

Procurement Assessment of High-Density Polyethylene Pipe in Department of Water Supply and Sewerage, Nepal

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ABSTRACT

High-density polyethylene pipe is a major part in procurement of Water Supply Projects in Nepal. Overall objective of this research was to analyze the procurement management analysis within Department of Water Supply and Sewerage (DWSS). The study was based on online questionnaire survey among senior employees of DWSS. The management duty assignment in contractual process seems significant for quality assurance. In DWSS, sometimes all the procurement process was made by regional offices and sent for payment to district offices. All procurement process should be made from district offices to make more responsible. Test certificates as per NS 40 should be mandatory in the frequency set by Nepal Bureau of Standards and Metrology. Office Chief and Engineer should be assigned for quality assurance. Length and weight both should be considered in procurement process. Regional laboratory for high-density polyethylene pipe testing should be established by DWSS. Transportation cost of high-density polyethylene pipe should be based on analysis of transportation from truck up to the nearest road head. High-density polyethylene pipe fittings should be purchased based on the detailed drawing of pipeline network and actual need basis.

Keywords: Transportation cost, bidding document, responsibility, quality

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BACKGROUND

The Department of Water Supply and Sewerage (DWSS) is leading organization in water supply sector. It has been facilitating to implement 1303 number (Devkota, 2013) [1] of piped water supply projects in Nepal. In FY 2069/70 about 100% of DWSS's projects use HDPE pipes. Total budget in FY 2069/70 for these projects was NRs. 2.40 billion and total expenditure was 2.30 billion. Since, its establishment in 1972 AD, DWSS has been purchasing large amount of HDPE pipe. In FY 2069/70 the length of pipe purchased by DWSS was about 2805 km. It was quite surprising that DWSS in a history had hardly conducted any pipe test and had been using HDPE pipes without any conformity to quality by itself. In FY

2068/69, DWSS wished to test pipe quality and thus sent an official instruction to its district offices to get conformity before accepting the purchased pipes [2].

There are around twenty-four HDPE manufactures in Nepal that has been producing HDPE pipe for Water Supply Projects. The quality conformity on HDPE is governed by NS 40 and there is a provision that it should be monitored by Gunastar Tatha Naptaoul Bibhag (*Nepal Bureau of Standards & Metrology-NBSM*). The DWSS does not have its lab facility for HDPE pipe testing rather. It intended to use facility of NBSM, later DWSS realized that the NBSM's capacity was not that much developed to meet the huge need of DWSS. The DWSS found that

NBSM may take one and half year to test all the sampling of pipes it purchased. Then DWSS decided to use the manufacturers' lab facilities itself under the strict supervision of the representatives of DWSS.

Rational of the Research

Since long period, supplied HDPE pipe quality was not tested by purchaser and it was conformed to quality. In general, lab reports and other justifications were not demanded prior to FY 2069/70. Service life of HDPE pipe is 50 to 100 years by designers in Nepalese context. A detailed quality assessment has been done in case of Nepal by Mishra &Yadav (2018) and recommended the need of further procurement assessment during supply. So, DWSS, the largest purchaser in Nepal has no system established for quality control and routine quality check. Further, procurement management for HDPE pipe is not effective with respect to quality assurance [6].

OVERALL OBJECTIVE

Overall objective of this research was to assess the procurement management for HDPE pipe for effective Quality Assurance in DWSS including fittings.

LITERATURE REVIEW

HDPE Pipe Manufacturers in Nepal

For the study of this study, researcher obtained data from registration book of NBSM with the help of officials of NBSM and the registered manufacturers found in NBSM record are as follows (Table 1).

Tabulated list obtained from NBSM (Table 1); it is seen that most of the factories for manufacture of HDPE pipe were established in central region. Far western region did not have any HDPE factory till the survey time. From Table 1, all factories are established at near Kathmandu or accessible easily by road network.

METHODOLOGY

The Research Work was based on online questionnaire survey among senior employees of DWSS. Online method of survey is very simple platform provided different online websites. In this questionnaire was prepared on as form and the form was shared to targeted group for responses by electronically. After receiving the link targeted people opened the page and submitted it back to me electronically.

For this study all district office Engineers and Senior Engineers who may be potentially involved in quality insuring and procurement managements of HDPE pipes purchased were targets.

