

Dawn Treader Industries: Long-Term Construction Contracts: Instructor Guide

Title:

Dawn Treader Industries: Long-Term Construction Contracts

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Discipline:

Accounting

Target Audience

Intermediate, accounting majors and finance majors

Keywords

Long-term construction, percentage of completion

Length of Time/Staging

The problem takes two seventy-five minute sessions.

Abstract

Having worked through the seven stages of the Dawn Treader Industries unfolding problem, students will be able to understand and perform the technical aspects of accounting for long-term



construction contracts. The problem departs from traditional textbook approaches to accounting in favor of the techniques currently used in the industry based on research by the author. Students will be required to make choices when they encounter a cancelled contract in Phase 6 of the problem. Because the problem unfolds in stages, accounting instructors may eliminate aspects that they do not wish to cover.

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Format of Delivery

The problem is delivered in a cooperative learning setting with mini-lectures interspersed.

Student Learning Objectives

1. Introduce students to alternative accounting methods for long-term construction contracts.
 1. Percentage-of-completion method.
 2. Completed contract method.
2. Enable students to decide which method to apply under differing circumstances.
3. Cause students to understand the details of percentage-of-completion accounting.
 1. Calculation of revenue to be recognized and the journal entries and financial reporting for the first year of a contract.
 2. Calculation of revenue to be recognized and the journal entries and financial reporting for subsequent years of a contract. Students should be able to account for a change in cost estimate.
 3. Understanding of alternate bookkeeping conventions and the reconciliation thereof.
4. Enable students to know what information to seek on a long-term construction contract and when to begin assembling construction costs.
5. Enable students to solve a more complex construction contract problem, including a situation where billings exceed costs and profits.
 1. Accounting for billings that exceed costs and profits.
 2. Financial statement presentation where both costs and profits in excess of billings and billings in excess of costs and profits exists.
6. Cause students to engage a non-standard situation-specifically the cancellation of a contract with cost reimbursement.
 1. Have students identify three possible solutions to the cancellation scenario.
 2. Have students reach a decision based on accounting reasoning.
 3. As part of this learning objective, the instructor will introduce students to the differences in dynamics when having a closely held company as a client as opposed to a SEC client.
7. Enable students to account for a contract that has been successfully completed.

8. Introduce students to costs not included in percentage of completion calculations.

Student Resources

Students may use Accounting Research Bulletin No. 45 as a resource. Alternatively, instructors may wish to have students conduct their own financial accounting research using the Financial Accounting Research System or other database. Instructors may wish to provide students with the PBL Worksheet for use when they work in groups.

Instructor Resources

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Author's Teaching Notes

The Dawn Treader Industries case is designed for use in a Problem-Based Learning (PBL) class. The case is set up to teach students the accounting required by Accounting Research Bulletin No. 45: Long Term Construction Contracts. Instructors may wish to make a copy of this relatively short pronouncement available to students. Alternatively, students may do research using the Financial Accounting Research System or other database resources to seek a solution to the problem. The latter approach buttresses the PBL experience.

I do not recommend the use of a traditional intermediate accounting text with this problem, because the bookkeeping shown in most texts differs from that used in practice according to the practitioners with whom I have consulted. If a text is used, the solution contains an extension activity that enables the students to reconcile the two bookkeeping conventions. Accounting critical thinking skills are developed and enhanced as students learn about different bookkeeping conventions that can be used to attain acceptable financial reporting results.

Duch (2001) describes the characteristics of good PBL problems. She notes that many PBL problems are designed with multiple stages. Bellas et al. (2000) explain these multi-stage problems as unfolding problems. Essentially, an unfolding problem differs from the traditional classroom problem or case in that the problem itself does not contain sufficient information for the student to solve it. In the initial stage, the problem has a vague and broad requirement. As students wrestle with the problem they first must determine what information they must obtain to fulfill the requirement. The problem "unfolds" as students are given additional information that allows them to engage the problem at an increasingly concrete level. As the students work together on the several stages of the problem, they simultaneously learn both course-related concepts and problem solving skills.

