

CONSTRUCTION PRACTICE**PAPERS PRESENTED ON GENERAL TOPICS****Return on Investment for Non-Profit Deconstruction****Kyle McLear and MaryEllen C. Nobe, Ph.D., LEED AP**Colorado State University
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Although deconstruction has numerous environmental benefits, it tends to require significant additional time and labor resources. As a result, deconstruction is often cost prohibitive due to these added costs. While several studies have been conducted on deconstruction processes, they typically focus on the for-profit deconstruction business model and residential construction. Additionally, these studies have varied economic results. Few studies focus on commercial deconstruction, let alone non-profit deconstruction models. In this instrumental case study, return on investment (ROI) for a commercial deconstruction project using the National Center for Craftsmanship (NCC) non-profit model is determined and compared to other deconstruction models. The results show that the NCC non-profit deconstruction model provides significantly higher ROI when compared to for-profit models. The financial return of the NCC deconstruction model is dependent on having a property owner that pays federal income tax and pays enough income tax to realize tax deductions benefits. Success of the NCC model is due to an educational focus, which allows property owners to utilize the cash donation to a non-profit deduction and the enterprise zone tax credit. These tax incentives increase the return on investment when compared to other deconstruction models.

Key Words: deconstruction, demolition, material reuse, material recycling, non-profit

Introduction

Construction and demolition waste create approximately 157 million tons of waste with 90% being directly related to renovation and demolition processes (Franklin Associates, 1998). Of this amount, it is estimated that 35 - 45% of construction debris go to landfills and only 20 - 30% is reused or recycled (Franklin Associates, 1998). The outcome is over 90 million tons of demolition and renovation waste with over 30 million tons taken to landfills annually (Chini & Bruening, 2003). A possible solution to this problem includes wider implementation of construction waste recycling and deconstruction practices. Deconstruction, also known as selective dismantling, is the process of dismantling building components in the reverse order of how they were originally constructed using a last in, first out methodology (Guy & McLendon, 2000). The goal is for the majority of removed materials to be either reused or recycled (Dantata, Touran, & Want, 2004). It is estimated that up to 75% of construction and demolition debris could be diverted from landfills using reuse and recycling markets (Leigh & Patterson, 2006). To reach this goal, better understanding and implementation of deconstruction practices is needed *along with* increased understanding the financial benefits of deconstruction.

Removal of buildings that are no longer usable has significant environmental and economic impacts. For property owners, the mere presence of the building can prevent properties from being sold or prevent progress on development proposals due to removal costs. Removal of structures through deconstruction, considered a more environmentally considerate method of building removal when compared to demolition, is often seen as cost prohibitive due to added time and labor resource requirements. The National Center for Craftsmanship (NCC) has developed a non-profit model for making deconstruction more attractive to owners from a financial view point.

Discussion of Deconstruction Business Models

Contracts currently used by owners and deconstruction professional fall into four categories (Guy & McLendon, 2000). In the first option, deconstruction is strictly a service to the property owner. In this option, owners retain ownership of all salvaged materials. A slight variation of this model is a guaranteed buy back of materials plus additional costs for material processing and handling. In this variation, owners pay more than demolition costs, but could be buying back high value materials. The second option is deconstruction with split (or shared ownership) of the salvaged materials. The contract in this scenario deals less with reduction and is based upon deconstruction contractors receiving materials as in-kind payment. In the third option, the deconstruction contractor retains all materials. The contract price incorporates potential revenue estimates from resale of salvaged materials as offsets to deconstruction costs. In the fourth option, non-profit deconstruction contractors perform deconstruction services for a fee and property owners donate salvaged materials as tax write-offs. The first three models utilize for-profit business models that rely on extraction and resale of salvageable materials to exceed the costs of labor intensive deconstruction processes. There have been several studies evaluating costs of for-profit deconstruction models compared to salvageable material values. Almost none; however, investigate the non-profit model.

One notable study conducted by the Center for Construction and Environment at the University of Florida, deconstructed six wood-framed residential structures in Gainesville, Florida (Guy & McLendon, 2000). In this study, additional upfront costs for deconstruction were approximately 21% more than demolition excluding the sale of salvaged materials. The increase in additional costs for the six structures deconstructed went from a minimum of 1.6% to a maximum 78%. Salvaged material values were based on a range of 25 - 50% of retail prices for new materials. The average value for salvaged materials was \$1.64 per square foot; the minimum was \$0.20 per square foot and the maximum was \$2.34. As a result, Guy & McLendon (2000) showed approximately 37% savings for deconstruction over demolition costs using calculated salvage values for materials. It is important to note that materials were never actually sold; therefore, no material storage cost, inventory cost, transportation costs, or sales personnel costs were incurred. Had materials been given retail values including the additional costs for overhead on the materials themselves, the results of this study would have changed significantly.

