The Water and Wastewater Workers Essential Skills Project

Report presented to Saskatchewan Learning

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Executive Summary

Background

The Water and Wastewater Workers Essential Skills Project was developed with the overall aim of offering assistance and support to water and wastewater workers as they faced the mandatory certification process. More specifically, the project focused on assessing their levels in workplace essential skills. Workplace essential skills are seen as the non-technical skills that will enable the workers to successfully participate in certification training and successfully gain certification.

In July 2000 the Saskatchewan Government mandated certification for system operators of water and wastewater treatment plants, effective July 2005. There are more than 1,300 operators in the province, and roughly 580 of them have one or more levels of certification as of March 2004. The mandated certification program presents major challenges to some of the individuals currently employed in this occupation. Many water and wastewater workers have been employed in their positions or in the public utility field for a long time and as such have been out of the formal education setting. As a result there may be a need for refresher training and upgrading assistance in the essential skills in order for them to be successful in the certification training and successful in the certification exams.

Essential Skills provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. The Government of Canada and other national and international agencies have identified and validated nine Essential Skills. These skills are used in nearly every occupation and throughout daily life in different ways and at different levels of complexity. While the commonly accepted list of essential skills includes Reading Text, Continuous Learning, Document Use, Working with Others, Writing, Numeracy (Math), Thinking Skills, Oral Communication and Computer Use, this project focused on the three that are often called literacy skills.

The Canadian Union of Public Employees (CUPE) took the lead for this Project in order to discover whether workers in the sector – unionized and non-unionized – needed assistance in workplace essential skills to help them gain their certification. CUPE Saskatchewan Division applied for funding from the Job Start/Future Skills Sector Partnership Program of

Saskatchewan Learning. Approval for funding was received in December 2002, and work on the project officially began in January 2003.

Stakeholders

An effort was made to create a "sector" committee with representation on it from all constituencies with a role or vested interest in the issue of certification for water and wastewater workers. To this end, correspondence and meetings were initiated with 15 organizations. In the end, the following organizations comprised the Steering Committee:

Canadian Union of Public Employees
City of Regina, Water/Wastewater Management
Communications, Energy & Paper Workers Union
Federation of Saskatchewan Indian Nations
Saskatchewan Environment
Saskatchewan Federation of Labour (Co-Chair, Labour)
Saskatchewan Institute of Applied Science and Technology (Co-Chair, Education)
Saskatchewan Labour Force Development Board
Saskatchewan Learning
Saskatchewan Regional Colleges
Saskatchewan Urban Municipalities Association
Saskatchewan Water and Wastewater Association

Learning Needs Assessment, Workplace Essential Skills

The project used a customized TOWES (Test of Workplace Essential Skills) to assess three workplace essential skills – Reading Text, Document Use, and Numeracy -- of a sample group of 44 water and wastewater workers. TOWES was contracted to develop an essential skills profile of the skills required for the job, have the profile validated by Saskatchewan industry experts, create a custom version of TOWES and mark the tests and provide test results reports.

The significant feature of the TOWES that distinguishes it from so many other tests and assessments is its use of authentic workplace documents such as instructions, diagrams, labels and flowcharts as source material. Workers who take the TOWES must search for information

contained in these documents in order to complete a task or solve a problem. All information required to solve the problem or complete the task is embedded in the document.

Representative sample group:

It was decided to deliver the TOWES only to workers with no certification or with certification up to Level Two. Water and wastewater workers with Levels Three and Four certification either have equivalent to post-secondary education through recognized substitutions of work experience or specialized technical training, or they have the actual formal post-secondary education. Workers with no certification or Levels One and Two certification may be found in all manner of facilities, though the complexity of the plant will be reflected in the higher certification levels of a portion of its workers. TOWES delivery sites were chosen from both urban and rural communities and from sites north of Prince Albert.

Results of the TOWES

The findings of the International Adult Literacy Survey (IALS) indicate that a score of at least 80% in the workplace essential skill being assessed indicates proficiency – an ability to transfer learning and knowledge to another situation in the home, workplace or community, the ability to learn new skills, and the ability to adapt to workplace changes such as new technology. As TOWES is based on the same methodology as IALS, TOWES consequently uses the same 80% score as the level that indicates proficiency.

The Summary Table, below, shows scores and percentages of correct answers in each of the three workplace essential skills surveyed.

Summary Table

Essential Skill		Location / Zone		
		Urban	North of Prince Albert	Other
	Number of Participants	23	9	12
Reading	*Number Passed	16	4	12
	% Pass	70%	44%	100%
Document Use	Number Passed	17	4	11
	% Pass	74%	44%	92%
Numeracy	Number Passed	16	3	10
	% Pass	70%	33%	
Average Percent Passing		71%	40%	92%

Comments, Questions and Concerns from Industry Partners

Participants and plant operators were a valuable source for understanding perspectives around the issue of the mandatory certification for water and wastewater workers. The Project includes this information alongside the hard data in acknowledgement of the impact the certification issue has on all aspects of the workers' lives. Questions and concerns that emerged during the course of the Project centred on issues such as:

- Relevance of Certification Exam to Workplace Culture and Workplace Knowledge
- Exam anxiety
- Personal anxiety and stress
- Fate of water and wastewater workers who will not attain certification

Conclusion

The results of the Water and Wastewater Workers Essential Skills Project indicate that there are significant essential skills issues in the existing workforce in the sector. Even in the relatively small sample group of 44 workers, there is significant evidence of a low level of essential skills.

The geographic and cultural issues as they pertain to the essential skills training needs particularly of northern and Aboriginal workers indicate the need for a variety of options for pilot projects and the development of best practices. Another need is to examine the relationship between the level of essential skills and the pass rate on certification exams administered by the Operator's Certification Board**.** This first look at the issue shows us that additional investigation is warranted and could be addressed in a second stage of this project.

To respond to the particular needs of the workers and of the industry in general, as ascertained by the Project, several recommendations are presented for consideration by the stakeholders. The recommendations, which are outlined more fully in the complete report, are as follows:

- appropriate models should be developed and piloted to assist workers to increase their proficiency in the essential skills surveyed in the Project and, particularly, in Numeracy and Text literacy;
- all water and wastewater workers in the province who will be writing examinations should be offered the opportunity to attend workshops in examination preparation and practice;
- industry (employer and labour), in partnership with other stakeholders, should undertake additional research into the technical training and essential skills needs of water and wastewater workers in a second stage of the project, through means such as literature reviews, pilot projects, anecdotal research and quantitative and qualitative data gathered on current initiatives that are showing signs of success;
- industry, in partnership with other stakeholders, should develop recommendations on developing a learning strategy, including Recognition of Prior Learning (RPL), and a communication plan around essential skills needs for workers who face challenging certification exams;
- further phases of this project, or a project that deals with matters within this sector, should be contracted to the Saskatchewan Water & Wastewater Association, with the project co-chaired by employer and labour representatives;
- in the North, as well as in other locations where significant essential skills needs exist, additional pilot project funding should be made available to target these needs in a timely and culturally appropriate manner;
- there should be an investigation of whether workers who are having difficulty passing certification-related exams could be given the opportunity of taking the exams by alternative methods;
- the workers, who make significant sacrifices of personal time, family time, and community involvement by preparing for certification exams should receive formal recognition of this by their employer after the parties are consulted about what recognition would be meaningful;
- the operators of water and wastewater treatment facilities should investigate how to best compensate workers for their certification-related work by use of initiatives that might include, but not limited to, providing work time for study, time off in lieu, a peer study opportunity within the workplace, or a monetary compensation;

Background

The Water and Wastewater Workers Essential Skills Project was developed with the overall aim of offering assistance and support to water and wastewater workers as they faced the mandatory certification process. More specifically, the project focused on assessing their levels in workplace essential skills. Workplace essential skills are seen as the non-technical skills that will enable the workers to successfully participate in certification training and successfully gain certification.

In July 2000 the Saskatchewan Government mandated certification for system operators of water and wastewater treatment plants, effective July 2005. There are approximately 1,200 municipal water and wastewater facilities located in about 600 Saskatchewan communities with water and wastewater works "licensed" by Saskatchewan Environment. This does not include either private or First Nations facilities/communities. As of July 2004, 144 facilities were in full compliance in that they have at least one certified operator at an appropriate level. In addition, there were 219 facilities that had an operator certified at some level in any or all categories of water treatment, water distribution, wastewater treatment and wastewater collection.

There are more than 1,300 operators in the province in water and wastewater works licensed by Saskatchewan Environment, and roughly 530 of them currently have one or more levels of certification as of July 2004. The mandated certification program presents major challenges to some of the individuals currently employed in this occupation. Many water and wastewater workers have been employed in their positions or in the public utility field for a long time and as such have been out of the formal education setting. As a result there may be a need for refresher training and upgrading assistance in the essential skills in order for them to be successful in the certification training and successful in the certification exams. For most workers, this will demand a great commitment to continuing education that enhances both technical knowledge and mastery of functional essential skills, such as reading, document use, and numeracy.

According to the Government of Canada's Essential Skills Research Project website, "Essential Skills are the skills needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. Through extensive research, the Government of Canada and other national and

international agencies have identified and validated nine Essential Skills. These skills are used in nearly every occupation and throughout daily life in different ways and at different levels of complexity" (from www15.hrdc-drhc.ca/english/general/Understanding). While the commonly accepted list of essential skills includes Reading Text, Continuous Learning, Document Use, Working with Others, Writing, Numeracy (Math), Thinking Skills, Oral Communication and Computer Use, the project focussed on the three that are often called literacy skills.

Although a large majority of municipal employees in Saskatchewan communities are not unionized, those who are union members are largely represented by the Canadian Union of Public Employees (CUPE) and, to a lesser degree, others by the Communications, Energy & Paper Workers Union (CEP). CUPE, along with the Saskatchewan Water and Wastewater Association, various provincial government departments and education institutions, supports the concept of mandatory certification. However, for this project, CUPE took the lead in the province to discover whether workers in the sector – unionized and non-unionized – needed assistance in workplace essential skills to help them gain their certification.

To support the workers in this issue, CUPE Saskatchewan Division applied for funding from the Job Start/Future Skills Sector Partnership Program of Saskatchewan Learning. Approval for funding was received in December 2002, and work on the project officially began in January 2003, with CUPE Saskatchewan as the holder of the Project contract with Saskatchewan Learning.

Introduction

To fulfill the purpose of the project, it was agreed in the contract to provide the following:

- Develop a customized TOWES/learning needs assessment test to assess the workplace essential skills of water/wastewater plant operators in the province
- Conduct a learning needs assessment with a sample and representative group of water/wastewater plant operators
- Identify training/education gaps in essential workplace skills for water/wastewater plant operators
- In partnership with industry, training providers and key stakeholders develop a learning strategy that would address the gaps

- In partnership with industry, training providers and key stakeholders develop recommendations about how best to communicate information to employees, employers, unions and key stakeholders about the mandatory certification process and Recognition of Prior Learning (RPL) and how best to assist employees in preparing to access the RPL process or to challenge the certification
- Develop and strengthen a sustainable sector partnership that would work together to foster a learning culture in the workplace

Additionally, the project proposal mentioned CUPE's expectations of other outcomes:

- Moral and other support for workers in this sector as they participate in a challenging and potentially stressful process
- Capacity building within CUPE, in that the lessons learned through the co-ordination and delivery of this project would assist CUPE in other training initiatives and would position CUPE to form additional partnerships with employers
- The beginning of a "learning culture" in smaller workplaces as management and workers are introduced to essential skills training and the philosophy of lifelong learning that underlies this training

Methodology

1. Steering Committee

An effort was made to create a "sector" committee with representation on it from all constituencies with a role or vested interest in the issue of certification for water and wastewater workers. To this end, correspondence and meetings were initiated with 15 organizations. In the end, the following organizations comprised the Steering Committee:

Canadian Union of Public Employees
City of Regina, Water/Wastewater Management
Communications, Energy & Paper Workers Union (CEP)
Federation of Saskatchewan Indian Nations (FSIN)
Saskatchewan Environment
Saskatchewan Federation of Labour (Co-Chair, Labour)
Saskatchewan Institute of Applied Science and Technology (SIAST) (Co-Chair, Education)
Saskatchewan Labour Force Development Board
Saskatchewan Learning
Saskatchewan Regional Colleges
Saskatchewan Urban Municipalities Association (SUMA)
Saskatchewan Water and Wastewater Association (SWWA)

The SWWA came on board when the project was near completion and expressed interest in being involved in a second stage if the Project were to have one. A contact list of Steering Committee organizations is included in the Appendices to this report.

