AUDIT REPORT

Department of Transportation & Infrastructure

Construction Manager/ General Contractor Project Delivery Method

SEPTEMBER 2021

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City and County of Denver

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AUDITOR'S LETTER

September 16, 2021

The objective of our audit of the Northfield Fire Station construction project was to assess how well the Department of Transportation & Infrastructure managed the $8.8 million project — specifically, to determine whether the city received all that it contracted for under the construction manager/general contractor project delivery method and whether the city was overcharged. I am pleased to present the results of this audit.

While we found the city received what it contracted for, the audit determined the Department of Transportation & Infrastructure inadequately managed the Northfield Fire Station construction project, which resulted in the city overpaying.

Transportation & Infrastructure needs to validate contractors' cost estimates and charges, enforce contractors' compliance with contract terms and deliverables, and oversee contractors' subcontracting processes. The department should also adequately train staff to properly manage technically complex construction projects and the contract payment terms associated with such projects. By implementing recommendations for stronger and more consistent management of construction projects, the Department of Transportation & Infrastructure will be better equipped to ensure the city does not overpay for construction services.

This performance audit is authorized pursuant to the City and County of Denver Charter, Article V, Part 2, Section 1, "General Powers and Duties of Auditor." We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We extend our appreciation to the personnel in the Department of Transportation & Infrastructure who assisted and cooperated with us during the audit. For any questions, please feel free to contact me at 720-913-5000.

Denver Auditor's Office

Timothy M. O'Brien, CPA
Auditor

REPORT HIGHLIGHTS

Construction Manager/General Contractor Project Delivery Method

SEPTEMBER 2021

Objective

To determine whether the Department of Transportation & Infrastructure's construction management was adequate enough to ensure:

1. The city received the scope of work included in its three contracts for the Northfield Fire Station construction project.
2. The city paid the correct amount to build the Northfield Fire Station.

Background

Transportation & Infrastructure used the "construction manager/general contractor" project delivery method to build Northfield Fire Station No. 39 in Denver's Central Park neighborhood. This approach is ideal for technically complex construction projects with accelerated schedules and budget constraints.

The fire station was completed in July 2020 and cost about $8.8 million.

The Department of Transportation & Infrastructure Inadequately Managed the Northfield Fire Station Construction Project and Did Not Effectively Monitor Costs to Ensure the City Was Not Overcharged

- Transportation & Infrastructure staff over-relied on the contractor to determine project costs, and the department did not validate the contractor's cost estimates.
- Staff did not ensure the designer and the contractor complied with key contract terms and required deliverables.
- Department staff did not oversee the contractor's subcontracting process to ensure it was competitive and fair — particularly for building trades work the contractor subcontracted to itself.
- Staff did not validate the accuracy of the costs the city paid for design and construction services.
- The department lacks policies and procedures to decide when it will use the "construction manager/general contractor" delivery method and to consistently manage such technically complex construction projects.

WHY THIS MATTERS

Inadequately managing city construction projects means the City and County of Denver potentially wastes taxpayer money. The city might not receive all contractually required services and deliverables it is paying for, and it risks paying too much for the services it does receive.

With the COVID-19 pandemic having a lingering impact on the price of construction materials and services, it is more important than ever that the city properly manage its construction projects.

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BACKGROUND

Department of Transportation & Infrastructure

The Department of Transportation & Infrastructure is responsible for managing the design, planning, and construction of all City and County of Denver projects, except for those at Denver International Airport.[1]

The department exercises its authority over city construction typically in one of two ways:

1. By designing and building a project itself.
2. By hiring independent contractors.[2]

When the department hires a contractor for design or construction services, the department is responsible for managing and overseeing the services performed under that contract.

Managing and overseeing the city's construction is an immense responsibility, which demands an efficient use of taxpayer resources. A key goal in Transportation & Infrastructure's mission is to efficiently deliver effective, high-quality, safe, and equitable public infrastructure projects and services.[3]

The department has three main sections: Project Delivery Administration, Operations Administration, and Utilities Administration. This audit focuses on work in the Project Delivery Administration section — the one in charge of planning, design, and construction activities citywide.

Overall, the number of infrastructure projects Transportation & Infrastructure manages continues to increase on an annual basis — from over 400 projects in 2017 to over 700 projects expected by 2022.[4] Figure 1 on the following page shows the six-year upward trend of the department's annual construction workload — which includes transportation, facilities, and wastewater projects.

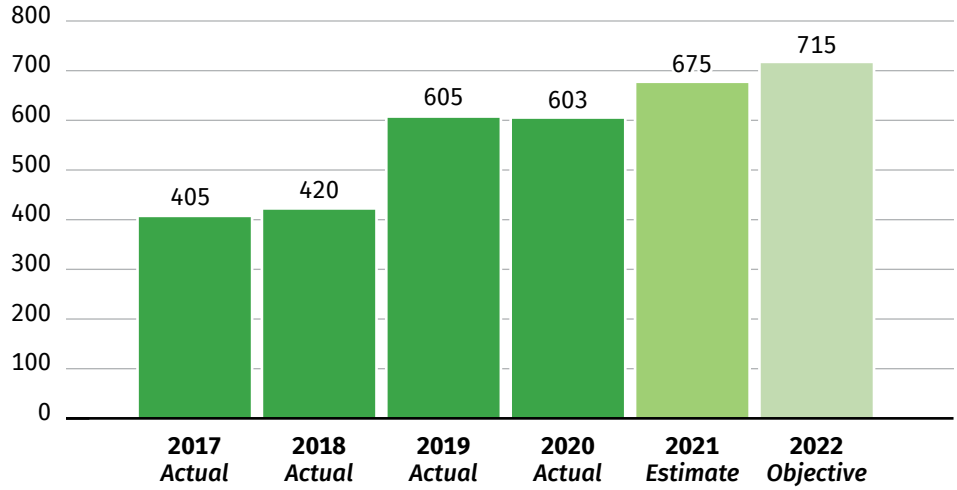
[1] Denver Charter § 2.3.3(A).

[2] Denver Charter.

[3] City and County of Denver, "2021 Mayor's Proposed Budget" (2020), accessed Dec. 11, 2020, https://www.denvergov.org/content/denvergov/en/denver-department-of-finance/financial-reports/city-budget.html.

[4] Data provided by the Department of Transportation & Infrastructure.

FIGURE 1. Department of Transportation & Infrastructure Project Totals, 2017-2022



Source: *Graphic created by Auditor's Office staff using data from the Department of Transportation & Infrastructure.*

Executive Order No. 8

When the Department of Transportation & Infrastructure hires contractors to design and build projects, the department's responsibilities do not end there. The department must still manage and oversee its contractors.

The city's Executive Order No. 8 says contracts are "one of the highest administrative priorities" in the city.[5] Under the executive order, city agencies are responsible for ensuring contractors perform according to the terms of their contracts.

In the context of a construction contract, this means ensuring the city gets everything it contracted for and at the correct price. As part of Executive Order 8's requirements, the Department of Transportation & Infrastructure must document its contract monitoring efforts and all contractually required deliverables.[6]

Northfield Fire Station No. 39

Northfield Fire Station No. 39 is near East 50th Avenue and Central Park Boulevard in Denver's Central Park neighborhood.[7] The fire station's construction is an example of the "construction manager/general contractor" project delivery method.

[5] Exec. Order No. 8, City and County of Denver (2020), accessed Dec. 22, 2020, https://www.denvergov.org/content/dam/denvergov/Portals/executiveorders/8-Contracts-Other-Written-Instruments-CCD.pdf.

[6] Exec. Order Memorandum No. 8A, City and County of Denver (2020), accessed Dec. 22, 2020, https://www.denvergov.org/content/dam/denvergov/Portals/executiveorders/8-Contracts-Other-Written-Instruments-CCD.pdf, § VII.

[7] The Central Park neighborhood was previously called Stapleton.

The need for the new fire station resulted from the neighborhood's growth and the addition of several new schools serving the area. As a result of the additional schools, Denver's fire chief recommended the city build a new fire station to ensure response times remain within 4 minutes, in line with national standards.

The fire station project began in August 2017 when the Department of Transportation & Infrastructure awarded a design contract to an architectural firm, OZ Architecture Inc. In May 2018, the department hired a construction firm, PCL Construction Services Inc., as the construction manager and general contractor to build the fire station.

The fire station was completed in July 2020 at a total cost to the city of about $8.8 million — about $691,600 for design services, $24,400 for preconstruction work, and $8.1 million for construction.[8]

Construction Project Roles

A typical construction project involves three primary parties: the owner, the designer, and the contractor. Together, these make up the "construction team." The owner's project manager and the contractor's subcontractors also play key roles.

Table 1 details the responsibilities of each party involved with the Northfield construction contract.

TABLE 1. Construction Project Roles

Role	Party	Description
Owner	The City and County of Denver	Pays for the project and contracts with other entities, which design and build the project.
Designer	OZ Architecture Inc.	Designs the project, prepares drawings and blueprints, and — when directed by the owner to do so — observes construction and monitors critical construction activities.
Contractor	PCL Construction Services Inc.	Contracts with the owner as an independent contractor to build the project.
Project manager	Department of Transportation & Infrastructure staff	Represents the owner and has day-to-day administrative responsibility for the project.
Subcontractors	Twenty-nine firms hired by the contractor	Building trades workers, such as plumbers and electricians, hired by the contractor who typically perform most of the actual construction.

Source: *Auditor's Office analysis based on terms defined in the 2018 Northfield construction contract.*

[8] The completion date is based on when the project reached final settlement — which is the final step in the construction process when the contractor has paid all subcontractors in full, all lien waivers have been signed and delivered, all guarantees and warranties have been delivered to the city, the contractor has submitted the final invoice, and the city has paid any money owed to the contractor for work completed that had yet to be paid.

Construction Project Delivery Methods

A construction project's delivery method sets the foundation for how a project's contracts are structured and how that project should be managed.

"Project delivery" describes the contractual relationships, roles, and responsibilities of the owner, the designer, and the contractor.[9] As such, the project delivery method dictates how these three parties interact with one another throughout a construction project.

The traditional method — and most common — is the "design-bid-build" delivery method. An alternative is the one Denver used when building the Northfield Fire Station: the "construction manager/general contractor" delivery method, which is ideal for technically complex construction projects that have an accelerated schedule and budget constraints.

DESIGN-BID-BUILD – The owner contracts separately for design and construction services in separate, consecutive agreements. As the name implies, there are three distinct stages:

1. The project is designed — either internally by the project's owner or by the owner hiring an architectural and engineering firm.
2. After design, the owner requests proposals from contractors who bid on the construction project.
3. The owner contracts with the chosen contractor, and the contractor then hires subcontractors who ultimately build the project.

As shown in Figure 2 on the following page, there is minimal interaction among the owner, the designer, and the contractor as they fulfill their specific roles. The owner works independently with the designer during the design stage and then independently with the contractor during the build stage. As such, the owner must have all design plans completed before they can put a project out for contractors to bid on.

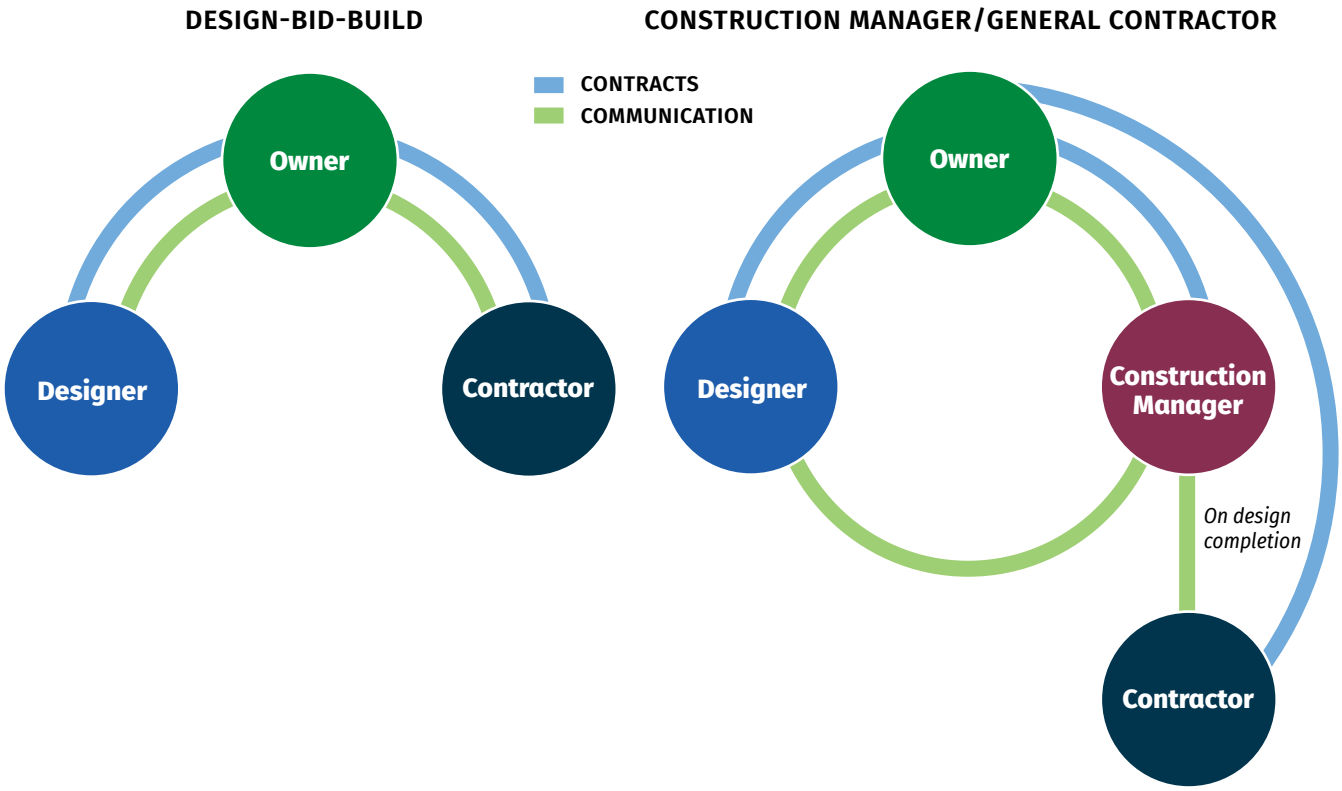
Under the design-bid-build method, the owner typically selects a contractor based entirely on cost — meaning the contractor who submits the lowest bid gets the construction contract.

