



TEST OF WORKPLACE ESSENTIAL SKILLS

TOWES

SKILLS

**TOWES TEST DESIGN
Technical Discussion
Syncrude Sample Problem**

Workplace

Reading Text

Document Use

Numeracy



Test Item Design

Test Item Complexity

The complexity of test items in a TOWES test is tied to the complexity of cognitive tasks that are performed in the workplace. This benchmarking and profiling of workplace tasks is described elsewhere. For the discussion that follows, we need only remember that for good test design, we need to write test items at a certain level of complexity. We can predict the level of complexity for test items by identifying and modifying the cognitive complexity factors for each item. The sample problem and discussion that follows will show how we assemble and rate a typical set of test items.

Selection of Stimulus Documents

One of the first steps when we build a custom version of TOWES is to select stimulus materials upon which to base assessment items. We refer to each stimulus document and related test items as a ‘problem.’ To ensure validity, we try to select stimulus materials that workers will need to use, or are required to read, as part of their normal work activities. This practice helps to ensure the face validity of the test and to eliminate any question of bias in the choice of stimulus materials.

For items involving **reading text**, orientation manuals, health, safety and environmental guides and benefit plan descriptions offer continuous texts which must be read by all workers. Where applicable, we will also add procedural reading selections from operating manuals and similar texts. We feel that it is important for workers to see that the test is a reasonable and fair reflection of workplace reading tasks.

The stimulus materials for **document use** items are generally more varied and more specific to individual worksites or employers. Document literacy items ask test-takers to locate, and sometimes integrate, information found in matrix documents such as lists, tables, schedules and catalogues. In the past, we have developed problem sets around charts, maps, scale drawings and flowcharts.

Numeracy items can be based on textual reading selections or workplace documents and may be mixed with other types of items in one problem set. It is important to stress that TOWES does not test mathematics in the formal sense of knowing and performing advanced operations. These are special skills that will require more specific testing. TOWES measures numeracy, the general and widespread ability to *locate and operate upon quantitative information embedded in text and documents*.

Complexity Level

TOWES items are constructed using a well-recognized model of cognitive processing that has been the foundation for all of the major literacy surveys administered in the last ten years by Statistics Canada, the Educational Testing Service and the OECD. A full explanation of the psychometric science behind TOWES can be found in any of the publications describing the recent International Adult Literacy Survey (IALS).

For the purpose of the IALS survey, and TOWES, the full range of *literacy task*

complexity is described on a 0 to 500 point response probability scale. On this scale, low numbers indicate simple tasks, while 500 indicates the greatest degree of task complexity. However, just as we condense actual waist sizes for pants into broad bands labelled small, medium, and large, the 500 point IALS and TOWES scales are divided into five levels, with five being the most complex. The scale takes in the measured literacy competence of Canadians aged 16 to 65 years old. The distribution of literacy skill across the three literacy domains measured by TOWES is shown below.

Distribution of Literacy in Canada - Adults 16-65

RP ⁸⁰	Level	Prose	Document	Quantitative
n < 225	1	17%	18%	17%
225-275	2	26%	25%	26%
276-325	3	35%	32%	35%
326-375	4	22%*	25%*	22%*
n > 375	5			

* The small number of Canadians with skills at Level 5 means that a reliable estimate could not be made for this group. Level 5 has been combined with Level 4 for reporting purposes. (It is believed that less than 5% of the population is at skill Level 5.)

Sample Problem

Before discussing the complexity factors of the test items on the next page, we encourage the reader to attempt the items and make a subjective judgment about the difficulty of completing the items. Consider also the relationship of the test items to literacy tasks at work.

Sample Problem

Look at the discussion of accident and injury reporting on the following page.

1. In the reading selection, circle or underline the names of the two documents which Syncrude workers use to report workplace hazards, incidents and near misses.

2. Under what conditions should the Near Miss or Hazardous Conditions Hotline be called?

3. What is the purpose of the Loss Control Report?

4. Why is it necessary to report injuries which are not related to work at Syncrude?

INCIDENT/INJURY REPORTING

Hazardous Conditions Reporting

The Hazardous Condition Report is to be used to identify unsafe conditions or work practices that may lead to an incident.