A second study conducted by the National Association of Home Builders (NAHB) Research Center documents the deconstruction of a 2,000 square foot building in Baltimore County Maryland (NAHBRC, 2000). The project is a 4-unit residential building deconstructed in 1997. The NAHB study concluded that approximate deconstruction costs were 17% higher demolition costs. This study, similar to the Guy & McLendon (2000) study, also estimated costs of salvaged materials as percentages of retail prices for new materials. As a result, the NAHB study does not include overhead costs on salvaged materials including storage, transportation, sales personnel or management of inventory, all of which would further increase deconstruction costs.

A third study by Dantata, Touran & Wang (2004) uses the same building input data as Guy & McLendon (2000) and NAHB (NAHBRC, 2000) and applies this information to Massachusetts market conditions. Dantata et al (2004) conclude that deconstruction costs could be 17 – 25% higher than demolition costs. In their study, Dantata et al (2004) analyze the parameters that increase costs in order of impact. They are: (1) labor costs (either productivity or hourly rate), (2) disposal cost (tipping fee and transportation), and (3) resale value of deconstructed materials. These effects of local market conditions on the economic feasibility of deconstruction, specifically labor rates, tipping fees, and resale value, can fluctuate in different regions and cities significantly impacting the feasibility of deconstruction from region to region. Additional challenges facing for-profit deconstruction models include:

- A lack of markets for used building materials, which make it challenging to sell salvaged materials from deconstruction projects (Chini & Breuning, 2003).
- The perception of salvaged building materials as predominately of low value. This perception of low value has direct influences on demand for salvage materials and therefore can negatively impact for-profit business models (Chini & Breuning, 2003).

- The lack of design for deconstruction in buildings. For many buildings at the end of their useful lives, it is not possible to extract materials in a manner that allows for their reuse (Chini & Balachandran, 2002).
- The reliance on the successful resale of salvaged materials. If materials are not consistently marketed and sold in a timely manner, it is nearly impossible for deconstruction to be profitable (Chini & Breuning, 2003).

The fourth deconstruction model currently being implemented involves non-profit organizations. This model is based on non-profit deconstruction professionals performing deconstruction for a fee and owners donating materials as a tax write-off (Guy & McLendon, 2000). Tax deductions can be powerful incentives for deconstruction. When a building is deconstructed, materials can be donated to non-profit organizations specializing in reuse and recycling of materials (Leigh & Patterson, 2006). In this model, the appraised values of donated materials become tax write-offs for property owners, offsetting additional costs for deconstruction. In this model, non-profit organizations resell salvaged materials in addition receiving contract fees covering costs of the deconstruction process. This model shifts uncertainty of salvaged material value from property owners to non-profit organizations. In turn, property owners receive guaranteed write-offs based on salvaged material appraisals. A challenge of this model for non-profit organizations, which inherently affects owners, is that organizations need to be selective of building types and locations to be deconstructed because sales of salvaged materials. In other words, a non-profits' current inventory of salvaged materials will effect what building types the non-profit is willing to bid on for deconstruction. Organization would not want to deconstruct buildings that have identical materials to those already in their inventory and that have not sold.

While deconstruction allows for the diversion of construction materials from landfills, widespread use of deconstruction is currently hindered by cost uncertainties associated with various deconstruction models. Previous studies have shown that profitability of deconstruction in for-profit markets can vary dramatically based on market conditions where the project is located. Additionally, the foundation of for-profit business models are dependent on resale value of salvaged materials exceeding cost increases associated with deconstruction. As a result, the return on investment from owners' perspective is dependent on extractable materials and the ability to sell these materials in local markets to offset initial upfront costs of deconstruction. The combined results of the case studies reviewed have lead to confusing information while also discouraging owners from using deconstruction. In order for owners' to better understand deconstruction options, additional case studies are need about the return on investment for the various deconstruction models.