The Steering Committee's role was to provide ongoing advice, direction, information, and feedback to the Project Coordinator, to connect the Project Coordinator with people from the various constituencies whose help was required to move the project forward, and to meet at regular intervals for multi-party discussion and decision making.

2. Learning Needs Assessment, Workplace Essential Skills

In terms of this project, the Learning Needs Assessment was limited to three Essential Skills. The project used a customized TOWES (Test of Workplace Essential Skills) to assess the workplace essential skills of a sample group of water and wastewater workers. The project recognized that TOWES is not the only survey tool available that can be used to assess literacy, and that TOWES does have its limitations. However the project decided to use the TOWES test as a survey, rather than as a test as such. In all, 44 water and wastewater workers were surveyed. Customization was used to ensure that the survey reflected the context of water and wastewater workers and the context of Saskatchewan.

Bow Valley College in Calgary and Skill Plan in Vancouver partnered to develop TOWES. SkillPlan, an initiative of the BC Construction Industry Skills Improvement Council, exists to develop strategies to improve the workplace essential skills of workers in the construction industry and beyond. The TOWES survey exists as a test bank of items that can be configured into a variety of different versions. The development has been ongoing since 1997 and the test bank was extensively field tested. For this Project, TOWES was contracted to develop an essential skills profile of the skills required for the job, have the profile validated by Saskatchewan industry experts, create a custom version of TOWES and finally to mark the tests and provide test results reports.

TOWES measures three workplace essential skills: reading text, document use (document literacy) and numeracy. These three essential skills were originally identified in the Essential Skills Research Project conducted by Human Resource and Skills Development (HRSD). TOWES is based on that research. Its significant feature that distinguishes it from so many other tests and assessments is its use of authentic workplace documents such as instructions, diagrams, labels and flowcharts as source material. Workers who take the TOWES must search for information contained in these documents in order to complete a task or solve a problem. All information required to solve the problem or complete the task is embedded in the document.

The customized TOWES was developed as follows:

- **An "essential skills profile" was developed:** A certified "profiler" from-TOWES visited three water treatment plants in Saskatchewan. These were either Level One or Level Two facilities. At these plants, the profiler interviewed workers judged to be competent workers who knew their jobs well. The profiler asked them questions about their work that would highlight the

workplace essential skills components, and collected real workplace documents. The profiler used as a starting point the National Occupation Classifications (NOC) for water workers and wastewater workers. The NOC profile – developed by Human Resources and Skills Development (HRSD) –lists the essential skills required for work in a particular occupations based on national standards.

- **The Saskatchewan profile was compared to the NOCs for water and wastewater workers.** Upon return to TOWES, the profiler compared what was learned through interviews with the NOC information and made adjustments where required. The profiler then developed a draft Essential Skills Profile of water and wastewater workers at Levels One and Two in Saskatchewan.
- **The draft profile was reviewed**. The draft profile was sent to 5 subject experts for review, feedback and validation and then revised.
- **A version of TOWES was custom designed, based on the Essential Skills Profile:** The TOWES development team then designed a customized version of TOWES, by choosing items from the test bank, based on the skills identified in the essential skills profile. The TOWES created for the Project included two problem sets specifically focused on the water/wastewater sector using the authentic documents gathered by the profiler during the profiling process.
- **TOWES questionnaire**: The TOWES booklets include at the beginning a short questionnaire developed to gather demographic information from those participants who write it. The project inserted two additional questions into that questionnaire (see Appendix 2 for the demographic information from the Questionnaire).

3. Choosing a representative sample group:

It was decided to deliver the TOWES only to workers with no certification or with certification up to Level Two. Water and wastewater workers with Levels Three and Four certification all have post-secondary education, or equivalent through allowed substitutions for missing formal post-secondary education, and therefore were judged to not need assistance in workplace essential skills. Table 1 below lists the communities whose facilities were surveyed. The class of facility is determined by its complexity and size. Workers with no certification or Levels One and Two certification may be found in all manner of facilities, though the complexity of the plant

will be reflected in the higher certification levels of a portion of its workers.

Table 1:
Facilities in which water/wastewater workers were surveyed

Facility Surveyed	Class of Facility	Number of workers surveyed
Air Ronge	2	1
Buffalo Pound	4	4
Creighton	2	3
La Ronge	2	1
Lac La Ronge	1	1
Prince Albert	4	11
Saskatoon	4	8
Stanley Mission	1	3
Yorkton	2	8
Wakaw	3	4
Total		**44**

TOWES delivery sites were chosen from both urban and rural communities and from sites north of Prince Albert. Table 1 shows the facilities that participated. The facilities that participated in the project self-selected themselves upon contact by the project coordinator. Approaches were made to a much larger number of facilities than actually participated. Many of the facilities that replied indicated operational reasons for not participating (e.g., low staff levels), while most simply did not reply to telephone, email, postal and faxed messages.

Results and Interpretation of TOWES

Table 2: Summary Table, below, shows scores and percentages of correct answers in each of the three workplace essential skills surveyed. To ensure the confidentiality of those who wrote the survey, results have been grouped as follows:

- Urban facilities (3 facilities, 23 TOWES completed)
- Facilities north of Prince Albert (PA) (5 facilities, 9 TOWES completed)
- Other (2 facilities, 12 TOWES completed)

The findings of the International Adult Literacy Survey indicate that a score of at least 80% in the workplace essential skill being assessed indicates proficiency – an ability to transfer learning and knowledge to another situation in the home, workplace or community, the ability to learn new skills, and the ability to adapt to workplace changes such as new technology. As TOWES is based on the same methodology as IALS, TOWES consequently uses the same 80% score as the level that indicates proficiency.

Table 2: Summary Table

Essential Skill		Location / Zone		
		Urban	**North of PA**	**Other**
	Number of Participants	23	9	12
Reading	*Number Pass	16	4	12
	% Pass	70%	44%	100%
Document Use	Number Passed	17	4	11
	% Pass	74%	44%	92%
Numeracy	Number Passed	16	3	10
	% Pass	70%	33%	
Average Percent Passing		71%	40%	92%

* A “pass” is a score of 80% or higher

TOWES Scores: Implications

Averages. It may not be useful to average out results reflected in the preceding chart (please see Appendices for individual Tables). For example, across all three essential skills measured, very high in one urban facility and very low scores in another will distort the average score of that group. Likewise, in the group of communities north of Prince Albert, one facility's workers had high scores while the remainder had significantly low scores. An average would distort the average score for four of the five communities surveyed and not be useful for our purposes.

Regional differences in scores. Of the nine water and wastewater workers who wrote the TOWES from communities north of Prince Albert, only three scored 80% or higher in **Reading Text** (see Table 4, Appendices). Two of these three were from the same water treatment facility (not distinguished in the Tables for this region). **Document Use** scores in this region were also poor (see Table 7, Appendices), with only four of the nine scores higher than 80%. Three of the four high scores were from the water treatment facility noted above). In **Numeracy** (see Table 10, Appendices), again the three water workers from the same plant scored extremely well – between 88% and 92%. These three were the only participants to score 80% or higher, with the next closest score being 67%.

It was not within the scope of this project to explore all the reasons that may account for the surveyed differences between the north and other areas. However, the challenges and uniqueness of the north warrant further investigation in a follow-up project.

Numeracy scores. Of the total 44 workers surveyed, 15 workers, or about one-third (33.38%) averaged out, scored less than the proficiency cut-off of 80%. Two-thirds of numeracy scores from north of Prince Albert are below 80%, ranging from a high of 67% to a low of 42%. Among scores from urban facilities, nearly one-third is below 80%, ranging from a high of 75% to a low of 38%. Scores for numeracy among the "Other" facilities surveyed are much higher and therefore raise the overall average.

Reading Text scores. Of the total 44 workers surveyed, 12, or about 27% averaged out, scored less than 80% on Reading Text. Of the 12, seven were from north of Prince Albert, where scores below 80% ranged from 77% down to 29%. Five were from Urban facilities, where scores below

80% ranged from 74% to 29%. The overall average is raised by the fact that there were no scores below 80% in the "Other" facilities category.

Document Use scores. Of the total 44 workers surveyed, 12, or about 27% averaged out, scored less than 80% on Document Use. Of the 12, six were from Urban facilities, where scores below 80% ranged from 77% to 38%; five were from facilities North of Prince Albert, where scores below 80% ranged from 77% to 50%; and one was from "Other" facilities, with a score of 77%.

Comments, Questions and Concerns from Industry Partners

The following are authentic comments, questions and concerns expressed by participants and plant operators at the time of the TOWES delivery.

1. Relevance of Certification Exam to Workplace Culture and Workplace Knowledge.

Exams and learning needs assessments did not take into account or reflect the culture of the workplace. Prior to one TOWES session, a worker told the invigilator that the certification exams, and probably the TOWES, were not really relevant or appropriate. When at work, he had access to co-workers and could ask someone for advice or to check his work, while the tests didn't allow this.

Several of the workers who took the TOWES volunteered their opinion that Level One and Two certification exams are mostly common sense. It is doubtful that all or most of the workers who scored less than 80% have impaired judgement skills. A logical conclusion seems to bear out studies conducted by SkillPlan that suggest multiple-choice exams are more a test of reading ability than of technical and operational knowledge.

SkillPlan has been conducting field studies over the past two years to research the relationship between essential skills and training outcomes. Lynda Fownes, Executive Director of SkillPlan, elaborates on the connection between reading ability and exam scores when she reports, "Comparative studies with groups of apprentices show that reading scores on TOWES significantly correlate with scores on Inter-provincial Red

Seal exams. Results from a study involving a security guard training program at a British Columbia college also reported the same correlation between high reading scores and success in certification exams (email communication to N. Frankel, December 2003).

The last word on this topic goes to a plant operator in a small community. In discussion with the Project Coordinator about how many of the workers at his plant might write the TOWES, he commented, "____ [name removed] won't do it. He makes really good water, the best water, but he just has [less than grade 8], there's no way he is going to get his certification."

2. Exam Anxiety

In every location in which TOWES sessions were delivered, water and wastewater workers expressed anxiety about writing exams. The anxiety centred on not only the consequences of failing the exams but also very much on the experience of writing them, e.g., the unfamiliar format for demonstrating knowledge, the formality, the length of time required to write the exam, the classroom environment, and the time limit for completing the exam. Participants can best speak for themselves in conveying their experience of exam anxiety, as the following two quotations show:

> I walked into the certification exam and couldn't do anything. I sat there for 20 minutes and then just walked out."
> [A co-worker, in response to the above comment] "Yeah, you didn't talk to nobody for a week or so after that, it was really bad."

> _____ did fine in the prep class and passed the prep class exam but he just froze when he went into the certification exam. He ended up just walking out.

3. Personal Anxiety and Stress

What at first glance was perceived by Project staff to be exam anxiety on further investigation proved to be a broader range of anxieties and stressors. At one TOWES session a worker was quite upset over taking the TOWES, despite the invigilator's reassurances that the results of the survey would remain confidential. The worker explained that there was cause for anxiety because he had just been married and was the sole income source for his partner and child. If he did poorly on the TOWES or certification exams, he thought he might lose his job. Therefore, instead of "exam anxiety" he experienced "income anxiety," and as a result of this stress he might have experienced increased difficulty with the certification exams.