CONSTRUCTION MANAGER/GENERAL CONTRACTOR – While the design-bid-build method involves only two contracts — one for design and a second for construction — the construction manager/general contractor method involves three: a design contract, a preconstruction contract, and a construction contract.

And unlike the design-bid-build method's siloed approach, this delivery method involves an integrated approach whereby the owner, the designer, and the contractor work together from early on in the project to plan, design, and build the project in line with a project schedule and agreed-upon price.

[9] National Academies of Sciences, Engineering, and Medicine, "Construction Manager-at-Risk Project Delivery for Highway Programs" (Washington, D.C.: The National Academies Press, 2010), accessed Feb. 9, 2021, https://doi.org/10.17226/14350.

FIGURE 2. Design-Bid-Build vs. Construction Manager/General Contractor Delivery Methods



Source: *Graphic designed by Auditor's Office staff using information from the Federal Highway Administration.*

These differences between the design-bid-build and construction manager/general contractor methods are shown in Figure 2.

Construction Manager/General Contractor Method

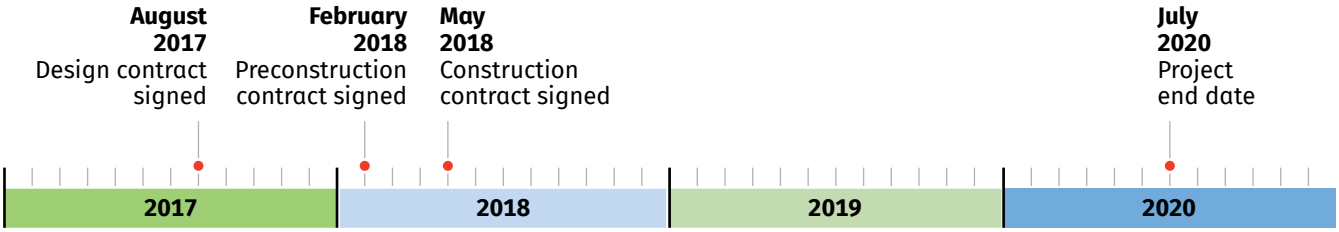
With the construction manager/general contractor method, the project owner procures both the design services and the construction services based on qualifications, not necessarily on which contractors can do the job at the lowest cost. Cost is not ignored under this approach, but it is not the primary consideration. Instead, the owner focuses on the skills and experience of the construction contractor — which serves initially as the construction manager during the design and preconstruction stages of the project.

DESIGN PHASE – By the owner entering into a preconstruction contract with the chosen contractor during the design stage, the contractor can offer suggestions early on about ways to save time and money and they can provide input on planning and design. For instance, the contractor can see the design as it evolves, create initial cost estimates for construction, and then refine those estimates and make them more accurate as the design becomes final.

After the design phase, the construction manager and project owner negotiate the price for the construction contract, and then the construction manager assumes the role of the general contractor to oversee construction.

Figure 3 shows the three contracts that made up the Northfield Fire Station project.

FIGURE 3. Northfield Fire Station Construction Manager/General Contractor Contracts



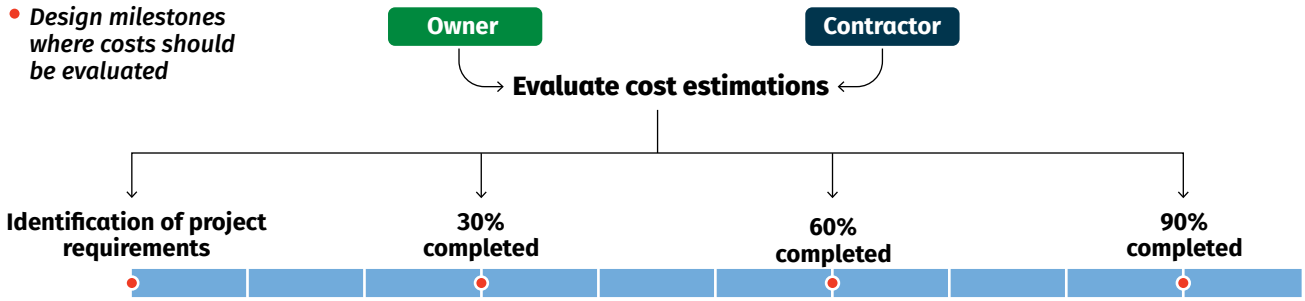
Source: *Graphic created by Auditor's Office staff based on the Department of Transportation & Infrastructure's contracts for the Northfield Fire Station project.*

PRECONSTRUCTION PHASE – The preconstruction phase of the construction manager/general contractor method is what differentiates it from other delivery methods. During preconstruction, the contractor also:

- Creates initial cost estimates at predetermined stages of the design and preconstruction phases that break down the project's scope of work in dollar terms.
- Uses those initial cost estimates to ultimately establish the agreed-upon "guaranteed maximum price" — the most the owner will have to pay the contractor for building the project.
- Creates the preliminary schedule for construction.
- Validates the design.
- Analyzes how to solve construction problems, identify and eliminate unnecessary costs, and improve the functionality of the building being constructed at the lowest possible cost.[10]
- Develops a work sequence plan and a construction logistics plan.
- Prepares subcontractor bid packages to solicit the various building trades required for construction.
- Performs market surveys of construction materials and equipment that have long delivery requirements.

[10] Gordian, "Value Engineering for Construction" (2019), accessed Feb. 1, 2021, https://www.gordian.com/resources/value-engineering-for-construction/.

FIGURE 4. Preconstruction Cost-Estimation Process



Source: *Graphic created by Auditor's Office staff based on information from the Colorado Department of Transportation's "Construction Manager/General Contractor Manual."*

COST-ESTIMATION PROCESS – As shown in Figure 4, cost estimation is one of the most important aspects of preconstruction because a contractor's initial estimates will evolve into the guaranteed maximum price that the owner and the contractor agree on in the construction contract.

As the design phase nears its end, the cost estimate becomes more and more accurate. Cost-estimation models should include details such as materials, equipment, subcontractors' quotes, production rates, general condition costs, and hours and rates for labor. General condition costs are those that are direct to the project but are more overhead in nature, such as costs incurred on-site for project supervision and administration.

Also during preconstruction, the owner and the contractor can talk through any disagreements about price, which allows them to resolve discrepancies before agreeing to the guaranteed maximum price.[11]

PRECONSTRUCTION COLLABORATION – The construction manager/general contractor delivery method requires strong collaboration — open communication, transparency, and a strong sense of trust by the construction team (i.e., the owner, the designer, and the contractor).[12] Collaboration is so vital to the success of this delivery method that each of the contracts for the design, preconstruction, and construction phases contains language that makes collaboration an explicit contractual requirement.

Active, direct involvement from the owner's project manager is also more necessary than with other construction delivery methods. Specifically, the project manager should coordinate the construction team and be responsible for guiding design decisions and overseeing collaboration

[11] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 3.6.

[12] National Academies of Sciences, Engineering, and Medicine, "Construction Manager-at-Risk Project Delivery for Highway Programs" (Washington, D.C.: The National Academies Press, 2010), accessed Feb. 9, 2021, https://doi.org/10.17226/14350.

with the designer and the contractor.[13] The project manager should also take a lead role in reviewing, questioning, and negotiating the preconstruction cost estimates.

CONSTRUCTION PHASE – Once preconstruction ends, construction happens just as it would under the design-bid-build method. The contractor subcontracts with various building tradespeople who then complete most, if not all, of the construction work.

Payment Terms

Aside from a project's delivery method, the payment terms of a contract also distinguish a construction project. Payment terms describe how the project owner will pay the designer and the contractor for their services.

The Northfield Fire Station project used three types of payment terms:

- **FIXED COST** – Also called "lump-sum" payment terms, the owner pays a set price in exchange for the contracted services, no more and no less.
- **COST-PLUS** – Also called "time and materials" payment terms, the designer or contractor bills the owner for the actual cost of their services and labor, plus a percentage for profit.
- **GUARANTEED MAXIMUM PRICE** – Under this arrangement, time and materials are reimbursed similar to the cost-plus payment terms; however, the owner and the contractor agree upfront to a maximum project cost, similar to a price cap. The project owner might pay less than the guaranteed maximum price but not more.

The "guaranteed maximum price" is the price cap — the most the city might have to pay for construction.

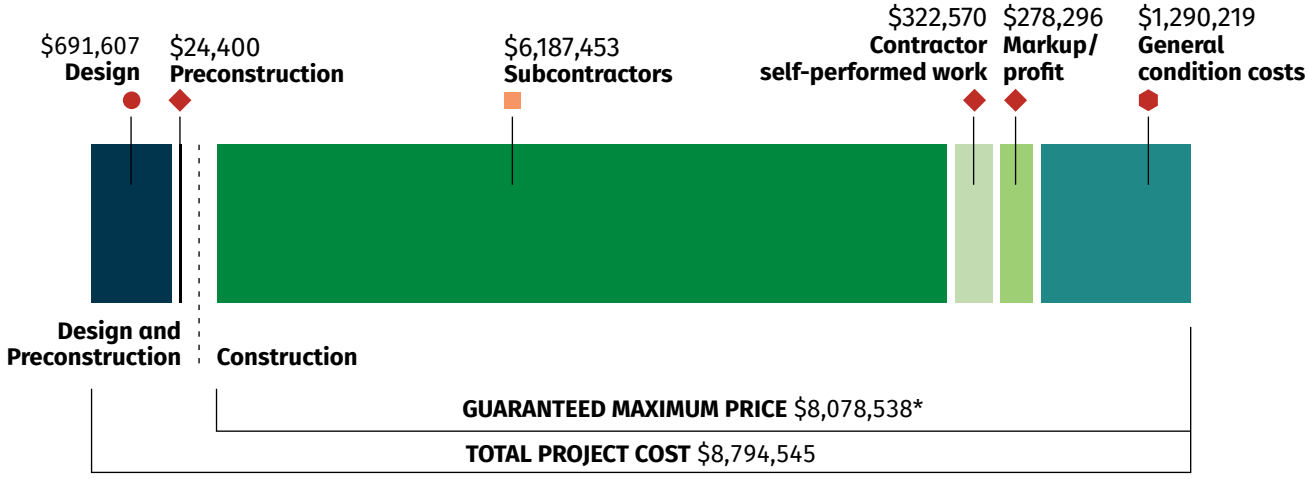
The payment terms for the Northfield Fire Station's design contract were based on time and materials, while the preconstruction contract had a fixed cost. The construction contract had a guaranteed maximum price.

Figure 5 on the next page breaks down the project costs for the Northfield Fire Station — including which costs were covered under which type of payment terms.

[13] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 3.1.

FIGURE 5. Project Costs, Guaranteed Maximum Price, and Payment Terms for Northfield Fire Station No. 39

- ● *Cost-plus contract between Department of Transportation & Infrastructure and OZ Architecture Inc.*
- ◆ *Lump-sum contract between Department of Transportation & Infrastructure and PCL Construction Services Inc.*
- ■ *Lump-sum subcontracts between PCL Construction Services Inc. and subcontractors*
- ⬢ *Direct costs reimbursed to PCL Construction Services Inc. for managing and overseeing the project on actual cost basis*



**$7,996,134 (original guaranteed maximum price), plus $82,404 (city-initiated change order)*

Source: *Auditor's Office analysis of information from contractor-submitted invoices from the Northfield Fire Station project.*

FINDING AND RECOMMENDATIONS

The Department of Transportation & Infrastructure Inadequately Managed the Northfield Fire Station Construction Project and Did Not Effectively Monitor Costs to Ensure the City Was Not Overcharged

The Department of Transportation & Infrastructure did not properly monitor and oversee all phases of the Northfield Fire Station construction project. This lack of oversight caused the city to diminish the advantages of the "construction manager/general contractor" project delivery method.

Specifically, we found department staff over-relied on the contractor, PCL Construction Services Inc. Department staff did not validate the contractor's cost estimates to ensure project costs were not inflated. They also did not enforce compliance with all contract terms and required deliverables for design and construction, and they did not adequately oversee how PCL Construction Services awarded work to subcontractors — including whether the company awarded itself a portion of the construction work in a fair and competitive manner.

Transportation & Infrastructure also lacks documented policies and procedures detailing how it determines the best delivery method to use for a construction project and the steps necessary to manage the unique risks associated with the construction manager/general contractor method. We also identified inconsistencies in the department's understanding of how to manage the various payment terms of a contract that uses this delivery method.

CONSTRUCTION MANAGER/GENERAL CONTRACTOR PROJECT DELIVERY METHOD

Project delivery methods dictate how the owner, the designer, and the contractor interact with one another throughout a construction project.

The "construction manager/general contractor" method is ideal for technically complex construction projects that have an accelerated schedule and budget constraints. It requires strong collaboration among the construction team members, because the owner, the designer, and the contractor work together from the beginning to plan, design, and build the project in line with a set schedule and agreed-upon payment terms.

The construction manager/general contractor project delivery method brings advantages to certain city projects that other construction delivery methods cannot. These include the ability for the city to:

- Select both the designer and the contractor based on their qualifications.

- Preserve competitive bidding for when the contractor hires subcontractors.
- Ensure the contractor can provide input on a project's design.
- Accelerate a project's schedule.
- Be certain of potential costs earlier in the design phase.
- Bid subcontracted work early to mitigate fluctuating construction prices.[14]

However, to maximize these advantages, the Department of Transportation & Infrastructure must monitor and oversee all phases of a construction manager/general contractor project: design, preconstruction, and construction.