For contract management questionnaire 24 either Engineers or post higher than Engineer are selected randomly available electronically for survey, which will represent all the seventy-five districts. Engineers and higher post personality are involved procurement process generally. All districts of Nepal have water supply and sanitation offices having office chief either Engineer or higher post than Engineer. So, 24 number of samples was chosen to reflect the whole DWSS.

For management questionnaire, an online form containing fourteen questions excluding basic information prepared on Google. Online Google form is a Google free platform where a survey can be conducted for free. For this type of data collection an email address is required. Google provides several products including Google form. Goggle form can be prepared online either individually or collaboratively. A response destination file was assigned to collect the responses.

There are such a lot of ways that to make on-line forms, it is often overwhelming to select the proper one for our wants.

Table 1. Nepal standard (NS) quality awarded HDPE pipe manufacturers in Nepal till Asar 2070 BS.

S.N.	Name of Industries	Address
1	Bishal Plastocab Industries (P) Ltd.	Thankot
2	Chitwan Polypipe	Bharatpur
3	Crystal Products (P) Ltd.	Hetauda Industrial District
4	Dakshinkali Plastic Industries (P) Ltd.	Bhadrapur
5	Daran Plastics	Khanar
6	GodawariPlastocraft Industries (P) Ltd.	Hetauda Industrial District
7	Hisi Polythene and Plastics	Balaju Industrial District
8	Inter Tech Pipes and Fittings	Butwal Industrial District
9	Kamala Polythene and Plastics Ind. (P) Ltd.	Mujelia, Janakpur
10	Kishan Pipe Products (P) Ltd.	Makar
11	Laxmi Plastics (P) Ltd.	Nepalgunj Industrial Zone
12	Manmaiju Industries (P) Ltd.	Pipaltar
13	Narayani Pipe Industries	Bharatpur
14	Narayani Plastic Udhyog (P) Ltd.	Kalaiya
15	Narayani Micro pipe Udhyog (P) Ltd.	Kalaiya
16	Nawa Nepal Plastic (P) Ltd.	Madhbalia
17	Nepal Black Gold and Allied Ind. (P) Ltd.	Butwal Industrial District
18	Nepal Plastic (P) Ltd.	Dharan Industrial Zone
19	Nepal Polypipe (P) Ltd.	Balaju Industrial District
20	Panchkanya Plastics Industries (P) Ltd.	Kotihawa
21	Sakura Pipe Udhyog (P) Ltd.	Butwal
22	Shyam Polymers (P) Ltd.	Padsari, Nawalparasi
23	Tondon Plastics Industries (P) Ltd.	Nepalgunj Industrial Zone
24	Yeti Pipe Industries (P) Ltd.	Nasikasthan, Kavrepalanchok

Source: Nepal Bureau of Standards & Metrology, 2013

Arguably the foremost powerful is one you have already got access to free it is a part of Google Drive. Drive is AN integral a part of each Google account, and is best referred to as a cloud storage service and for its Docs workplace suite. One amongst its lesser-known options is Forms, a survey-building tool that is as easy or as complicated as we want it to be. Whether or not grouping email addresses, running snap polls on our web site, or are building AN in-depth client service survey, Forms is the ideal tool to use (Betts, 2014) [5].

After finalizing the form by supervisor, it was shared through email and Facebook to target group. These forms can be shared either through email or through link. Forms can be published on website. In DWSS, Engineer, Senior Divisional Engineers (SDE) and Superintending Engineers (SE) are involved in districts offices and in projects as district chief or project manager.

So, I choose to take either Engineer or posted higher than Engineer and 24 were selected randomly available from all over the Nepal. Twenty-four were selected because there are 75 district offices, and this helped me to represent management from all over the Nepal. After twenty-four responses it was stopped to receive more responses. The collected responses were downloaded as excel file and studied in appropriate format.

Characteristics of Respondent from DWSS

Involvement of Respondent

All the respondents are either Engineer or posted higher post than Engineer and all involved to procurement process of HDPE pipe as well as contract management. Among 24 respondents are from all over the Nepal and has experience of more than one district. So, all respondents can represent total procuring process of HDPE

pipe in Nepal. Only 21% was engineer whereas 79% senior divisional engineer.

Average Experience of Respondent

The respondents were very much experienced within water supply projects. Among them who are posted as senior divisional Engineer seen more experience because they also worked as Engineer in DWSS till their promotion and has average 14.95 years of experience. Likewise, Engineer has less average experience average 10.20. Generally, in office both are involved in procurement process and quality conformance. Collected data and information was presented in different tables and groups.

