

Report № 2
of technical inspection (piping works).

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Summary

The purpose of this report is to inform and review about the Piping project in Vinnytsia, including readiness of necessary documents for approval of proper piping works provision.

The tasks of provided piping works were as follow: to replace old pipelines on the streets of P. Kommuny, Talalikhina, Kyivska and Griboyedov by new preinsulated pipes; to connect 12 residential buildings and hospital, served by new IHSs modules to the main pipelines from boiler house at P. Kommuny str., 18. Recall that the IHSs at Kyivska street 54, 56, 58, 60, 62, 64 and 66 and on Griboyedov str, 3 (DHW will be supplied via rehabilitated CHS on Griboyedov str, 3) will only provide heat supply (as the buildings are equipped by the separate water heaters in the apartments) and at Kievksa street 50 and 52 and at Talalihina street 3 and 5 the IHS will provide both DHW and heat supply.

For DHW the modern polyethylene preinsulated pipes are used. The fiber optics are laid together with the new pipelines to each IHS module for provision of their dispatching.

The scheme of the new and reconstructed pipelines is given in the Annex 1.

The Utility provided all works for design, ground works and installation by its own staff and techniques, but also using subcontractors. Only the stage of streets restoration was performed with the financial support of City Council. These works were done partly by Vinnytsia regional department of the State Agency of motor roads of Ukraine and partly by Private businessman Khaloian.

The Corporation Energoresurs-Invest was providing the support under their contractual obligations:

- design training;
- pipe installation training;
- revision of design documents;
- supervision for the installation works.

As the result of trainings 10 employees of Utility were trained for the design and installation of preinsulated pipes under the progressive technology and have got appropriate certificates.

All works for design, ground works and installation were performed successfully, as well as the supply of all required materials. The ultrasonic tests of welding quality were performed for 100% of joints and the commissioning of pipelines was done properly. Necessary approvals for the beginning of piping works as well as for its finalization are prepared.

As for the opinion of PMC, all the necessary works were provided in time and according to Ukrainian legislative requirements, in compliance with appropriate norms of safety, all required instructions were done. The informing of population about the main characteristics of this project was performed. The appropriate technical and safety supervision was provided by Utility at all stages of piping works.

There were not any problems with new pipelines during their exploiting for now.

Some notes of PMC are given for possible design optimization in future similar projects, namely recommendation to avoid any U-bends and to use pre-heating in line with the proposed progressive technology that will enable to cut the costs of piping. Also there is no evidence of State Expertise provision for the cost estimate of design project, which is the obligatory for the projects that are fully or partly financed by the state funds.

Other notes are concerning the quality of installation works (performed by Utility) and technical supervision from the side of Energoresurs-Invest, where there seem to potential for improvements. For example, hard material as stones should be removed and more generous filling with sand around the pipes (see page 16). Also it was remarked to the Utility that on some occasions the pipes were stored directly on the ground without any in-between protection that cannot be acceptable for this kind of pipes. Some pipe joints could have been better performed to minimize the risk for moisture to enter (see page 15). The Utility was recommended to consider these notes as room for future improvements.

Also it should be noted, that quite weak evidences of inspections provision by Energoresurs-Invest during the piping works, as part of their contractual obligations were submitted.

In spite of above-mentioned remarks, the works is deemed to be acceptable and final.

The Special Inspection Scheme for Piping, as well as the list of the approval documents is shown in the Annex 4.

The main stages of piping works performance are described below in details.

1. Design training

Provision of design training for technical specialists of Utility is one of the contractual obligations of the pre-insulated pipes supplier, who is the company “ENERGORESURS-INVEST” LLC.

Provision of preinsulated pipelines design and installation trainings for technical specialists of Utility is one of the contractual obligations of the pre-insulated pipes supplier “Energoresurs-Invest” LLC.

In the scope of this task, the design training and installation training were performed by Energoresurs-Invest”, where 10 persons of Utility have participated. Their certificates of trainings are in the process of registration.

As the approval, the following documents were submitted to PMC:

- ✓ Plan of design and installation trainings, where are the topics, time and date of trainings;
- ✓ Approval Protocol of design and installation trainings, signed by the audience (10 employees of Utility) and teachers (5 persons of Energoresurs-Invest).