This means that, during design and preconstruction, the city must monitor the costs billed by the designer, validate the contractor's cost estimates and the proposed guaranteed maximum price, and carefully monitor how the contractor gives input to the designer and how that input is considered and incorporated.

This monitoring is critical because the contractor is the primary driver in developing the guaranteed maximum price. In essence, the contractor sets the price tag of the construction contract it will subsequently be awarded, and if left unchecked, that price could be higher than the city should ultimately pay.

Then, during construction, the city needs to verify the contractor's billings to ensure the city pays only for the actual cost of construction and that it does not unnecessarily pay more than it should.

The city did not meet these standards of oversight on the Northfield project. Therefore, it is impossible to quantify the potential savings the city could have realized during this project.

Transportation & Infrastructure Over-Relied on Its Contractor to Determine the Guaranteed Maximum Price

Department of Transportation & Infrastructure staff did not verify cost estimates during preconstruction, nor did they verify the final cost estimate that established the guaranteed maximum price the city would pay for the Northfield Fire Station project.

In addition, the department lacks a standardized and documented threshold for determining how reasonable a contractor's cost estimates are. Without these processes, the Department of Transportation & Infrastructure cannot guarantee the city is getting the best price on construction costs.

LACK OF COST-ESTIMATE VALIDATION – The Transportation & Infrastructure staff who oversaw the Northfield Fire Station project over-relied on the

[14] National Academies of Sciences, Engineering, and Medicine, "Construction Manager-at-Risk Project Delivery for Highway Programs" (Washington, D.C.: The National Academies Press, 2010), accessed Feb. 9, 2021, https://doi.org/10.17226/143501, 12.

contractor's estimates and conducted only a high-level, undocumented visual review of the estimates. A well-documented cost-estimation process would help department staff make decisions with the best possible information — rather than completely relying on a contractor's estimates.[15]

When we asked department staff about their process to validate the contractor's cost estimates for the Northfield Fire Station project, they said they did not verify the contractor's estimates against historical or market data to determine whether the estimates were reasonable. Staff also said the Department of Transportation & Infrastructure did not use an independent, third-party cost estimator on the Northfield Fire Station project to help verify the contractor's estimates.

Department of Transportation & Infrastructure staff fundamentally misunderstand "guaranteed maximum price" payment terms.

Staff provided no documentation about their reported high-level, visual review of cost estimates. Staff said minutes of meetings among the construction team members (i.e., the city, the designer, and the contractor) might contain discussions of cost estimates. But we identified no evidence of these discussions in our review of the minutes obtained from the department.

Furthermore, department staff fundamentally misunderstand "guaranteed maximum price" payment terms — a common misconception among project owners.[16] During our audit, the staff who oversaw the Northfield project often referred to guaranteed maximum price terms as being equivalent to "lump-sum" payment terms.

With lump-sum payment terms, the city pays the full set amount for the services received. By contrast, the guaranteed maximum price is developed through a series of cost estimates during a project's design phase and is more equivalent to a price cap, in that the city might end up paying less.

Because the guaranteed maximum price quantifies the most the city could end up paying its contractor, it is crucial for Transportation & Infrastructure to be involved in creating cost estimates — especially the final cost estimate that becomes the guaranteed maximum price.

However, department staff viewed the guaranteed maximum price as a means to shift 100% of the construction risk to the contractor. The staff's rationale was that the contractor is ultimately responsible for any costs that exceed the guaranteed maximum price. While we agree with that, we do not agree with the claim that the city might not pay more than the guaranteed maximum price.

For example, the project's change order of $82,404 increased the guaranteed maximum price, which was ultimately paid by the city. Therefore, validating the contractor's cost estimates to establish final project costs becomes more important to ensure the city receives the best price for the work performed.

The Colorado Department of Transportation's "Construction Manager/

[15] National Academies of Sciences, Engineering, and Medicine, 56.

[16] National Academies of Sciences, Engineering, and Medicine.

General Contractor Manual" is a highly relevant, leading practice in the state, which lays out the necessary policies and procedures for managing and executing these types of complex construction projects. The state Department of Transportation has an entire unit that focuses on nontraditional project delivery methods, such as construction manager/general contractor projects, and state staff have extensive experience with these projects — having used them since 2009 for many large, high-risk, and complex construction projects.

The state manual draws on both its own staff's experience using the construction manager/general contractor method and the experiences of other state departments of transportation. The manual was created by an advisory committee with representatives from relevant state agencies and Colorado's construction industry, including:

- The Colorado Department of Transportation.
- The Federal Highway Administration's Program Delivery Section.
- The American Council of Engineering Companies of Colorado.
- The Colorado Contractors Association.
- The University of Colorado at Boulder.
- The Colorado Attorney General's Office.

The manual says the state relies on an independent, third-party cost estimator as a key component when developing a guaranteed maximum price. The independent cost estimator uses estimates and solicits quotes similar to the contractor bidding process.[17] The independent estimator also verifies contractors' prices, quotes, and methods to ensure project owners receive the best prices possible from their contractors.

As the design phase progresses, the contractor and the independent cost estimator prepare interim estimates at established milestones. At each milestone, the owner and the contractor also discuss and reconcile any price differences before committing to the final price.

While the city's use of an independent cost estimator may depend on the Department of Transportation & Infrastructure's resources, the department — at the very least — should use its own staff's expertise to conduct internal cost estimates to compare with contractors' estimates.

NO THRESHOLD FOR QUESTIONING DIFFERENCES IN COST ESTIMATES – The Department of Transportation & Infrastructure also lacks standardized metrics and thresholds for reviewing contractors' cost estimates. Specifically, the department has not established a predetermined acceptable threshold that would trigger further review and discussion when differences occur between its internal cost estimates and a contractor's.

As an example, if the department set an acceptable threshold at 10% and found through internal cost estimates that a contractor's estimates for

[17] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 2.9.

construction work exceeded that threshold, the department would then question the contractor's costs and further validate them before agreeing to a guaranteed maximum price.

According to the Colorado Department of Transportation's manual, the project owner should review the overall project cost proposal — as well as individually bid items — for major discrepancies, and the owner should accept the proposal if it is within an acceptable percentage of the independent cost estimate. The acceptable cost difference depends on a project's size and complexity but typically ranges from 2% to 10%.

The cost-estimation process is one of the most important steps that Transportation & Infrastructure staff should be involved with on a construction manager/general contractor project. This point is reinforced by the Federal Highway Administration, which says from the initial cost estimate to when the agreed-upon maximum price is established, costs tend to balloon more with construction manager/general contractor projects than with other delivery methods. This is likely because of the less competitive nature of highly complex construction projects, where prices are negotiated and not competitively bid.[18]

Without a thoroughly documented internal process to estimate costs and validate a contractor's estimates and without a standard to review significant price differences between the two sets of estimates, the Department of Transportation & Infrastructure cannot guarantee the city is agreeing to fair and uninflated guaranteed maximum prices for its construction manager/general contractor projects.

Compound this with the high tendency for construction manager/general contractor projects to grow in cost, the cost-estimation process — and the city's oversight of that process — is even more crucial to minimize inflated costs and ensure efficient use of taxpayer dollars.

1.1 RECOMMENDATION Validate Contractors' Cost Estimates

The Department of Transportation & Infrastructure should develop and document a process to independently verify contractors' cost estimates — either internally or by contracting with an independent third-party estimator. The department should hold review meetings at key project milestones that include the contractor, the designer, the cost estimator, and department staff who will evaluate and negotiate cost estimates. Meetings to discuss cost estimates should be thoroughly documented, along with the department's internal cost-estimation activities.

AGENCY RESPONSE: AGREE, IMPLEMENTATION DATE – JUNE 30, 2022
SEE PAGE 42 FOR THE AGENCY'S FULL RESPONSE TO OUR RECOMMENDATIONS.

[18] Federal Highway Administration, "Alternative Contracting Method Performance in U.S. Highway Construction" (2018), accessed Jan. 27, 2021, https://www.fhwa.dot.gov/publications/research/infrastructure/17100/17100.pdf, 14.

1.2	RECOMMENDATION	Establish Thresholds for Price Variations

The Department of Transportation & Infrastructure should develop and document thresholds for differences in all cost estimates that should prompt further evaluation of a contractor's estimates. These thresholds should be thoroughly documented and adjusted based on a project's risk and budget. Project thresholds should be established before the guaranteed maximum price is negotiated, and the final agreed-upon price should be within an acceptable deviation of the established threshold.

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Transportation & Infrastructure Staff Did Not Collaborate With the Construction Team to Ensure the City Received All Cost Estimates

Beyond not validating the contractor's cost estimates before agreeing to a guaranteed maximum price for the Northfield Fire Station project, the city did not ensure the contractor provided the city with all its cost estimates to begin with. We also found the city, the designer, and the contractor were not sufficiently collaborating while the contractor developed its cost estimates.

By not ensuring it was provided all required cost estimates and by not requiring strong collaboration among the construction team, the Department of Transportation & Infrastructure made it challenging to have open communication, transparency, and a strong sense of trust among all team members. In turn, this lack of transparency increased the risk and likelihood that the city agreed to an inflated guaranteed maximum price for the Northfield project. Better collaboration also could reduce the likelihood of scheduling delays, because problems would be addressed more openly.

Despite the design contract noting the cost estimates as explicit deliverables, we determined Transportation & Infrastructure staff did not fully understand the terms and requirements of the design contract. We also reviewed the designer's meeting minutes and found the minutes lacked the necessary detail to describe the department's involvement in the cost-estimation process.

The design contract with OZ Architecture Inc. required the company to work collaboratively with PCL Construction Services Inc. during the project's design and preconstruction phases to prepare preliminary cost estimates for the three major milestones in the design phase.[19] The contract also required regular meetings — such as a weekly one-hour design meeting — between the city and the design team through all phases of the project.

[19] City and County of Denver, Northfield Fire Station Design Contract (August 2017), § F.2, G.4, and H.1.4.

In addition, the design contract provided the city opportunity to review and approve the three major milestone documents for the preliminary cost estimates.

The state's "Construction Manager/General Contractor Manual" reinforces the need for strong collaboration among construction team members while cost estimates are developed. The manual requires the project owner to take a lead role and be directly involved in managing the preconstruction phase. This includes ensuring construction team members actively participate.[20]

Furthermore, the city's Executive Order No. 8 requires city agencies to monitor contractors' performance throughout the life of a contract — such as ensuring that contract terms are met and documenting contract monitoring activities, such as construction meetings and deliverables.[21]

The city received only two of the three required cost estimates for the three major milestones in the Northfield project's design phase, and department staff did not ensure they reviewed and approved these estimates as they were contractually required to do. We reviewed the documentation the department provided and determined the cost estimates the city did receive did not satisfy the required contract deliverable for each of the three design milestones.

One of the cost estimates had elements for two milestones, making it unclear which contract deliverable it was meant to fulfill. Neither of the estimates provided evidence of the department's involvement and collaboration in developing the cost estimates.

The Transportation & Infrastructure staff involved with the Northfield project did not fully understand the importance of the cost-estimation process, nor did they understand the significance of the collaborative nature that must exist throughout a project. We conclude that this misunderstanding ultimately led to the department staff failing to ensure the cost-estimation process was collaborative, transparent, and documented.

During our audit, Transportation & Infrastructure staff repeatedly said the guaranteed maximum price for the Northfield project was treated as a lump-sum fixed cost rather than a maximum price. For example, department staff said on one occasion that the guaranteed maximum price was "not an estimate; it is a contractually obligated number" similar to lump-sum payment terms in that "it is one lump-sum cost for all of the work." This misinterpretation contributed to the department's lack of understanding about the importance of the cost-estimation process, potentially causing the city to pay an overinflated final cost for the fire station.

[20] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 3.1.

[21] Exec. Order No. 8, City and County of Denver (2020), accessed Dec. 10, 2020, https://www.denvergov.org/content/dam/denvergov/Portals/executiveorders/8-Contracts-Other-Written-Instruments-CCD.pdf.

1.3	RECOMMENDATION	Ensure All Cost Estimates Are Developed, Delivered, and Collaborative

The Department of Transportation & Infrastructure should ensure collaboration and provide leadership of the construction team when producing the schematic, design development, and construction documents. This collaboration should be documented either in meeting minutes of construction team meetings or by other means. In addition, the department should enforce the contract terms requiring the department to review and approve the schematic, design development, and construction documents.

AGENCY RESPONSE: AGREE, IMPLEMENTATION DATE – DEC. 1, 2021
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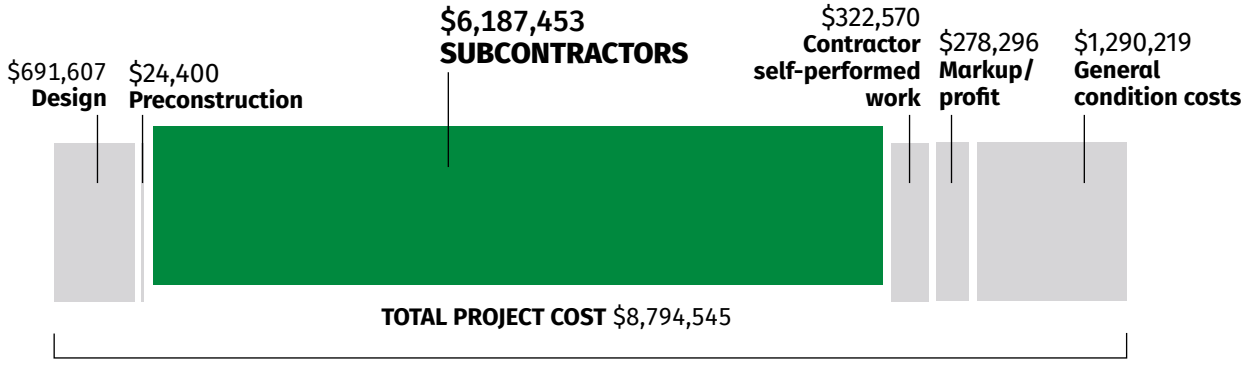
Transportation & Infrastructure Staff Did Not Monitor the Contractor's Subcontracting Process

As noted in Figure 6, 77% of the $8.1 million in construction costs to build the Northfield Fire Station was paid to 29 subcontractors. However, Department of Transportation & Infrastructure staff did not adequately oversee how the contractor hired those subcontractors — specifically to ensure PCL Construction Services Inc. followed a fair and reasonable bidding process, as required by the construction contract.