Management Survey within DWSS Officials

This survey was conducted within DWSS senior Engineers and a sample was taken

from another department. This was all concerned about management related problems of HDPE pipe quality assurance and quality management.

RESULTS AND DISCUSSIONS

Management Analysis

As shown in Figure 1, among 24 respondents 21 are involved in all types of managing work in procurement and contract management as well as quality assurance. Same time three respondents responded that they were involved only in office work and paper management. Who responded that they were involved in bid document preparation was new to this department. So, it seems that all the respondents who had more tenure they were involved all procurement and quality conformance process of HDPE pipe procurement.

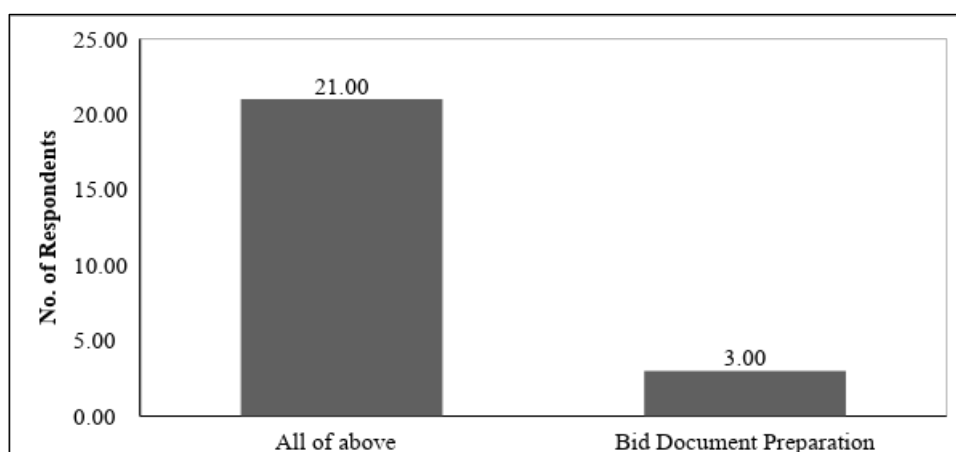


Fig. 1. Type of involvement.

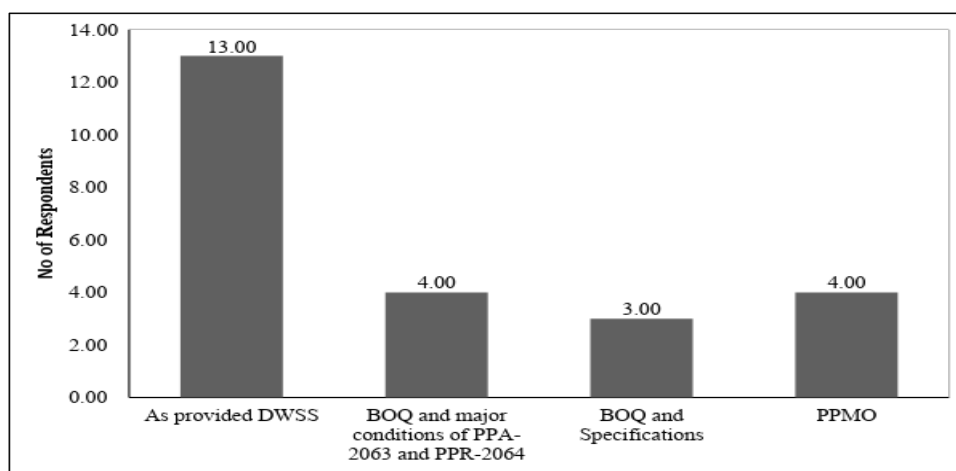


Fig. 2: Standard bidding document.

Standard Bidding Document

In earlier stage the standard document for procurement were very much ignored. Although it was provided no Standard Bidding Document (SBD) option in the survey questionnaire but no one has pointed that no document was provided. Survey shows in Figure 2 that 13 out of 24 respondents have used SBD that provided by DWSS but DWSS provided sample SBD and specification. General practice was to provide Bill of Quantity (BOQ) and specification.