Other workers spoke of the hardship associated with preparing for the certification exams. Workers, for example, had to spend their evenings studying instead of meeting domestic responsibilities and enjoying family time. More than one union activist and/or executive member spoke about having to withdraw from union activities and responsibilities due to the time needed for studying.

While these comments and concerns outline only a few of the challenges faced by workers, a little analysis provides us with positive messages. Their comments are also about what they do for their job, and therefore their community, when faced by these challenges. The commentary about the union activists is quite positive in that instead of fighting the issue, giving up, or complaining, these folks recognize that they do need that certification, and they put aside many of the important parts of their lives to study at home. They persevered, despite the lack of ideal training practices at their workplace.

The story of the worker who was anxious about income concerns is positive in that, again, despite his anxiety and concerns over his new family, he and his family decided that he had to focus on preparing for certification tests on his own time, and he did just that. That's a great commitment to his job and to his community, despite the obvious work/life balance problems.

4. Fate of Water and Wastewater Workers Who Will Not Attain Certification

The Literacy Coordinator at Northlands College, who invigilated the TOWES there, raised the issue of what happens to water and wastewater workers who may never attain their certification:

> In the six water and wastewater training courses offered by Northlands College between 2001 and 2003, the average success rate was 51%. Actual success rates ranged from 25% to 100%. The courses were held in various northern communities in order to accommodate the schedules of the workers. In all, 27 communities were represented in these classes. In some cases, participants repeated the training course twice. At the time of writing this report, more than half of those who participated in the training courses have yet to be certified.
>
> There is an evident difficulty for northern workers in sitting through the three-hour exams. About 25% of these workers have less than grade 12 educations. An additional challenge for about 32% of the workers is that English is their second language.
>
> Those water and wastewater workers who will not gain their certification are not going to disappear. And there is no pool of trained and certified *local* people to take their places. Workers who were unsuccessful at gaining certification will still be living in their communities, but they will not be able to serve the same function in them. These workers will still need to provide for their families within their communities. There are fewer and fewer job options for adults with low levels of education, but a low level of education does not negate a person's need to participate in the economy of the North.

There is a certification option that may mitigate the situation described above. A "Regional/Contract Operator" may be contracted by a particular community to act as the certified operator for that community, going on-site on a regular basis and if a problem arises. (For further information about this point, see http://www.saskh2o.ca/PDF/Regional-ContractOperatorProgram.pdf).

Currently, Northlands College has the mandate to build capacity for northerners and prepare them for retraining if necessary. The College is hoping that the PLAR portfolio development process and the self-examination that comes as a result of essential skills testing through TOWES and other means will give non-certified workers alternative options.

As can be seen by the charts in Appendix 7, the issue of what happens to water and wastewater workers who do not attain certification is certainly a salient one. However, any conclusions made from the data in Appendix 7 would be so general and would require so many qualifications that speculating on any conclusions from that data would not illuminate the results from this project.

Challenges and Lessons Learned

Timelines

It was originally planned that the Project would take eight months to complete. With the initial money received at the beginning of January 2003, the Project anticipated TOWES development taking place in January and February, delivery occurring from mid-February to April, and evaluation of the results being completed in May.

An experienced and certified profiler was not available until late March. This delayed the development of TOWES until late May. If Project staff, Bow Valley College and SkillPlan had discussed and agreed upon timelines with one another at the time the proposal was submitted, perhaps this major delay could have been avoided or a contingency plan developed. Developing firm guidelines so that the project was able to schedule project activities in accordance with the contract between Bow Valley/SkillPlan and the Project would have been quite valuable. In addition, a person from TOWES who could have been designated as the project's "problem-solver" may have served to mitigate delays and correct any administrative mishaps or process problems. Another factor contributing to the delays in progress was the inability of many committee members to participate at the level desired by the project.

Recruitment Challenges

The rural, comparatively isolated nature of many Saskatchewan communities presented unforeseen challenges in carrying out the Project's task. Recruitment of the sample group of water and wastewater workers proved more difficult than expected. When the Project was first envisioned, it was thought that delivery of the TOWES to the 50 workers would take place in groups of eight to ten workers in perhaps half a dozen or fewer sites across the province. It wasn't apparent to the committee that the Level One and Level Two water and wastewater works employed only one to at most four or five workers in the target participant group. Thus the project coordinator needed to contact considerably more facilities than originally planned in order to find enough participants.

Another hurdle in the recruitment of participants was the difficulty in identifying supervisors and operators who were interested and able to participate in the project. The coordinator and the project planners did not expect they would have to make a significant numbers of calls to each plant in order to ascertain their interest in participating in the study, and to then schedule a TOWES session. In retrospect, significantly more time and budget should have been allocated to communication and promotion activities that would support and facilitate the participation of key groups.

Finding sufficient numbers was not the only challenge. As well, delivering the TOWES was more time consuming than imagined. Originally the project planned to gather participants from within a particular cluster of communities at the regional college in the area to write the TOWES. It quickly became apparent that several of the small plants with only a few workers could not manage operationally to have the workers going off-site for three hours to write the TOWES. Thus the project members who delivered the TOWES more often than not went to individual water treatment plants to deliver the TOWES rather than invigilating at a central location with workers from several plants.

Roles and Responsibilities of Steering Committee Members

During the run of this project, the amount of time and the type of assistance that committee members made available to the project generally, and to the Coordinator specifically, was qualitatively less than what had been anticipated. This resulted in

necessarily having to change the forecast completion date by several months. To remedy this in any future project, prospective committee members should be advised of the time demands and expectations associated with committee membership. At the first committee meeting, a discussion about the project, its operation and its outcomes should take place. All members should clearly understand the support expected from them, and they should clearly inform the committee of the time and support they are able to provide.

Recognition of Prior Learning

According to the *Provincial Framework for the Recognition of Prior Learning in Saskatchewan*, Recognition of Prior Learning (RPL) can be an important tool for individuals, industry (employers and unions), education and training providers, and professional regulatory bodies/associations. Learning recognition systems provide effective mechanisms to identify, record/document, and demonstrate what a person knows and can do, in order for it to be assessed and recognized. Because water and wastewater workers have varied levels of literacy, formal education and training, and learning on-the job, RPL processes can help identify the learning (knowledge and skills) that the individual has acquired. RPL processes can support development of individual training/education plans, and may help fulfill the requirements of certification or facilitate challenge for credit at post-secondary institutions.

One element identified as a component of this project was the exploration of options for using RPL processes to support water and wastewater workers. Due to time and resource limitations during the completion of this phase of the project, this analysis may best be completed in a subsequent phase of the project. The potential support provided to workers through RPL processes, such as portfolio development, may be considered. In addition, RPL processes are based upon authentic, flexible assessment methods, which offer alternatives to traditional examinations. Learning recognition systems provide mechanisms to validate skills in practical and relevant ways, which enable the knowledge and skills to be assessed separately from literacy levels.

Conclusion and Future Activities

The results of the Water and Wastewater Workers Essential Skills Project indicate that there are significant essential skills issues in the existing workforce in the sector. Even in the relatively small sample group of 44 workers, there is significant evidence of a low level of essential skills.

The geographic and cultural issues as they pertain to the essential skills training needs particularly of northern and Aboriginal workers indicate the need for a variety of options for pilot projects and the development of best practices. Another need is to examine the relationship between the level of essential skills and the pass rate on certification exams administered by the Operator Certification Board**.** This first look at the issue shows us that additional investigation is warranted and could be addressed in a second stage of this project.

Recommendations

1. Essential Skills Upgrading

Workplace Essential Skills levels need to be raised in a significant proportion of water and wastewater workers. It is recommended that appropriate models be developed and piloted to assist workers to increase their proficiency in the essential skills surveyed in the Project and, particularly in Numeracy and Text literacy, the essential skill surveyed that had the highest proportion of scores below the 80% mark.

2. Exam Preparation

It is recommended that an opportunity to participate in Examination Preparation and Practice workshops be extended to all water and wastewater workers in the province who will be sitting examinations. Many water and wastewater workers facing the certification process have not written an exam in 20 or even 30 years, so it is logical that they would experience examination anxiety prior to writing formal examinations for certification purposes.

3. Learning Strategy

It is recommended that industry (employer and labour), in partnership with other stakeholders, should undertake additional research into the technical training and essential skills needs of water and wastewater workers in a future stage of the Project. Primary research could take the form of pilot projects, gathering anecdotal evidence and both quantitative and qualitative data from current initiatives that show signs of success. Additionally, secondary research through a literature review would provide the information necessary to the development of a worker-friendly learning strategy.

4. Steering Committee

It is recommended that further activity within the Project's committee – as is the case with most multipartite committees that deal with workplace matters -- should be led by those with the greatest interest in the workplace. In the case of a second phase of this Project, or a project that deals with matters within this sector, the project contract should

be let to the SWWA, and the project co-chaired by representatives from employer and labour. The steering committee should be composed of representatives of as many stakeholders as is possible. Significant orientation should take place with the committee members to ensure all know what is expected of them and, in return, what level of participation each member is able to provide.

5. Access to Education and Training

It is recommended that additional and dedicated literacy funding be made available to water and wastewater workers in communities north of Prince Albert and, indeed, to every region in the province where it is found that there are significant challenges in literacy. The funding may be used to provide pilot projects that would target workplace essential skills training in a timely and culturally appropriate manner.

6. Occupational knowledge, literacy levels, and alternative examination methods

Many exams – including the water and wastewater certification exams -- are in a format that relies heavily on the exam-taker's ability to read text-heavy, multiple-choice questions. For a water or wastewater worker with poor literacy skills, the certification exams may become tests of reading ability rather than assessments of occupational knowledge. For this reason, it is recommended that there should be an investigation into whether workers who are having difficulty with passing the certification exams could be given the option of taking the exams by alternative methods.

7. Recognition of Workers' Effort and Commitment

Because water and wastewater workers make significant sacrifices of personal time, family time, and community involvement in order to prepare for taking the certification exams, it is recommended that they receive some form of formal recognition. Examples of recognition include monetary reward, letters of congratulation, certificates of achievement, commendations in personnel files, and opportunities for advancement. It is further recommended that in the matter of recognition, all parties should be consulted

about what would be meaningful recognition for the workers' hard work and achievements.

8. Compensation for Study Time

Because water and wastewater workers are preparing for mandatory certification and because this preparation requires that significant time be set aside to study, it is recommended that water treatment plants and the municipalities in which they are situated investigate how to best compensate the workers, such as providing work time during which their workers may study, time in lieu, providing a peer study opportunity within the workplace, or a monetary compensation.