Department staff also failed to approve the subcontractors PCL Construction Services selected, and they did not review the lump-sum subcontracts to ensure there were no unallowable terms.

This lack of oversight over the subcontracts means the city could have paid unnecessarily higher costs when the contractor did not select the most competitive bidder or if the terms of the subcontracts failed to conform with the primary construction contract.

FIGURE 6. Subcontractor Costs for Northfield Fire Station No. 39



Source: *Auditor's Office analysis of information from contractor-submitted invoices from the Northfield Fire Station project.*

LACK OF COMPETITIVE BIDDING – The Northfield Fire Station construction contract required PCL Construction Services Inc. to use a fair, reasonable, and competitive process when hiring subcontractors.[22] But the Transportation & Infrastructure staff who oversaw the Northfield project did not ensure the contractor followed a fair and reasonable bidding process so that the city could receive the best value from the subcontractors.

A competitive bidding process is only fair and open when the work is awarded to the qualified bidder that offers the lowest cost out of at least three bids received through a public solicitation. Competitive bidding helps organizations control costs by seeking the best value.

The construction contract required PCL Construction Services to award subcontracted work to the "lowest, responsive and qualified bidder," which can be waived with "the express written approval of the project manager" (i.e., the city).[23] Transportation & Infrastructure staff provided no written approval waiving that bidding requirement.

Subcontractors were used primarily for building trades work during construction that include masonry, carpentry, plumbing, drywall, and electrical. We reviewed bid packets for the 21 subcontracted trades required for the project and found the contractor did not receive at least three bids for two of the trades. For 10 trades, where the contractor did not choose the lowest bidder, it did not document its rationale for nine of the 10.

We also found four trades that had three bids — but one of those bids for each of the four trades was from the contractor itself. While one of the bids may come from the contractor itself, the lack of three additional bids from other subcontractors does not promote the appearance of a competitive bidding environment. Transportation & Infrastructure staff should more carefully review these bids to ensure they are competitive.

NO REVIEW AND APPROVAL OF SUBCONTRACTORS – The Northfield Fire Station construction contract says that the city shall review the selection of each subcontractor and supplier and the city can reject any subcontractor or supplier.[24] But while reviewing the bid packets for the 21 subcontracted trades, we found no evidence that Transportation & Infrastructure staff reviewed and approved the subcontractors PCL Construction Services selected.

Eleven of the 21 bid packets included a letter detailing the contractor's selection with a signature line for Transportation & Infrastructure staff to document their approval. But none of the letters were signed. The other 10 bid packets contained only a "bid recap" detailing the bids and associated costs for the work — no letter.

When we asked department staff how they documented their approval of the subcontractors, they said they circled the lowest bid. We did note

[22] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.1.

[23] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.1.

[24] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.1.

77% of the $8.1 million in construction costs to build the Northfield Fire Station was paid to subcontractors.

the lowest bidder was circled on some bid recaps, but this was not done consistently and does not provide sufficient evidence of the department's review and approval of each subcontractor.

NO REVIEW OF SUBCONTRACT TERMS – Although subcontracted work on the Northfield Fire Station project amounted to 77% of the total construction cost, Transportation & Infrastructure staff did not request or review any agreements between the contractor and the subcontractors — or any changes to those agreements — to ensure they did not include any unallowable items, fees, or markups that did not comply with terms of the primary construction contract between PCL Construction Services and the city.

When we compared the winning bids with the subcontracts and any subsequent revisions to those subcontracts, we noted that many agreements exceeded the bid amounts — some significantly. Eight subcontracts were for less than the subcontractors' initial bids, but as Table 2 shows, we found that overall the amount of money awarded through the subcontracts was $354,069 more than what the subcontractors proposed to spend.

TABLE 2. Cumulative Dollar Amounts of Subcontractors' Bids vs. Amounts Awarded

Bid vs. Award	Total Cost
Bids	$6,031,474
Awards for All Subcontracts and Revisions	$6,385,543
Difference	**$354,069**

Source: *Auditor's Office analysis based on subcontractors' bids and the subcontracts for the Northfield Fire Station project.*

Limited information in the subcontracts, such as the lack of a detailed cost breakdown or other documentation, prevented us from determining whether the inflated amounts were justifiable or whether they were because of unallowable markups, fees, profit, or an error in the bid process.

For example, the winning bid for "earthwork" was $255,842, yet the contractor ultimately awarded the subcontractor a $361,637 contract — 41%, or $105,795, above the bid amount. Meanwhile, the winning bid for "electrical – low volt" work was $679,739, but PCL Construction Services awarded the subcontractor a $965,498 contract — 42%, or $285,759, above the bid.

The subcontracts also required the subcontractors to submit a budget and time estimate for the city's review upon request when revisions were necessary. While the city is not a party to the subcontracts, the city could have requested the additional cost detail supporting the subcontracted

amounts to determine whether the amounts over the bid were justifiable.

Based on the evidence we reviewed, we found Department of Transportation & Infrastructure staff were not involved with or aware of the contractor's subcontracting practices and they relied solely on the contractor to award and oversee all subcontracted work.

In addition, staff said they were concerned only with ensuring the contractor received three bids for each building trade. The Transportation & Infrastructure staff who oversaw the Northfield project failed to request or review the subcontracts or a detailed breakdown of costs associated with the amount of each subcontract.

When we asked them about their lack of involvement in the contractor's subcontracting processes, they said subcontracts are "irrelevant" to the city as the city is not a party to the agreements. They also said they believe subcontracts reflect only what a contractor pays its subcontractors — not what the city pays the contractor. However, the money a city contractor pays to its subcontractors comes from Denver taxpayers.

Department staff said subcontracts are "irrelevant" to the city as the city is not a party to the agreements.

We acknowledge the legal principle known as "privity of contract," which requires subcontractors to deal directly with the contractor that hired them.[25] And as such, we do not suggest that the city circumvent a contractor to deal in any direct way with subcontractors.

However, the city — as the owner and ultimate authority of its construction projects — should have more involvement in a contractor's subcontracting practices. This would not require the city to have any contact or relationship with a subcontractor. Rather, the Department of Transportation & Infrastructure could use its legal relationship with a contractor to obtain necessary information from the contractor to determine whether subcontractors are being selected based on fair and open competition.

The Institute of Internal Auditors' construction auditing guide says project owners should obtain construction subcontracts because the documents could include overhead and profit markups that are not in line with the terms of the contract between the owner and the contractor.[26] The Institute of Internal Auditors also warns that many subcontracts contain allowances and/or alternatives in the contract sum and that reviewing subcontracts provides owners insight as to whether these items are present.

Because the Northfield construction contract between the city and the contractor allowed the city to obtain from the contractor all subcontracts associated with the project, we reviewed all of them for this audit.[27] Based on our review, the subcontracts' language and terms were identical across all 29 agreements. Therefore, obtaining and reviewing all subcontracts for this project would not have been a hefty endeavor for Transportation &

[25] Ron Risner, "The Practitioner's Blueprint to Construction Auditing" (Altamonte Springs, Florida: The Institute of Internal Auditors Research Foundation, 2012), 97.

[26] Ron Risner, 97-100.

[27] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.3.

Infrastructure staff.

Inadequate oversight of a contractor's subcontracting processes increases the opportunity for taxpayer dollars to be mismanaged.

While we did not find issues with the limited contract language available on the Northfield project, the department should obtain subcontracts on future projects to ensure the language does not contradict the primary contract between the city and the general contractor it hires and that it does not contain unallowable or potentially inflated costs.

Inadequate oversight of a contractor's subcontracting processes increases the opportunity for taxpayer dollars to be mismanaged. Specifically, it increases the risks of possible fraud schemes in which a contractor may target specific subcontractors and unfairly award them contracts or give them an unfair advantage by manipulating the scope of work. There is also a heightened risk that a contractor and subcontractor might coordinate to increase their profits.

Finally, without a proper review of subcontracts and the detailed costs that make up the amounts awarded to subcontractors, the city could pay for services it does not actually receive or it could ultimately pay more for a construction project than it should.

1.4 RECOMMENDATION Actively Participate in Subcontracting

The Department of Transportation & Infrastructure should ensure project managers are actively involved in the awarding of subcontracted work to ensure the terms of a construction manager/general contractor agreement are adhered to regarding subcontracted work. Specifically, project managers should ensure a contractor's subcontracting process is fair, reasonable, and — to the greatest extent practicable — based on open competition.

At a minimum, the department's involvement should include:

- **Obtaining and reviewing the documentation of each bid package submitted by a subcontractor to ensure at least three bids per building trade are received and that the lowest qualified bidder is selected.**
- **Ensuring the contractor tried to re-solicit the bid when three bids are not received.**
- **Documenting and retaining the department's review and approval of the selected subcontractors — including both the contractor's rationale for not selecting the lowest bid and the project manager's approval.**
- **Obtaining and reviewing subcontracts for unallowable terms, fees, and other items to ensure the subcontracts do not contradict the agreement between the city and the contractor.**

AGENCY RESPONSE: AGREE, IMPLEMENTATION DATE – JUNE 30, 2022
SEE PAGE 42 FOR THE AGENCY'S FULL RESPONSE TO OUR RECOMMENDATIONS.

Transportation & Infrastructure Did Not Oversee the Contractor's Process for Hiring Itself as a Subcontractor

"Self-performed work" — that is, when a contractor subcontracts work to itself — is a common and widely accepted practice in construction. However, we found PCL Construction Services Inc. exceeded the amount it had proposed for the work it subcontracted to itself, and the city paid the company twice for some services related to preconstruction.

Transportation & Infrastructure staff did not adequately oversee the contractor's self-performed work and did not ensure the contractor's bidding process for this work was competitive and fair. The department also did not review and approve the extra work the company subcontracted to itself, as the construction contract required the city to do.

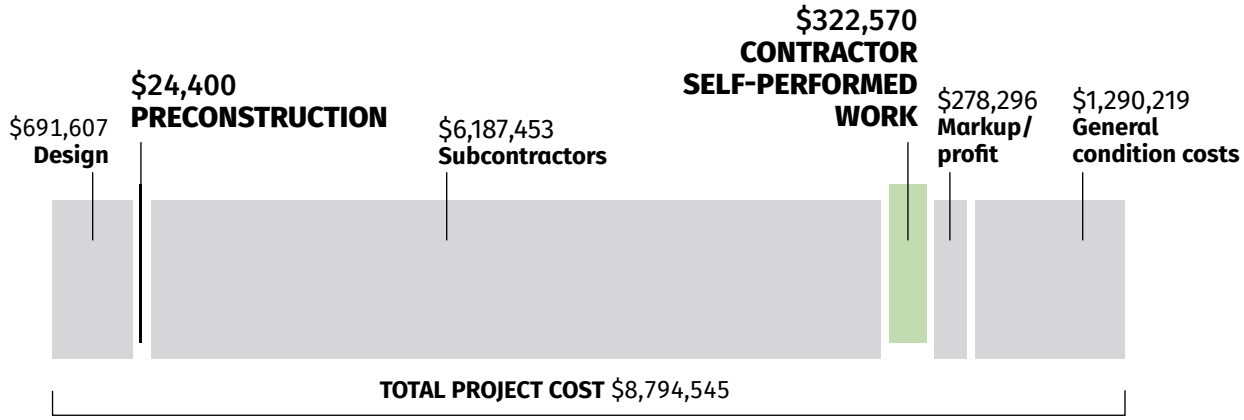
The city's over-reliance on the contractor and the city's inadequate oversight of the contractor awarding itself subcontracted work increased the risk that the contractor could have had an unfair advantage. In such a circumstance, a contractor could hire itself for subcontracted work outside a fair and competitive bidding process — which could lead to the city overpaying for construction work or receiving building trades work from a contractor that is not the most qualified.

The Contractor Exceeded Its Proposed Cost, and the City Overpaid

Transportation & Infrastructure staff were not involved in the contractor's process for hiring itself as a subcontractor, and we learned PCL Construction Services awarded itself more money than it had proposed to spend in its bid by including a duplicate charge for some preconstruction work — resulting in the city overpaying.

Included in the Northfield construction contract was a proposal by PCL Construction Services to self-perform concrete work for $295,445. However, when the company awarded itself the subcontract, the cost of the agreement was for $305,845 — or $10,400 more than the proposal. The company also performed additional work, resulting in two revisions to the subcontract that cost the city $6,800 and $9,925, respectively, totaling $322,570 — as shown in Figure 7.