As for this document, the nine trainings were held for two days (August, 12-13, 2014).

The first day (August, 12) was devoted for Design Trainings, which topics were the following:

- requirements for transportation, unloading and storage of pre-insulated pipes;
- requirements for preparing of tranches and sandy bed;
- the basics of pipelines installation with pre-heating, calculation of heating regimes;
- preparation works, sequence of ground works;
- welding of pipelines: requirements and methods;
- requirements for installation of control and monitoring system for leakages at the joints of pipelines;
- requirements and sequence of works for thermal and hydraulic insulation of joints;
- hydraulic insulation by use of shrink sleeves, preparing of polyurethane foam for insulation of joints;
- preparing of Acts for hidden works and executive documentation.

The PMC judges the training performed as adequate though not participating.

2. Design

The design documents were prepared by the technical staff of the Utility and approved in the prescribed manner.

As the approval, the following documents were submitted to PMC:

- ✓ The 29 drawings of pipelines;
- ✓ The short Explanatory note for project;

As for the opinion of PMC, the design projects are prepared at the sufficient extent to provide the quality realization of the designated tasks. Possibly the design could have been further optimized, for example not using any U-bends, but at the same time the utility prefers to stay close to previous routing.

It should be noted, that there are no evidence of State Expertise provision for the cost estimate of design project.

3. Optimisation and revision of Design

As the approval, the following documents were submitted to PMC:

- ✓ The letter of Energoresurs-Invest N 1565 from August, 26, 2014 about revision of design project and hydraulic calculations.

Energoresurs-Invest confirms by this letter that they have performed revision of technical design project of “Reconstruction of heat supply system for the microdistrict of streets Kyivska-Talalikhina from the boiler house on P.Kommuny Street, 18 in city Vinnytsia”, as well as the verification of hydraulic calculations for reconstruction of heat supply pipelines in the project. They confirm by this letter, that the project documents are prepared according to the current norms of Ukraine. There are not any objections for the submitted hydraulic calculations as well.

4. Environmental management plan

The Environmental management plan according to the requirements of DemoUkraina projects was fulfilled by Utility's staff during the piping works.

As the approval, the following documents were submitted to PMC:

- ✓ The completed Environmental management plan for pipelines.

As follows from the document, all works were performed in compliance with appropriate norms of safety, the all required instructions were done, the working staff is quite experienced and properly instructed, including of safety and first aid, was supplied by uniforms, footwear, personal protective equipment. To minimize injuries and accidents the responsible persons were assigned for the safe performance of work. However, improvements could clearly be made in handling of pipes, for example to avoid undesired movement of pipes when still above ground.

The measures on the informing of population about the main characteristics of this project were performed (see Annex 2).

The asbestos insulation materials were not used and not dismantled in the course of the project.

The appropriate technical and safety supervision was provided by the Utility's authorized staff at all stages of the work for piping.

The particular questions of the Environmental management plan are specified in the table below.

Waste management plan for construction	Concrete and other waste construction were transported to the corresponding landfill and left according to appropriate documentation. N/a asbestos containing structures.
Heat loss minimisation	All necessary norms and standards were observed during the design preparation. The pre-insulated pipes with the appropriate heat saving properties were used.
Heat supply disruption	There was not any disruption as the works were finished before the beginning of the heating season.
Dust and Noise	Investigation was performed. Employees were supplied with necessary safety equipment.
Waste: Disposals of solid materials – non hazardous waste materials (metal scrap, concrete etc.)	Metals were removed from the sites and deposited at authorised dealers for recycling. Concrete and other scrap material were removed to approved deposits.
Waste: Hazardous materials (e.g. asbestos)	Asbestos containing structures were not identified.
Demolition of asbestos containing structures	
Prevention of accident due to working in confined spaces when gas welding	Implemented. There were not such an accidents.
Policies and procedures for using products containing or producing isocyanides	Implemented.
Identification and remediation of contaminated soils	Constant monitoring during works process at site with the purpose to avoid pollution of environment was performed. Materials applied do not have hazardous content.
Safety and environmental inspections at construction sites	There was a separate order related to this matter issued by the Utility
Maintenance	Implementation of maintenance program to prevent, detect and fix leakage is in progress
Fuel consumption	The measures to ensure system is adequately optimized and the equipment is properly adjusted are in the progress.
Water consumption in Generation plants	Such measures as the sufficient temperature to prevent detrimental health effect such as legionaries' disease and the maintenance program to prevent, detect and fix leakage are in progress.
Monitoring of environmental impacts after Project completion	Are in progress in accordance with requirements of loan and grant agreements