APPENDICES

- **Appendix 1: TOWES Results, Individual Tables**
- **Appendix 2: Demographics of Respondents**
- **Appendix 3: Sample TOWES Problem Set**
- **Appendix 4: Questionnaire from Customized TOWES Booklet**
- **Appendix 5: Communications**
- **Appendix 6: Contact List, Steering Committee**
- **Appendix 7: Certification Exam Results**
- **Appendix 8: Essential Skills Profile:**

Saskatchewan Water & Wastewater Workers

Appendix 1: TOWES Results, Individual Tables

Table 3: Reading Text

Urban Facilities
(3 facilities, 23 TOWES completed)
Maximum Possible Correct Answers: 35

	# correct answers	percentage
1	35	100%
2	35	100%
3	35	100%
4	35	100%
5	34	97%
6	34	97%
7	33	94%
8	33	94%
9	32	91%
10	31	89%
11	31	89%
12	31	89%
13	31	89%
14	31	89%
15	31	89%
16	29	83%
17	26	74%
18	25	71%
19	19	54%
20	16	46%
21	15	43%
22	11	31%
23	10	29%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 4: Reading Text
Facilities North of Prince Albert
(5 facilities, 9 TOWES completed)

Maximum Possible Correct Answers: 35

	# correct answers	percentage
1	34	97%
2	32	91%
3	31	89%
4	28	80%
5	27	77%
6	26	74%
7	23	66%
8	15	43%
9	10	29%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 5: Reading Text
Other
(2 facilities, 12 TOWES completed)

Maximum Possible Correct Answers: 35

	# correct answers	percentage
1	35	100%
2	34	97%
3	34	97%
4	34	97%
5	34	97%
6	33	94%
7	33	94%
8	31	89%
9	30	86%
10	30	86%
11	30	86%
12	29	83%

Table 6: Document Use
Urban Facilities
(3 facilities, 23 TOWES completed)

Maximum Possible Correct Answers: 26

	# correct answers	percentage
1	26	100%
2	26	100%
3	26	100%
4	26	100%
5	26	100%
6	25	96%
7	25	96%
8	25	96%
9	25	96%
10	25	96%
11	25	96%
12	25	96%
13	25	96%
14	24	92%
15	23	88%
16	23	88%
17	22	85%
18	20	77%
19	18	69%
20	14	54%
21	14	54%
22	12	46%
23	10	38%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 7: Document Use
Facilities North of Prince Albert
(5 facilities, 9 TOWES completed)

Maximum Possible Correct Answers: 26

	# correct answers	percentage
1	26	100%
2	25	96%
3	25	96%
4	25	96%
5	20	77%
6	19	73%
7	16	62%
8	13	50%
9	13	50%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 8: Document Use
Other
(2 facilities, 12 TOWES completed)

Maximum Possible Correct Answers: 26

	# correct answers	percentage
1	26	100%
2	26	100%
3	26	100%
4	26	100%
5	26	100%
6	26	100%
7	26	100%
8	25	96%
9	24	92%
10	23	88%
11	23	88%
12	20	77%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 9: Numeracy
Urban Facilities
(3 facilities, 23 TOWES completed)

Maximum Possible Correct Answers: 24

	# correct answers	percentage
1		100%
2	24	100%
3	23	96%
4	22	92%
5	22	92%
6	22	92%
7	22	92%
8	22	92%
9	21	88%
10	21	88%
11	21	88%
12	20	83%
13	20	83%
14	20	83%
15	20	83%
16	20	83%
17	18	75%
18	17	71%
19	16	67%
20	15	62%
21	12	50%
22	10	42%
23	9	38%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 10: Numeracy
Facilities North of Prince Albert
(5 facilities, 9 TOWES completed)

Maximum Possible Correct Answers: 24

	# correct answers	percentage
1	22	92%
2	22	92%
3	21	88%
4	16	67%
5	14	58%
6	14	58%
7	13	54%
8	13	54%
9	10	42%

The heavy line indicates cut-off point for those scores of less than 80%.

Table 11: Numeracy
Other
(2 facilities, 12 TOWES completed)

Maximum Possible Correct Answers: 24

	# correct answers	Percentage
1	23	96%
2	23	96%
3	23	96%
4	23	96%
5	23	96%
6	23	96%
7	22	92%
8	21	88%
9	21	88%
10	20	83%
11	19	79%
12	18	75%

The heavy line indicates cut-off point for those scores of less than 80%

Appendix 2: Demographics of Respondents

Demographic information on the sample group was collected by a Questionnaire that was included in the TOWES test booklet. The following tables highlight this information.

Table 12: Age Distribution (Overall)

Age	# of workers
16-24	3
25-34	12
35-44	14
45-54	11
55-64	4
Total	44

Table 13: Age Distribution: Urban, North of Prince Albert, Other

Age	Urban	North of Prince Albert	Other
16-24	2	--	1
25-34	5	3	5
35-44	6	4	3
45-54	8	2	1
55-64	2	--	2

The following two Tables reflect the number of years of formal schooling among the respondents, beginning with grade one and not counting repeated years at he same level.

Table 14:
Years of formal education
(Overall)

Years formal ed.	# of workers
6	2
10	5
11	1
12	22
13	2
14	2
15	5
16	2
17	1
25	1
Total	43*

* One participant did not answer this question

Table 15:
Years of Formal Education (Urban, North of Prince Albert, Other)

Years of formal ed.	Urban	North of Prince Albert	Other
6 years		2	
10 years	3	2	
11 years		1	
12 years	14	4	4
13 years	1	--	1
14 years			2
15 years	2		3
16 years			2
17 years	1		
25 years	1		

Table 16:
Highest Level of schooling completed by respondent

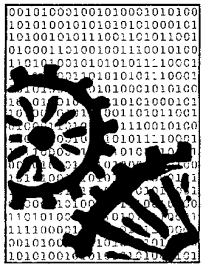
	Overall	Urban	North of Prince Albert	Other
Less than High School	6	3	3	
High School	19	13	4	2
Trade or vocational certificate	4	1	1	2
Apprenticeship certificate	4	2	1	1
Non-university certificate or diploma	10	3		7
University degree	1	1		
Total	44	23	9	12

Table 17:
First language of respondents with less than 12 years of formal education

Years of formal ed.	Urban	North of Prince Albert	Other
6 years		2 Cree for both	
10 years	3 English for all	2 Cree for both	
11 years		1 English	

One respondent, whose mother tongue was not English, French or First Nations, had a university degree and 25 years of education.

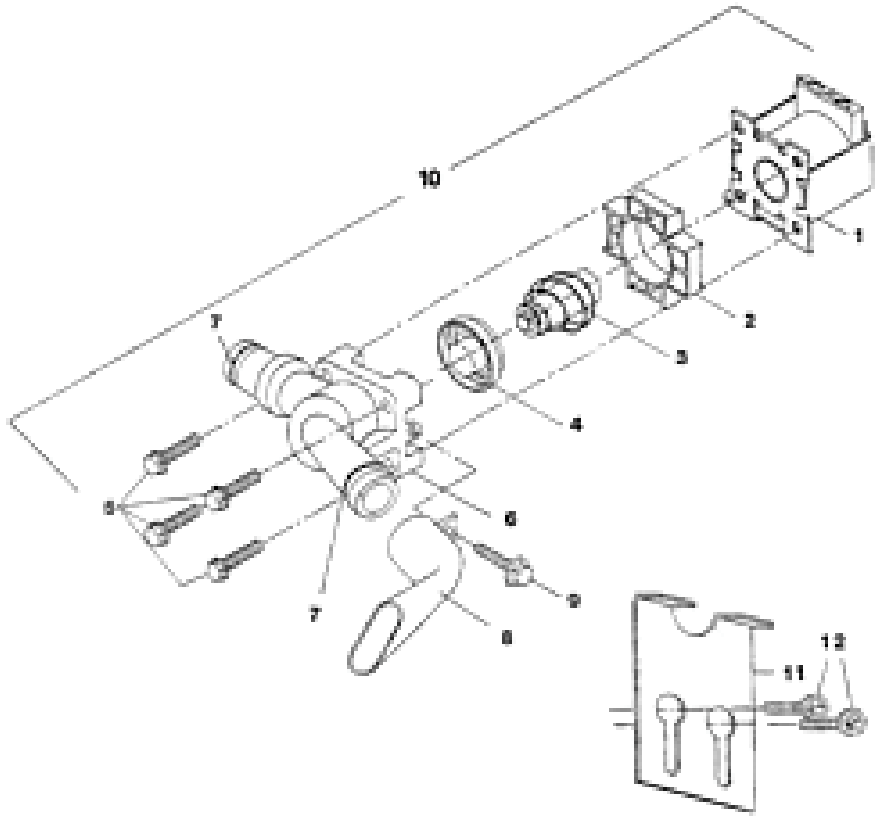
Appendix 3: Sample TOWES Problem Set



TOWES

TEST OF WORKPLACE ESSENTIAL SKILLS

Sample Problem Set



EATON BREWER VALVE ASSEMBLY

Items with Part Numbers are Stocked by RMI

1.	Coil, Red	30596
2.	Adapter	27787
3.	Armature and Spring	30598
4.	Diaphragm	27793
5.	Screw, Valve Mounting	
6.	Body, Brewer Valve, White	28732
7.	"O" Ring, ½ x 1/8	14759
8.	Spout, Brewer Valve, Black	28733
9.	Screw, 6 x 1/2, PH, Type 25, SCP	28825
10.	Valve Asm Brewer (Includes Items 1-9)	30854
11.	Bracket, Brewer Valve Retainer	28814
12.	Screw, 8-32 x 1/4, HH, SCP	14806

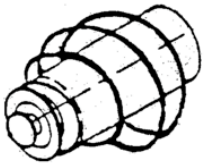
NOTE: Items 11 and 12 are Sold Separately from Valve Asm, Item 10

Brewer Valve Problem

Look at the drawing and parts listing for the Eaton brewer valve on the page opposite.

Brewer valves are found in automatic coffee machines. They open to allow hot water to mix with the coffee.

Question 1 What is the name of the part shown here?



_____

Question 2 What is the part number of the two "O" rings used in this valve?

_____

Question 3 What part number would a repair person use to order the whole valve?

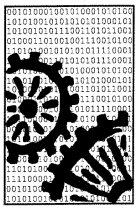
_____

Question 4 On the drawing, highlight or circle the picture of the parts that are not included when Part 10 is ordered.

Mark the brewer valve diagram

_____

Appendix 4: Questionnaire from Customized TOWES Booklet



Questionnaire

Please give us the following background information so that we can better interpret your test results. To protect your privacy, all of the data collected by TOWES is related to the test booklet, not to you as an individual.

A1 Age ○ 16 - 24 ○ 25 - 34 ○ 35 - 44 ○ 45 - 54 ○ 55 - 64

A2 Gender ○ Male ○ Female

A3 Were you born in Canada?

○ yes, Canadian citizen by birth. Go to question A5

○ no

A4 How many years have you lived in Canada? ☐☐ years

A5 What is the language you first learned at home in childhood and still understand? (Mark only one unless two languages were learned at the same time)

○ English ○ French
○ Italian ○ Chinese
○ German ○ Portuguese
○ Polish ○ Ukrainian
○ Spanish ○ Dutch
○ Punjabi ○ Greek
○ Other _____

A6 During your lifetime, how many years of formal education have you completed, beginning with grade one and not counting repeated years at the same level?

☐☐ years If 00, no education, go to question A8

Turn page for more questions

A7 What is the highest level of schooling that **you** have ever completed?

- ○ less than high school
- ○ high school
- ○ trade or vocational certificate
- ○ apprenticeship certificate
- ○ CEGEP diploma or certificate
- ○ non-university certificate or diploma from a school of nursing, technical institute, or other such educational institution.
- ○ university transfer program
- ○ university degree

A8 What is the highest level of schooling that **your mother** ever completed?

- ○ less than high school
- ○ high school
- ○ more than high school

A9 What kind of training have you received for your present job?

- ○ training courses
- ○ on-the-job training
- ○ self-study
- ○ other _____

A10 What training would you like to receive in order to do your job better or get a different job? *(for example, computer skills training, basic accounting, or leadership courses.)*

_____

Thank you for completing this questionnaire.
Now, go to the next page and begin the test

Test booklet code	WWO101A	**10**

Appendix 5: Communications

CUPE Literacy News, May 2003

CUPE leads the way in Saskatchewan

Naomi Frankel, Saskatchewan literacy project coordinator

What happened in Nova Scotia eight years ago is now happening in Saskatchewan. The provincial government has decided that as many as 750 water workers who are now working in water and wastewater plants must be certified by January 2005.

In response to mandatory certification, CUPE's national literacy project has been working closely with the Saskatchewan Federation of Labour to set up Canada's first union-led essential skills project for water workers.