Any procurement process purchase must include standard bidding document along with other legal documents like tender notice, General Conditions, Special conditions, instructions to bidder, Eligibility criteria. All these documents are included at the time of bid document sell and in agreement document which is legal. Avoiding these documents is not allowed legally as per Public Procurement Act, 2063 and Public Procurement Regulation, 2064. But from the survey 3 respondents who accepted that they do not use any document except BOQ and Specification are legally void. At the time of legal procedure when any conflicts raised it will not be justified.

Appropriate Agency for Purchase

General practice till yet for the HDPE pipe procurement in DWSS was to arrange a meeting with all the manufacturers and make discussion for new rate per kg in the coming fiscal year and finalizing the rate among them. And then the rate was provided to all district offices for new purchase. The grouping of tender was prepared region wise and regional offices publishes notice for all districts of respective region. After then bid document was sold either from regional offices or from respective district offices and finally evaluation was made either in regional offices or in respective office. In Figure 3, 22 out of 24 respondents responded that

procurement should be done through district office.

Specification before FY 2069-70

Before fiscal year 2069/70 HDPE pipe procurement process a systematic approach were not practiced. Specification used for bid document preparation was dependent on DWSS. If it was provided by DWSS it was attached otherwise not. Respondents responded 18 were depended to the DWSS and 6 were followed NS standard as of Figure 4. DWSS must provide Specification required to the district offices and now this is practiced within DWSS.

Laboratory Test before FY 2069-70

Before fiscal year 2069/70 HDPE pipe procurement process a systematic approach were not practiced. Laboratory testing certificate were not mandatory. Based on Figure 5, 16 respondents out of 24 clearly told that they never demanded for laboratory test and only one third responded that responded that they demanded for test certificates.

Laboratory testing for HDPE pipe is mandatory in NS 40-2042. There is provision of two types of laboratory testing first one is type test and second is acceptance test. Type test is manufacturers' yearly test valid for the respective year. Type test is performed within a year if there is change in machine, material, and technology. Acceptance test is mandatory for each consignment or lot. Manufacturers claim that they perform all the test, but purchaser never demanded for the test result. So, it seems contradictory to not demanding the test report for the final payments from DWSS side [3].

Cause of Ignorance of Quality of HDPE Pipe before FY 2069-70

Most of the respondent said that there were cause to ignorance but never accepted the responsibility to act at own initiation.

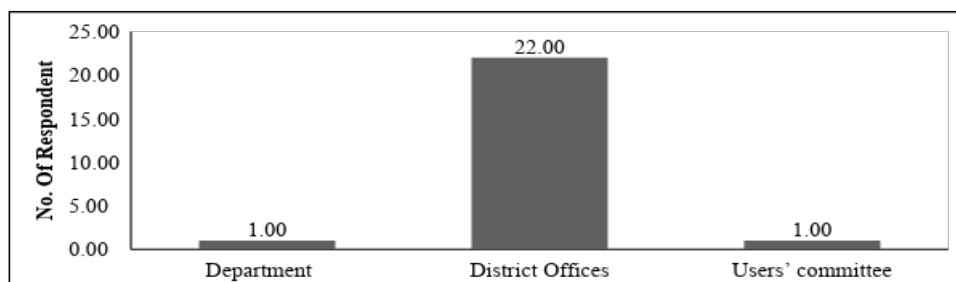


Fig.3. Appropriate agency recommendations.

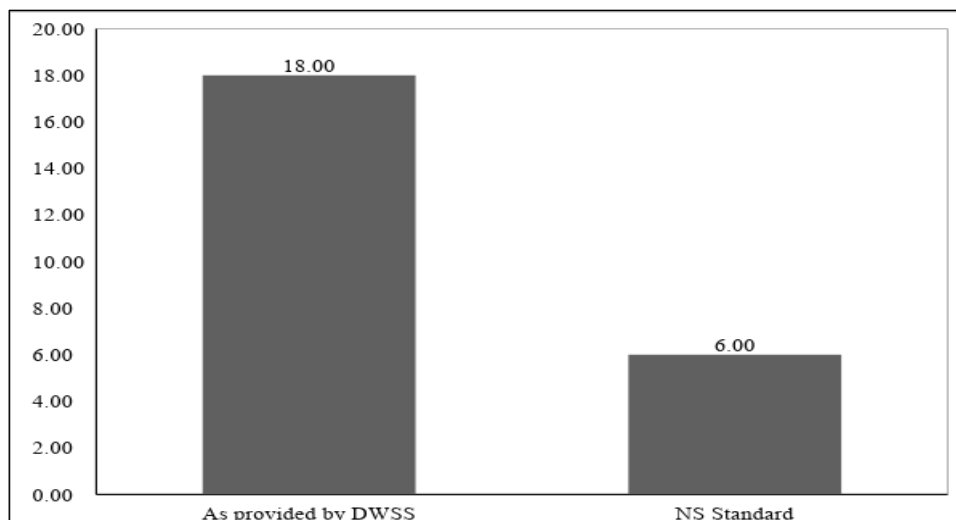


Fig. 4. Specification used in past.

