<br>different. The combustion of cables is only affected by the<br>environment of the cable tunnel and the parameters of the<br>cable itself. Air can freely entrain from arou different. The combustion of cables is only affected by the environment of the cable tunnel and the parameters of the cable itself. Air can freely entrain from around itself, and the thermal radiation generated by combusti environment of the cable tunnel and the parameters of the cable itself. Air can freely entrain from around itself, and the thermal radiation generated by combustion is fed back to the outside of itself, partially acting on cable itself. Air can freely entrain from around itself, and the thermal radiation generated by combustion is fed back to the outside of itself, partially acting on the surrounding environment.<br>Previous studies have been c thermal radiation generated by combustion is fed back to the outside of itself, partially acting on the surrounding environment.<br>Previous studies have been conducted on closed cable tunnel fires. However, previous studies outside of itself, partially acting on the surrounding<br>environment.<br>Previous studies have been conducted on closed cable<br>tunnel fires. However, previous studies have shown that the<br>ignition point of cable tunnel fires is g environment.<br>
Previous studies have been conducted on closed cable<br>
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ignition point of cable tunnel fires is generally located on<br>
the longitudinal centerline. Th Previous studies have been conducted on closed cable<br>tunnel fires. However, previous studies have shown that the<br>ignition point of cable tunnel fires is generally located on<br>the longitudinal centerline. The author's earlie tunnel fires. However, previous studies have shown that the ignition point of cable tunnel fires is generally located on the longitudinal centerline. The author's earlier research has involved the distribution characterist

IAENG International Journal of Applied Mathema<br>to supplement previous research gaps. This article The cable tunnel was 6.0<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1, it is<br>cable t **IAENG International Journal of Applied Mathematics**<br>to supplement previous research gaps. This article The cable tunnel was 6.0 m 1<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1, it **IAENG International Journal of Applied Mathema**<br>to supplement previous research gaps. This article The cable tunnel was 6.0<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1, it is<br>cable **IAENG International Journal of Applied Mathen**<br>to supplement previous research gaps. This article The cable tunnel was 6<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1,<br>cable tunnels IAENG International Journal of Applied Math<br>to supplement previous research gaps. This article The cable tunnel we<br>establishes a physical model of the fire characteristics of high. As shown in Fig.<br>cable tunnels and conduc IAENG International Journal of Applied Mathematics<br>to supplement previous research gaps. This article<br>tablishes a physical model of the fire characteristics of high. As shown in Fig. 1, it is the<br>cable tunnels and conducts **IAENG International Journal of Applied Math**<br>to supplement previous research gaps. This article The cable tunnel wa<br>establishes a physical model of the fire characteristics of high. As shown in Fig.<br>cable tunnels and cond **IAENG International Journal of Applied Mathemation**<br>to supplement previous research gaps. This article The cable tunnel was 6.0 m<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1, it i **IAENG International Journal of Applied Mathemati**<br>to supplement previous research gaps. This article The cable tunnel was 6.0 n<br>establishes a physical model of the fire characteristics of high. As shown in Fig. 1, it is<br>c **EXENT INTERT STATE INTERT AT ANCE INTERTATION CONTROL THE CONDEM CONDENSISES A physical model of the fire characteristics of high. As shown in Fig. 1, it is the cable tunnels and conducts research through model in Table 1** to supplement previous research gaps. This article The cable tunnel was 6.<br>
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during the combustion process of cabi<br>
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da maximum t experiments. This paper organized and an experimental data on the combustion time and temperaturibution of cables during the combustion process cable tunnels, a longitudinal temperature distribution model and a maximum tem



	T ADLE T			CASES OF VENTILATION WITH FINE IN CABLE TUNNEL	ັັ
Case	Fuel quantity (ml)	Oil pool $/cm \times$ cm)	Cable type	Number of cables per layer	The tunnel,
$\mathbf{1}$	10	$13\times13$	<b>ZRYJV</b>	1	This
$\overline{c}$	20	$13\times13$	<b>ZRYJV</b>	$\mathfrak{2}$	in cab
$\overline{\mathbf{3}}$	20	$13\times13$	<b>ZRYJV</b>	$\overline{4}$	layer-b
$\overline{4}$	10	$9.2 \times 9.2$	<b>RVVR</b>	$\mathbf{1}$	total ca
5	20	$9.2 \times 9.2$	<b>RVVR</b>	2	was no
6	40	$9.2 \times 9.2$	<b>RVVR</b>	4	layer.
$\tau$	10	$13\times13$	<b>RVVR</b>	$\mathfrak{2}$	under
$\,$ 8 $\,$	40	$13\times13$	<b>RVVR</b>	1	in cabl
9	10	$18.3 \times 18.3$	<b>RVVR</b>	4	by mul
10	20	$18.3 \times 18.3$	<b>RVVR</b>	$\mathbf{1}$	observ
11	40	$18.3 \times 18.3$	<b>RVVR</b>	4	in som
12	10	$4 \times 21$	<b>ZRYJV</b>	1	others,
13	20	$4 \times 21$	<b>ZRYJV</b>	4	
14	10	$4 \times 21$	<b>ZRYJV</b>	2	Theref
15	10	$9.2 \times 9.2$	<b>ZRYJV</b>	$\overline{2}$	differe
16	10	$13\times13$	<b>ZRYJV</b>	$\mathfrak{2}$	cable t
17	20	$2\times 42$	<b>ZRYJV</b>	$\mathfrak{2}$	The
18	20	$4\times 42$	<b>ZRYJV</b>	$\overline{2}$	$g/s$ , an
19	20	$18.3 \times 18.3$	<b>ZRYJV</b>	$\overline{c}$	1.65 g/
20	20	$4 \times 21$	<b>RVVR</b>	2	3.10 g
21	20	$9.2 \times 9.2$	<b>RVVR</b>	$\mathfrak{2}$	$14 - 19$
22	20	$2\times 42$	<b>RVVR</b>	$\mathfrak{2}$	2.45 g
23	20	$13\times13$	<b>RVVR</b>	2	$0.83$ g
24	20	$4\times 42$	<b>RVVR</b>	$\overline{c}$	$g/s.$ To
25	20	$18.3 \times 18.3$	<b>RVVR</b>	$\mathfrak{2}$	0.34 g/