FIGURE 7. Costs for Self-Performed Work and Preconstruction for Northfield Fire Station No. 39

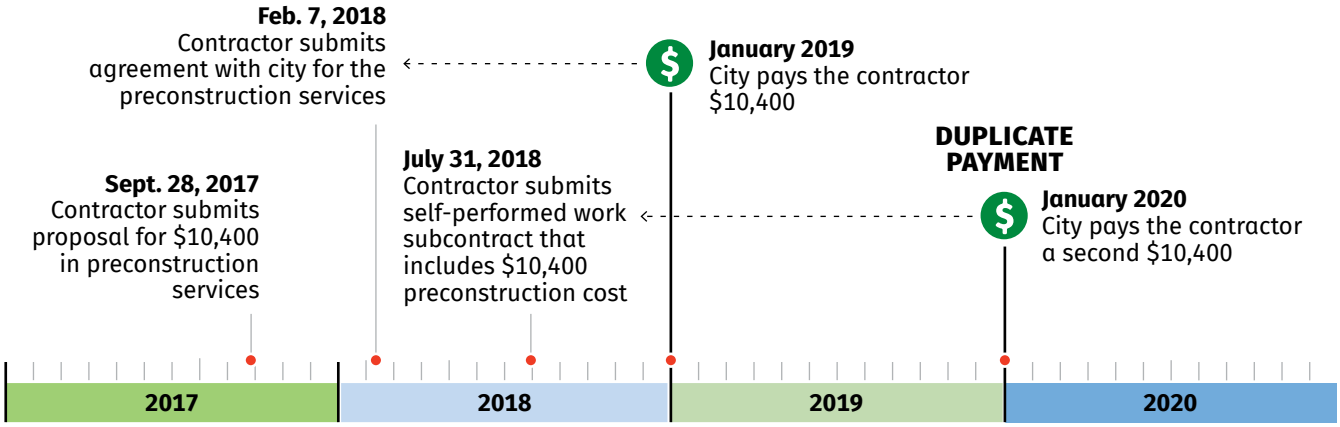


Source: *Auditor's Office analysis of information from contractor-submitted invoices from the Northfield Fire Station Project.*

We found PCL Construction Services' subcontract with itself — dated July 31, 2018 — erroneously included an extra $10,400 for preconstruction services based on a proposal from September 2017. This means the city paid the company twice for the same $10,400 in preconstruction services — once in January 2019 as part of the preconstruction contract and once again in January 2020 as part of the subcontracted construction work.

The contractor's proposal in the Northfield construction contract for this self-performed work did not mention preconstruction services as being part of its bid. See Figure 8 for a timeline of the city's payments to the contractor.

FIGURE 8. Timeline of Duplicate Preconstruction Services Payment



Source: *Auditor's Office analysis of invoices and contracts from the Northfield Fire Station project.*

Transportation & Infrastructure was unaware the city made a duplicate payment of $10,400.

Meanwhile, the construction contract required the contractor to submit for the Department of Transportation & Infrastructure's review any additional self-performed work, along with all bids submitted to the contractor by competing subcontractors.[28] The final award for the work was supposed to be made only after Transportation & Infrastructure staff talked with the contractor.

As mentioned, we found the company's subcontract with itself had two revisions — one for $6,800 and a second for $9,925. While the city approved the first change in an amendment to the construction agreement, staff did not review or approve the second revision for $9,925.

When we asked Transportation & Infrastructure staff about the duplicate payment of $10,400 and the lack of approval for the second revision to the subcontract, staff were not even aware that a separate self-performed work agreement existed.

[28] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.2.1.

The city is ultimately responsible for paying for all services related to a project irrespective of whether the work was performed by the contractor or a subcontractor.

Transportation & Infrastructure staff again reiterated that the subcontract covering the self-performed work was "irrelevant" to the city as the city was not a party to that agreement. But as we discuss in this report, that mindset is incorrect. The city is ultimately responsible for paying for all services related to a project irrespective of whether the work was performed by the contractor or a subcontractor.

The Contractor's Agreement with Itself Did Not Follow a Competitive Bidding Process

The Transportation & Infrastructure staff who oversaw the Northfield Fire Station project also did not ensure PCL Construction Services Inc. followed a fair and reasonable bidding process when awarding itself a subcontract.

As discussed, the construction contract required the contractor to use a fair, open, and competitive process when hiring subcontractors.[29] However, when we reviewed the bid documentation for PCL Construction Services' self-performed concrete work, we noted the contractor received only two other bids besides its own — and the contractor had underbid its two competitors by $41,000 and $184,000, respectively, as shown in Table 3.

TABLE 3. Bid Comparison for the Contractor's Self-Performed Concrete Work

Source of Bid for Concrete Work	Bid Amount	Percentage Difference from Contractor's Bid
PCL Construction Services Inc.	$295,445	
Subcontractor No. 1	$336,680	14%
Subcontractor No. 2	$479,452	62%

Source: *Auditor's Office analysis of bid-packet documentation obtained from the Department of Transportation & Infrastructure.*

While it is common practice for one of the bids for self-performed work to come from the prime contractor, Transportation & Infrastructure should still ensure the contractor's process to obtain the other two bids is competitive and fair.

We compared the scope of each subcontractor's bid and did not find any significant differences to explain such a gap. Transportation & Infrastructure staff said they were not concerned with the large difference among the three bids and they asked no further questions about the contractor's process before accepting the company's proposal to subcontract with itself.

However, the Construction Audit and Cost Control Institute says project owners should consider the possibility that contractors may manipulate a

[29] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 7.1.

competitive bidding process when seeking to subcontract with themselves. This includes the potential to:[30]

- Minimize effective competition by limiting potential bidders and only obtaining bids from contractors not interested in doing the work and by manipulating the scope of work to ultimately award itself the subcontract even though the contractor may not appear to be the lowest bidder.
- Enter into a subcontract for self-performed work with effective competition, then doubling or tripling the self-performed subcontract amount by awarding itself change orders that add to the scope of work.

The Institute of Internal Auditors' construction auditing guide also says project owners should ensure contractors follow their own bid-and-award procedures for self-performed work, including by having a competitive process with sealed bids. Owners should also ensure contractors do not layer their fees, such as by adding markups.[31]

The Colorado Department of Transportation requires its project managers to use one of a variety of methods to identify significant differences between bids — which can include the use of an independent review of cost estimates to identify notable costs that have more than a 10% difference, as we discussed on page 13. Another method is to review only high-dollar differences exceeding a set dollar amount while reviewing items with significant percentage differences.[32]

While self-performed work is not unusual in construction, failure to adequately monitor a contractor's practices increases the opportunity for contractors to use inside and unfair knowledge of a project to their benefit.[33]

In this case, the Department of Transportation & Infrastructure's lack of involvement in the subcontracting processes for self-performed work resulted in the city making a duplicate payment of $10,400. Further, because of the lack of oversight and detailed documentation, the city cannot be assured it did not overpay for PCL Construction Services' other self-performed work.

[30] Construction Audit and Cost Institute Inc., "Self-Performed Work by Construction Managers" (2014), accessed April 19, 2021, https://www.caacci.org/wp-content/uploads/2018/08/Self-Performed-Work-by-Construction-Managers.pdf.

[31] Ron Risner, "The Practitioner's Blueprint to Construction Auditing" (Altamonte Springs, Florida: The Institute of Internal Auditors Research Foundation, 2012), 123-126.

[32] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 3.6.7.

[33] Ron Risner, "The Practitioner's Blueprint to Construction Auditing" (Altamonte Springs, Florida: The Institute of Internal Auditors Research Foundation, 2012), 123-126.

1.5	RECOMMENDATION	Actively Participate in a Contractor's Awarding of Self-Performed Work

The Department of Transportation & Infrastructure should ensure project managers are actively involved in the awarding of any contractor's self-performed work to ensure the contractor adheres to the terms of its contract. Specifically, project managers should ensure the bidding process is fair, reasonable, and based on open competition.

At a minimum, project managers should:

- **Obtain and review documentation of the bid packages for self-performed work to ensure the contractor received at least three bids and that the lowest qualified bidder is selected.**
- **Ensure the contractor tried to re-solicit the bid when three bids are not received.**
- **Document and retain the department's review and approval of the selected subcontractors — including the contractor's rationale for selecting itself when it is not the lowest bidder.**
- **Document and review the bids, proposed costs, and scope to understand why significant cost differences occur.**
- **Obtain and review all self-performed work agreements for unallowable terms, fees, and other items that may not be reasonable, such as duplicate work and costs.**

AGENCY RESPONSE: AGREE, IMPLEMENTATION DATE – JUNE 30, 2022
SEE PAGE 42 FOR THE AGENCY'S FULL RESPONSE TO OUR RECOMMENDATIONS.

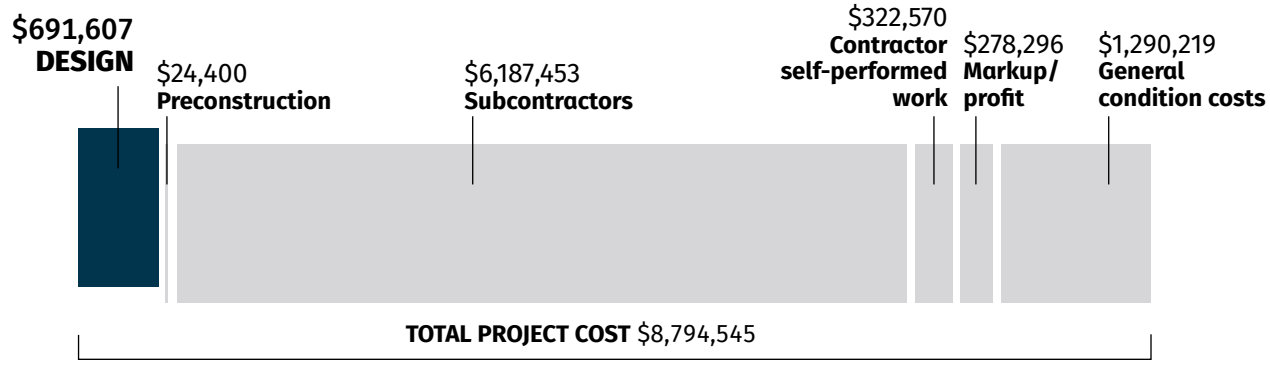
Department Staff Did Not Verify the Accuracy of All Costs Paid to the Designer

We found the Department of Transportation & Infrastructure did not ensure OZ Architecture Inc.'s billing rates on its detailed invoices matched the billing rates set in the cost-plus design contract.

We reviewed a random sample of 10 — or 43% — of the 23 invoices for design services and identified several inconsistencies related to the billing rates:

- Eight invoices had a billing rate lower than the rate listed in the contract.
- Three invoices for engineering and surveying had a higher billing rate for the senior engineer and the design engineer than was listed in the contract.
- Two invoices had a higher billing rate for the designer and a lower billing rate for a graphics person than was listed in the contract.

FIGURE 9. Design Contract Costs for Northfield Fire Station No. 39



Source: *Auditor's Office analysis of information from contractor-submitted invoices from the Northfield Fire Station project.*

The city paid OZ Architecture $691,607 for designing the Northfield Fire Station. Figure 9 shows the design costs as part of the total project costs of the fire station.

The design contract stipulated specific billing rates the city would pay for the design consultant's staff.[34] The contract also said the firm's monthly invoices should include time worked by the design consultant's staff and all other essential information to assess the firm's progress.

The design contract had "cost-plus" payment terms — that is, OZ Architecture's consultants would be paid only for their time and materials plus a percentage for profit. We confirmed our interpretation of the design contract's payment terms with the City Attorney's Office.

But Transportation & Infrastructure management did not enforce the contract's terms — such as by rejecting invoices when the billing rates differed from the contracted rates, and management allowed the designer to modify billing rates over the course of the project without approval.

Most significantly, Transportation & Infrastructure management did not understand the cost-plus payment terms in the design contract. Department staff treated the cost-plus payment terms as though they were lump-sum payment terms. That is, the firm was supposed to be paid only for time and materials plus a percentage for profit, but Transportation & Infrastructure staff believed the city had agreed to pay the full contracted amount regardless of the actual costs the firm incurred.

Transportation & Infrastructure officials claimed that any changes in the billing rates would not cause the city to incur more costs beyond what they believed was a set amount for the design contract.

However, this belief does not consider the possibility that the city could pay less if actual costs were less than the contracted amount or that the city could pay more if it was billed incorrectly because the contract terms

[34] City and County of Denver, Northfield Fire Station Design Contract (August 2017), Exhibit B.

were not adequately enforced.

By the city improperly enforcing contractual billing rates and failing to enforce areas of noncompliance, the city paid an inaccurate amount to the designer. It also increased the risk that the city paid for services the firm did not provide or that the city either over- or underpaid for specific services.

1.6	RECOMMENDATION	Enforce Contractual Billing Rates and Properly Manage Payment Terms

The Department of Transportation & Infrastructure should enforce contractual billing rates as written in professional service contracts. Furthermore, the department should ensure the staff who oversee construction contracts understand the different types of payment terms so the terms are managed accordingly.

AGENCY RESPONSE: AGREE, IMPLEMENTATION DATE – SEPT. 16, 2021
SEE PAGE 42 FOR THE AGENCY'S FULL RESPONSE TO OUR RECOMMENDATIONS.

Transportation & Infrastructure Lacks Policies and Procedures for Managing Construction Manager/General Contractor Projects

The Department of Transportation & Infrastructure does not have policies and procedures specifically for managing projects that use the "construction manager/general contractor" delivery method. This has resulted in staff who manage and oversee these projects having inconsistencies in philosophies, which means staff are not approaching all technically complex construction projects the same way.

In addition to speaking with the city's project manager on the Northfield Fire Station project, we spoke with another Transportation & Infrastructure project manager experienced at overseeing construction manager/general contractor projects who had recently completed a project that used the same delivery method and contractor as the Northfield project. Based on these discussions, we noted vast inconsistencies related to how they view and treat certain project management activities, including:

- Review and approval of detailed construction invoices, known as "pay applications."
- Cost estimation.
- Awarding of subcontracted work.

Transportation & Infrastructure's lack of documented policies and procedures that detail the steps required to consistently and effectively manage a construction manager/general contractor project means project management is not standardized nor is it executed consistently across all such projects.

With the Northfield Fire Station project, we learned Transportation & Infrastructure staff relied on their own professional judgment and expertise to determine the steps performed and the extent of those steps. While complex construction projects — like the projects that typically use the construction manager/general contractor delivery method — have different risks and challenges, overall, the essential steps and goals for managing such projects are the same for every project.[35]

Therefore, having documented policies and procedures that address the essential steps and goals will be beneficial by bringing consistency to the city's project management of construction manager/general contractor contracts while still providing project managers with the flexibility to address unique challenges and risks that vary by project.