The Dawn Treader Industries case contains eight phases, each of which constitutes a stage of the unfolding problem. Having worked through these eight phases, students will have completed the eight learning objectives of the case. The handouts file contains a PBL worksheet that students will find useful as they confront the various stages of the problem. The bottom of the worksheet contains a block where students may assess their learning at each stage of the problem. Students should turn in the PBL worksheet at the conclusion of each class. Instructors may use

information gathered from students as a Classroom Assessment Technique as suggested by Angelo and Cross (1993).

The following outline gives a step-by-step strategy for implementing the Dawn Treader Industries Unfolding Problem in a PBL classroom.

1. The first learning objective is to introduce students to the two methods of accounting for long-term construction contracts. The second learning objective is to have students recognize when to use which method. Pass out Phase 1 of the unfolding problem. Also give students a copy of the PBL worksheet for use in their deliberations. Having given students time in their groups to discuss the information call upon a group to report.
 - a. The fact that there are two methods should emerge during whole class discussion.
 - i. The percentage of completion method is used when the following criteria are met:
 1. The extent of progress toward completion can be reasonably estimated.
 2. Contract revenues can be reasonably estimated.
 3. Contract costs can be reasonably estimated.
 - ii. These criteria are usually met for companies engaged in construction. Thus the percentage of completion method is usually used.
 - iii. The completed contract method is used when the criteria are not met. The major place this is found is in the residential housing industry. In this industry, housing units constructed are uniform in nature. Therefore, the industry treats them like inventory in the classic sense through the completed contract method.
 - b. Under the "needed information" students need costs to date, estimated costs to complete, and the contract price.
 - c. Having completed this whole class discussion, the first and second learning objectives will have been met.
2. The third learning objective is to have students learn the details of the percentage of completion method. This should be done in stages.
 - a. Pass out Phase 2 of the unfolding problem.
 - b. After giving students time to work on this phase, call for a report on accounting for the first year of the Aslan job. The solution appears below.

Construction expenses	\$1,250,000
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Cash	\$1,250,000
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To record construction costs as they occur.

Revenue recognized this period:

(Cost incurred to date)/(Estimated total costs)

* (Estimate of revenue)

- Revenue recognized in prior periods.

Revenue recognized in Year 2000



$$= (\$1,250,000 / \$4,250,000 * \$5,000,000) - \$0$$

$$= \$1,470,588$$

Journal entry:

Costs and profits in excess of billings	\$1,470,588
Construction revenue	\$1,470,588

To record construction revenue for the period.

Year 2000 Income statement:

Construction revenue	\$1,470,588
Construction expense	<u>\$1,250,000</u>
Gross profit	\$ 220,588

Year 2000 Balance Sheet:

Costs and profits in excess of billings (asset) \$1,470,588

- c. If the students are using the typical intermediate textbook, it will show bookkeeping conventions that are rarely used in the heavy construction industry.
 - a. If a student points out the methodology used in the text, you will have been presented with a tremendous teaching opportunity. Explain that public accountants normally allow clients to use any bookkeeping conventions they choose during the course of the year. Then at year-end, adjusting entries are required so that the financial statements conform to Generally Accepted Accounting Principles.
 - b. As an extension activity, which will enhance critical thinking skills, you may ask the students to explain how the two bookkeeping conventions can arrive at the same financial statement results. Below are the results using textbook conventions:
 - i. Under the textbook method the percentage of completion is applied to gross profit rather than revenue using the following formula:
 Gross profit recognized this period = (cost to date / total expected cost * expected profit) - profit previously recognized.
 - ii. Costs when incurred are inventoried in a construction in process account.
 - iii. Revenues and expenses are booked at year-end with a corresponding debit to construction in process.
 - iv. When billings are made, a contra asset, billings on construction in process, is credited.
 - v. For reporting purposes the difference between construction in process and the billings on construction in process is reported as either an asset or a liability on the balance sheet.

vi. Alternate solution for the Aslan contract:

Contract price	\$5,000,000
Less costs:	
Costs incurred to date	\$1,250,000
Expected future costs	\$3,000,000
Total expected costs	\$4,250,000
Estimated gross profit	\$750,000

Gross profit recognized this period

= $(\$1,250,000 / \$4,250,000$

* \$750,000) - \$0

= \$220,588

Journal entries:

Construction in process	\$1,250,000
Cash	\$1,250,000
Construction in process	\$220,588
Construction expenses	\$1,250,000
Construction revenue	\$1,470,588

Calculation of balance sheet account:

Balance of construction in process account

$(\$1,250,000 + \$220,588)$ \$1,470,588

Balance of billings account 0

Costs and profits in excess of billings (asset) \$1,470,588

vii. Point out to the students that the reported amounts (revenues, expenses, gross profit and costs and profits in excess of billings) are identical under the two bookkeeping conventions. The convention used in practice is easier from the viewpoint of the client.

- d. Pass out Phase 3 of the unfolding problem. This phase adds the complication of a change in cost estimate. After the students have worked in groups call for a report. The solution for the computation of gross profit for the second year of the Aslan

job is below. When they have completed this phase, students will have fulfilled both portions of the third learning objective. The solution is shown below.

Cost in year 2000	\$1,250,000
Cost in year 2001	<u>\$2,300,000</u>
Cost incurred to date	\$3,550,000
Estimated cost to complete	<u>\$800,000</u>
Total expected costs	\$4,350,000

Revenue recognized in year 2001

$(\$3,550,000 / \$4,350,000$

$* \$5,000,000) - \$1,470,588$

$= \$2,609,872.$

Journal entries:

Construction expenses	\$2,300,000
Cash	\$2,300,000

To record construction costs as they occur.

Costs and profits in excess of billings	\$2,609,872
Construction revenue	\$2,609,872

To record construction revenue for the period.

Year 2001 Income statement:

Construction revenue	\$2,609,872
Construction expense	\$2,300,000
Gross profit	\$309,872

Year 2001 Balance Sheet:

Costs and profits in excess of billings (asset)	
$(\$1,470,588 + \$2,609,872)$	\$4,080,460

- The fourth learning objective is to enable students to know what information to seek on a long-term construction contract and when to begin assembling construction costs. Pass out Phase 4 of the unfolding problem and provide each group with a PBL worksheet.

Students should record the information they know, and that which they need to know on the PBL worksheet. Call for a brief report and review these items.

- a. Students should recognize that they will need costs to date on the project, an estimate of costs to complete the project, and a contract price.
 - b. The \$75,000 mentioned in this phase should not be included in the costs for the project. Point out that contract costs are assembled after the contract has been signed.
4. The fifth learning objective calls for enabling students to solve a more complex construction contract problem, including a situation where billings exceed costs and profits. Pass out Phase 5 of the unfolding problem for students to solve in groups. Then call for a report. The accounting for the Crosley job is given below.

- a. Entries DTI made during the year:

Construction expenses	\$3,893,000
Cash	\$3,893,000

To record construction costs as they occur.

Accounts receivable	\$5,000,000
Construction revenue	\$5,000,000

To record the billing.

Cash	\$5,000,000
Accounts receivable	\$5,000,000

To record collection.

- b. Calculation of recognizable revenue:

Engineering	\$1,400,000
Purchase of raw materials	\$900,000
Manufacturing of assembly line components (labor and overhead)	\$1,341,000
Assembly and testing at the Brookville site	\$252,000
Cost to date	\$3,893,000
Total expected costs	\$8,000,000
Revenue recognized in prior years	\$0

Revenue recognized in year 2001

$$= (\$3,893,000 / \$8,000,000 * \$10,000,000) - \$0$$

$$= \$4,866,250$$

- c. We must now make the entry necessary to bring the revenue account to the balance we have calculated:

Recorded revenue	\$5,000,000
Recognizable revenue	<u>\$4,866,250</u>

Entry amount	\$133,750
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Construction revenue	\$ 133,750
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Billings in excess of costs and profits	\$133,750
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To record construction revenue for the period.