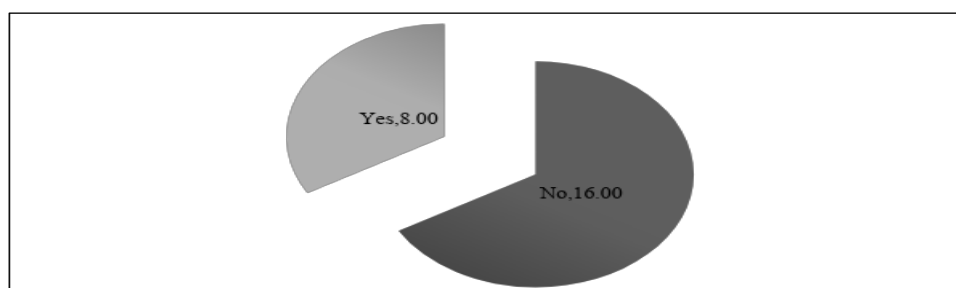


Fig.5. Laboratory testing in past.

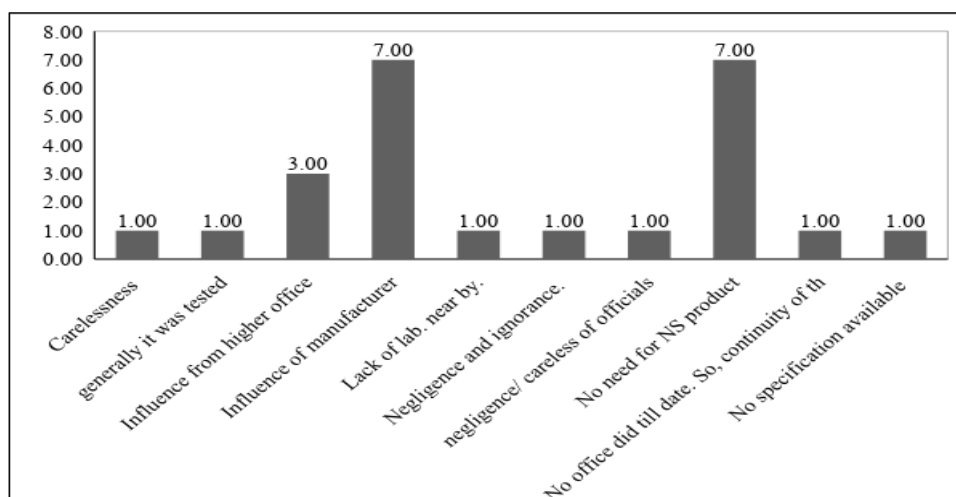


Fig.6. Cause of ignorance of quality.

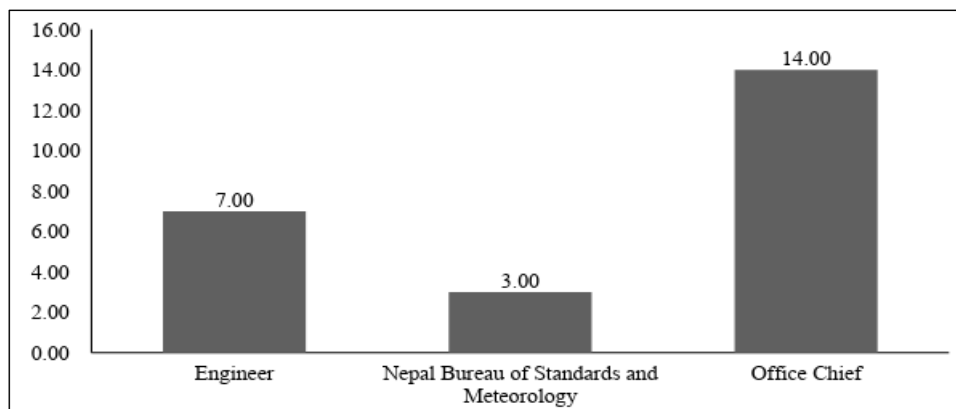


Fig. 7. Responsible person to quality assurance.