As previously mentioned, the Colorado Department of Transportation's "Construction Manager/General Contractor Manual" is a highly relevant, leading practice in the state, which lays out the necessary policies and procedures for managing and executing the construction manager/general contractor delivery method. The manual is used by contractors, consultants, and state department personnel for guidance on how to effectively manage and perform all essential steps in a consistent manner on a construction manager/general contractor project — from project scope through completion.[36]

The state's manual provides similar guidance for managing construction manager/general contractor projects as the Institute of Internal Auditors' construction auditing guide, which says uniformity throughout an organization prevents architects, contractors, and subcontractors from managing the organization's project in their own way. At a minimum, uniformity should exist when:[37]

- Approving capital projects.
- Approving construction agreements.
- Developing an agency's organizational chart, including job descriptions.
- Bidding and awarding projects to contractors.
- Approving detailed contractor invoices each month.
- Approving and processing change orders.
- Reimbursing costs.

According to the Department of Transportation & Infrastructure and as shown in Figure 1 on page 2, the six-year upward trend of the department's annual construction workload is anticipated to reach over 700 projects

[35] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 1.1.

[36] Colorado Department of Transportation, § 1.1.

[37] Ron Risner, "The Practitioner's Blueprint to Construction Auditing" (Altamonte Springs, Florida: The Institute of Internal Auditors Research Foundation, 2012), 194.

by 2022. Given Transportation & Infrastructure's current and future construction plans, having documented policies and procedures is crucial.

While we did not find any concerns with the city not getting the work agreed upon in the Northfield Fire Station contract, continued inconsistencies in managing construction manager/general contractor projects could lead to steps being missed or not performed to the extent necessary — which can lead to the city paying more than it should for a project or not receiving the full scope of work it contracted for.

1.7 RECOMMENDATION — Develop and Implement Policies and Procedures for the Construction Manager/General Contractor Delivery Method

The Department of Transportation & Infrastructure should develop and implement policies and procedures addressing the unique risks of the construction manager/general contractor delivery method. These policies and procedures should detail the steps required to effectively deliver such projects — from when a project is scoped through the end of construction.

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Transportation & Infrastructure Lacks a Process to Determine which Project Delivery Method to Use

The Department of Transportation & Infrastructure did not use a structured or risk-based approach to determine the best delivery method to use when building the Northfield Fire Station. The department also lacks a documented policy on how to select a project delivery method; instead, staff relied solely on their own professional judgment.

While we agree department staff should have adequate experience and be able to use their professional judgment to determine the delivery method for a construction project, the department needs written guidance so decisions are made consistently and the optimal project delivery method is selected for a given project.

Federal guidance recommends using a systematic approach whereby a project's delivery method is selected after considering the advantages and disadvantages of competing delivery methods.[38] These considerations should be documented and provide a transparent justification of the decision — especially when using an alternative delivery method, such as the construction manager/general contractor method.

[38] National Academies of Sciences, Engineering, and Medicine, "A Guidebook for the Evaluation of Project Delivery Methods" (Washington, D.C.: The National Academies Press, 2009), accessed Jan. 25, 2021, http://www.trb.org/Publications/Blurbs/161690.aspx.

Likewise, the Colorado Department of Transportation also emphasizes the importance of a structured approach to selecting an appropriate delivery method for a project. Key considerations in selecting project delivery should include:[39]

- The schedule.
- The level of complexity.
- The cost.
- The level of risk.
- The owner's experience.
- The owner's desired level of control.

The state also recognizes that the construction manager/general contractor method is not suitable for every project, so the Colorado Department of Transportation developed a matrix for evaluating relevant factors and determining which project delivery method is optimal. The selection matrix considers project goals, attributes, and constraints according to factors such as schedule, complexity, cost considerations, and level of design.[40] Delivery methods are then scored with a simple weighted system.

A structured assessment of the strengths and weaknesses as they relate to a project can maximize construction efficiency and minimize project risks.

The construction manager/general contractor method presents unique risks, advantages, and disadvantages in the areas of cost, construction schedule, risk management, and risk allocation. Therefore, the choice of that delivery method is an important process. A structured assessment of the strengths and weaknesses as they relate to a project can maximize construction efficiency and minimize project risks.[41]

Having a documented, structured, and risk-based approach to determining a project's delivery method decreases the risk that the city might select an inappropriate delivery method for a project, and it decreases the risk of scheduling delays, cost overruns, and various other negative effects.

Thoroughly documenting the project delivery selection process creates a record of considerations made and provides shared knowledge among other staff. It also enhances transparency when spending taxpayers' money. Having a formal process would allow the Department of Transportation & Infrastructure to refer to past analyses when engaging in similar construction projects in the future to aid in selecting which delivery method is most appropriate.

[39] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 2.3.1.

[40] Colorado Department of Transportation, § 2.3.

[41] National Academies of Sciences, Engineering, and Medicine, "A Guidebook for the Evaluation of Project Delivery Methods" (Washington, D.C.: The National Academies Press, 2009), accessed Jan. 25, 2021, http://www.trb.org/Publications/Blurbs/161690.aspx.

1.8	RECOMMENDATION	Develop and Implement Policies and Procedures for Selecting Project Delivery Methods

The Department of Transportation & Infrastructure should develop and implement policies and procedures for a project delivery selection process that aligns with leading government practices. At a minimum, this process should be thoroughly documented and include primary selection factors as outlined in the Colorado Department of Transportation's project delivery selection matrix, as well as selection rationale.

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Transportation & Infrastructure's Project Risk Assessment Process was Neither Collaborative nor in Line with Leading Practices

Department of Transportation & Infrastructure staff did not collaborate with its entire construction team when identifying, managing, and monitoring construction risks specific to the Northfield Fire Station project.

While department staff used a project risk register to identify, assess, and mitigate risks related to the project, they primarily used the register as an internal tool and did not require the designer, OZ Architecture Inc., or the contractor, PCL Construction Services Inc., to participate to ensure everyone continuously monitored project risks and mitigation strategies.

We reviewed meeting minutes involving city staff and representatives from the design firm and the contractor and we did not find any discussions related to project risks.

We determined Transportation & Infrastructure's risk register did not fully align with best practices set by the state's "Construction Manager/General Contractor Manual." We also identified areas to improve the register related to mitigating risks, monitoring risks, and documenting processes for allocating risk.

For example, the department should properly identify who exactly is responsible for each risk, instead of using "other" when the city is not responsible. And while the department's risk register has a section on analyzing potential impacts of a risk, the team should further study and document the likelihood of a risk being realized.

Transportation & Infrastructure could more effectively manage construction manager/general contractor projects if it documented its policies and procedures to include specifying the responsible parties involved in developing the risk register, how components of the risk register should be monitored, and how the register should be properly used during a project.

Risks could include unforeseen environmental hazards, impacts to nearby properties, unforeseen cost overruns, design issues, and construction materials being unavailable.

According to the state manual, project risks should be assessed continuously while a project is being developed — from when the project is scoped through the end of construction. This ongoing risk assessment should include, at a minimum:[42]

- Risk identification.
- Risk assessment and analysis.
- Risk mitigation and allocation.
- Risk monitoring and control.

Construction teams should use a risk register to document and manage the risk process — such as by defining and documenting each risk, identifying a risk's impact on the project's cost and schedule, and developing a mitigation plan for each risk.[43] Risks could include unforeseen environmental hazards, impacts to nearby properties, unforeseen cost overruns, design issues, and construction materials being unavailable. Contractors should use the risk register to monitor responsible parties assigned to each risk and update it through collaboration with the designer and the project owner.[44]

The Federal Transit Administration's "Construction Project Management Handbook" similarly says a risk register should be used to complete the risk assessment process from the design phase through construction.[45] A register allows the team to effectively identify and document all related risks, and all key stakeholders should work together to develop the register so they can identify, at a minimum:[46]

- Project risks with descriptions.
- Potential impacts to the project cost and schedule.
- Project activities that will be affected.
- How likely a risk is to occur.

When Transportation & Infrastructure's risk register does not include all essential components, does not involve collaboration among all parties, or is not consistently revisited throughout a project, it can lead to schedule delays or additional costs to the city.

[42] Colorado Department of Transportation, "Construction Manager/General Contractor Manual" (January 2015), accessed Jan. 14, 2021, https://www.codot.gov/business/designsupport/adp-db-cmgc/documents/cmgc-manual, § 2.23.

[43] Colorado Department of Transportation, § 3.5.1.

[44] Colorado Department of Transportation.

[45] Federal Transit Administration, "Construction Project Management Handbook" (2016), accessed Nov. 21, 2020, https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Construction_Project_Management_Handbook_2016.pdf, 69.

[46] Federal Transit Administration.

1.9	RECOMMENDATION	Develop and Document Policies and Procedures for the Project Risk Register

Along with Recommendation 1.7 for policies and procedures specific to the project delivery method, the Department of Transportation & Infrastructure should include specific details in its policies and procedures to ensure the department's risk register aligns with leading government practices. At a minimum, the policies and procedures should include the five components of a risk register (i.e., risk identification, risk assessment, risk mitigation, risk allocation, and risk monitoring), who should be involved in creating the register, and how it is to be used throughout the project.

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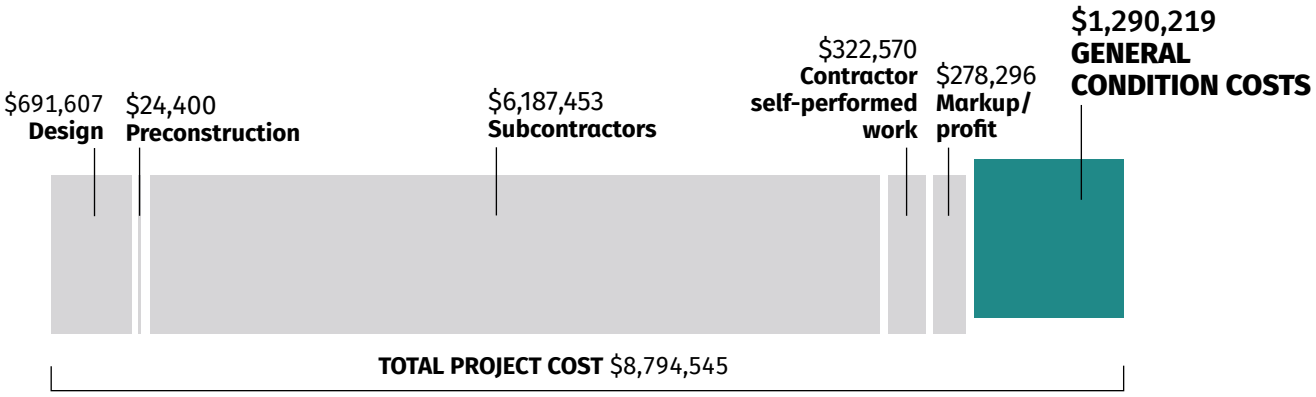
Transportation & Infrastructure Did Not Verify the Accuracy of the Contractor's Billings for General Condition Costs

We found the Department of Transportation & Infrastructure staff who oversaw the Northfield project did not require PCL Construction Services Inc. to submit any supporting detail that the city could use to verify the accuracy of $1.29 million in costs. The staff said detailed support was optional, and the city's project manager decided not to require it on this project.

As noted in Figure 10, the city paid the contractor over $1.29 million — or 15% of the total project cost — in what are called "general condition" costs to build the Northfield Fire Station.

FIGURE 10. General Condition Costs for Northfield Fire Station No. 39



Source: *Auditor's Office analysis of information from contractor-submitted invoices from the Northfield Fire Station project.*

General condition costs are those that are direct to a project but are more overhead in nature, such as costs incurred on-site for project supervision

and administration. Other common examples include on-site portable offices and equipment, jobsite utilities and internet, jobsite bathroom facilities, small tools, and hours and rates for the contractor's management and administrative staff.

Because the Northfield project had a guaranteed maximum price of $8,078,538, the construction contract's payment terms required the contractor to bill general condition costs on the basis of the actual costs incurred. The Department of Transportation & Infrastructure's contract administration procedure statement — which is applicable to all the department's construction contracts — defines the "guaranteed maximum price" as a "not-to-exceed price in which the contractor is reimbursed for actual costs plus a fixed fee." The fixed fee related to markup and profit for the Northfield contractor amounted to about $278,000.

Like the Department of Transportation & Infrastructure's policy, the Northfield construction contract similarly defined the guaranteed maximum price as "costs necessarily incurred [by the contractor] in the proper performance of the Work."[47]

The guaranteed maximum price is an agreed-upon price cap — not necessarily the amount the city should end up paying.

Additionally, 39 sections of the contract explicitly detail all the types of allowable and unallowable costs that can be reimbursed as "the cost of work" under the guaranteed maximum price payment terms.[48] The contract then says when the actual cost of work plus the fee paid to the contractor is less than the guaranteed maximum price, the city keeps all of the resulting savings.[49]

Both the construction contract and Transportation & Infrastructure's procedures clearly say that the guaranteed maximum price is not the equivalent to having a lump-sum, fixed-price agreement. Rather, the guaranteed maximum price is an agreed-upon price cap — not necessarily the amount the city should end up paying.

Excluding the design and preconstruction costs, construction of the fire station cost about $8.1 million and was made up of four main components. Of those, all but the $1.29 million in general condition costs was from lump-sum, fixed amounts. For the Department of Transportation & Infrastructure to verify the cost of work related to the three lump-sum components, it simply required reconciling the contractor's billed amounts with the lump-sum amounts set forth in the contract.