5. Approvals for installation

All approvals for proceeding of piping works according to Ukrainian procedures were received by Utility before its start.

As the approval, the following documents were submitted to PMC:

- ✓ Four permissions for carrying out of excavation works, issued by the city administration;
- ✓ One order for blocking of traffic on the P.Kommuny street for the purpose of piping works, issued by the city administration.
- ✓ The 17 Acts o division for pipelines sections where the situation of sections are appointed at the place.

6. Pipe installation training

As it was described for item 1, the design training and installation training were performed by Energoresurs-Invest" in August, 12-13, 2014.

The second day was devoted to the Installation Training, concerning the practical mastering of the following:

- installation of control and monitoring system for leakages and defects at the joints of pipelines;
- thermal and hydraulic insulation of joints of pre-insulated pipelines;
- welding of preinsulated pipes;
- pre-heating of preinsulated pipelines;
- control of control and monitoring system for leakages during the installation of pipelines;
- search and localization of fault sections by portable devices for control and monitoring of leakages and defects.

As the approval, the same documents were submitted to PMC, as for the item 1 (design training), because the both trainings were executed by this documents:

- ✓ Plan of Trainings, where are the topics, time and date of trainings;
- ✓ Approval Protocol of trainings, signed by the audience (10 employees of Utility) and teachers (5 persons of Energoresurs-Invest).

As for this documents there were two dedicated trainings for pre-heating pipelines installation (one for theoretical and design, and another one for practical aspects of the technology).

The PMC judges the training performed as adequate though not participating.

7. Acceptance delivered material

As the approval from the contractual parties, the following documents were submitted to PMC:

- ✓ Total Delivery schedule;
- ✓ Nine of Packing lists signed by the both contractual parties.

All materials were delivered by “ENERGORESURS-INVEST” LLC to the Utility according to Supply& Service contract. It was investigated and approved by PMC by the comparison of the contents of the Supply& Service contract (Annex 2) and the content of the abovementioned Packing lists. There were not any deviations from the Specification of Contractor’s Goods Supply of the Supply& Service contract.

It was noted and remarked to the utility that on some occasions the Piping was not stored properly – directly on the ground without any in-between protection.

8. Inspection of pipeline bed

The inspection of pipeline bed is not requested as a special procedure by relevant Ukrainian requirements. This task is performed on the working stage of “Arrangement of sandy bed for piping” and is registered by special approval documents, submitted to PMC:

- ✓ The Acts of Hidden Works - “Arrangement of sandy bed for piping” (17 Acts).

The each Act concerns to one of 17 sections of pipelines were laid in scope of this project.

It was noted that the preparation of pipeline beds was not always made the proper way and there is room for improvements. It is important that the pipe bed is free of foreign and hard material.

9. Pipe laying

The pipe laying was performed by Utility and arranged by approval documents, submitted to PMC:

- ✓ The Acts of Hidden Works - “Assembly works of district heating pipelines” (17 Acts).

The execution of works to a certain extent is recorded at the photo in Annex 3.

10. Pipe joints incl. welding, X-ray etc.

There next approval documents were submitted to PMC for this stage of works:

- ✓ The Acts of Hidden Works - “Mounting of couplings for welded joints” (17 Acts);

- ✓ The Summaries of ultrasonic tests–16 summaries for sections of pipelines.

The summaries of ultrasonic tests contain the drawings where each joint is shown and numerated, as well as the diameters of pipelines. The summaries are approved that all joints are properly welded and don't have any defects. The ultrasonic tests were performed by the certified Metal control laboratory of Utility.