NS 40 clearly set frequency for acceptance and type test. As of Figure 6, among 24, 7 told that it was not necessary for the NS product to test quality having general belief that NS product is always as per standard. It was considered the product is regularly monitored by NBSM and we should not be worry about the quality. 7 other respondents told that there was huge influence over the top management of DWSS by manufacturers that we were not interested to check quality.

Responsibility of QA of HDPE Pipe in District Offices

Quality assurance is always crucial part of the procurement process in HDPE pipe. A responsible person within office is required. For this respondent have suggested the NBSM is suitable for quality assurance on behalf of individual office. Figure 7 shows 14 out of 24 respondents suggested that office chief should be solely responsible for quality assurance while 7 suggested that Engineer within the office should be responsible for quality assurance of HDPE pipe. In really office chief should be responsible for quality check through document and Engineer should be assigned to laboratory test and another field test.

Technical Analysis of Procurement Process

Defect in Quality of HDPE Till Yet

Although there was less quality check and laboratory test for the HDPE pipe in past,

general performances of HDPE pipe were good according to respondents.

Based on Figure 8, 11 out of 24 responded that there was no any defect to the purchased pipe in past. Small claims relating to leakage and difficult to reading mark were reported. Since in previous discussion it is found that our HDPE pipes according to NS 40-2042 are over qualified due to PE 63 raw material is used to manufacture. Rate of HDPE pipe in Nepal is fixed with weight calculation. Thus, the qualities of pipe produced by Nepalese industries have more quality and pipes are over strength from the required [4].

Better Unit for Payment of HDPE Pipe

In our practice, we estimate HDPE pipe according to length and it is priced by calculating average weight from standard of the pipe with unit price of per kg of HDPE pipe. For the payment process we pay according to length. In a research conducted by Mishra and Yadav (2018) regarding HDPE quality in Nepal, it is seen that pipes manufactured by Kamala Plastics was below average and above minimum. If the weight of unit pipe is above minimum it is not objectionable. We are paying more than we must pay because we agreed to pay by length and estimated according to weight.

Respondents suggestion are 13 and 11 that shows that Engineers in DWSS believes

that if we only dependent to length manufacturers may manufacture less weight, so it is better to consider both as shown in Figure 9.

Lab Requirement Owned by DWSS

In the fiscal year 2069/70 DWSS sent a circular to perform compulsory lab report for the HDPE pipe procurement and payment. After that all seventy-five districts were took keen interest to perform lab test. In Nepal labs are available with manufactures and NBSM. In hydraulic test only takes 48 hours to make complete test for one piece and parallel 3-4 piece of sample. So, it was almost impossible to perform laboratory test outside the manufacturer's lab and manufacturer's lab was overloaded. For the test procedure electricity was required for continuous and we all were very dependent on manufactures. So, it was very crucial to perform laboratory and we again dependent on what we were provided by the manufacturers. From the survey it was suggested that DWSS should have own laboratory by all 24 respondents. DWSS running water testing laboratory, which should be integrated with hydraulic test and another test for HDPE pipe.

Estimation of Transportation Cost for HDPE

Transportation cost of HDPE pipe purchased is very varied. For example, Sindhupalchok district purchased HDPE

pipe by 8 percent in Fiscal Year 2069/70. While Kathmandu district adopted 2 percent cost of total HDPE pipe cost. Hilly districts have longer distance and gravel road, so it may not generalize by flat some percent.

From the survey, it was recommended that estimation should be done by truck analysis. Truck analysis is method of estimation of transportation cost according to district rate and variable components. So, in Figure 10, survey 17 percent responded that it might be flat 3 percent or more. And another 33 percent suggested that truck analysis should be done up to road head and then it should be estimated during purchase and another arrangement should be prepared for manual transportation. From the analysis it can be fair to adopt truck analysis up to road head and then separate transportation for remaining distance.

Random rate of transportation is not considered scientific. For the estimators it is always suggested to be realistic. Putting the random rate by the decision of office head is not reasonable according to Public procurement 2063 and Public Procurement Regulations 2064. It would be better to take rates from district rate. District rate is determined by every district headed by Chief District officer in the association with secretariat office District Development Office of respective districts.