"We think that some workers in the sector may need tuning up in areas such as reading, problem solving, writing, and math skills that they use every day on the job," says Naomi Frankel, the project's coordinator. "Phase one of the project will look at these essential workplace skills and then develop a plan of action for offering training and education to meet needs in this area." Saskatchewan's Department of Education is providing funds for phase one of the project, which began in January and will run until the end of the summer.

Ron Torgerson says the challenge in Saskatchewan is that "quite a number of the workers who are facing certification are of 'a certain age', namely over 50." Torgerson is labour co-chair of the CUPE project and coordinator of the Workers' Education for Skills Training (WEST) program, which has been part of the Saskatchewan Federation of Labour since 1982. "These workers have been out of school since the 1960s and for some of them, the idea of writing an exam is very frightening," Ron says.

The focus of the Saskatchewan project will be both water workers and wastewater workers. Only about 200 of the 1,300 water workers in Saskatchewan are CUPE members, although many are members of other unions. Ron says the project embraces all of the workers, no matter what their union affiliation. "In fact, we are expecting that most of the people we will be in touch with have no experience working together as a group," he says.

Labour's perspective on essential skills includes the idea that workers have skills and knowledge they have developed on the job. A process called Recognition of Prior Learning (RPL) aims to recognize that "knowledge is just as important as credentials," Ron says. During phase one of the project, this perspective will be introduced at group meetings led by the project coordinator.

For more information about the Saskatchewan Water Workers Essential Skills Project, contact Naomi Frankel at (306) 374-6968 or by e-mail at waterworkersproject@mail.com

BC and Ontario are interested

In British Columbia, CUPE research representative Kathy Corrigan is working with CUPE water workers to ensure that their needs and concerns are reflected in that province's mandatory certification program. Although the regulations have not yet been handed down, the BC government has said that all water workers must have Level 1 and Level 2 certification by January 2005, and higher levels by January 2006.

(Continued on page 4)

(continued from page 3)

Late last year, Kathy sent a short survey about mandatory certification to all CUPE municipal locals in BC. She also met with a group of 23 CUPE water workers to hear what they had to say about certification.

"I got a real sense of how professional they are about the work they do," she says. "They take their jobs very seriously, and believe that it's their responsibility to provide clean drinking water to the public."

The survey results showed that CUPE locals believe as many as 1,000 water workers may need to be certified in the years to come. "We know the situation, that some of our members who have 20 years' experience but who are not certified, will create some challenges for us," says Kathy. That's why CUPE is talking to the BC government about oral exams, about Prior Learning Assessment and about help with basic literacy skills.

With all the cutbacks the Campbell government is making to programs in BC, Kathy says she is not sure where the money will come from. But the work going on in Saskatchewan and the solidarity that has been building among CUPE water workers across the country may make it possible to find a way forward in the months to come.

In Ontario, CUPE is frustrated that that the Eves government won't allow us to see or comment on regulations that the province is developing as part of the Safe Drinking Water Act. The Act, passed in November 2002, says that water workers in the province must be certified by the end of 2004. If the Ontario government calls a spring election, the new regulations may be delayed even further, says Shelly Gordon, a research representative in CUPE's Ontario regional office.

Resources

Free kits. If your literacy program could use a kit that contains a variety of resources for classroom teachers, please contact Sylvia Sioufi at CUPE National in Ottawa. Materials in the kit were donated to the CUPE Literacy Project by the Labour Education Centre of the Toronto and York Region Labour Council. (For Sylvia's contact information, check the box at the bottom of this page.)

CUPE Literacy Project Reference Group

These CUPE people are literacy activists who are helping to guide and support the Literacy Project:

Ron Bishop, CUPE 30, Alberta
Danny Cavanagh, CUPE 734, Nova Scotia
Leo Cheverie, CUPE 1870, PEI
Tom Ciancone, CUPE 4400, Ontario
Catherine Jeffrey, HEU, British Columbia
Jim Jensen, CUPE 825, British Columbia
Gail Lasiuk, CUPE 1975, Saskatchewan
Dianne Martin, CUPE 1289, Newfoundland
Donald McLaughlin, CUPE 1282, New Brunswick
Kathy Todd, CUPE 500, Manitoba
Monique Joly, Union Development Staff
Cathy Remus, National President's Office
Sylvia Sioufi, Literacy Project Coordinator

This newsletter is published by the CUPE Literacy Project. For more information or to subscribe, please contact:

Sylvia Sioufi, Project Coordinator.
Phone: 613-237-1590. E-mail: literacy@cupe.ca
or visit our website www.cupe.ca
(look for Literacy under Getting involved with CUPE).

We are grateful to the National Literacy Secretariat, Human Resources Development Canada for its support of the CUPE Literacy Project.

Learning Together (Canadian Labour Congress) Fall/Winter 2003

2

Learning and clean water: labour takes the plunge

Following a 2002 inquiry into a serious incident of contaminated water in North Battleford, Saskatchewan, water and wastewater workers now have to be certified by June 2005. For many of these workers, certification is going to be a problem.

In northern Saskatchewan and in small communities across the province, many got their Grade 12 decades ago, while others never went past Grade 8 or 10. Although the workers may well be doing their jobs safely and effectively, they could face problems with the certification exams if they have difficulty reading text and documents or if they have forgotten math skills they don't use. They may also need help with how to take an exam: dealing with multiple choice questions, for example, and managing exam anxiety.

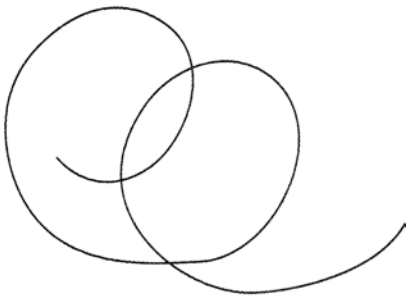
The aim of the Water and Wastewater Workers Essential Skills Project is to support workers in the sector who face losing their jobs or being frozen in their current jobs if they do not get certification. The project is surveying workers across the province to see what their training needs are in essential skills and recommending training strategies.

The union-led Sector Committee for the project, with representation from CUPE and CEP and co-chaired by Ron Torgerson of the Saskatchewan Federation of Labour (SFL), is committed to looking at the certification issue from a worker-centred point of view.

For more information on the project, contact Naomi Frankel, Project Coordinator at: *waterworkersproject@mail.com*

by Naomi Frankel, Project Co-ordinator, member of CUPE and the American Federation of Musicians.

"The union-led Sector Committee... is committed to looking at the certification issue from a worker-centred point of view."



Organization	Contact Person	Telephone & email
Canadian Union of Public Employees		Regina: 306-525-5874 cupesask@sasktel.net
City of Regina Water/Wastewater Management	John Harrison Engineering & Works	Regina:306-777-7642 jharriso@cityregina.com
Communications, Energy & Paper Workers Union	Rhoda Cossar Staff rep	Regina: 306-777-0006 rhoda.cep@sasktel.net
Federation of Saskatchewan Indian Nations	Bill Marion	Kinistino: 306-864-3636 bmarion.jscn@sasktel.net
Saskatchewan Environment Drinking Water Quality Section Environmental Protection Branch	Gus Feitzelmayer	Regina: 306-787-6174 Fax: 306-787-0197 gfeitzelmayer@serm.gov.sk.ca
Saskatchewan Federation of Labour	Ron Torgerson	Regina: 306-924-8574 Fax: 306-525-8960 sfl.west@sasktel.net www.sfl.sk.ca
Saskatchewan Institute of Applied Technology (SIAST)	Vern Corbett, Program Head, Civil Engineering Technology Program	Moose Jaw: 306-694-3340 http://www.siast.sk.ca/virtualcampus/educationtraining/technology/waterwastewater.htm
Saskatchewan Learning Training and Employment Programs Unit	Betty Fisowich	Regina: 800- 597-8278 Fax: 306-787-7182 bfisowich@sasked.gov.sk.ca
Saskatchewan Learning Recognition of Prior Learning		recognizinglearning@sasked.gov.sk.ca http://www.sasklearning.gov.sk.ca/branches/institutions/rpl/indexshtml
Saskatchewan Labour Force Development Board		Regina: 306-352-5999 http://www.slfdb.com
Saskatchewan Regional Colleges: Carlton Trail Cumberland Cypress Hills Lakeland Northlands North West Parkland Prairie West South East	Program contacts: Don Harris Julie Bedel Theresa Cole Bob Cholowski Bebe Ivanochko Michael Yuhasz Brian Shul Gord Bothnar Trent Jordens	 306-554-3767 306-862-9846 306-778-5462 780-871-5773 306-425-4480 306-234-5100 306-728-6596 306-948-1307 306-848-2508
Saskatchewan Water & Wastewater Assn.	Mark Krecsy, President	306-695-3808 Fax: 306-695-2398 krecsy.swwa@sasktel.net
Water & Wastewater Workers Essential Skills Project:	Naomi Frankel, Project Coordinator	306-546-2101 naomi_frankel@email.com

Appendix 7: Certification Exam Results

Saskatchewan Water/Wastewater Operator

Certification Exam Results

All Locations/Sponsors/Trainers

July 21, 2000 to March 31, 2004

Time Frame	Exams Written	Exams Passed	Percentage Passed
July '00 – Dec. '00	319	259	81%
Jan. '01 – Dec. '01	993	761	77%
Jan. '02 – Mar. '02	374	297	79%
Apr. '02 – Mar. '03	1,497	1,062	71%
Apr. '03 – Mar. '04	1,912	1,500	78%
Totals:	5,095	3,879	76%

Note: includes all Saskatchewan locations; includes all trainers/sponsors.

Saskatchewan Water/Wastewater Operator

Certification Exam Results

Locations North of Prince Albert

July 21, 2000 to March 31, 2004

Time Frame	Exams Written	Exams Passed	Percentage Passed
July '00 – Dec. '00	-	-	-
Jan. '01 – Dec. '01	153	73	48%
Jan. '02 – Mar. '02	89	63	71%
Apr. '02 – Mar. '03	345	188	54%
Apr. '03 – Mar. '04	288	229	80%
Totals:	875	551	63%

Note: Includes all Saskatchewan locations North of Prince Albert (PA) (except City of PA); includes all trainers/sponsors. Excludes two mine-sites where staff may likely come from south of PA.

Appendix 7: Essential Skills Profile

Water and Wastewater Operators

(Saskatchewan Class 1 and 2 Facilities)

Water and Wastewater Operator

Introduction

Water and wastewater operators monitor, evaluate and adjust processes using manual, semi-automatic (computerized) control systems and related equipment in water treatment plants to regulate the treatment and distribution of water. They evaluate the characteristics of source and treated water, and perform and interpret laboratory analysis of water samples collected and make appropriate process control changes. Water and wastewater operators monitor, evaluate and adjust processes using manual, semi-automatic (computerized) control systems and related equipment in wastewater treatment facilities to regulate the treatment and disposal of treated sewage and wastes. Water and wastewater operators perform preventative and corrective maintenance on instruments and equipment. They are employed by municipalities (towns and cities).

The most important Essential Skills for water and wastewater operators are:

Document use

Numeracy

Decision making

A. Reading Text

The Essential Skill of ***Reading Text*** refers to reading material that is in the form of sentences or paragraphs. ***Reading Text*** generally involves reading notes, letters, memos, manuals, specifications, regulations, books, reports or journals. ***Reading Text*** includes:

- forms and labels if they contain at least one paragraph;
- print and non-print media such as computer screen and microfiche text; and
- paragraph-length text within charts, tables and graphs.