of Applied Mathematics<br>The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>gh. As shown in Fig. 1, it is the physical model. As shown<br>Table 1, it is the experimental tests in cable tunnel fire.<br>This article conducted 25 **al of Applied Mathematics**<br>The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>high. As shown in Fig. 1, it is the physical model. As shown<br>in Table 1, it is the experimental tests in cable tunnel fire.<br>This article con

**and Solution 1)**<br>The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>high. As shown in Fig. 1, it is the physical model. As shown<br>in Table 1, it is the experimental tests in cable tunnel fire.<br>This article conducted 25 of Applied Mathematics<br>The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>gh. As shown in Fig. 1, it is the physical model. As shown<br>Table 1, it is the experimental tests in cable tunnel fire.<br>This article conducted 25 **Such as fuel meant as follow and the matrice of the cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m high. As shown in Table 1, it is the experimental tests in cable tunnel fire. This article conducted 25 cases. The impa al of Applied Mathematics**<br>The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>high. As shown in Fig. 1, it is the physical model. As shown<br>in Table 1, it is the experimental tests in cable tunnel fire.<br>This article con **and of Applied Mathematics**<br>
The cable tunnel was 6.0 m long, 0.4 m wide and 0.5 m<br>
high. As shown in Fig. 1, it is the physical model. As shown<br>
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such as fuel quantity, pool type, cable type, and num<br>
cables per layer were considered* This article conducted 25 cases. The impact of factors<br>
chas fuel quantity, pool type, cable type, and number of<br>
bles per layer were considered. This article mainly studied<br>
e characteristics of longitudinal temperature such as fuel quantity, pool type, cable type, and number of<br>cables per layer were considered. This article mainly studied<br>the characteristics of longitudinal temperature attenuation,<br>maximum temperature rise, and dimensio re rise, and dimensionless fire source<br>ls. Different types of oil pools could<br>iition source. The fuel was n-heptane.<br>me retardant bridged polyethylene-clad<br>s ZRYJV and RVVR. The ventilation<br>ventilation.<br>ventilation.<br>izis<br>

follows:

$$
15.6 \times [\dot{Q}_{peak}^*]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}
$$
 (1)

where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude

this paper studied lo<br>
natural ventilation<br>
proposed a predicti<br>
distribution of smo<br>
ventilation effect. F<br>
model of ceiling max<br>
with natural ventilati<br>
Number of<br>
A. Combustion of c<br>
Number of<br>
The burning char:<br>
tunnel were flame retardant bridged polyethylene-clad<br>
ed cables ZRYJV and RVVR. The ventilation<br>
natural ventilation.<br>
cal Analysis<br>
predicted the cable HRR. Heat release rate was<br>
ing experimental tests could be calculated as<br> exthed used natural ventilation.<br>
Theoretical Analysis<br>
This paper predicted the cable HRR. Heat release rate was<br>
tained during experimental tests could be calculated as<br>
llows:<br>  $15.6 \times [\dot{Q}_{peak}]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1 B. Theoretical Analysis<br>
This paper predicted the cable HRR. Heat release rate was<br>
obtained during experimental tests could be calculated as<br>
follows:<br>  $15.6 \times [\dot{Q}_{peak}^{\dagger}]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>
where,  $\Theta_1$  and B. Theoretical Analysis<br>
This paper predicted the cable HRR. Heat release rate was<br>
obtained during experimental tests could be calculated as<br>
follows:<br>  $15.6 \times [\hat{Q}^*_{peak}]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>
where,  $\Theta_1$  and  $\Theta$ This paper predicted the cable HRR. Heat release rate was<br>obtained during experimental tests could be calculated as<br>follows:<br> $15.6 \times [\dot{Q}_{peak}^{\dagger}]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Fr obtained during experimental tests could be calculated as<br>follows:<br> $15.6 \times [\dot{Q}_{peak}^{\dagger}]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude numbers.<br>III. RESULTS AND DISCUSSIONS<br>First, this pap follows:<br>  $15.6 \times [\dot{Q}_{peak}^*]^{2/5} = \Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>
where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude numbers.<br>
III. RESULTS AND DISCUSSIONS<br>
First, this paper investigated cable combustion time in<br>
cable tunnels 15.6×[ $\dot{Q}_{peak}^*$ ]<sup>2/5</sup> =  $\Theta_1 + \Theta_2 \cdot Fr^{2/3}$  (1)<br>where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude numbers.<br>III. RESULTS AND DISCUSSIONS<br>First, this paper investigated cable combustion time in<br>cable tunnels under the where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude numbers.<br>
III. RESULTS AND DISCUSSIONS<br>
First, this paper investigated cable combustion time in<br>
cable tunnels under the natural ventilation effect. Secondly,<br>
this pap Where,  $\Theta_1$  and  $\Theta_2$  are parameter. Fr is Froude numbers.<br>
III. RESULTS AND DISCUSSIONS<br>
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this pap III. RESULTS AND DISCUSSIONS<br>
First, this paper investigated cable combustion time in<br>
cable tunnels under the natural ventilation effect. Secondly,<br>
this paper studied longitudinal temperature distribution with<br>
natural v III. RESULTS AND DISCUSSIONS<br>First, this paper investigated cable combustion time in<br>ble tunnels under the natural ventilation effect. Secondly,<br>s paper studied longitudinal temperature distribution with<br>tural ventilation First, this paper investigated cable combustion time in<br>cable tunnels under the natural ventilation effect. Secondly,<br>this paper studied longitudinal temperature distribution with<br>natural ventilation in cable tunnels. Thir From the tunnels under the natural ventilation effect. Secondly, s paper studied longitudinal temperature distribution with tural ventilation in cable tunnels. Third, this paper pposed a prediction model of longitudinal te this paper studied longitudinal temperature distribution with<br>natural ventilation in cable tunnels. Third, this paper<br>proposed a prediction model of longitudinal temperature<br>distribution of smoke in cable tunnels with the