It was remarked by PMC that some pipe joints could have been better performed to minimise the risk for moisture to enter. The utility was recommended to make a follow-up on this and repair if required. There is clearly room for future improvements.

11. Hydraulic test

Usually the hydraulic tests are the mandatory stage of the quality assurance of the new and existing pipelines before its commissioning. But the Ukrainian norms (NPAOP0.00-1.11-98 "Rules of construction and safe operation of pipelines of steam and hot water") enable not to do this test in case of full ultrasonic inspection of 100% welded joints. This requirement was met in this project, so there were not hydraulic tests.

There next approval documents were submitted to PMC for this stage of works:

- ✓ The Summaries of ultrasonic tests– the same as for the previous item.

12. Alarm system test

The cables for remote control and monitoring were tested by the specialists of Utility, and the satisfactory results were obtained.

There next approval documents were submitted to PMC for this stage of works:

- ✓ The Acts of tests dated October, 23, and November, 4, 2014.

The tests were done by experienced staff, using the testing device "ПІКМ-1". The results of tests indicate that the entirety of wires and the quality of soldered joints are satisfied.

13. Pipeline bed OK before refilling

The inspection of pipeline bed before refilling is not requested as a special procedure by relevant Ukrainian requirements. But this stage was under the continuous control of responsible technical staff of Utility during the performance of works that is affirmed by the appropriate photos (see Annex 3) and by signature at the Special Inspection Scheme for Piping (see Annex 4).

However, from the inspections made it is obvious there is room for improvements avoiding hard material as stones and filling with sand around the pipes.

It should be noted, that any evidences of inspections provision by Energoresurs-Invest during the piping works, as part of their contractual obligations were not submitted. It was only the verbal confirmation from Head of Utility's Construction department that some inspections were held, but it is not possible to assess its number an duration.

14. Pre-heating OK

Pre-heating was not performed as the specialists of Utility after analysis of design documents and appropriate calculations were convinced that existing turns and distances provide thermal extension compensation of pipes during their operation.

However, using pre-heating could still be an important solution for future installations and it is a pity that the utility did not use the opportunity to test it. Also, the existing turns might have been possible to avoid, decreasing the total costs.

15. Refilling

The refilling was performed by Utility and arranged by approval documents, submitted to PMC:

- ✓ The Acts of Hidden Works - “Refilling of tranches” (17 Acts).

The Acts confirmed that refilling was properly done according to design project in line with appropriate building codes, norms and technical requirements, using the mortar sand.

16. Restoration of streets etc.

The restoration of streets was performed by the support of Vinnytsia city administration, which was paid for contracting firms, for example, for asphalt works. The approval documents, submitted to PMC, were:

- ✓ The three Acts of works acceptance (two intermediate and one final) for restoration of P.Kommuny Street. The contractor was the Vinnytsia regional department of the State Agency of motor roads of Ukraine.
- ✓ The 11 Acts of works acceptance for restoration of sites near the buildings on kyivska and Talalikhina streets, performed by contractor- Private business owner Khaloian.
- ✓ The results of visual survey provided by PMC, which are shown on the photos (see Annex 3).

17. As built drawings

There was a minor changes. Some of drawings are in the process of adjustment to the results of the piping works. The approval documents, submitted to PMC, were:

- ✓ The executive circuits of pipelines sections (33 drawings).

The executive circuits, according to the Ukrainian building codes, are the part of executive documentation for construction, that is submitted to put it into operation. At the same time, it reflects the real situation and details of the performed construction works.