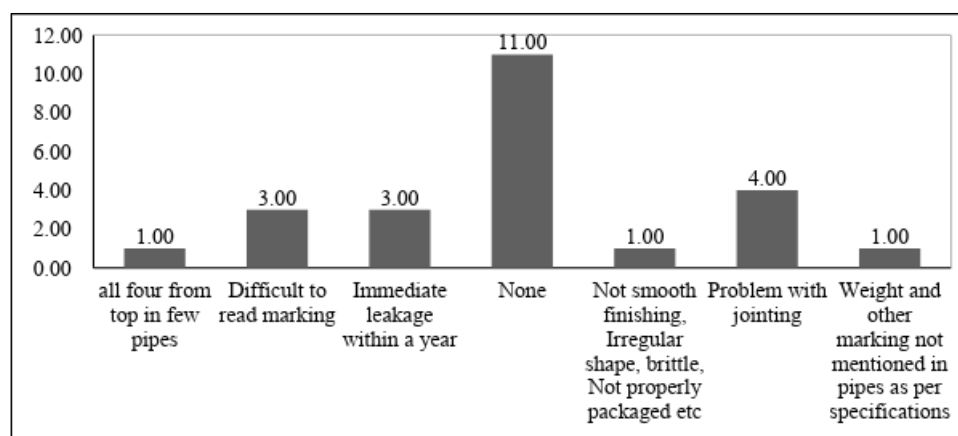


Fig.8. Defects Observed in Field.

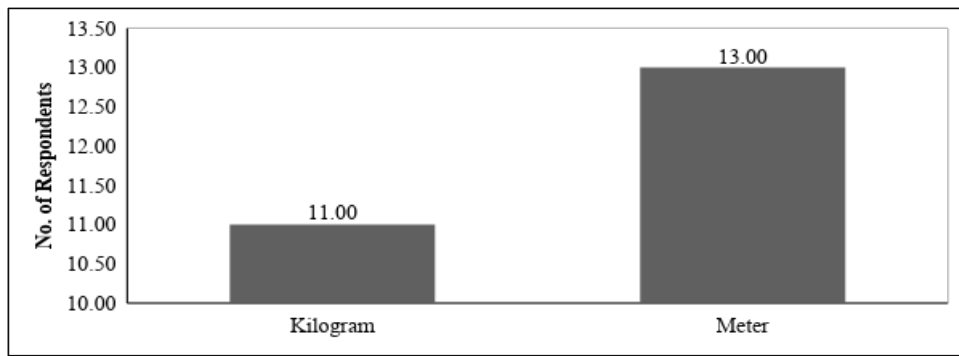


Fig.9. Unit to Purchase Recommendation.

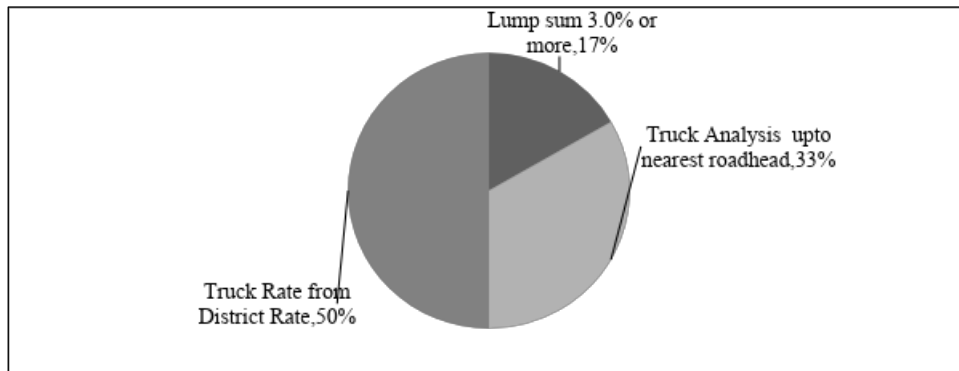


Fig.10. Estimation of transportation cost.