in cable tunnels, the duration of combustion in each case, layer-by-layer cable mass loss, total cable mass loss, and total cable weight loss rate. Under the same conditions, there matural ventilation in cable tunnels. Third, this paper<br>proposed a prediction in cable tunnels. Third, this paper<br>proposed a prediction model of longitudinal temperature<br>distribution of smoke in cable tunnels with the natu proposed a prediction model of longitudinal temperature<br>distribution of smoke in cable tunnels with the natural<br>ventilation effect. Fourth, this paper proposed a prediction<br>model of ceiling maximum temperature rise in cabl distribution of smoke in cable tunnels with the natural<br>ventilation effect. Fourth, this paper proposed a prediction<br>model of ceiling maximum temperature rise in cable tunnels<br>with natural ventilation effect.<br>A. Combustion ventilation effect. Fourth, this paper proposed a prediction<br>model of ceiling maximum temperature rise in cable tunnels<br>with natural ventilation effect.<br>A. Combustion of cables in cable tunnel under ventilation<br>The burning model of ceiling maximum temperature rise in cable tunnels<br>with natural ventilation effect.<br>A. Combustion of cables in cable tunnel under ventilation<br>The burning characteristics of cables is displayed in the<br>tunnel, as sho with natural ventilation effect.<br>
A. Combustion of cables in cable tunnel under ventilation<br>
The burning characteristics of cables is displayed in the<br>
tunnel, as shown in Table 2.<br>
This article provided the combustion con A. Combustion of cables in cable tunnel under ventilation<br>The burning characteristics of cables is displayed in the<br>tunnel, as shown in Table 2.<br>This article provided the combustion conditions of cables<br>in cable tunnels, t A. Combustion of cables in cable tunnel under ventilation<br>The burning characteristics of cables is displayed in the<br>tunnel, as shown in Table 2.<br>This article provided the combustion conditions of cables<br>in cable tunnels, t The burning characteristics of cables is displayed in the tunnel, as shown in Table 2.<br>
This article provided the combustion conditions of cables<br>
in cable tunnels, the duration of combustion in each case,<br>
layer-by-layer tunnel, as shown in Table 2.<br>
This article provided the combustion conditions of cables<br>
in cable tunnels, the duration of combustion in each case,<br>
layer-by-layer cable mass loss, total cable mass loss, and<br>
total cable w This article provided the combustion conditions of cables<br>in cable tunnels, the duration of combustion in each case,<br>layer-by-layer cable mass loss, total cable mass loss, and<br>total cable weight loss rate. Under the same in cable tunnels, the duration of combustion in each case,<br>layer-by-layer cable mass loss, total cable mass loss, and<br>total cable weight loss rate. Under the same conditions, there<br>was no significant difference in the mas layer-by-layer cable mass loss, total cable mass<br>total cable weight loss rate. Under the same conditi<br>was no significant difference in the mass loss of e<br>layer. However, the total mass loss rate varied sig<br>under different al cable weight loss rate. Under the same conditions, there<br>is no significant difference in the mass loss of each cable<br>ver. However, the total mass loss rate varied significantly<br>der different conditions, indicating that was no significant difference in the mass loss of each cable<br>layer. However, the total mass loss rate varied significantly<br>under different conditions, indicating that cable combustion<br>in cable tunnels under ventilation co layer. However, the total mass loss rate varied significantly<br>under different conditions, indicating that cable combustion<br>in cable tunnels under ventilation conditions was influenced<br>by multiple factors. This article sel under different conditions, indicating that cable combustion<br>in cable tunnels under ventilation conditions was influenced<br>by multiple factors. This article selected several examples to<br>observe what happens when cables bur

