



LIMITED LIABILITY  
COMPANY «ENGINEERING  
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## Working project

«Current repair of anti-radiation shelter № 52108 (group P-4) Ingul Lyceum of Ingul village council, at the address: st. Sadova, 49, Ingulka village, Bashtanka district, Mykolaiv region»

Communication and signaling systems structured cable networks

173-WP-2024-F-SCN

Chief Project Engineer

Qualification Certificate for Engineering and Construction Design  
AS № 019809. Ministry of Regional Development, Construction,  
Housing and Communal Services of Ukraine. Attestation  
Architectural and Construction Commission.

Shelikhova. V.

2024

Agreed

LIST OF DRAWINGS OF THE MAIN SET

Sheet	Name	Note
1	2	3
1	General data	
2	The outline of the structures of the cable measure and the GSM signal	
3	Diagram of SCM and GSM signal	on two sheets
4	Cable magazine	

LIST OF REFERENCED DOCUMENTS AND ATTACHED DOCUMENTS

Denomination	Name	Note
	<u>Referenced documents</u>	
NPAOP 40.1-1.32-01	Rules for the arrangement of electrical installations. Electrical equipment of special installations.	
PUE-2017	Rules for the arrangement of electrical installations	
DBN V.2.5-23:2010	Design of electrical equipment of civil facilities appointment	
ISO/IEC 11801 Second edition 2002-09	Interernational Standard for Universal SCS	
ANSI/TIA/EIA 606A	Administration Standart for telecommunications Infrastructure	
	<u>Documents to be attached</u>	
173-RP-2024-F-SCN.S	Specification of equipment according to working drawings	on two sheets

The technical solutions adopted in the project meet the requirements of environmental, sanitary and hygienic, fire and other standards in force on the territory of Ukraine and ensure safe for life and human health, operation of the facility in compliance with the measures provided for in the working drawings.

Chief engineer of the project Shelikhova V.



General data






**Structured cabling system:**  
The designed structured cabling network meets the requirements of international ISO/IEC standards 11801 Second edition 2002-09, ISO/IEC 18010 (05-2002).  
The principle of SCM construction based on the shielded cat 5e cable system has been implemented. Main functions SCM operates an A1 router with 16 ports of MikroTik CCR2004-16G-2S+ type and Wi-Fi access points 1/1-1/3 type Ubiquiti Unifi UAP-AC-PRO. Cables from the router to Wi-Fi access points are routed in flexible halogen-free self-extinguishing PP pipes with a low smoke level on the walls of the shelter premises on the distances not closer than 600 mm to power supply cables.

**GSM signal amplification system:**  
This system is built on the basis of a multi-channel repeater-amplifier of standards GSM/UMTS/LTE (2G GSM 900/1800 MHz, 3G UM 2100 MHz, 4G LTE 1800 MHz).  
OserJep 16dBi circular polarization wideband antenna was chosen as the receiving antenna, which it is installed outdoors in the area of the most confident signal, without directing towards the base station. The signal from such an antenna is transmitted by cable to a repeater installed inside room 1, and from it transmitted to internal antennas installed indoors where it is necessary to provide cellular communication. The 900/1800/2100 MHz repeater TM Lintratek KW20L-GDW is implemented in a durable metal case and it is equipped with a digital information display that shows the gain level of each of the channels separately. This solution allows you to simplify the installation of equipment, even if you are not a specialist.

Features of the Lintratek KW20L-GDW repeater:

- Device type Repeater, Amplifier, Tri-band repeater;
- Frequency range 900 MHz, 1800 MHz, 2100 MHz;
- Communication standard GSM, LTE, WCDMA;
- Support for operators - Kyivstar, Vodafone, Lifecell, Trimob;
- Adjustment and control of system parameters LCD display with input signal indicator for each frequency range;
- GSM + DCS + WCDMA operating frequency band:
  - 890 ~ 915/1710 ~ 1785/1920 ~ 1980 MHz download;
  - Offloading 935 ~ 960/1805 ~ 1880/2110 ~ 2170 MHz;
- Gain • subscriber station - 65 ± 2 dB • subscriber station - 65 ± 2 dB;
- Ripple in the band ≤4 dB.

As internal transmitting antennas, the model "Fungus" 800-2700 MHz, 3dB was chosen, which are installed on the ceiling of the premises and connected through the A4 signal splitter.