Near Miss or Hazardous Conditions Hotline

When you see or are involved in a near miss incident, please report the incident by filling in a card and dropping it into one of the boxes or submit the card to your supervisor. This will help us to take preventative action. For Near Misses or Hazardous Conditions that require immediate attention please call the Near Miss/Hazardous Conditions Hotline in your area.

Loss Control Reports (LCR):

A Loss Control Report is generated in the event of a loss or a potential loss in production, injury/illness, loss of security, damage to equipment, or environmental impact. If the severity of the loss is classed as serious or major the incident will be investigated.

It is everyone's responsibility to report any adverse conditions and potential hazards that may have escaped the notice of operators and supervisors. Such reporting is one way in which accidents and resulting injury can and should be prevented.

Report any damage you discover, such as faulty tools or broken equipment, to your immediate supervisor.

Injury Reporting

Personal injury on the job site must be reported to your supervisor and to the Health Center. No matter how minor an injury may seem it must be reported and attended to before resuming your work.

- All health concerns must be reported to the SCL Health Center. Even if it is not the result of a work-related incident. There may be limitations that your supervisor should be made aware of before performing your work assignments.

Item by Item Discussion

1. *In the reading selection, circle or underline the names of the two documents that Syncrude workers use to report workplace hazards, incidents and near misses.*

Item 1 asks the test-taker to locate the names of two documents and to mark them. This item, like many TOWES items, is in a ‘constructed response’ format that mimics what a reader might naturally do. On the surface it is a simple enough task—use the given information (in green) to locate the information requested by the item (in red).

On closer examination, we can see that it is a task that requires the reader to first locate one document name and then ‘cycle’ back to the text to locate the second document name. This is slightly more complex than finding just one document and slightly more complex again because the two documents are located in different paragraphs.

The given information can be stated as: “Workers use two documents to report workplace hazards, incidents and near misses.” The item asks for the names of the documents which must be located in the text. The ‘requested information’ is the document titles shown in red on the following page. The information requested in this item is quite concrete, two names. During reading, the given information is used to identify sections of the text where the requested information may, or is likely, to be found. The sections where given information appears are marked in green on the following page.

Inference is the ability to generate alternatives to the language of given and requested information. In this case, it will take a low-level text-based inference to match the requested *document* with the

reports in the text. The item would be less complex if the item asked for the two *reports* instead of two *documents*. Inference is also required to match *incident* with a *loss*; *hazard* with *adverse condition*; or *injury* with *accident*.

The discussion of the Hotline in paragraph two is what we call a ‘distractor.’ It contains enough of the given information to draw the reader’s attention, but does not contain any part of the requested information. The final paragraph contains similar distractors for the given information. In this item, the distractors for the given information force the reader to read more, and consider more possibilities for the requested *documents*. However, only two reports are mentioned in the stimulus text. The item would be more difficult if other reports were mentioned and the reader had to use more of the given information to make the correct match. If another paragraph which discussed a *Harassment Report* were added, that would give rise to a distractor for the requested information. Just as adding another bar to a horse jump eliminates some of the competitors, some readers would not be able to identify correctly two of three reports.

On the basis of the properties discussed above, we can predict with some certainty that this is a low Level 2 prose or textual reading item. It is a nice warm-up for more difficult items to come and should reassure the more skilled test-taker.

INCIDENT/INJURY REPORTING

Hazardous Conditions Reporting

The **Hazardous Condition Report** is to be used to identify unsafe conditions or work practices that may lead to an incident.

Near Miss or Hazardous Conditions Hotline

When you see or are involved in a **near miss incident**, please report the incident by filling in a card and dropping it into one of the boxes or submit the card to your supervisor. This will help us to take preventative action. For **Near Misses or Hazardous Conditions** that require immediate attention please call the **Near Miss/Hazardous Conditions Hotline** in your area.

Loss Control Reports (LCR):

A **Loss Control Report** is generated in the event of a **loss or a potential loss** in production, **injury/illness**, loss of security, **damage to equipment**, or environmental impact. If the severity of the loss is classed as serious or major the incident will be investigated.

It is everyone's responsibility to report any **adverse conditions** and **potential hazards** that may have escaped the notice of operators and supervisors. Such **reporting** is one way in which accidents and resulting injury can and should be prevented.

Report any damage you discover, such as faulty tools or broken equipment, to your immediate supervisor.