3.10 g/s, and 3.76 g/s. Total cable mass loss rate in cases 14~19 is 0.79 g/s, 1.45 g/s, 3.52 g/s, 0.39 g/s, 0.77 g/s, and 2.45 g/s. The total cable mass loss rate in cases  $20\neg 25$  is 0.83  $g/s$ , 1.87  $g/s$ , and 1.10  $g/s$ , 3.38  $g/s$ , 1.71  $g/s$ , and 5.80 in cable tunnels under ventilation conditions was influenced<br>by multiple factors. This article selected several examples to<br>observe what happens when cables burn. It can be seen that<br>in some cases, the cable was completel by multiple factors. This article selected several examples to observe what happens when cables burn. It can be seen that in some cases, the cable was completely burned, while in others, it was not severely burned, as sho observe what happens when cables burn. It can be seen that<br>in some cases, the cable was completely burned, while in<br>others, it was not severely burned, as shown in cases 2 and 3.<br>Therefore, it is necessary to analyze and in some cases, the cable was completely burned, while in others, it was not severely burned, as shown in cases 2 and 3. Therefore, it is necessary to analyze and study the effects of different factors under natural ventil others, it was not severely burned, as shown<br>Therefore, it is necessary to analyze and still<br>different factors under natural ventilatio<br>cable tunnel fires.<br>The total cable mass loss rate in cases 1-<br>g/s, and 6.41 g/s. Tot





20 523 114.4 108.9 106.4 105.4 106.9 106.4 105.4 106.9 106.4 104.9 108.4 105.4 107.9 104.4 104. 20 22 1144 105.4 1044 1044 0.7<br>
22 384 106.4 105.4 1044 1044 0.7<br>
23 137 108.9 109.4 108.9 108.4  $\leq 0.6$ <br>
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25 74 108.4 107.4 106.9 106.9 0.4<br>
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25 74 10 22 384 106.4 105.4 1044 1044 1044 1044 1044 1044 1045 0.6<br>
23 137 108.9 109.4 108.9 108.4 24 247 107.9 104.4 104.9 105.4 23 0.5<br>
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25 74 108.4 107.4 106.9 106.9 0.4<br>
25 74 108.4 107.4 106. 23 137 108.9 109.4 108.9 108.9 108.4 25 74 108.9 109.4 108.9 108.9 108.4 25 74 108.4 107.4 106.9 106.9 0.5 108.4 25 74 108.4 107.4 106.9 106.9 0.3 25 74 108.4 107.4 106.9 106.9 0.3 25 74 108.4 107.4 106.9 0.5 1.9 0.1 2.1 24 247 107.9 104.4 104.9 105.4  $\overline{z}$  0.5<br>
25 74 108.4 107.4 106.9 106.9 0.4<br>
25 74 108.4 107.4 106.9 106.9 0.4<br>
<br> *B. Longitudinal temperature distribution of smoke with* 0.2<br> *natural ventilation*<br>
To better study lon









IAENG International Journal of Applied Mathems<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results sho<br>ventilation was analyzed. The dimensionless temperature of catches fire near the was<br>the fir **IAENG International Journal of Applied Mathematics**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results showed<br>ventilation was analyzed. The dimensionless temperature of catches fire near the wa **IAENG International Journal of Applied Ma**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Resu<br>ventilation was analyzed. The dimensionless temperature of catches fire near t<br>the fire source was the **IAENG International Journal of Applied Mathem**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results sh<br>ventilation was analyzed. The dimensionless temperature of catches fire near the w<br>the fire IAENG International Journal of Applied Mathem<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results show<br>entilation was analyzed. The dimensionless temperature of catches fire near the was<br>the fire **IAENG International Journal of Applied Mathematic**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results showed<br>ventilation was analyzed. The dimensionless temperature of the ceiling the<br>temperatu **IAENG International Journal of Applied Mathematic**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Results showed<br>ventilation was analyzed. The dimensionless temperature of eaches fire near the wal **IAENG International Journal of Applied Mathemation**<br>
of various factors in cable tunnel fire under natural et al. [19][20]. Results shower<br>
ventilation was analyzed. The dimensionless temperature of caches fire near the **IAENG International Journal of Applied Math**<br>of various factors in cable tunnel fire under natural et al. [19][20]. Result<br>ventilation was analyzed. The dimensionless temperature of catches fire near the<br>the fire source **EXERT INCRET INCRET SURFER THE UNIT OF APPIPED MATHEM**<br>
of various factors in cable tunnel fire under natural et al. [19][20]. Results sh<br>
ventilation was analyzed. The dimensionless temperature of catches fire near the of various factors in cable tunnel fire under<br>ventilation was analyzed. The dimensionless tempera<br>the fire source was the maximum. The dimens<br>temperature of the cable tunnel decreased with the ir<br>in distance from the fire various factors in cable tunnel fire under natural et al. [19][20]. Results showed<br>trilation was analyzed. The dimensionless temperature of catches fire near the wall,  $\frac{1}{2}$ . Fire source was the maximum. The dimension of various factors in cable tunnel fire under natural et al. [19][20]. Results showed<br>ventilation was analyzed. The dimensionless temperature of catches fire near the wall, the fire source was the maximum. The dimensionle ventilation was analyzed. The dimensionless temperature of catches fire near the wall,<br>the fire source was the maximum. The dimensionless combustion of the cable in the<br>temperature of the cable tunnel decreased with the i

tunnels.