On the other hand, the general condition costs were not a lump-sum amount. Therefore, verifying the accuracy of general condition costs required a much more detailed reconciliation using supporting documentation provided by the contractor to verify the accuracy of the amounts billed. For example, if the contractor billed for its on-site management personnel, the city should have received time sheets that could be used to verify the cost.

[47] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 8.1.

[48] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 8.1.1 through 8.2.10.

[49] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 8.5.

Transportation & Infrastructure paid $1.29 million to the contractor without verifying the accuracy of the costs.

To gauge the department's consistency in overseeing construction manager/general contractor projects, we reviewed supporting documentation submitted by PCL Construction Services Inc. for a different city project. For comparison purposes, we looked at a project as similar as possible to the Northfield project. The project we selected had a comparable project time frame and the same:

- Project delivery method (i.e., construction manager/general contractor).
- Payment terms (i.e., guaranteed maximum price).
- Basic contract terms.

We found that the Transportation & Infrastructure managers who oversaw the other project required PCL Construction Services to submit detailed documentation for all general condition costs it billed. Table 4 lists examples of the types of costs and corresponding supporting detail that we reviewed for the comparable project.

TABLE 4. Examples of General Condition Costs and Corresponding Contractor-Submitted Detail for Comparable Construction Project

Type of Cost	Contractor-Submitted Documentation
Labor for contractor's on-site personnel	Time sheets detailing hours worked
On-site mobile office rental	The invoice from the rental company detailing monthly rental rates
On-site mobile office utility and communication services	Invoices from service providers detailing monthly rates
Fencing for construction site	The invoice from the rental company detailing monthly rental rates
Small tools purchases	Invoices from the seller detailing purchases

Source: *Auditor's Office analysis of information from contractor-submitted invoices.*

When a contractor submits construction invoices without supporting detail, the Department of Transportation & Infrastructure cannot determine whether the amounts the city will pay the contractor are allowable, accurate, billed to the correct project, or even actually incurred by the contractor. In this case, the department cannot say with any certainty that the $1.29 million it paid PCL Construction Services for general condition costs to build the Northfield Fire Station was correct.

Because the department staff who oversaw the Northfield project thought "guaranteed maximum price" payment terms are the same as a fixed-price, lump-sum contract, they thought they were required to pay the contractor the full $8,078,538 regardless of the actual cost of work.

Staff's misunderstanding of the payment terms is a recurring issue we identified. The repeated misconception of payment terms on this project explains why Transportation & Infrastructure did not require the contractor to submit supporting documentation for general condition costs.

The risk that the city overpaid for construction of the Northfield Fire Station is compounded by the department's inadequate oversight when the contractor set the guaranteed maximum price during preconstruction.

If a project begins with an inflated guaranteed maximum price and Transportation & Infrastructure then wrongly believes it has agreed to pay a fixed lump-sum amount, such a scenario creates an incentive for a contractor to overcharge.

RELATED INFORMATION

See page 11 to learn more about how the Department of Transportation & Infrastructure over-relied on its contractor to determine the guaranteed maximum price.

INAPPROPRIATE INSURANCE AND TRAVEL CHARGES – Without supporting documentation, we had limited ability to verify for ourselves the accuracy of PCL Construction Services' general condition costs. However, we were able to analyze some costs, and we found the city overpaid $6,551 in inappropriate insurance charges and $2,351 for unexplained travel.

According to the Northfield construction contract, the contractor could be reimbursed for the cost of insurance premiums while building the fire station — at the stipulated rate of 1.28% of the cost of work.[50] However, when we recalculated insurance costs based on the 1.28% rate and compared that amount with what the contractor billed, we found the city overpaid the contractor $6,551.

The Department of Transportation & Infrastructure overpaid the contractor $6,551 for insurance costs.

We also analyzed travel costs the contractor billed the city for and found the city reimbursed the company $2,351 in travel. Despite multiple requests for evidence that Transportation & Infrastructure staff had approved the travel charges, staff did not respond by the time our fieldwork ended in June 2021.

The Northfield construction contract allowed for "reasonable" travel by PCL Construction Services if the Department of Transportation & Infrastructure granted "prior written approval."[51] As part of this approval, the contract requires the department to assess the reasonableness of the travel. We feel department staff should have questioned any travel reimbursement request, because the contractor's U.S. headquarters is in Denver. Significant staff would be local and, therefore, travel would be rare.

Once again, we determined the city staff who oversaw the Northfield project lacked a proper understanding of the construction contract's

[50] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 8.1.9.

[51] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § 8.1.19.

terms — in this case, regarding allowable and unallowable costs of work. Not understanding all the terms of what costs a contractor can and cannot be reimbursed for led to the city paying more than it should have for the Northfield Fire Station construction project.

1.10 RECOMMENDATION Train Project Managers

Along with the efforts to address the second part of Recommendation 1.6, the Department of Transportation & Infrastructure should ensure that staff charged with project oversight understand the various payment terms that accompany different types of construction contracts, and the department should adequately train all staff to ensure they have a consistent understanding.

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1.11 RECOMMENDATION Verify Billed Costs

The Department of Transportation & Infrastructure should ensure staff charged with project oversight verify the actual cost of work on "guaranteed maximum price" contracts to ensure the city pays the correct amount and pays only for allowable items. At a minimum, this review should verify that the costs included in a pay application:

1. **Are reimbursable according to the terms of the contract.**
2. **Accurately reflect the amount incurred by the contractor.**
3. **Are supported with documentation (e.g., vendor invoices, time sheets, etc.).**

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Staff Did Not Establish a Pay Schedule or Ensure the Designer and the Contractor Submitted Invoices On Time

The design, preconstruction, and construction contracts for the Northfield Fire Station each required OZ Architecture Inc. and PCL Construction Services Inc. to submit detailed invoices to the city on a monthly basis for their services rendered the previous month. But we found Department of Transportation & Infrastructure staff did not ensure the companies complied with these contract terms.

We reviewed all 41 invoices submitted by the two companies across the three contracts, and we found 23, or 56%, were late — often by several months.

For example, we found several invoices from the designer that covered 10 months of work instead of a single month, as required by the design contract. Meanwhile, the contractor turned in one invoice for preconstruction work that covered eight months of services, and the company submitted it four months after services were completed.

We found other instances when the two companies submitted invoices months after completing the work. For example, the design firm did not seek payment for one invoice for services completed in October and November 2017 until September 2018 — nearly a year after the work was completed.

A 2019 internal audit found Transportation & Infrastructure staff not enforcing contract requirements for submitting invoices on time was a systemic issue.

Aside from the contract requirements, the city's policy for general contract conditions requires the project manager to establish a pay schedule for each 30-day period of services provided.[52] Transportation & Infrastructure's own policy also requires project managers to inform their supervisors and contractors in writing when a contractor does not comply with the set pay schedule, and project managers are also required to meet with the contractor when they are noncompliant for two consecutive months.

For the Northfield project, department staff did not establish a pay schedule nor did they provide a reason why they failed to enforce the contract terms regarding the timing of invoices. They also did not provide evidence that they talked with either the design firm or the contractor about their noncompliance. Staff did tell us the contractor "did not feel it was worth the time and additional overhead to run multiple invoices" for the $24,400 preconstruction contract.

We learned the department's internal auditor found in 2019 that contractors on other projects were not being held to contract requirements for submitting invoices on time. That audit pointed to a systemic issue in the department.

Failure to enforce contractors' compliance with contract terms and ensure invoices are submitted each month could inhibit the city's ability to confirm that a contractor is performing all services as outlined in

[52] City and County of Denver, "Standard Specifications for Construction General Contract Conditions" (2011), accessed Dec. 22, 2020, https://www.denvergov.org/content/dam/denvergov/Portals/743/documents/2011%20DENVER%20GENERAL%20CONTRACT%20CONDITIONS.pdf, § 905.

its contract. This inability to confirm services rendered could result in additional costs to the city and the city could pay for services it did not ultimately receive.

1.12 RECOMMENDATION Enforce Contractually Required Payment Terms

The Department of Transportation & Infrastructure should ensure project managers enforce contract terms related to the submission of pay applications, and project managers should develop pay schedules with contractors.

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The Department Did Not Verify the Accuracy of Change Order Costs

Change orders are always a possibility in construction. A "change order" is an agreement between the city and a contractor to change the scope of work performed or to change the amount of the contract.[53]

The Northfield Fire Station construction contract had one change order for $82,404 in additional construction work needed to conform with the Denver Fire Department's requests and for minor repairs. We reviewed and recalculated this change order and its associated invoices and found that the city paid $4,767 in costs considered unallowable under the terms of its contract.

For example, the city paid $4,200 in duplicate fees for supervision and overhead costs, which were included in the change order invoice as markup fees. The remaining $567 in overpayment by the city included unallowable markups on bonds and insurance costs incurred by subcontractors and duplicate markups by the contractor on work performed.

The section of the construction contract related to markups and overhead says all the contractor's and subcontractors' field and office overhead and supervision costs are included in the standard allowed markup.[54] The same section also says bonds and insurance are to be paid at cost and are not eligible for the standard markup. It also forbids the contractor and its subcontractors from attempting to apply percentage adjustments "in a way which would pyramid either the cost or credit because of the involvement of a subcontractor."

Despite these restrictions, Transportation & Infrastructure staff did not

[53] City and County of Denver, "Standard Specifications for Construction General Contract Conditions," § 1101.1.

[54] City and County of Denver, Northfield Fire Station Construction Contract (May 2018), § SC-16.

Change orders adjust a project's guaranteed maximum price. Therefore, they present a significant financial risk and must be carefully managed and reviewed.

conduct a thorough review of the proposed costs before approving the change order. Staff said they conducted a high-level visual review, but they provided no evidence because there was no deliverable.

Additionally, the construction contract required the design consultant to review the change orders and assist with pricing. When we asked Transportation & Infrastructure staff about how involved OZ Architecture Inc. was in reviewing the change order, they said the firm was involved but they provided no evidence because there was no deliverable associated with the designer's involvement. Therefore, we cannot provide assurance the designer complied with the contract terms.

Because change orders adjust a project's guaranteed maximum price after it is agreed upon, they present a significant financial risk and must be carefully managed and reviewed. Transportation & Infrastructure's inadequate review of change orders increases the risk that the city might overpay for work performed or for work it did not approve of as part of the project scope.

Furthermore, without sufficient documentation of the department's processes to provide transparency of staff decisions, the department cannot provide assurance that tax dollars were properly managed to build the Northfield Fire Station.

1.13 RECOMMENDATION Develop and Implement Processes for Change Orders

The Department of Transportation & Infrastructure should develop and implement processes for verifying costs for change orders on construction contracts. The processes should be well documented and, at a minimum, include:

- **Obtaining an itemized breakdown of the proposed change order costs and validating the costs to verify their accuracy.**
- **Negotiating any differences in pricing.**
- **Comparing itemized change order costs with contract terms to ensure all items included in the change order are allowable.**
- **Recalculating all markup for profit applied to the costs to ensure they are accurate and comply with contract terms.**
- **Ensuring other parties — such as the project designer — are involved in reviewing the change order, as contractually required.**

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AGENCY RESPONSE TO AUDIT RECOMMENDATIONS

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September 2, 202 1

Auditor Timothy M. O'Brien, CPA
Office of the Auditor
City and County of Denver
201 West Colfax Avenue, Dept. 705
Denver, Colorado 80202

Dear Mr. O'Brien,

The Office of the Auditor has conducted a performance audit of the Department of Transportation & Infrastructure Construction Manager/General Contractor Project Delivery Method.

This memorandum provides a written response for each reportable condition noted in the Auditor's Report final draft that was sent to us on August 23, 2021. This response complies with Section 20-276 (c) of the Denver Revised Municipal Code (D.R.M.C.).

AUDIT FINDING 1
The Department of Transportation & Infrastructure Inadequately Managed the Northfield Fire Station Construction Project and Did Not Effectively Monitor Costs to Ensure the City Was Not Overcharged

RECOMMENDATION 1.1
Validate Contractors' Cost Estimates
The Department of Transportation & Infrastructure should develop and document a process to independently verify contractors' cost estimates — either internally or by contracting with an independent third-party estimator. The department should hold review meetings at key project milestones that include the contractor, the designer, the cost estimator, and department staff who will evaluate and negotiate cost estimates. Meetings to discuss cost estimates should be thoroughly documented, along with the department's internal cost-estimation activities.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.1
DOTI agrees to develop a CM/GC Guidance Document to describe the process to engage/obtain independent cost estimates — either internally or externally, to verify contractors' cost estimates. Review meetings will be held and documented at key project milestones to evaluate, align, and/or negotiate costs.

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RECOMMENDATION 1.2
Establish Thresholds for Price Variations
The Department of Transportation & Infrastructure should develop and document thresholds for differences in all cost estimates that should prompt further evaluation of a contractor's estimates. These thresholds should be thoroughly documented and adjusted based on a project's risk and budget. Project thresholds should be established before the guaranteed maximum price is negotiated, and the final agreed-upon price should be within an acceptable deviation of the established threshold.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.2
DOTI agrees to develop guidance for staff regarding acceptable thresholds for differences between cost proposals provided by the Contractor and project cost estimates; this guidance will be included in DOTI's CM/GC Guidance Document. The thresholds may be adjusted based on a project's risk and budget. Any deviation from the thresholds will be justified and documented.

RECOMMENDATION 1.3
Ensure All Cost Estimates Are Developed, Delivered, and Collaborative
The Department of Transportation & Infrastructure should ensure collaboration and provide leadership of the construction team when producing the schematic, design development, and construction documents. This collaboration should be documented either in meeting minutes of construction team meetings or by other means. In addition, the department should enforce the contract terms requiring the department to review and approve the schematic, design development, and construction documents.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	12/1/21	Cara Sequino 720.913.4585

Narrative for Recommendation 1.3
DOTI agrees to ensure collaboration among the project team at milestones throughout the project. DOTI agrees to document these meetings, as well as provide review and approval of the construction document milestones as required by the contract terms.