Injury Reporting

Personal injury on the job site must be reported to your supervisor and to the Health Center. No matter how minor an **injury** may seem it must be reported and attended to before resuming your work.

- All health concerns must be **reported** to the SCL Health Center. Even if it is not the result of a **work-related incident**. There may be limitations that your supervisor should be made aware of before performing your work assignments.

2. Under what *conditions* should the *Near Miss or Hazardous Conditions Hotline* be called?

In this second item, we can immediately see that the information requested is more abstract. The reader can no longer rely on an easy identification of the requested information such as the categorical relationship between *report* and *document* in the previous item. A ‘condition’ is at the same level of abstraction as concepts such as cause, effect, purpose or reason.

The question is made easier because there are no distractors for either given or requested information. The fact that given information appears in the same form in both

the item and the text being searched makes matching fairly easy. On some TOWES items we use multi-page document samples and the possibility for distracting information increases.

This item is a request for the test-taker to locate information; he or she is not asked to do anything more with the information retrieved but to write it down. By asking for both conditions—that there is a hazard and that it requires immediate attention—we make the task slightly more complex. This is a mid Level 2 task.

3. What is the *purpose* of the *Loss Control Report*?

It is fairly easy to locate the paragraph containing the requested information in this item because there are no distractors for the given information. The problem in this item is to correctly identify the requested *purpose*. As noted in the discussion of the previous item, this is quite abstract information which requires a precise understanding of the text.

In the paragraph where the reader finds the requested information, there are at least five possibilities for an answer. (When we put these items through trials, we always discover other distracting information that we overlook as being too improbable.) The first sort of answer that will be given is ‘when’ the loss control report will be generated—marked 1 and 5 on the stimulus document. The next best answer is that the Loss Control Report’s purpose is to prevent accidents (marked 4 on the source document). If Loss

Control Reports are filled out and investigated, preventing accidents will be the consequence of the resulting actions. This is several degrees of meaning away from the correct answer.

The answer that we want, and the answer we think shows the best textual reading skill, will have to be synthesized from several parts of the paragraph and then restated in some coherent fashion. If we do this to the information marked 2, 3, and 4 we can infer that the purpose of the Loss Control Report is to “ensure that all losses and hazards (no matter how small) are brought to the attention of supervisors (and investigated if necessary)” Expert markers will refine the range of answers accepted according to actual test results. This item is a mid Level 3 textual reading task.

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2 It is everyone's responsibility to report any adverse conditions and potential hazards that may have **escaped the notice of operators and supervisors**. Such reporting is **one way** **3** **in which accidents and resulting injury can and should be** **4** **prevented**.

5 **Report any damage** you discover, such as faulty tools or broken equipment, to your immediate supervisor.

Injury Reporting

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4. *Why is it necessary to report injuries which are not related to work at Syncrude?*

We have inserted an easier item to end the set of items in this problem. It is a good practice to vary item difficulty throughout the test. Too many difficult questions in succession and the test-taker may become discouraged or ‘burnt out.’

The requested information for this item, a reason or rationale, can be located in one place and copied without restatement. There are some weak distractors for the given information and one for the answer we are requesting. The reader will have to match two phrases—*report injuries* and *not work-related*—to find the answer, making this item slightly more difficult than it would be otherwise. The two phrases appear in the final paragraph, followed by the sentence which gives the requested information—“that injuries not related to work may still limit the type of work you are able to carry out.” If he or she fails to match the phrase *not work-related*, the answer given may be: “It is necessary to report injuries so that they can be attended to.” This answer demonstrates a partial understanding of the text passage, but not discerning reading.

From the analysis, this appears to be a low Level 3 task, but intuition says it is easier than that. The exact level of difficulty for this and the other items in the question set will only be determined after the items have been trial-tested and test results analyzed by expert psychometric consultants.

Conclusion

Following the initial development of a problem set like this one, it will be trial-tested in a variety of situations and administered to representative groups of test-takers. TOWES’ quality standard requires that we carry out an extensive statistical analysis of the trial-test results to confirm the complexity levels of items, assess their ability to discriminate, and check for bias. Some test items will not make this cut; some will discriminate erratically, or not at all; some will be too obvious, or obvious to one gender. Before we use any item in a TOWES assessment, it has satisfied the most stringent psychometric standards so that it will measure cognitive skills reliably and accurately when administered under standard conditions.

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