**Example 19** or desired manimum temperature is  $\frac{0}{0.0}$  or  $\frac{0.0}{0.5}$  i.o.  $\frac{0.0$ As shown in Fig. 8, under<br>  $\begin{array}{c|c|c|c|c|c} \hline 0 & 0.5 & 1.0 & 1.5 & 2.0 & 2.5 & 3.0 \\ \hline 1 & 0 & 0.5 & 1.0 & 1.5 & 2.0 & 2.5 & 3.0 \\ \hline \end{array}$  As shown in Fig. 8, under<br>
Fig. 6. Formula fitting of dimensionless temperature longitudina 0. 1<br>  $\frac{1}{2}$ <br>  $\frac{1}{2}$ <br>  $\frac{1}{2}$ <br>
Fig. 6. Formula fitting of dimensionless temperature longitudinal of a fire cable tunnel<br>
distribution under natural ventilation in the middle of cable tunnel<br>
distribution under nat Example 1. So Formula fitting of dimensionless temperature longitudinal of a fire cable tunnel near the tribution under natural ventilation in the middle of cable tunnel<br>
The smoke temperature rise is  $\Delta T_0$ . To obtain t distribution under natural ventilation in the middle of cable tunnel<br>
and the cases was proposed, as sh<br>
The smoke temperature rise is  $\Delta T_o$ . To obtain the<br>
dimensionless temperature rise, it divides the temperature<br>
ris The smoke temperature rise is  $\Delta T_o$ . To obtain the  $\frac{\Delta T_m(H)}{T_\infty} = 0.674 + 0.593$ <br>dimensionless temperature rise, it divides the temperature<br>rise at each position measured in the experiment by the<br>temperature rise at the

$$
\frac{\Delta T_x}{\Delta T_0} = 1.205 e^{-(x-x_0)/2.934} - 0.216
$$
 (2)

First exactly point and the experiment by the experiment by the experiment of the experiment by the draw the distance from the reference point. It uses this value to draw the distance from the reference point  $x-x_0$ . The  $rac{\Delta I_x}{\Delta T_0}$  = 1.205  $e^{-(x-x_0)/2.934}$  - 0.216 (2)<br>
The fitting results of the smoke temperature rise and<br>
atecnuation coefficient of the cable tunnel were obtained.<br>
According to fitting correlation, the force index fit The fitting results of the smoke temperature rise and<br>attenuation coefficient of the cable tunnel were obtained.<br>According to fitting correlation, the force index fitting<br>method is very close to the experimental data, wit The intimg results of the shoke temperature in attenuation coefficient of the cable tunnel were of According to fitting correlation, the force index method is very close to the experimental data, wit greater than 0.97. The

Freedom is a transportant of the experimental data, with an R<sup>2</sup> experimental is also very close to the predicted value of the prediction model.<br>
The longitudinal temperature distribution below the ceiling in cable tunnel The fitted attenuation coefficient is also<br>
areaser than 0.97. The fitted attenuation coefficient is also<br>
very close to the predicted value of the prediction model.<br>
The longitudinal temperature distribution below the<br>
e

**al of Applied Mathematics**<br>et al. [19][20]. Results showed that when the cable tunnel<br>catches fire near the wall, the heat generated by the<br>combustion of the cable in the storage pool is not included<br>in the temperature ri **and of Applied Mathematics**<br>et al. [19][20]. Results showed that when the cable tunnel<br>catches fire near the wall, the heat generated by the<br>combustion of the cable in the storage pool is not included<br>in the temperature r **al of Applied Mathematics**<br>et al. [19][20]. Results showed that when the cable tunnel<br>catches fire near the wall, the heat generated by the<br>combustion of the cable in the storage pool is not included<br>in the temperature ri **al of Applied Mathematics**<br>et al. [19][20]. Results showed that when the cable tunnel<br>catches fire near the wall, the heat generated by the<br>combustion of the cable in the storage pool is not included<br>in the temperature ri **al of Applied Mathematics**<br>et al. [19][20]. Results showed that when the cable tunnel<br>catches fire near the wall, the heat generated by the<br>combustion of the cable in the storage pool is not included<br>in the temperature ri **al of Applied Mathematics**<br>
et al. [19][20]. Results showed that when the cable tunnel<br>
catches fire near the wall, the heat generated by the<br>
combustion of the cable in the storage pool is not included<br>
in the temperatur **and of Applied Mathematics**<br>
et al. [19][20]. Results showed that when the cable tunnel<br>
catches fire near the wall, the heat generated by the<br>
combustion of the cable in the storage pool is not included<br>
in the temperatu **and of Applied Mathematics**<br>
et al. [19][20]. Results showed that when the cable tunnel<br>
catches fire near the wall, the heat generated by the<br>
combustion of the cable in the storage pool is not included<br>
in the temperatu