5. Calculation of financial statement amounts:

Year 2001 Income statement:

Revenue from Aslan contract	\$2,609,872
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Revenue from Crosley contract	<u>\$4,866,250</u>
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Total contract revenue	\$7,476,122
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Construction expenses for Aslan contract	\$2,300,000
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Construction expenses for Crosley contract	\$3,893,000
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Total construction expenses	<u>\$6,193,000</u>
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Gross profit	\$1,283,122
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Year 2001 Balance sheet:

Costs and profits in excess of billings

(Aslan contract)

Beginning Balance	\$1,470,588
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Amount added in 2001	<u>\$2,609,872</u>
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Year end balance (asset)	\$4,080,460
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Billings in excess of costs and profits

(Crosley contract) (liability)	\$133,750
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Note both the asset and the liability will appear
on DTI's balance sheet.

6. The sixth learning objective calls for students to engage a non-standard situation-specifically the cancellation of a contract with cost reimbursement. Pass out Phase 6 of the unfolding problem. Give the groups time to develop alternatives and a solution to the new information.

- a. Professionals who confronted a situation similar to the one stated in the problem developed three alternatives for consideration:
 - i. Leave the percentage of completion calculation in tact for the current year.
 - ii. Restate the percentage of completion calculation for the anticipated cancellation.
 - iii. Treat the contract as completed contract and make appropriate adjustments.
- b. Leave the schedule intact: Essentially this option would leave the accounting the same as it was under Phase 5. The justification for this alternative is that the contract with Crosley has not, in fact been officially canceled. Therefore, at year-end the calculations are correct. If this option were chosen the fact that work on the contract had ceased and that it was anticipated that the contract would be canceled should be disclosed in a footnote as a subsequent event.
- c. Restate the percentage of completion calculation for the anticipated cancellation.

Costs already incurred during the year	\$3,893,000
Additional anticipated costs	\$250,000
Cancellation penalty	\$1,000,000
Recoverable acquisition expenses	\$75,000
Less: Returnable materials	<u>(50,000)</u>
Anticipated revenues	\$5,168,000

Costs incurred to date	\$3,893,000
Anticipated future costs	\$250,000
Less: returns of materials	<u>(50,000)</u>
Total project costs *	\$4,093,000

Revenue recognized in year 2001

$$= (\$3,893,000 / \$4,093,000 * \$5,168,000) - \$0$$

$$= \$4,915,471.$$

Adjusted revenue recognized	\$4,915,471
Revenue on the books	<u>\$4,866,250</u>
Adjustment required	\$49,221

Adjusting entry:

Billings in excess of costs and profits	\$ 49,221
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Construction revenue	\$ 49,221
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To adjust Crosley contract revenue.

*The \$75,000 acquisition expense is not properly considered a cost of the project.

i. Note this adjustment checks.

Billings	\$5,000,000
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Adjusted revenue	<u>\$4,915,471</u>
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Balance of billings in excess of costs and profits	\$84,529
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Old Balance of Billing in excess of costs and profits	\$133,750
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Adjusting entry	<u>\$49,221</u>
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Balance of billings in excess of costs and profits	\$84,529
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ii. The primary argument for this option is it is consistent with the contract essentially being finished.

iii. The primary arguments against this option is the logical inconsistency of increasing revenue due to a canceled contract and the uncertainty as to whether Crosley will pay the \$1,000,000 penalty and \$75,000 acquisition expenses.

d. Switch to completed contract method.

i. This will require the capitalization of expenses into an inventory account. No profits will be realized under this method until the conclusion of the contract.

ii. Accounting:

Construction-in-process	\$3,893,000
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Construction expenses	\$3,893,000
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To capitalize construction expenditures.

Billings in excess of costs and profits	\$133,750
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Construction revenue	\$4,866,250
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Billings on construction contract	\$5,000,000
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To eliminate accounts created under percentage-of-completion method and create billings.

iii. The rationale for this option is that the uncertainty created by the stop all work order have eliminated the necessary conditions for the percentage of

completion method. Recall these conditions for the students using a Think-Pair-Share.