18. Final inspection

There next approval documents were submitted to PMC for this stage of works:

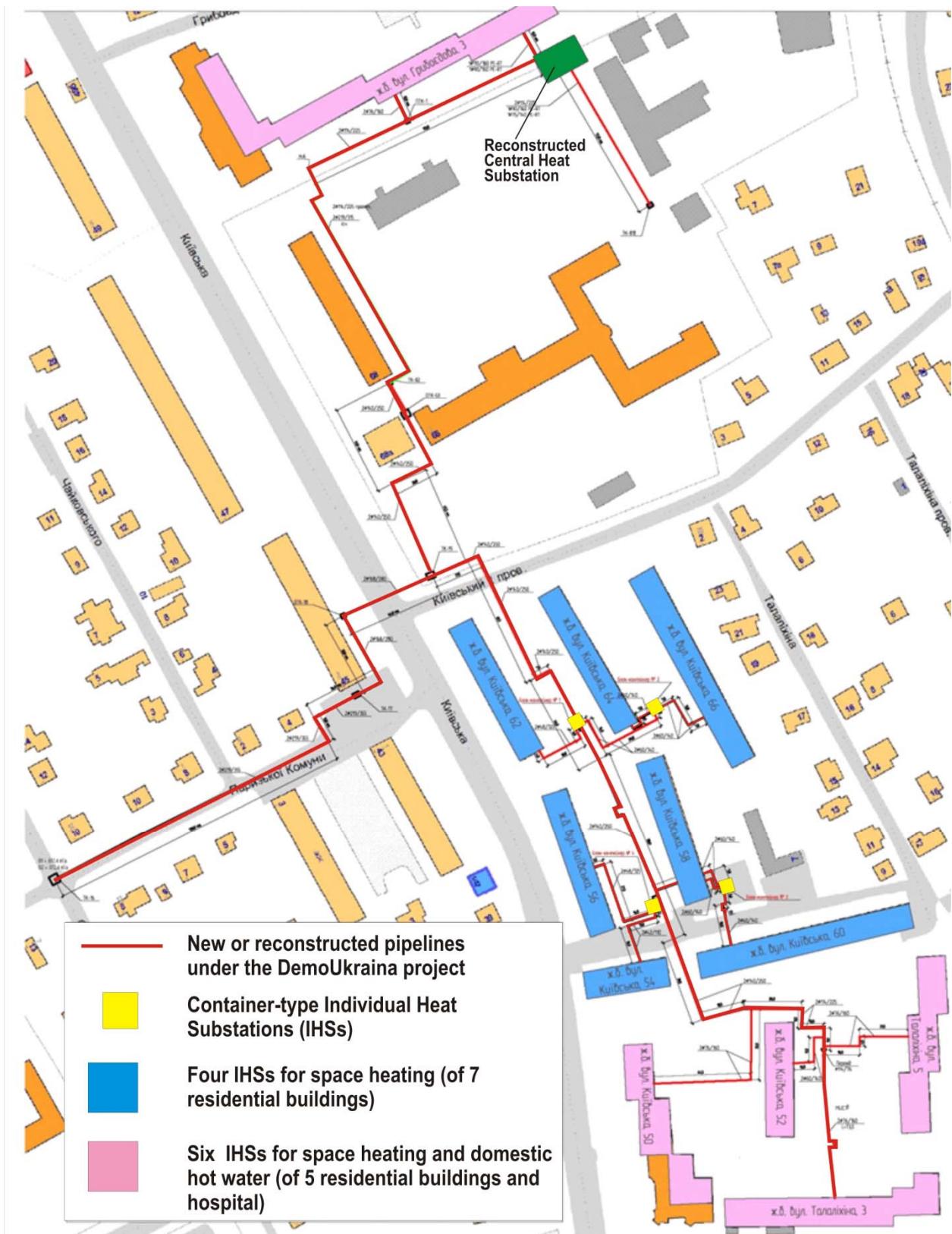
- ✓ “Act of acceptance of the district heating pipelines and equipment after general overhaul”.

This document says that according to the Project of “Reconstruction of heat supply system for the microdistrict of streets Kyivska-Talalikhina from the boiler house on P.Kommuny Street, 18 in city Vinnytsia”, the district heating pipelines were reconstructed with use of preinsulated pipes of diameters from 60/160 to 219/400 mm, with total length of 1.4 km. The disassembling, excavation, construction and installation works were done under this project. The works are deemed final and done according to the design project. The quality is assessed as “good”. The object is put into operation.

The operating state of the system is confirmed by its trouble-free work for more than 50 days of the heating season, which is the case today.