<sup>400</sup><br>
<sup>350</sup><br>
<sup>26</sup><br>
<sup>26</sup><br>
<sup>26</sup><br>
<sup>26</sup><br>
<sup>26</sup><br> **Experimental Value**<br>
<sup>26</sup><br>
<sup>26</sup><br> **Experimental Value**<br>
<sup>26</sup><br> **Fig. 7.** Influence of natural ventilation on the maximum temperature rise<br>
of cable tunnel with HRR and comparison 350<br>  $\frac{1}{2}$ <br>  $\frac{2.5 \times 10^{-11} \text{ N}}{4 \text{ K}}$ <br>
Fig. 7. Influence of natural ventilation on the maximum temperature rise<br>
of cable tunnel with HRR and comparison with Li model.<br>
As shown in Fig. 8, under natural ventilatio *p Aluence of natural ventilation on the maximum temperature rise*<br> *pel with HRR and comparison with Li model.*<br> **p** *temperature rise prediction model formula below<br>
<i>g* of cable tunnel fits well. Therefore, a predict

$$
\frac{\Delta T_m(H)}{T_\infty} = 0.674 + 0.593 \dot{Q}_H^{*2/3} \cdot H^{-1}
$$
\n
$$
\text{where, } \dot{Q}_H^* = \dot{Q} / (\rho_\infty T_\infty c_p \sqrt{g} H^{5/2}), \text{ R}^2 \text{ is 0.99.}
$$
\n(3)



IAENG International Journal of Applied Mathematic<br>tunnel fire model test near the wall of the cable tunnel, the data analyses on the dimension<br>fire smoke first moved vertically upward and affected the tunnels. It can be co **IAENG International Journal of Applied Mathematic**<br>tunnel fire model test near the wall of the cable tunnel, the data analyses on the dimension<br>fire smoke first moved vertically upward and affected the tunnels. It can be **IAENG International Journal of Applied Math**<br>tunnel fire model test near the wall of the cable tunnel, the data analyses on the di<br>fire smoke first moved vertically upward and affected the tunnels. It can be co<br>ceiling. T **IAENG International Journal of Applied Mathemat**<br>tunnel fire model test near the wall of the cable tunnel, the data analyses on the dimensio<br>fire smoke first moved vertically upward and affected the tunnels. It can be con **IAENG International Journal of Applied**<br>tunnel fire model test near the wall of the cable tunnel, the data analyses on<br>fire smoke first moved vertically upward and affected the tunnels. It can<br>ceiling. Then, a portion of IAENG International Journal of Applied Mathemational<br>
inel fire model test near the wall of the cable tunnel, the data analyses on the dimension<br>
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**IAENG International Journal of Applied Mathematics**<br>
tunnel fire model test near the wall of the cable tunnel, the<br>
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data analyses on the dimensio<br>
fire smoke first moved vertically upward and affected the<br>
tunnels. It can be **EXENG INTERTATIONAL JOUTHAT OF Applied MATHEMATION**<br>
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tata analyses on the dimension<br>
fire smoke first moved vertically upward and affected the<br>
tunnels. It ca tunnel fire model test near the wall of the cable tunnel, the<br>
fire smoke first moved vertically upward and affected the<br>
tunnels. It can be concluded<br>
ceiling. Then, a portion of the smoke moved horizontally<br>
relationship combustion. *D. Dimensionless fire source heat release rate*<br> *D. D. Dimensionless fire source that maximum values of 7.31 kW, 10.90 kW,* and 313.32 kW. After 240 s, 115 s, 55 s, 215 s, 220 s, and 30 and 10 and 13.32 kW. After 240 s, Fig. Then, a portion of the smoke moved horizontally<br>
iling. Then, a portion of the smoke moved horizontally<br>
elationship between the dimension externine and entered the cable tunnel vertically.<br>
An experimental study was 2.31 For the cable tunnel, while another portion diffused along Fr. It also verified the previous<br>
the centerline and entered the cable tunnel vertically.<br>
An experimental study was conducted on the total<br>
combustion time the centerline and entered the cable tunnel vertically.<br>
An experimental study was conducted on the total<br>
combustion time of cable tunnel fires. As shown in Table 2,<br>
the combustion time of cable tunnel fires can indicate

An experimental study was conducted on the total<br>
combustion time of cable tunnel fires. As shown in Table 2,<br>
the combustion time of cable tunnel fires can indicate the<br>
cable combustion status. ZRYJV cables burned more<br> combustion time of cable tunnel fires. As shown in Table 2,<br>the combustion time of cable tunnel fires an indicate the<br>combustion status. ZRYJV cables burned more<br>tunnels under natural ventilaties<br>throroughly than RVVR cab **EXECUTE:**<br> **EXEC** This article alms to study<br>
and cases cable combustion status. ZRYJV cables burned more<br>
thoroughly than RVVR cables. While the cable model was<br>
The results indicated that the<br>
ZRYJV, the larger the cable layer, the more c thoroughly than RVVR cables. While the cable model was<br>
ZRYJV, the larger the cable layer, the more complete the longitudinal<br> *A*. Dimensionless fire source heat release rate<br>
Afte 65 s, 100 s, and 785 s, the heat releas