The Reading Text Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical text reading tasks of water and wastewater operators are at Complexity Levels 1 to 3. Their most complex text reading tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

read notes from supervisors to confirm what work tasks have been assigned. (1)

read short memos from municipal administrators addressing municipal concerns, budget issues, water and wastewater-related matters, and administrative procedures. (1)

read directions on containers of various treatment chemicals, e.g. hydrofluosilic acid (fluoride) and chlorine to understand solution strengths, product handling procedures, application processes and health and safety warnings. (2)

may skim newspaper and Internet articles to learn more about water and wastewater treatment-related subjects such as emerging technologies, water-borne illnesses, environmental concerns, and water treatment incidents. (2)

may read professional journals such as the Saskatchewan Water and Wastewater Association newsletter, *The Pipeline* or *Public Works*, *Water and Wastes Digest* and *Water and Engineering Management* to learn about new technologies and equipment, and other water treatment-related topics. (2)

read Material Safety Data Sheets (MSDS) to locate information about safe handling of a substance. Text may be a paragraph in length and contain technical terms. (2)

refer to provincial and municipal regulations, various standards, design guides, objectives and other guidelines to identify approved processes, standards, specifications, tolerances and safety practices. (3)

refer to training manuals to remind themselves of processes and mathematical formulas not regularly addressed on the job. (3)

read manufacturers' equipment manuals to learn about use, repair, maintenance, calibration, troubleshooting and technical specifications of laboratory, water and sewage treatment equipment. (3)

Reading Profile

Type of Text	Purpose for Reading			
	To scan for specific information/To locate information.	To skim for overall meaning, to get the 'gist'.	To read the full text to understand or to learn.	To read the full text to critique or to evaluate.
Forms				
Labels				
Notes, Letters, Memos				
Manuals, Specifications, Regulations				
Reports, Books, Journals				

B. Document Use

Document Use refers to tasks that involve a variety of information displays in which words, numbers, icons and other visual characteristics (e.g., line, colour, shape) are given meaning by their spatial arrangement. Workplace examples of documents include graphs, lists, tables, blueprints, schematics, drawings, signs and labels.

If a document includes a paragraph of text, as may be the case on a label or a completed form, it is also included in ***Reading Text***. Documents requiring the entry of words, phrases, sentences and paragraphs are also included in ***Writing***.

The Document Use Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical document reading tasks of Water and wastewater operators are at Complexity Levels 1 to 3. Their most complex document reading tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

record in a water consumption log the amount of water treated every 24 hours to determine if daily consumption amounts correspond to previous readings and established trends. (1)

to monitor water quality, record on a daily basis in an analysis and testing form the amount of iron and manganese found in water samples. (1)

complete preventative maintenance checklists and log book entries to provide written record of the tasks addressed on a specific date. (1)

read LCD displays on instruments such as turbidity meters, water meters, digital pH meters, water and wastewater flow meters and pressure gauges. (1)

interpret pipe colours to differentiate between pipes carrying untreated and treated water. (1)

may make short point form entries into a daily communications or log book to inform or remind co-workers what tasks have been completed, what problems have arisen, and what tasks must be undertaken. (1)

may use topographical maps to identify where waste water will drain if valves are opened and water released. (1)

to assess the possibility of contamination or system leakage, record on a daily basis in an analysis and testing form the chlorine residual levels in collected water samples. Errors in data entry can have negative health and environmental consequences. (2)

read chemical dosage charts supplied by provincial environment officials and manufacturers to ensure correct amounts of chemicals such as chlorine and fluoride are being released into the water supply. (2)

interpret blueprints to determine where water lines are located. (2)

use schematics to identify pipeline configurations and valve locations. (2)

use elevations to determine if gradients are adequate for storm sewers to function efficiently. (2)

observe WHMIS symbols and make interpretations regarding their applications. (2)

read Material Safety Data Sheets (MSDS) to learn about hazardous products such as chlorine gas. (2)

interpret assembly drawings and cross-sectional diagrams to disassemble, assemble and repair equipment such as pump motors and aeration equipment. (2)

take measurements from maps drawn to scale to determine the distance of a pipe, reservoir, curbstop or well from a specific reference point. (2)

recognize common angles to understand water line configurations. (2)

interpret strip charts generated by computerized Bailey meter. (2)

complete a government testing form which includes a free and total chlorine and turbidity reading to accompany the compulsory water sample submitted weekly or bi-weekly to a regional government lab. Knowledge of the subject matter is required to assess if treatment processes need to be adjusted. Errors in data entry can result in liability issues. (2)

may complete water complaint forms to document water and sewage problems reported by the public, and actions taken to remedy the situation. These reports may be used in a court of law in the event of a water quality incident. (2)

may write a brief point form report to document tasks completed during the shift, problems encountered, actions taken, and follow-up required. (2)

may complete purchase orders, expense claims and budget templates. (2)

read blueprints for information on site layouts, physical dimensions of structures, and machinery specifications to plan new installations or to make repairs to existing structures and equipment. (3)

read tables, graphs and charts embedded in government documents such as the *Drinking Water Compliance Report 2002*. (3)

Examples of creating documents:

Water and wastewater operators:

make sketches of pipelines, joints, trenches and flow patterns to assist with water line maintenance and construction.

may create their own data capture forms to record information such as amount of water treated on a daily basis, water analysis and test results, daily pump readings, chemical levels and dosages, and flow quantities. These documents are usually in a tabular format and may include pre-programmed formulae.

may create duty lists for team members to ensure tasks are addressed in an efficient and timely manner.

may create shift schedules for staff members, including “on-call” assignments.

may take photographs of damaged or malfunctioning system components as well as repairs completed to document problems and provide evidence of solutions implemented.

may prepare a list of water/wastewater laboratory and treatment equipment and chemicals on hand or a spare parts inventory.

may prepare a plan and instructions for normal and emergency operation of water/wastewater facility equipment and/ or process.

may prepare a plan and procedures for operation of water/wastewater facility in response to an emergency such as water contamination, chemical spill or major power outage.

Document Use Profile

Water and wastewater operators:

read signs, labels or lists.

complete forms by marking check boxes, recording numerical information or entering words, phrases, sentences or texts of a paragraph or more.

read completed forms containing check boxes, numerical entries, phrases, addresses, sentences or texts of a paragraph or more.

read tables, schedules or other table-like text.

enter information on tables, schedules or other table-like text.

obtain specific information from graphs or charts.

interpret information on graphs or charts.

recognize common angles such as 15º, 30º, 45º, and 90º.

draw, sketch or form common shapes such as circles, triangles, spheres, rectangles, squares, etc.

interpret scale drawings.

make measurements from scale drawings.

read assembly drawings.

read schematic drawings.

make sketches, includes creating sketches for assembly.

obtain information from sketches, pictures (includes photographs) or icons.

C. Writing

The Essential Skill of ***Writing*** includes:

- text writing and writing in documents such as filling in forms; and
- non-paper-based writing such as typing on a computer.

The Writing Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical writing tasks of Water and wastewater operators are at Complexity Level 1 to 3. Their most complex writing tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

outline in pocket notebooks or personal work diaries any unusual situations encountered, specific actions taken, and monitoring processes used. These entries include specific details in cases where potential liability issues could arise. (1)

write brief notes on preventative maintenance forms to indicate information such as deficiencies identified, actions taken, and follow-up measures required. (1)

may write notes to co-workers and supervisors to coordinate work activities and provide details about job progress. (1)

write a brief point form monthly report to the municipality to detail operations and expenditures. (2)

communicate system upsets and disinfection system failures to environmental officers as soon as possible as required by Regulation 37(2). (2)

may complete complaint forms to note issues raised by the public regarding water quality, and the actions taken to address these concerns. In the event of a water quality incident, these documents could be used in a court of law. (2)

prepare an annual report to council of sampling frequency and quality of water produced and how parameters of water produced relate to water quality standards. (2)

may complete accident/incident investigation reports to record information and explanations about occurrences. This requires 2-3 paragraphs, and some analysis and integration of information. Since these documents could be used in a court of law, clarity, detail and accuracy are important. (3)

Writing Profile

Length	Purpose for Writing						
	To organize/ to remember	To keep a record/ to document	To inform/ to request information	To persuade/ to justify a request	To present an analysis or comparison	To present an evaluation or critique	To entertain
Texts requiring less than one paragraph of new text							
Texts rarely requiring more than one paragraph							
Longer texts							

D. Numeracy

The Essential Skill of ***Numeracy*** refers to the use of numbers by workers and their requirement to think in quantitative terms in order to complete tasks. Two aspects of ***Numeracy*** are profiled: *Numerical Calculation* and *Numerical Estimation*.

Numerical Calculation is rated within four different application settings as specific knowledge of concepts or procedures are exclusive to each setting:

- ***Money Math*** - financial transactions, such as handling cash, preparing bills or making payments;
- ***Scheduling or Budgeting and Accounting Math*** - managing time and money as resources, planning and monitoring their use, assessing best value, reducing waste;
- ***Measurement and Calculation Math*** - measuring and describing the physical world; and,
- ***Data Analysis Math*** - analysis of numerical data.

Numerical Estimation refers to tasks involving any estimation (i.e., an approximation based on judgment) that results in a number.

Numerical Calculation

The Numerical Calculation Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The numeracy tasks of water and wastewater operators involve:

money math at Complexity Level 1.

scheduling or budgeting and accounting math at Complexity Level 2.

measurement and calculation math at Complexity Levels 1 to3.

data analysis math at Complexity Levels 1 and 2.

Examples

Water and wastewater operators:

purchase materials and services using company purchase orders or credit cards. (money math) (1)

schedule their own daily activities to complete assigned tasks. (scheduling or budgeting and accounting math) (1)

may assign duties and develop daily work schedules to ensure all activities are completed and that individual team member strengths are used to best advantage. (scheduling or budgeting and accounting math) (2)

calculate 24 hour consumption amounts by recording the amount of water treated as indicated by the meter, and subtracting the previous day's total. (measurement and calculation math) (1)

measure the length of pipe required to replace older or damaged lines. (measurement and calculation math) (1)

calculate chemical dosage rates by comparing the amount of chemical added in a 24 hour period to the volume of water treated. The rate is expressed in terms of parts per million or milligrams per litre. (measurement and calculation math) (1)

calculate the amount of chlorine gas used daily by weighing the gas canister and subtracting the previous day's recorded weight. (measurement and calculation math) (2)

calculate adjustments in solution strength when switching from chlorine gas which is 100% strength to liquid chlorine which is 12% solution strength. (measurement and calculation math) (2)

convert measurements from the Imperial system and US gallons to metric and visa versa when instruments such as meters and pressure gauges are calibrated in different measurement systems. (measurement and calculation math) (2)

calculate the amount of chemical needed for a dosage using a formula. For example, dosage x gallons treated x 10 x 100% divided by (1,000,000 x % active ingredient). (measurement and calculation math) (3)

compare pressure gauge readings to stated norms to determine if a pump is malfunctioning or there is a leak in the system. (data analysis math) (1)

compare readings for chlorination levels to stated norms to determine if there is a contaminate in the system or an equipment malfunction. (data analysis math) (1)

compare the total chlorine reading to the free chlorine reading to determine if the gap between the two measurements indicates contamination. (data analysis math) (1)

compare daily consumption amounts to previous readings and identified trends to determine if there is a possible leakage or contamination problem. (data analysis math) (2)

analyse daily, weekly and monthly water consumption rates to determine average consumption amounts for reporting purposes. (data analysis math) (2)

compare iron and magnesium readings to water quality regulations and to previous days' readings to determine if a possible equipment malfunction has occurred or if filter backwashing is required. (data analysis math) (2)

compare chlorine readings to water quality regulations to determine if they are too low which could indicate equipment malfunction, contamination in the reservoir or a line break. (data analysis math) (2)

Numerical Estimation

The Numerical Estimation Rating Scale ranges from Level 1 (least complex) to Level 4. The numeracy tasks of Water and wastewater operators involve numerical estimation at Complexity Levels 1 and 2.