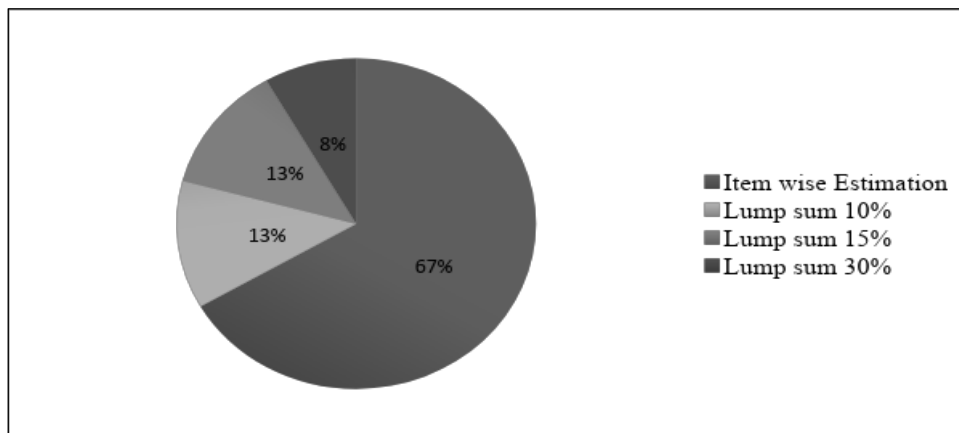


Fig. 11. HDPE fittings estimation.

Method for Estimation of Cost for HDPE Fittings

Another cost estimation of HDPE fitting is significant. It is estimated unsystematically because the list and number of HDPE fittings are very high and very cumbersome. So, the estimators use arbitrary method for estimation their own decision in number of ways. Some uses flat 20-30 percent and other estimates by item wise estimation during pipe

estimation. So, for consistency and actual valuation a single method should be adopted by DWSS.

As per endorsement from the survey 67 percent of respondents suggested to estimate should be done item wise estimation. Item wise estimation has authentic value and transparent to manage items purchased and use of these items. In case of random percentage, the items

supplied can be distorted from the demand because it is vague. Although at the time of purchase purchaser makes the list of required goods but it in advance evaluators cannot find the real item amount.

Lump sum amount of 30 percent of total HDPE pipe purchase d is suggested by 8 percent of respondent, which is not justifiable. Likewise, in Figure 11, 13 percent suggested to amount of 15 percent should be adopted. Likewise, 12 percent respondents suggested that lump sum amount should be 10 percent amount of HDPE pipe. Altogether 33 percent of respondent suggested purchasing the HDPE fittings according to random basis. So, the Item wise Estimation of HDPE pipe Fittings is justifiable and scientific for the procurement process.

CONCLUSION

Procurement Management

- Sometimes all the procurement process was made by regional offices and sent for payment to district offices
- Test certificates as per NS were not mandatory in past but now it is mandatory.
- Laboratory test must be performed because different lot may have different quality and for quality assurance it is necessary
- Office chief and Engineer should be responsible for quality assurance
- Length and weight both should be considered in procurement process

Technical Management

- Regional laboratory for HDPE pipe testing should be established by DWSS
- Transportation cost of HDPE pipe should be adopted from truck analysis till nearest road head
- HDPE pipe fittings should be estimated on actual basis item wise

rather than fixed percentage of HDPE pipe cost.

RECOMMENDATIONS

Management

- Office chief and Engineer should be assigned for quality assurance
- Length and weight both should be considered in procurement process
- Regional laboratory for HDPE pipe testing should be established by DWSS
- Transportation cost of HDPE pipe should be adopted from truck analysis till nearest road head
- HDPE pipe fittings estimation should be on actual quantity basis item wise not by the flat certain percentage of HDPE pipe purchased

REFERENCES

1. Devkota R. *Progress Report of DWSS*. Kathmandu: DWSS. 2013.
2. DWSS. *Specifications for HDPE Pipe*. Kathmandu: Department of Water Supply and Sewerage. 2013.
3. Nepal Standard. (2042 BS). *HDPE Pipe Standard*. Government of Nepal, Nepal Beureau of Standard and Metrology. Kathmandu: Nepal Bureau of Standards & Metrology.
4. Nepal Standard. (2046 BS). NS:206-2046. *PVC Pipe for Water Supply*. Nepal: Nepal Bureau of Standards and Metrology.
5. Betts, A. Google Docs.Retrieved 12 1, 2015, from How to Make a Survey in Google Docs: <http://computers.tutsplus.com/tutorials/how-to-make-a-survey-in-google-docs--cms-20928>. 2014, May, 12
6. Mishra AK, Yadav LP. Quality Assessment of High Density Polyethylene Pipe in Department of Water Supply and Sewerage.J Adv Res Civil Envi Engr 2018; 5(4): 18-33.