The Special Inspection Scheme for Piping including the main points for the abovementioned items 1-18, as well as the list of the approval documents are shown in the Annex 4.

Scheme of new and updated pipelines under the reconstruction of the DH system at the district of Kyivska and Talalikhina streets, served by boiler house on P.Kommuny Str., 18, city Vinnytsia



Informing of population about the project



Annex 3.

Execution of pipelines works

Laying of pipelines (Sept., 15-18)



The trenches



Preinsulated pipes

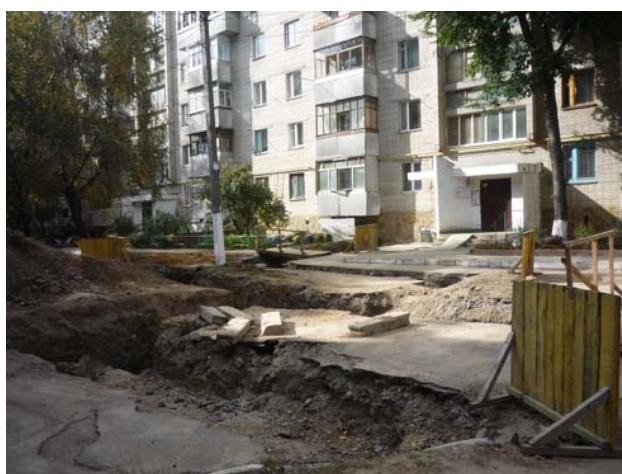


Refilling of trenches



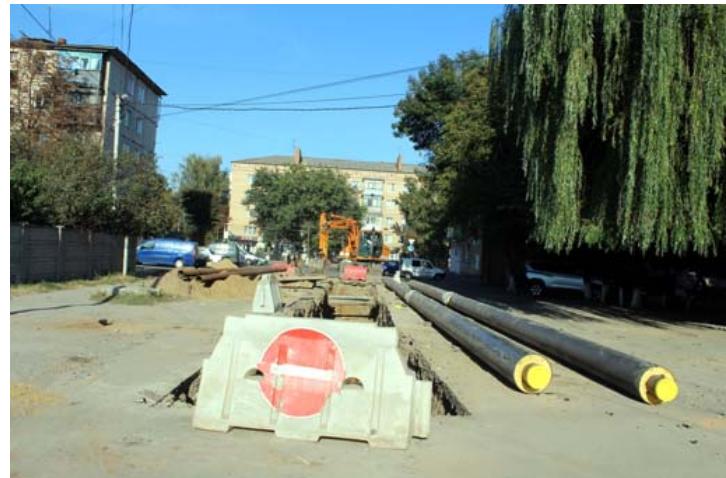
Insulation of welded joints

Laying of pipelines at the microdistrict of Talalikhina Str. (Sept., 30-Oct.01).





Restoration of streets



The street under the pipe laying works



The same street after restoration (November, 11, 2014)

Annex 4.**Special Inspection Scheme for Piping**

Project name Назва проекту	DemoUkrainaDH – Vinnytsia DemoUkrainaDH – Вінниця								
Sub-project Підпроект	DH Pipelines Трубопроводи централізованого опалення								
Milestones for inspection and supervision at site (for objectives and responsibilities please refer to Inspection Programme) Ключові питання по інспекції та нагляду по виконанню робіт щодо завдань (щодо завдань та відповідальності див. Програму Інспектування)									
№		Stage Етап	Ref	Planned date Планован а дата початку	Completion date Дата завершення	Confirmation of completion Підтвердження виконання		Comment Коментарі	
						Purchaser Замовник	Contractor Виконавець	PMC Консультант проекту	
1	Design training Тренінг з проектування	D1	28.07.2014	26.08.2014	“VMTE” Public Utility O. Rozborskyi	«Energoresurs-Invest» Corporation	Volodymyr Kramar	<u>Approvals:</u> 1) Plan of Trainings, where are the topics, time and date of trainings; 2) Approval Protocol of trainings, signed by the audience (10 employees of Utility) and teachers (5 persons of Energoresurs-Invest).	
2	Design Проектування	D2	2013	2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 3) The 29 drawings of pipelines; 4) The short Explanatory note for project.	
3	Optimisation and revision of Design Коригування проектної документації	D3	28.07.2014	26.08.2014	“VMTE” Public Utility O. Rozborskyi	«Energoresurs-Invest» Corporation	Volodymyr Kramar	<u>Approvals:</u> 5) The letter of Energoresurs-Invest N 1565 from August, 26, 2014 about revision of design project and hydraulic calculations	
4	Environmental management plan План з екології	D5	2013	2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 6) The completed Environmental management plan for pipelines	
5	Approvals for installation Необхідні дозволи на проведення робіт	I2	29.08.2014	21.11.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 7) Four permissions for carrying out of excavation works, issued by the city administration; 8) One order for blocking of traffic on the P.Kommuny street for the purpose of piping works, issued by the city administration. 9) The 17 Acts o division for pipelines sections	