Fraces14-19 Fitting line  $\frac{\text{cases 14}}{2}$  (asses1<sup>2</sup>-19 Fitting line  $\frac{\text{cases 23}}{2}$  (asses1<sup>2</sup>) B itting line  $\frac{\text{cases 24}}{2}$  (asses1<sup>2</sup>) B itting line  $\frac{\text{35}}{2}$  (asses1<sup>2</sup>) B itting line  $\frac{\text{36}}{2}$  (asses1<sup>2</sup>) B i Fig. 9. Formula fitting of heat telease are increased in the effects of metall-scale<br>  $\frac{20}{6}$  asses 11 Pitting line (asses 11 Pitting line) and to consider the effects of metall boundar<br>
Fig. 9. Formula fitting of heat Fig. 9. Formula fitting of heat release 20–25 Fitting line and postess of the effects of the consider the effects of Fr<sup>2/3</sup> work, the influence of Frag. 9. Formula fitting of heat release rate prediction model of cable d **Example 19** and 0.00 0.05 0.10 0.15 0.29 0.25 Pitting line and the effects of me<br>
Fig. 9. Formula fitting of heat release rate prediction model of cable<br>
Fig. 9. Formula fitting of heat release rate prediction model of c  $\frac{1}{2}$  of the control of the solution of the solution of the solution of the solution of  $\frac{1}{2}$ . Firem and time in the more dimensionless power and attenuation law of cable tunnel fire under natural ventilation<br>
The fitting equations in cases 1~3, cases 4~11, and cases 14~19 Fig. 9. Formula fitting of heat release rate prediction model of cable ditenuation law of cable tunnel fire under natural ventilation<br>
intensional heat release rate increases with the<br>
increase of Fr. There is difference line. Subility is that there may be measurement errors in the<br>
section of ecording actual fires in the experiment. The<br>
ting equations in cases 1~3, cases 4~11, and cases 14~19<br>
the experiment of methanic over horize<br>
the shown

$$
15.6 \times [\dot{Q}_{peak}^*]^{2/5} = 10.22 + 9.71 \cdot Fr^{2/3}
$$
 (4) [5] Z. Tang, K.

$$
15.6 \times [\dot{Q}_{peak}^*]^{2/5} = 6.72 + 25.92 \cdot Fr^{2/3}
$$
 (5) no. 6, pp. 20

$$
15.6 \times [\dot{Q}_{peak}^*]^{2/5} = 4.91 + 40.60 \cdot Fr^{2/3}
$$
 (6) thermal and  
urban traffic

$$
15.6 \times [\dot{Q}_{peak}^*]^{2/5} = 4.66 + 34.88 \cdot Fr^{2/3}
$$
 (7) Technology,  
15.6 × [ $\dot{Q}_{peak}^*$ ] (7) (7) C. Liu, M.

**and Solution School Mathematics**<br>data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also v **and State of Applied Mathematics**<br>data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also **and Subset of Applied Mathematics**<br>data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also **and Solution Mathematics**<br>**Example 3** data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It a IV. CONCLUSIONS

**Solution Solution Solution Conton Set is a study of Cable**<br>then analyses on the dimensionless fire source HRR of cable<br>nels. It can be concluded that there is a functional<br>ationship between the dimensionless fire source H **and of Applied Mathematics**<br>
data analyses on the dimensionless fire source HRR of cable<br>
tunnels. It can be concluded that there is a functional<br>
relationship between the dimensionless fire source HRR and<br>
Fr. It also ve The results indicated that there is a functional<br>data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR an data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also verified the previous theoretical E data analyses on the dimensionless fire source HRR of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also verified the previous theoretical E data analyses on the dimensionless tire source HKK of cable<br>tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also verified the previous theoretical E tunnels. It can be concluded that there is a functional<br>relationship between the dimensionless fire source HRR and<br>Fr. It also verified the previous theoretical Equation (1).<br>IV. CONCLUSIONS<br>This article aims to study the relationship between the dimensionless fire source HKK<br>Fr. It also verified the previous theoretical Equation (1).<br>IV. CONCLUSIONS<br>This article aims to study the fire characteristics of ca<br>tunnels under natural ventilation It also verified the previous theoretical Equation (1).<br>
IV. CONCLUSIONS<br>
This article aims to study the fire characteristics of cable<br>
nnels under natural ventilation cases through experiments.<br>
e results indicated that t IV. CONCLUSIONS<br>This article aims to study the fire characteristics of cable<br>tunnels under natural ventilation cases through experiments.<br>The results indicated that the theoretical equation applied to<br>the longitudinal temp IV. CONCLUSIONS<br>This article aims to study the fire characteristics of cable<br>tunnels under natural ventilation cases through experiments.<br>The results indicated that the theoretical equation applied to<br>the longitudinal temp IV. CONCLUSIONS<br>This article aims to study the fire characteristics of cable<br>tunnels under natural ventilation cases through experiments.<br>The results indicated that the theoretical equation applied to<br>the longitudinal temp This article aims to study the fire characteristics of cable<br>tunnels under natural ventilation cases through experiments.<br>The results indicated that the theoretical equation applied to<br>the longitudinal temperature attenuat nels under natural ventilation cases through experiments.<br>
e results indicated that the theoretical equation applied to<br>
bout construct the non-dimension of cable tunnels. At<br>
e same time, a prediction model was proposed f The results indicated that the theoretical equation applied to<br>the longitudinal temperature attenuation of cable tunnels. At<br>the same time, a prediction model was proposed for the<br>maximum temperature rise below the ceiling