Examples

Water and wastewater operators:

estimate how much additional chlorine or other chemical will be fed into the system when the amount of water to be treated increases due to spikes in demand. (1)

estimate the amount of time tasks will take to ensure daily work schedules are completed. (1)

estimate how many containers of chemicals to keep on hand to ensure proper functioning of the water treatment facility. This includes accounting for seasonal peaks and planned water-intensive municipal events. (2)

Math Skills Profile

a. Mathematical Foundations Used

Number Concepts	
Whole Numbers (e.g., 1, 2, 3)	Read and write, count, round off, add or subtract, multiply or divide whole numbers. For example, adding daily water consumption quantities measured in gallons to calculate weekly and monthly totals.
Rational Numbers – Fractions (e.g., ½, ⅝)	Read and write, add or subtract fractions, multiply or divide by a fraction. For example, measuring the location of shut-off valves (curb stops) from property lines in feet and fractions of feet such as 14 ½ feet.
Rational Numbers – Decimals (e.g., 8.50, .75)	Read and write, round off, add or subtract decimals, multiply or divide by a decimal, multiply or divide decimals. For example, converting US gallons to litres using the conversion rate: 1 US gal. = 3.785 L. For example, measuring milligrams per litre of free and total chlorine in daily chlorine testing.

Rational Numbers – Percent	Read and write percentages, calculate the percent one number is of another, calculate a percent of a number. For example, calculating solution strengths such as a 50% solution. For example, using 2% concentrations of potassium permanganate ($KMnO_4$) to achieve total saturation.
Equivalent Rational Numbers	Convert between fractions and decimals or percentages, convert between decimals and percentages. For example, converting decimals to percentages by multiplying by 100 when performing calculations requiring percentage solution strengths.
Other Real Numbers	Use powers and roots, scientific notation, significant digits. For example, using volume measurements such as cubic metres. For example, using formulas such as $л\ r^2$ to calculate the floor area of a round tank.

Patterns and Relations	
Equations and Formulae	Use formulae by inserting quantities for variables and solving. For example, calculating flow rates of millilitres per minute (mL/min) using the formula: $\frac{\text{gals./day x 4,546 (L/gal) x 1000 (mL/L)}}{\text{1440 min./day}}$ For example, calculating dosage for a solution feed using the Imperial measurement system: $\frac{\text{\% solution strength x gals. solution used x 1,000,000}}{\text{gals. treated x 100\%}}$
Use of Rate, Ratio and Proportion	Use a rate showing comparison between two quantities with different units, use a ratio showing comparison between two quantities with the same units, use a proportion showing comparison between two ratios or rates in order to solve problems. For example, calculating chemical dosage rates as parts per million (PPM). For example, expressing solution strengths as a ratio such as a 2:1 solution. For example, calculating dosages as milligrams per litre. For example, calculating pressure as pounds per square inch (PSI).
See *Document Use* for information on:	- Using scale drawings.
Shape and Spatial Sense	
Measurement Conversions	Perform measurement conversions For example, converting Imperial gallons to litres by using the formula: 1 gal. = 4.54 litres. For example, converting litres to millilitres by multiplying the number of litres by 1000.
Areas, Perimeters, Volumes	Calculate areas, calculate perimeters and volumes. For example, calculating the volume of a reservoir. For example calculating the surface area of a lagoon.
Geometry	Use geometry. For example, calculating pipe circumference by using the formula: Circumference = Diameter x л

See *Document Use* for information on:	- recognizing common angles; - drawing, sketching and forming common forms and figures.
Statistical Probability	
Summary Calculations	Calculate averages, calculate ratios other than percentage; calculate proportions or ratios. For example, calculating average daily, weekly and monthly water consumption rates.
See *Document Use* for information on:	- using tables, schedules or other table-like text - using graphical presentations.

b. How Calculations Are Performed

Water and wastewater operators perform calculations:

in their head.

using a pen and paper.

using a calculator.

using a computer .

c. Measurement Instruments Used

Water and wastewater operators measure:

time - using a clock, watch, stop watch.

weight or mass – using a scale or balance.

distance or dimension - using a tape measure, squares, measuring wheel, callipers.

liquid volume – using a meter, graduated cylinder, electronic float level, ball float, construction

levels, cuvette or pipette

temperature - using a thermometer, digital pH meter.

pressure - using a pressure gauge.

amperage – using an amp meter.

volts – using a voltage meter.

angles – using squares.

turbidity – using a turbidimeter

coagulant dosage – jar testing apparatus

chlorine residual, iron & manganese concentrations – using a spectrophotometer, colorimeter, photometer or test kits

pH – using litmus paper or digital pH meter.

atmospheric hazards – using a gas meter or chlorine gas detector.

Flow – using timing meters or pumps or time to fill a known volume.

They use:

the SI measurement system.

the Imperial measurement system including US gallons.

E. Oral Communication

The Essential Skill of **Oral Communication** pertains primarily to the use of speech to give and exchange thoughts and information.

The Oral Communication Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical oral communication tasks of Water and wastewater operators are at Complexity Level 1 to 2. Their most complex oral communication tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

interact with supervisors to receive task-specific directives. (1)

interact with co-workers to coordinate work and to schedule activities. (1)

interact with suppliers and manufacturers to get product information, to order supplies and equipment, and to seek advice regarding processes and results. (2)

discuss with provincial environmental officers water testing results, government regulations, environmental concerns, and other water and sewage treatment-related issues. (2)

communicate system upsets and disinfection system failures to environmental officers as soon as possible as required by Regulation 37 (2). (2)

communicate with the general public to address concerns about water quality, system malfunctions, household meter readings, and customer service. (2)

communicate with the public at open house events at the waterworks. For example, for school groups. (2)

interact with municipal officers to receive information about administrative processes, budgets, equipment and supplies, general water treatment concerns, salary issues, staffing and special work assignments. (2)

may interact with former employees or operators at other facilities to get information and advice regarding challenging or historical issues. (2)

may train new employees to ensure they understand facility-specific procedures and operating conventions. (2)

may interact with businesses to deal with complaints when their production is adversely affected by waterline breaks and water pressure problems. (2)

may communicate formally with town council to provide water and sewage updates, request additional funds, propose projects, make recommendations, defend actions, and provide technical advice. (3)

may communicate formally with co-workers as an officer in the operator association or speak at workshops or conferences. (3)

Modes of Communication Used

Water and wastewater operators communicate:

in person.

using the telephone.

using a two-way radio or other such means.

using specialized communication signals, for example informal hand signals.

Environmental Factors Impacting Communication

Water and wastewater operators have to access confined spaces such as a chlorine gas storage rooms, pumping stations, and manholes where self-contained breathing apparatus, eye protection, masks and protective clothing may have to be worn. They also work in extremely cold and wet conditions repairing water and sewage lines and malfunctioning pumps. Wind, equipment noise, rushing water and protective equipment can impact communication. In addition, water and wastewater operators may have to engage in trenching activities in which visibility is restricted. Since much of the job involves site travel, cell phone and two way radio communication is common.

Type	Purpose for Oral Communication											
	To greet	To take messages	To provide/ receive information, explanation, direction	To seek, obtain information	To co-ordinate work with that of others	To reassure, comfort	To discuss (exchange information, opinions)	To persuade	To facilitate , animate	To instruct, instill understanding, knowledge	To negotiate, resolve conflict	To entertain
Listening (little or no interaction)												
Speaking (little or no interaction)												
Interact with co-workers												
Interact with those you supervise or direct												
Interact with supervisor/ manager/ regulators												
Interact with customers/ clients/ public												
Interact with suppliers, servicers												
Participate in group discussion												
Present information to a small group												
Present information to a large group												

F. Thinking Skills

Thinking Skills differentiate among five different types of cognitive functions. However, these functions are interconnected and include:

1. ***Problem Solving***
2. ***Decision Making***
3 ***Job Task Planning and Organizing***
4. ***Significant Use of Memory***
5. ***Finding Information***

1. Problem Solving

Problem solving involves problems that require solutions. For example, a mechanic solves problems, e.g., the car shakes when driven over 80 km./hr., by eliminating probable causes until the correct one is identified and remedied. Most problems concern mechanical challenges, people or situations.

The Problem Solving Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical problem solving tasks of Water and wastewater operators are at Complexity Levels 1 to 3. Their most complex problem solving tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

may experience a fire in the town. This requires monitoring water flows to ensure there is enough pressure for fire trucks to fill and discharge. If additional water pumps activate to meet increased demand, chlorine levels must be monitored. When the fire fighting activities cease, pumps will switch off, meaning further adjustment to chlorine levels is required. (1)

discover the main pump which should operate continuously is not running and will not reset. The second pump which should only respond to increased demand is not shutting off when water pressures drop. Water and wastewater operators do an on-site check of the second pump to ensure it is operating properly. They then investigate the first pump to determine if it must be taken out of use for cleaning and repair. (1)

sometimes face iron and magnesium readings that are too high. If this happens suddenly, the test is redone and the chemical feed pump is examined for a malfunction. If it happens gradually over a period of days, the tests are likely redone and the

operation is reviewed and the condition of the filter media is evaluated to determine if a change is required. (1)

must be shut down which can cause sewage to back-up in residents' basements. As a countermeasure, a septic company is called to pump the sewage while equipment is examined to determine the extent of repairs required. The objective is to get one pump operational as soon as possible. (1)

are sometimes faced with low water flows to the water treatment plant. They assess the situation by checking the pumps to determine if there is a malfunction. If pumps are operating properly, a waterline break is assumed. (2)

are sometimes faced with daily consumption rates that are significantly higher than expected. Investigative research is undertaken to determine if water consuming activities such as industries using more water than normal or if there is a water break. (2)

sometimes experience chlorine testing results that are below acceptable levels. The test is re-done to validate results. If the reading is still low, the chemical feed is checked to ensure it is operating properly. If there are no mechanical problems, the filters, well sites and reservoirs are tested for contamination. If there is no indication of contamination, a break in the line may be investigated. (2)

receive complaints from residents about water quality. The problem is addressed by visiting the household and taking a water sample for testing. If the test results fall within defined parameters, other explanations are sought. While the investigation is being conducted, the resident is reassured and advised. All details of the incident are recorded, including actions taken. (2)

may identify a contaminant in the water supply, especially in surface water systems. If the contaminant is in the last reservoir on the flow path, valves are changed to circumvent the contaminated reservoir and disinfecting procedures initiated. If the contaminant is elsewhere in the flow path, the entire system may have to be shut down for flushing and super chlorination. A water sample must be sent to provincial authorities for bacterial analysis. An inappropriate response to contaminated water can have dire health and liability ramifications. (3)

may have to repair unfamiliar equipment. This requires reading equipment manuals, asking others who have experience with the equipment, and contacting suppliers. (3)

determine the location of water line breaks. When there is frost, water will surface in the place of least resistance which may not be close to the actual break. To pinpoint ruptures, water and wastewater operators listen to the water in the pipes using a hydrophone, look for surface indicators such as pooling and cracking, and identify discrepancies in water pressure at various points in the line. (3)

Decision Making

Decision making refers to making a choice among options.

Decision making occurs during problem solving, but not all decision making is part of problem solving. It is, therefore, presented as a separate thinking skill. For example, buyers for retail outlets regularly make decisions about which suppliers to buy from, i.e., they select from the options for particular types of merchandise. This is not problem solving.

The Decision Making Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical decision making tasks of Water and wastewater operators are at Complexity Level 1 to 3. Their most complex decision making tasks are at Complexity Level 3.