								where the situation of sections are appointed at the place.
6	Pipe installation training Тренінг по укладенню трубопроводів	I5	12.08.2014	13.08.2014	“VMTE” Public Utility O. Rozborskyi	«Energoresurs-Invest» Corporation	Volodymyr Kramar	<u>Approvals:</u> The same as for item 1.
7	Acceptance delivered material Приймання доставлених матеріалів	I6	1.09.2014	10.10.2014	“VMTE” Public Utility O. Rozborskyi	«Energoresurs-Invest» Corporation	Volodymyr Kramar	<u>Approvals:</u> 10) Total Delivery schedule; 11) Nine of Packing lists signed by the both contractual parties.
8	Inspection of pipeline bed Перевірка місця (підложки) укладання труб	I8	01.09.2014	20.10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 12) The Acts of Hidden Works - “Arrangement of sandy bed for piping” (17 Acts)
9	Pipe laying Укладання труб	I11	01.09.2014	20.10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 13) The Acts of Hidden Works - “Assembly works of district heating pipelines” (17 Acts)
10	Pipe joints incl. welding, X-ray etc. З'єднання труб включаючи зварювання, дефектоскопію, тощо	I11	01.09.2014	20.10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 14) The Acts of Hidden Works - “Mounting of couplings for welded joints” (17 Acts); 15) The Summaries of ultrasonic tests – 16 summaries for sections of pipelines.
11	Hydrostatic test Гідролічні випробування	I14			“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	Was not used
12	Alarm system test Випробування системи оповіщення (витоків)	I15	01.09.2014	03.11.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 16) The Acts of tests dated October, 23, and November, 4, 2014.
13	Pipeline bed OK before refilling Підтвердження задовільного стану підложки перед засипкою	I17			“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	There are no special documents.
14	Pre-heating OK Підтвердження проведення попереднього нагрівання	I18				–	Volodymyr Kramar	Was not used
15	Refilling Засипка траншей	I19	04.09.2014	20.10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar	<u>Approvals:</u> 17) The Acts of Hidden Works - “Refilling of tranches” (17 Acts).
16	Restoration of streets etc. Відновлення вулиць, доріг, тощо	I20	09.2014	10.2014	“VMTE” Public Utility O. Rozborskyi	<u>Vinnytsia regional department of the State</u>	Volodymyr Kramar	<u>Approvals:</u> 18) The three Acts of works acceptance (two intermediate and one final) for restoration of P.Kommuny Street. The contractor was the

					<u>Agency of motor roads of Ukraine; Private business owner Khaloian</u>		Vinnytsia regional department of the State Agency of motor roads of Ukraine. 19) The 11 Acts of works acceptance for restoration of sites near the buildings on Kyivska and Talalikhina streets, performed by contractor- Private business owner Khaloian.
17	As built drawings Остаточні версії креслень	I21	09.2014	10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar <u>Approvals:</u> 20) The executive circuits of pipelines sections (33 drawings).
18	Final inspection Остаточна перевірка виконаних робіт	I22	20.10.2014	20.10.2014	“VMTE” Public Utility O. Rozborskyi	–	Volodymyr Kramar <u>Approvals:</u> 21) Act of acceptance of the district heating pipelines and equipment after general overhaul.