the longitudinal temperature attenuation of cable tunnels. At<br>the same time, a prediction model was proposed for the<br>maximum temperature rise below the ceiling of near-wall<br>fire cable tunnels with natural ventilation. The the same time, a prediction model was proposed for the maximum temperature rise below the ceiling of near-wall<br>fire cable tunnels with natural ventilation. The main<br>conclusions are as follows:<br>(1) Various factors such as c maximum temperature rise below the ceiling of near-wall<br>fire cable tunnels with natural ventilation. The main<br>conclusions are as follows:<br>(1) Various factors such as cable type, cable layout, and<br>cable quantity have a sign fire cable tunnels with natural ventilation.<br>
conclusions are as follows:<br>
(1) Various factors such as cable type, cable 1<br>
cable quantity have a significant impacts on the c<br>
characteristics of cables in cable tunnels. Th nclusions are as follows:<br>(1) Various factors such as cable type, cable layout, and<br>ble quantity have a significant impacts on the combustion<br>aracteristics of cables in cable tunnels. This affects the<br>ality loss and combus (1) Various factors such as cable type, cable layout, and<br>cable quantity have a significant impacts on the combustion<br>characteristics of cables in cable tunnels. This affects the<br>quality loss and combustion time of the ca

cable quantity have a significant impacts on the combustion<br>characteristics of cables in cable tunnels. This affects the<br>quality loss and combustion time of the cables. It further<br>impacts the quality loss rate of cables in characteristics of cables in cable tunnels. This affects the<br>quality loss and combustion time of the cables. It further<br>impacts the quality loss rate of cables in cable tunnel fires.<br>(2) The non-dimensional longitudinal te quality loss and combustion time of the cables. It further impacts the quality loss rate of cables in cable tunnel fires.<br>
(2) The non-dimensional longitudinal temperature attenuation was influenced by the fuel consumption impacts the quality loss rate of cables in cable tunnel fires.<br>
(2) The non-dimensional longitudinal temperature<br>
attenuation was influenced by the fuel consumption of the<br>
oil pool and cable tunnel, the type and quantity (2) The non-dimensional longitudinal temperature<br>attenuation was influenced by the fuel consumption of the<br>oil pool and cable tunnel, the type and quantity of cables in<br>each layer. This article established a longitudinal<br> attenuation was influenced by the fuel consumption of the<br>oil pool and cable tunnel, the type and quantity of cables in<br>each layer. This article established a longitudinal<br>dimensionless temperature decay model under natura oil pool and cable tunnel, the type and quantity of cables in<br>each layer. This article established a longitudinal<br>dimensionless temperature decay model under natural<br>ventilation conditions.<br>(3) To study the effects of HRR each layer. This article established a longitudinal<br>dimensionless temperature decay model under natural<br>ventilation conditions.<br>(3) To study the effects of HRR and natural ventilation on<br>cable tunnel fires, a predictive mo dimensionless temperature decay model under natural<br>ventilation conditions.<br>(3) To study the effects of HRR and natural ventilation on<br>cable tunnel fires, a predictive model for the maximum<br>temperature rise below the ceili ventilation conditions.<br>
(3) To study the effects of HRR and natural ventilation on<br>
cable tunnel fires, a predictive model for the maximum<br>
temperature rise below the ceiling was proposed. Moreover,<br>
this article establis (3) To study the effects of HRR and natural ventilation on cable tunnel fires, a predictive model for the maximum temperature rise below the ceiling was proposed. Moreover, this article established a relationship between cable tunnel fires, a predictive model for the maximum<br>temperature rise below the ceiling was proposed. Moreover,<br>this article established a relationship between fire source<br>HRR and Fr, which was verified through experimen Example 19 and 10 and the vertical position of fire sources in cable tunnels. In future work, the influence of mechanical ventilation on the dimensionless pow rever, some initial boundary conditions in this article did<br>consider the effects of mechanical ventilation and the<br>cal position of fire sources in cable tunnels. In future<br>k, the influence of mechanical ventilation on the<br> consider the effects of mechanical ventilation and the<br>cal position of fire sources in cable tunnels. In future<br>c, the influence of mechanical ventilation on the<br>ensionless power and temperature longitudinal<br>uation law of vertical position of fire sources in cable tunnels. In future<br>work, the influence of mechanical ventilation on the<br>dimensionless power and temperature longitudinal<br>attenuation law of cable tunnel fires should be considered early position of the solution of mechanical ventilation on the ensionless power and temperature longitudinal unation law of cable tunnel fires should be considered.<br> **Figure 1.0** REFERENCES<br>
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