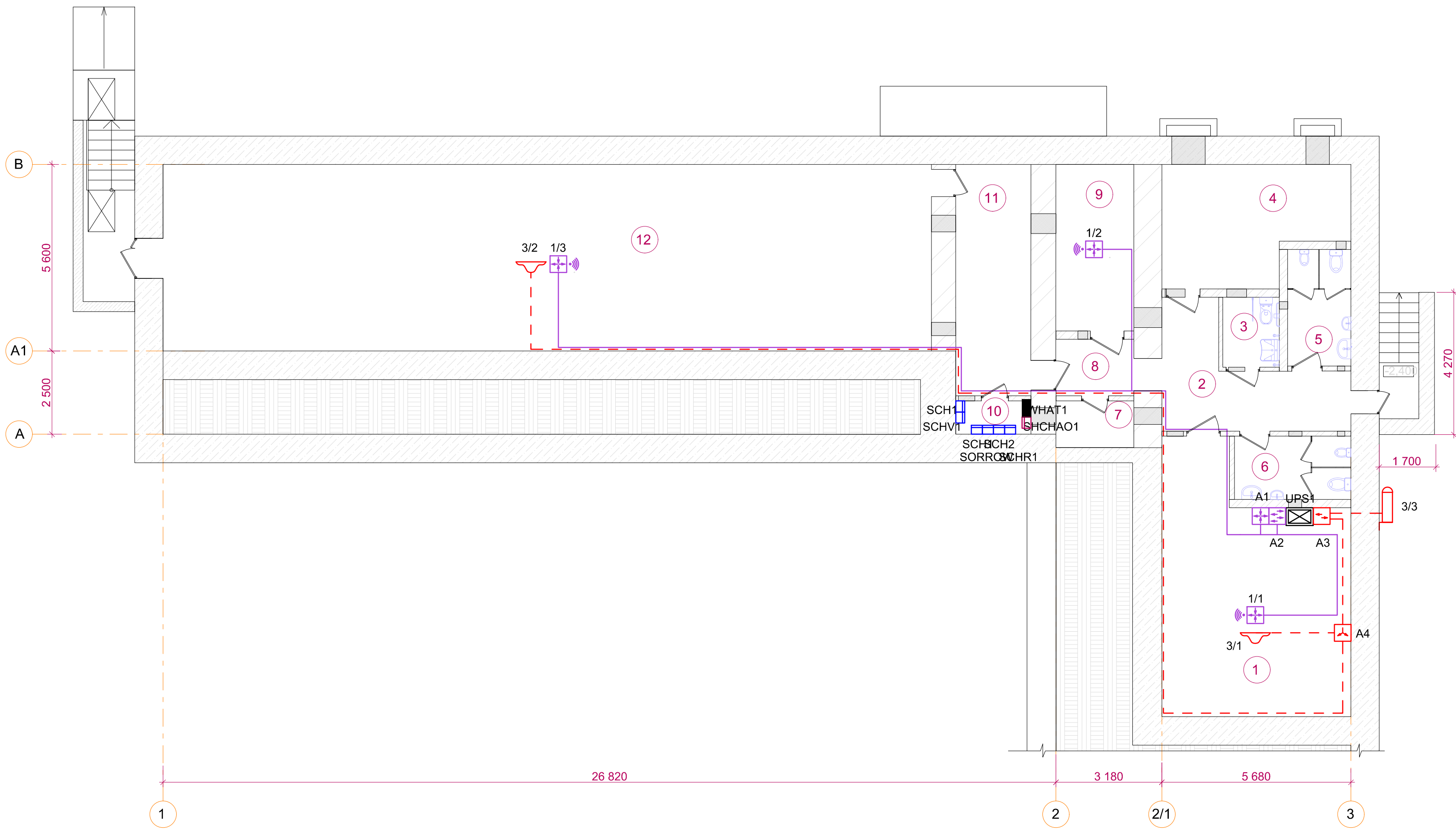
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						«Current repair of anti-radiation shelter № 52108 (group P-4) Ingul Lyceum of Ingul village council, at the address: st. Sadova, 49, Ingulka village, Bashtanka district, Mykolaiv region»			
Sw.	Stake.	Arc.	doc. no	Signature	Date				
CPE		Shelikhova				Communication and signaling systems structured cable networks	Stage	Sheet	Sheets
Developed		Kovaleva					WP	1	4
Checked		Shelikhova							
						General data			
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Subp. and date

Inv. No. Podl.

Deputy. Inv. No.



Explication of premises			
Number of room	Name	Area, m²	Note
1	Premises for persons subject to shelter	39.98	
2	Corridor	14.03	
3	Universal sanitary and hygienic premises, for LMG	3.57	
4	Ventilation	18.15	
5	Women's bathroom	6.65	
6	Men's bathroom	6.65	
7	Water conservation facilities	3.28	
8	Corridor	3.98	
9	Premises for persons subject to shelter	11.70	
10	Switchboard room	2.26	
11	Premises for persons subject to shelter	15.71	
12	Main room	129.25	
Total area		255.21	
Estimated area		#####	

- Legend:
- A1 Router;
  - A2 Controller;
  - Wi-Fi точка доступа;
  - UPS Uninterruptible power supply;
  - A3 GSM пеніреп;
  - A3 Signal splitter;
  - Internal antenna;
  - External antenna;