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RECOMMENDATION 1.4
Actively Participate in Subcontracting
The Department of Transportation & Infrastructure should ensure project managers are actively involved in the awarding of subcontracted work to ensure the terms of a construction manager/general contractor agreement are adhered to regarding subcontracted work. Specifically, project managers should ensure a contractor's subcontracting process is fair, reasonable, and — to the greatest extent practicable — based on open competition.

At a minimum, the department's involvement should include:

- Obtaining and reviewing the documentation of each bid package submitted by a subcontractor to ensure at least three bids per building trade are received and that the lowest qualified bidder is selected.
- Ensuring the contractor tried to re-solicit the bid when three bids are not received.
- Documenting and retaining the department's review and approval of the selected subcontractors — including both the contractor's rationale for not selecting the lowest bid and the project manager's approval.
- Obtaining and reviewing subcontracts for unallowable terms, fees, and other items to ensure the subcontracts do not contradict the agreement between the city and the contractor.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.4
DOTI agrees that the Contractor's subcontracting process should be fair, reasonable, and — to the greatest extent practicable — based on open competition. DOTI will continue to review the bids submitted by a subcontractor to ensure a minimum of three bids were received and that where applicable the lowest qualified bidder is selected, or that sound reasons exist for another selection. DOTI will document this review, approval, and if lowest qualified bidder is not selected, DOTI will document justification for not selecting the lowest qualified bidder. DOTI may not obtain and review subcontractor agreements, but DOTI will obtain a description of the Contractor's process for subcontracting the work, including risk mitigation for unallowable contract terms. This guidance will be included in DOTI's CM/GC Guidance Document. DOTI believes that by obtaining the Contractor's concurrence, agreement, and executed Prime contract, as well as conducting appropriate due diligence on the selection of subcontracting work, that the intent of this recommendation will be met.

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RECOMMENDATION 1.5

Actively Participate in a Contractor's Awarding of Self-Performed Work

The Department of Transportation & Infrastructure should ensure project managers are actively involved in the awarding of any contractor's self-performed work to ensure the contractor adheres to the terms of its contract. Specifically, project managers should ensure the bidding process is fair, reasonable, and based on open competition.

At a minimum, project managers should:

- Obtain and review documentation of the bid packages for self-performed work to ensure the contractor received at least three bids and that the lowest qualified bidder is selected.
- Ensure the contractor tried to re-solicit the bid when three bids are not received.
- Document and retain the department's review and approval of the selected subcontractors — including the contractor's rationale for selecting itself when it is not the lowest bidder.
- Document and review the bids, proposed costs, and scope to understand why significant cost differences occur.
- Obtain and review all self-performed work agreements for unallowable terms, fees, and other items that may not be reasonable, such as duplicate work and costs.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.5

DOTI agrees to obtain and review the bid packages for self-performed work to ensure that the Contractor received at least two other bids (a minimum of three bids) and that the lowest qualified bidder is selected, unless best value selection is approved by DOTI prior to receiving bids. DOTI will document this review, approval, and if lowest qualified bidder is not selected, DOTI will document justification. DOTI will obtain agreements, if they exist, that the Prime Contractor creates for itself/subcontracted work to itself to ensure no unallowable terms are present, but in any event, will insist on strict compliance with the terms of the Prime Contract. This guidance will be included in DOTI's CM/GC Guidance Document.

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RECOMMENDATION 1.6 **Enforce Contractual Billing Rates and Properly Manage Payment Terms** The Department of Transportation & Infrastructure should enforce contractual billing rates as written in professional service contracts. Furthermore, the department should ensure the staff who oversee construction contracts understand the different types of payment terms so the terms are managed accordingly.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	9/16/21	Cara Sequino 720.913.4585

Narrative for Recommendation 1.6
Since the execution of this project, DOTI has implemented and improved education and guidance for staff regarding different types of payment terms and enforcing contract terms related to the submission of pay applications. This includes development of DOTI's Invoice/Payment Application Processing Procedure (effective August 1, 2020). In addition, DOTI has partnered with Office of Human Resources Learning to develop two workday training modules regarding payment processing; modules are currently available on Workday Learning.

RECOMMENDATION 1.7 **Develop and Implement Policies and Procedures for the Construction Manager/General Contractor Delivery Method** The Department of Transportation & Infrastructure should develop and implement policies and procedures addressing the unique risks of the construction manager/general contractor delivery method. These policies and procedures should detail the steps required to effectively deliver such projects — from when a project is scoped through the end of construction.		
Agree or Disagree with Recommendation	**Target date to complete implementation activities (Generally expected within 60 to 90 days)**	**Name and phone number of specific point of contact for implementation**
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.7
DOTI agrees to develop a CM/GC Guidance Document for managing projects utilizing the CMGC delivery method.

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RECOMMENDATION 1.8

Develop and Implement Policies and Procedures for Selecting Project Delivery Methods

The Department of Transportation & Infrastructure should develop and implement policies and procedures for a project delivery selection process that aligns with leading government practices. At a minimum, this process should be thoroughly documented and include primary selection factors as outlined in the Colorado Department of Transportation's project delivery selection matrix, as well as selection rationale.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.8

Since the time of this project, DOTI has implemented a project delivery selection process and agrees to continue to utilize it for evaluating potential CMGC delivery. The process includes review and approval of delivery strategy by DOTI's Procurement Committee. Additional guidance will also be included in DOTI's CM/GC Guidance Document.

RECOMMENDATION 1.9

Develop and Document Policies and Procedures for the Project Risk Register

Along with Recommendation 1.7 for policies and procedures specific to the project delivery method, the Department of Transportation & Infrastructure should include specific details in its policies and procedures to ensure the department's risk register aligns with leading government practices. At a minimum, the policies and procedures should include the five components of a risk register (i.e., risk identification, risk assessment, risk mitigation, risk allocation, and risk monitoring), who should be involved in creating the register, and how it is to be used throughout the project.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	6/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.9

DOTI agrees to develop a guidance document for staff managing projects utilizing the CMGC delivery method, including guidance on risk management. Risk management will include appropriate risk components for given project scopes and complexities, including risk identification, risk assessment, risk mitigation, risk allocation, and risk monitoring.

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RECOMMENDATION 1.10
Train Project Managers
Along with the efforts to address the second part of Recommendation 1.6, the Department of Transportation & Infrastructure should ensure that staff charged with project oversight understand the various payment terms that accompany different types of construction contracts, and the department should adequately train all staff to ensure they have a consistent understanding.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	9/16/21	Cara Sequino 720.913.4585

Narrative for Recommendation 1.10
Since the execution of this project, DOTI has implemented and improved education and guidance for staff regarding different types of payment terms and enforcing contract terms related to the submission of pay applications. This includes development of DOTI's Invoice/Payment Application Processing Procedure (effective August 1, 2020). In addition, DOTI has partnered with Office of Human Resources Learning to develop two workday training modules regarding payment processing; modules are currently available on Workday Learning.

RECOMMENDATION 1.11
Verify Billed Costs
The Department of Transportation & Infrastructure should ensure staff charged with project oversight verify the actual cost of work on "guaranteed maximum price" contracts to ensure the city pays the correct amount and pays only for allowable items. At a minimum, this review should verify that the costs included in a pay application:

1. Are reimbursable according to the terms of the contract.
2. Accurately reflect the amount incurred by the contractor.
3. Are supported with documentation (e.g., vendor invoices, time sheets, etc.).

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	06/30/22	Cara Sequino 720.913.4585

Narrative for Recommendation 1.11
DOTI agrees to improve the verification process of the actual costs of work on GMP contracts to ensure that the City pays the correct amount and for allowable items only,

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including backup when needed. This will be included in DOTI's CM/GC Guidance Document.

RECOMMENDATION 1.12
Enforce Contractually Required Payment Terms
The Department of Transportation & Infrastructure should ensure project managers enforce contract terms related to the submission of pay applications, and project managers should develop pay schedules with contractors.

Agree or Disagree with Recommendation	Target date to complete implementation activities (Generally expected within 60 to 90 days)	Name and phone number of specific point of contact for implementation
Agree	9/16/21	Cara Sequino 720.913.4585

Narrative for Recommendation 1.12
Since the execution of this project, DOTI has implemented and improved education and guidance for staff regarding different types of payment terms and enforcing contract terms related to the submission of pay applications. This includes development of DOTI's Invoice/ Payment Application Processing Procedure (effective August 1, 2020). In addition, DOTI has partnered with Office of Human Resources Learning to develop two workday training modules regarding payment processing; modules are currently available on Workday Learning.

RECOMMENDATION 1.13
Develop and Implement Processes for Change Orders
The Department of Transportation & Infrastructure should develop and implement processes for verifying costs for change orders on construction contracts. The processes should be well documented and, at a minimum, include:

- Obtaining an itemized breakdown of the proposed change order costs and validating the costs to verify their accuracy.
- Negotiating any differences in pricing.
- Comparing itemized change order costs with contract terms to ensure all items included in the change order are allowable.
- Recalculating all markup for profit applied to the costs to ensure they are accurate and comply with contract terms.
- Ensuring other parties — such as the project designer — are involved in reviewing the change order, as contractually required.

Agree or Disagree with Recommendation	Target date to complete implementation activities	Name and phone number of specific point of

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	(Generally expected within 60 to 90 days)	contact for implementation
Agree	9/16/21	Cara Sequino 720.913.4585

Narrative for Recommendation 1.13
Since the execution of this project, DOTI has refined our Change Order process, workflows, and checklist. DOTI will continue to utilize this process and provide additional reviews as required.

Please contact Peter Spanberger, Director of Accounting at (303) 446-3447 with any questions.

Sincerely,

Peter Spanberger
Director of Accounting

cc: Valerie Walling, CPA, Deputy Auditor
Dawn Wiseman, CRMA, Audit Director
Patrick Schafer, CPA, CFE, CIA, MBA, Audit Manager

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OBJECTIVE

To determine whether the Department of Transportation & Infrastructure's construction management was adequate enough to ensure:

1. The city received the scope of work included in its three contracts for the Northfield Fire Station construction project.
2. The city paid the correct amount to build the Northfield Fire Station.

SCOPE

The audit assessed the Department of Transportation & Infrastructure's management and oversight of the Northfield Fire Station No. 39 construction project. The audit focused on the project's three contracts: the design contract, the preconstruction contract, and the construction contract.

The project began in August 2017 when the design contract was signed. The preconstruction contract was signed in February 2018, and the construction contract was signed in May 2018.

The project concluded in July 2020 at a total cost to the city of $8,794,545 — $691,607 for design services, $24,400 for preconstruction work, and $8,078,538 for construction.

METHODOLOGY

We used the following methodologies to gather and analyze information related to our audit objectives, including:

- Interviewing:
  - Department of Transportation & Infrastructure staff responsible for managing and overseeing "construction manager/general contractor"-delivered projects.
  - Staff from the City Attorney's Office.
  - Staff in the Colorado Department of Transportation's Innovative Contracting Division.
- Reviewing:
  - City Fiscal Accountability Rules.

- City and County of Denver Executive Order No. 8.
- The City and County of Denver's "Standard Specifications for Construction General Contract Conditions" manual.
- The Department of Transportation & Infrastructure's internal policies and procedures.
- The U.S. Government Accountability Office's "Standards for Internal Control in the Federal Government."
- The Northfield Fire Station design, preconstruction, and construction contracts.
- The Colorado Department of Transportation's "Construction Manager/General Contractor Manual."
- The University of Colorado's "Guidebook for Selecting Alternative Contracting Methods for Roadway Projects: Project Delivery Methods, Procurement Procedures, and Payment Provisions."
- The Federal Transit Administration's "Construction Project Management Handbook."
- The Transit Cooperative Research Program's "A Guidebook for the Evaluation of Project Delivery Methods."
- The Federal Highway Administration's tech brief "Alternative Contracting Method Performance in U.S. Highway Construction."
- The National Cooperative Highway Research Program's "Construction Manager-at-Risk Project Delivery for Highway Programs."
- The Institute of Internal Auditors Research Foundation's "Practitioner's Blueprint to Construction Auditing."
- The Construction Audit and Cost Control Institute's "Self-Performed Work by Construction Managers."

- Observing the Textura information system.
- Analyzing:
  - The designer's meeting minutes for 2017 and 2018.
  - The city's, the designer's, and the contractor's meeting minutes for the Northfield Fire Station for 2018 and 2019.
  - Invoices and supporting documentation submitted for the three Northfield Fire Station contracts.
  - The risk register for the Northfield Fire Station project.
  - The schematic design, design development, and construction documentation and corresponding cost estimates for the Northfield Fire Station project.
  - Subcontractor bid packages from the contractor.
  - The change order for the Northfield Fire Station construction contract.
  - Contingency logs maintained by the city and the contractor.
  - The Northfield Fire Station contractor's submittal log and its request-for-information log.
  - The Northfield Fire Station designer's site observation reports.
  - The Department of Transportation & Infrastructure's construction inspection reports for the Northfield Fire Station.
  - The Northfield Fire Station contractor's job cost detail report.

Office of the Auditor

The **Auditor** of the City and County of Denver is independently elected by the residents of Denver. He is responsible for examining and evaluating the operations of city agencies and contractors for the purpose of ensuring the proper and efficient use of city resources. He also provides other audit services and information to City Council, the mayor, and the public to improve all aspects of Denver's government.

The **Audit Committee** is chaired by the Auditor and consists of seven members. The Audit Committee assists the Auditor in his oversight responsibilities regarding the integrity of the city's finances and operations, including the reliability of the city's financial statements. The Audit Committee is structured in a manner that ensures the independent oversight of city operations, thereby enhancing residents' confidence and avoiding any appearance of a conflict of interest.

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Our Mission

We deliver independent, transparent, and professional oversight in order to safeguard and improve the public's investment in the City and County of Denver. Our work is performed on behalf of everyone who cares about the city, including its residents, workers, and decision-makers.