1. The extent of progress toward completion can be reasonably estimated.
 2. Contract revenues can be reasonably estimated.
 3. Contract costs can be reasonably estimated.
 - iv. The disadvantage of this method, especially from the client's point of view, is that all the gross profit of the job (\$4,866,250 - \$3,893,000 = \$973,250) has been eliminated.
 - e. The professionals who encountered circumstances similar to the ones related in this case chose the first alternative. They considered the second option to violate the principle of conservatism. The third option was too draconian from the client's perspective. This is a particularly germane point when the client is closely held as opposed to a SEC client.
7. The seventh learning objective calls for students to be able to account for a contract that has been successfully completed. Pass out Phase 7 of the unfolding problem and ask students to complete the requirement in their groups. Then call for a report. The solution follows:
- a. Accounting for the third and final year of the Aslan job.

Contract revenue (100%)		\$5,000,000
Revenue recognized in 2000	\$1,470,588	
Revenue recognized in 2001	<u>\$2,609,872</u>	
Previously recognized revenue		<u>\$4,080,460</u>
Revenue recognized in 2002		\$919,540

Journal entries:

Construction expense		\$650,000
Cash	\$650,000	

To record construction expenses as they occur.

Accounts receivable		\$5,000,000
Construction revenue	\$5,000,000	

To record billing.

Cash		\$5,000,000
Accounts receivable	\$5,000,000	

To record receipt of payment.



Year-end adjustment:

Revenue recorded	\$5,000,000
Recognizable revenue	<u>\$919,540</u>
Required debit to revenue	\$4,080,460*

Construction revenue	\$4,080,460
Costs and profits in excess of billings	\$4,080,460

To record construction revenue for the period.

*Note this corresponds to the balance in cost and profits in excess of billings. The system works!

- b. Note the balance of costs and profits in excess of billings is wiped out. This is appropriate because the project has been transferred to the customer.
8. The eighth learning objective introduces students to costs not included in percentage of completion calculations. Pass out Phase 8 of the unfolding problem and ask students to complete the requirement in their groups. Then call for a report. The solution follows:
 - a. Because the direct materials that Lewis has purchased have not been placed into production, they are not considered a cost of the job. Rather they are an asset, "Materials on site but not in use."
 - b. The repercussion of this is these costs do not enter into the percentage of completion calculation.
 - c. This prevents companies from artificially inflating revenues by simply purchasing materials. Let's compare the revenues under the incorrect and correct methods:

Revenues if costs allowed:

Costs incurred

$$\begin{aligned} &= 60\% * \$5,500,000 \\ &= \$3,300,000 \end{aligned}$$

Revenue recognized

$$\begin{aligned} &= (\$3,300,000 / \$5,500,000 * \$6,000,000) - \$0 \\ &= \$3,600,000 \end{aligned}$$

Revenues if costs not allowed

$$= \$0$$

- d. Journal entries DTI made for the Lewis contract during the year:

Construction expenses	\$3,300,000
Cash	\$3,300,000

To record purchase of materials.

Accounts receivable	\$600,000	
Construction revenue		\$ 600,000

To record initial billing.

Cash	\$600,000	
Accounts receivable		\$ 600,000

e. Adjusting entries required at year-end:

Materials on site but not in use*		\$3,300,000
Construction expenses	\$3,300,000	

To adjust construction expenses.

Construction revenues	\$600,000	
Billings in excess of costs and profits		\$ 600,000

To adjust construction revenue.

*An asset account.

9. Time permitting, review the principles of accounting for long-term construction contracts.

References:

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Assessment Strategies

The PBL worksheet that is attached in the teaching note contains a block at the bottom that asks students what they have learned. Throughout the process, the instructor may use student responses to assess learning (formative assessment). Having worked through this problem, students should be able to successfully take traditional accounting tests containing earnings per share questions (summative assessment).



Solution Notes

Contained in the Teaching Notes.