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Sw. Stake	Arc. doc. no	Signature	Date	Stage	Sheet
CPE	Shelikhova			WP	2
Developed	Kovaleva				
Checked	Shelikhova				
Norm. control Vetrov				Structured Cabling Plan and GSM signal amplification	
				FORTIS	



	Position	Name					Amount	Note		
	A1	16-Port Router, MikroTik CCR2004-16G-2S+					1	piece		
	A2	Ubiquiti Unifi UC-CK Controller					1	piece		
	1/1-1/3	Wi-Fi Access Point Ubiquiti Unifi UAP-AC-PRO					3	piece		
	UPS1	Uninterruptible Power Supply, Phantom UPS-0512					1	piece		
		Rechargeable battery, 12 V, 200 Ah, Ventura GPL 12-200					1	piece		
	A3	Multichannel repeater/amplifier GSM/UMTS/LTE, KW20L-GDW					1	piece		
	A4	Signal splitter, 1/2 ZTE					1	piece		
	3/1, 3/2	Internal antenna type "Fungus" 800-2700 MHz, 3dB					2	piece		
3/3	16 dBi Circular Polarization Receiving Antenna with Bracket, OserJep 16 dBi					1	piece			
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										3.2
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




Inv. No. ob.	Signature & Date	Deputy. Inv. No.

Cable Magazine

Denomination cable wire	Route		Passage through				Cable, wire					
	Beginning	End	pipe			drawer length	on the project			laid		
			Denomination	Diameter by state- dard, mm	Length m		Mark	Quantity number and intersection	Length m	Mark	Quantity number and intersection lived	Length m
1/1-Q1	Router A1	Wi-Fi Access Point 1/1	GR	16	15		F/UTP cat 5E	4x2x0.51	15			
1/2-Q1	Router A1	Wi-Fi Access Point 1/2	GR	16	20		F/UTP cat 5E	4x2x0.51	20			
1/3-Q1	Router A1	Wi-Fi Access Point 1/3	GR	16	35		F/UTP cat 5E	4x2x0.51	35			
1/4-Q1	Router A1	A2 Controller					F/UTP cat 5E	4x2x0.51	5			
A4-K1	GSM repeater A3	A4 signal splitter	GR	16	5		RG-58U		5			
3\1-K1	A4 signal splitter	Internal Antenna 3/1	GR	16	10		RG-58U		10			
3\2-K1	A4 signal splitter	Internal Antenna 3/2	GR	16	35		RG-58U		35			
3/3-K1	GSM repeater A3	External Antenna 3/3	GR	16	20		RG-58U		20			

Legend

GR 16 - corrugated plastic pipe *F* 16 mm;

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CPE		Shelikhova								RP	4	
Developed		Kovaleva										
Checked		Shelikhova				Cable Magazine						
Norm. contro		Vetrov										

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			Position	Name and technical characteristics	Type, brand, designation	Code equipment product material	Manufacturing plant	Units of measurement	Amount	Mass unit kg	Note		
			1	2	3	4	5	6	7	8	9		
				Structured cabling									
			1	Router	CCR2004-16G-2S+		Mikrotik	piece	1				
			2	Controller	Ubiquiti Unifi UC-CK		Ubiquiti	piece	1				
			3	Wi-Fi Access Point	Ubiquiti Unifi UAP-AC-PRO		Ubiquiti	piece	3				
			4	Flexible halogen-free self-extinguishing PP pipe with low smoke	SUPER MONOFLEX HFPP	1216HFPP_L100	KOPOS	m	70				
			5	Holder for fixing pipes to the base material		5316_LB	KOPOS	piece	140				
			6	LAN Cable	FTP cat 5E 4x2x0.51		Odeskabel	m	75				
			7	Ethernet Connector	RJ45		Eserver	piece	8				
			8	Telecommunications cabinet 19", 9U 600x350x507 мм (W*D*H)	UA-MGSWL935G		CMS	piece	1				
			9	Полка для шафи, 4 кріплення (perf)	UA-SHC250G		CMS	piece	1				
			10	Cable organizer 19" 1U	CM-5P		Hypernet	piece	1				
			11	Socket Box 19" For 8 Sockets With Wire 16A 3m	646823		Shuko	piece	1				
			12	Fastening kit screw+nut+washer	PNS		Hypernet	piece	20				
			13	Patch Panel 19" 1U 24 port FTP RJ45 Cat 5E in 3b	WT-2126-CAT.5E		W&T	piece	1				
			14	Uninterruptable power source power 500 Вт	Phantom UPS-0512		Phantom	piece	1				
			15	Rechargeable battery, 12 V, 200 Ah	GPL 12-200		Ventura	piece	1				
			16	Flexible halogen-free self-extinguishing PP pipe with low smoke	SUPER MONOFLEX HFPP	1225HFPP_L100	KOPOS	m	3				
			17	Connecting wire, with copper SPZh, with PVC compound insulation	PV3 <sub>ngd</sub> 1x16		Pivdenkabel	m	6				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122
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