Examples

Water and wastewater operators:

decide how much water can be transported in a trailer unit. The decision is made by using a conversion formula to calculate the weight of the water to be hauled and comparing it to the load restrictions for the trailer. (1)

decide whether it is safe to enter a trench or whether shoring is required. The decision is made by determining whether the trench has been dug using a 3 to 1 width to depth ratio after the first 3 vertical feet. (1)

decide whether to adjust water pressure with the change of seasons. Since summer tends to be a time of greater water usage, water pressures can be adjusted upward to increase flow. (1)

decide whether to replace or repair equipment components. The decision is based on expertise, experience, knowledge of regulations, and operating budgets. (2)

decide what precautions to take when entering confined space. The decision is based on the type of space to be entered, regulations governing the site, past problems at the location, degree of visibility, presence of chemical odours, gas detector readings and known risks. (2)

decide whether to install a temporary service when replacing new lines or to suspend water and sewage services until the new line is completed. The decision is made based on the types of facilities affected, the length of time the work will take, budget considerations, and the impact of disrupted services on affected individuals. (2)

decide when to take a reservoir out of service for maintenance or volume checks. The decision is based on the amount of time required to perform the operation, daily

consumption trends, and estimated time to deplete water supplies based on flow calculations. (2)

alum and/or chlorine dosage rates and/or processes every time there is a significant change in turbidity, temperature, wind or sunshine. (2)

decide whether a piece of equipment or process is operating normally or abnormally with or without any measured parameters or test results. (2)

may decide when to reduce the amount of sewage sludge in clarifiers. The decision is based on the capacity of the clarifiers, and the colour and smell of the sludge. (2)

decide how to react to external issues that could impact water quality. For example, West Nile virus threats will result in more pesticide applications, which could impact water quality, especially surface water systems. Technical knowledge is required to make a decision. (3)

may decide with others when to alert provincial government environmental officials that there is a possible problem. For example, contamination, process break-down or disinfection equipment out of service or other situations requiring a precautionary drinking water advisory to be issued. The decision to alert officials is based on water testing results and/or the occurrence of an environmental catastrophe. This decision involves significant health and liability issues. (3)

3. Job Task Planning and Organizing

Job Task Planning and Organizing refers to the extent to which the workers plan and organize their own tasks. It does not refer to involvement in the planning function for the organization in which they work.

The Job Task Planning and Organizing Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Water and wastewater operators plan and organize their job tasks at Complexity Level 2.

Description

Water and wastewater operators decide upon daily task sequencing and work priorities in consultation with their supervisor. Many of the daily activities are routine (e.g. checking pumps and recording outputs in the mornings, performing chlorine tests at set times) so it is a matter of determining who will take responsibility for completing and "signing off" each duty. The water and wastewater operators' work plan is also determined by the urgency of equipment breakdowns and unforeseen disruptions to the water and sewage treatment process. Water and wastewater operators coordinate their activities so they are available to assist each other when malfunctions occur. Water and wastewater operators

also arrange their schedules around municipal concerns that may be unrelated to water treatment procedures, for example, snow removal and household water meter reading for billing purposes. Once the general plan for the day has been established, water and wastewater operators schedule their own individual activities to maximize travel efficiency and satisfy prescribed timelines.

4. Significant Use of Memory

Significant Use of Memory includes any significant or unusual use of memory for workers in the occupational group. It does not include normal memory use that is a requirement for every occupation.

Examples

Water and wastewater operators:

remember priorities and directives for the day.

remember where they left off in projects when they are working on two or more at the same time.

memorize tolerances and norms for measurements such as regulated common water quality parameters, water pressure, turbidity, and daily consumption rates.

remember locations of valve stems and water lines.

remember scheduled activities which make unusual demands on the water supply such as livestock auctions, industry tank wash-downs, swimming pool maintenance, and fire hydrant flushing.

remember equipment idiosyncrasies such as a well that has too much iron in its water or a pump that has a certain sound.

remember to take detailed notes in situations that could have legal and liability ramifications.

remember previous complaints lodged by a customer and actions taken.

Remember sampling requirements and frequency.

5. Finding Information

Finding Information involves using any of a variety of sources including text, people, computerized databases or information systems.

Finding Information is highlighted in this section as an essential job skill. However, workers' use of various information sources may be referred to in other sections such as *A. Reading Text, B. Use of Documents, E. Oral Communication* and *H. Computer Use*.

The Finding Information Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Water and wastewater operators tasks that involve finding information are at Complexity Levels 1 and 2.

Examples

Water and wastewater operators:

contact their supervisor to obtain information about procedures or technical problems. (1)

consult co-workers to gain technical knowledge and assistance with problems. (1)

may refer to a catalogue or parts book to locate and order equipment and materials. (1)

refer to MSDS to get information on products being used. (1)

consult town administrative workers about municipal procedures, paper flow, and budget issues. (1)

consult suppliers to receive information about equipment and products. (1)

may refer to operating instructions posted near equipment to ensure correct procedures are followed. (1)

consult provincial environmental officers to get information on testing and results, new government regulations, water quality parameters, treatment processes and environmental concerns. (2)

consult with customers to obtain information about water quality and related client needs. (2)

may contact other facilities to gain specific information about a process, outcome or piece of equipment. (2)

may use the Internet to locate information about equipment, new technology, and other water-related topics. (2)

locate information in training and equipment manuals to review procedures, mathematical formulas, specifications and troubleshooting advice. (2)

locate information in government regulations and documents on a regular basis to review procedures, specifications, tolerances and environmental laws. (2)

G. Working with Others

The Essential Skill of ***Working with Others*** examines the extent to which employees work with others to carry out their tasks. Do they have to work co-operatively with others? Do they have to have the self-discipline to meet work targets while working alone?

Water and wastewater operators work as part of a small team made up of co-workers and municipal administrators. Water and wastewater operators meet informally throughout the day with their immediate co-workers and supervisor to plan and discuss the day's activities. They also interact casually with the municipality staff on a daily basis to receive instructions and discuss water-related issues. Water and wastewater operators need to be able to communicate effectively with co-workers, especially to provide accurate details of problems and equipment malfunctions. Water and wastewater operators are also expected to complete tasks assigned to them with limited direct supervision and to be accountable for outcomes. They work cooperatively with team members, assisting each other with repair work when called upon to do so. Water and wastewater operators must be self-disciplined in order to perform assigned duties in a comprehensive and timely manner. Since water and wastewater operators spend many hours per day doing independent offsite work, they must be responsible and reliable; tasks not completed properly can result in liability issues for the municipality.

Participation in Supervisory or Leadership Activities

Water and wastewater operators:

participate in formal discussions about work processes or product improvement.

participate in formal discussions concerning the allocation of responsibilities within own group or appropriate goals for the work group or methods for achieving goals.

have opportunities to make suggestions on improving work processes.

monitor the work performance of others.

inform other workers or demonstrate to them how tasks are to be performed.

orient new employees.

may select contractors and supplies.

assign routine tasks to other workers.

assign new or unusual tasks to other workers.

may identify training that is required by, or would be useful for, other workers.

deal with other workers' grievances or complaints.

may become involved in an operator association .

H. Computer Use

The Essential Skill of ***Computer Use*** indicates the variety and complexity of computer use within the occupational group.

The Computer Use Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical tasks of Water and wastewater operators are at Complexity Level 2.

Examples

Water and wastewater operators:

use digitised programmable equipment such as digital pH meters, chlorine gas detectors and scientific calculators. (1)

re-program the computerized settings on various process control instrumentation. (2)

may use word processing. For example, water and wastewater operators may write a short report for town council, generate forms and checklists, write a project proposal. (2)

may use a spreadsheet. For example, water and wastewater operators may track daily water flow, calculate and track dosages, record chlorine test readings, calculate and record monthly well outputs using spreadsheets and embedded formulae they create. (2)

may use communication software. For example, use email to send and receive messages and attachments. May use the Internet to access manufacturer or supplier websites to get information about products and equipment. (2)

I. Continuous Learning

Continuous Learning examines the requirement for workers in an occupational group to participate in an ongoing process of acquiring skills and knowledge.

Continuous Learning tests the hypothesis that more and more jobs require continuous upgrading, and that all workers must continue learning in order to keep or to grow with their jobs. If this is true then the following will become Essential Skills:

- knowing how to learn;
- understanding one's own learning style; and
- knowing how to gain access to a variety of materials, resources and learning opportunities.

New provincial water regulations dictate that by July 15, 2005, every treatment facility in Saskatchewan will have at least one certified operator on site with a certification level that corresponds to the designated level of the treatment plant. As a result, operators are seeking to upgrade their qualifications by taking provincially certified courses and professional association sponsored workshops. These are pursued on company time and paid for by the municipality. In addition, water and wastewater operators are required by law to renew their certification every two years. After July 15, 2003, water and wastewater operators will be required to obtain 5 contact hours, a .5 Continuing Education Unit (CEU) or credit hours per year of training in an area considered relevant to the occupation. One of the most practical ways for water and wastewater operators to gain new expertise is to learn "on the floor" from more experienced co-workers or supervisors.

How the Learning Occurs

Learning may be acquired:

as part of regular work activity.

from co-workers.

through training offered in the workplace.

through reading and other forms of self-study:

- at work.
- on worker's own time.
- using materials available through work.
- using materials obtained on worker's own initiative.

through off-site training:

- during working hours at no cost to the worker.

J. Other Information

Other Information summarizes additional information collected during interviews with job incumbents and focus groups with occupational experts.

In addition to collecting information for this Essential Skills Profile, our interviews with job incumbents also asked about the following topics.

1. Attitudes

The water and wastewater operators interviewed felt that operators should be conscientious, thorough, safety-focussed and reliable. They should also feel comfortable multi-tasking and working in an environment where they participate in all aspects of the job. They should be accountable for their actions and meticulous where testing and chemical usage is concerned; errors can result in fatalities. Water and wastewater operators should enjoy working in an organized way and be willing to follow set routines for a portion of each day. They should also be adaptable, patient and tolerant. This is in part because operators often have to respond to unexpected situations such a water line breaks, pump malfunctions, and water quality complaints which interrupts daily schedules. In addition, water and wastewater operators sometimes work in confined, uncomfortable, unpleasant and potentially dangerous surroundings, especially in terms of sewage treatment operations. They should enjoy contributing to a team and dealing with the public. Water and wastewater operators should also be comfortable upgrading their skills levels and addressing technological change through continuous learning.

Future Trends Affecting Essential Skills

With recent changes in provincial environmental laws and monitoring procedures, waste water management will become more and more regulated, and more attune to liability and environmental issues. Operators will be expected to be conversant with detailed and complex regulations, and be aware of ongoing changes in the industry.

This will require strong document literacy and navigation skills. The industry is also demanding strict adherence to detail, especially in terms of testing and chemical usage. Numeracy skills will continue to be important as municipalities and provincial authorities demand increased tracking and data analysis. Because of the recent focus on water quality in the province and across Canada, water testing and treatment has become more of a science with new approaches and technologies emerging everyday. The industry is also moving towards full automation and computer-managed systems, which will require advanced computer literacy skills. In addition, processes such as reverse osmosis, electro dialysis reversal and membrane filtration are being introduced in the industry which again creates the need for well developed learning-to-learn skills and a positive attitude toward life-long learning.

3. Additional contributions from interviewees

The industry is changing rapidly and becoming increasingly regulated. Workers must be prepared to pursue certification in many areas (water and wastewater management, confined spaces, first aid, etc.). They must also be aware of global environmental issues and the impacts on water quality. For example, the recent concern over West Nile virus will result in increased pesticide use in Saskatchewan which can affect surface waters and well access points. The emergence of "super bugs" which may be transmitted via the water supply must also be monitored. Even increased use of certain prescription drugs and hormones can impact the water supply. Water and wastewater operators are more and more considered specialized technicians with significant responsibilities around public health and environmental protection. There is a greater awareness of pathogens such as Ecoli, Crypto, Giardia and Norwalk virus that now have operators reviewing past operation procedures and making sure that these pathogens do not affect treated water supply.

The operators stressed that there is a significant difference between surface water and well water operations. The former are much more challenging because of fluctuations in temperature and water levels, exposure to the elements, et cetera.