Methodology

According to Stake (1995), case study research is meant to "catch the complexity of a single case". Case studies are useful when the case itself is of particular interest and unique. Case studies represent bounded systems focusing on the object of study rather than processes. Instrumental case studies are conducted for the purpose of learning about a particular case so that the essence of the case can be better understood and captured, addressing the need for general understanding of a particular issue (Stake, 1995). To this end, Stake (1995) points out that case study research is not sampling research and that selection of the case study should be guided by both the goal to maximize what can be learned and ability to access needed information. The project selected for this case study is both unique and accessible, fulfilling both of Stake's requirements. Additionally, this case study was selected specifically to highlight the unique approach of the National Center for Craftsmanship (NCC) to deconstruction in the hope that other organizations will be able to implement this model. NCC is a non-profit organization whose purpose is to deconstruct buildings, not the marketing of salvaged materials, making the NCC deconstruction model stand out among other options previously reviewed. The purpose of this instrumental case study is to investigate how the NCC deconstruction model impacts the owner's return on investment for a commercial deconstruction project. Information for this case study comes from the deconstructor and related state tax codes.

Case Study

The deconstruction project for this case study is a commercial property in Northern Colorado with two buildings on the site that were built around 1958. One building is a wood framed, 5,000 square foot structure that is 2,600 square feet on the main level with a full finished basement. The other building is a 17,000 square foot single story steel framed structure. The current owner purchased the properties in 2001; both buildings have been vacant since that time. As a result, the property owner decided to remove the buildings without any plans or proposal for new construction, eliminating any possible negative impacts of deconstruction time requirements on future construction schedules. As a result, there is no financial impact to the property owner for the extended schedule of deconstruction in this case study. The National Center for Craftsmanship (NCC) was contracted by the property owner to perform the deconstruction in the beginning of 2010. The property owner contracted with NCC for \$35,000 to have the buildings deconstructed in a sustainable manner achieving United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) credits. The LEED credits the project contributed to include the Construction Waste Management Credit and Innovation in Design Credits.

The comparative cost of removing the buildings via demolition is \$20,000. Therefore, the net increase cost of deconstruction for the property owner is \$15,000. The added value of achieving LEED credits will not be included in the determination of the financial return on investment for the property owner on this project. It is understood that there is an added value for achieving LEED credits, but the value could not be determined in this study because new improvements for the site have not been determined. Therefore, the opportunity costs to achieve other credits in lieu of the deconstruction credits could not be calculated.

In this case study, the non-profit deconstruction model is based around using tax deductions for material donations to decrease costs compared to demolition. The deduction is recognized in the 526 Publication from the Department of the Treasury's Internal Revenue Service for Charitable Contributions (IRS, 2010). The first step in calculating the value of a donated building is a deconstruction appraisal for the property. The appraisal provides a value of the materials for the in-kind donation and subsequent tax deductions. The appraisal value is multiplied by the property owner's income tax bracket to determine the tax deduction benefit. The combined appraisal value for the two buildings donated to NCC is \$54,600. The property owner is in the 35% income tax bracket. Therefore, tax deductions for the property owner are \$19,110 (or $0.35 \times \$54,600$). Additionally, NCC's focus on training and education makes the contract price to perform the deconstruction a cash donation towards the training of adults and youths in craft skills. The cash donation is recognized in the 526 Publication from the Department of the Treasury's Internal Revenue Service for Charitable Contributions (IRS, 2010) and is eligible for a tax deduction. This tax deduction is unique to the NCC when compared to the other non-profit deconstruction models which do not have an education and training focus. The value of the cash donation tax deduction equals the deconstruction contract times the owner's income tax bracket. Since the contract price for deconstruction is \$35,000, the cash donation tax deduction is \$12,250 (or $\$35,000 \times 0.35$).

An additional tax credit, the Colorado State Enterprise Zone Tax Credit, also applies to NCC because their offices are located within an enterprise zone. For an organization to qualify for the credit, the donation must be used for activities directly related to job creation, job preservation, or assistance programs for homeless persons (Colorado Department of Revenue, Income Tax E, October 2010). The deconstruction training program conducted by NCC meets the enterprise zone tax credit requirements; therefore, the credit can be used as a tax incentive. Both monetary and in-kind contributions to an enterprise zone administrator for the purpose of implementing the economic development plan of the enterprise zone may claim an income tax credit of 25% of the value of the contribution up to a maximum credit of \$100,000 (Colorado Department of Revenue, Income Tax E, October 2010). The tax credit limits the in-kind donation enterprise zone tax credit to 50% of the otherwise allowable credit (Colorado Department of Revenue, Income Tax E, October 2010). Based on the Enterprise Tax Zone Credit Calculations, the tax credit is \$22,400 (Table 1) to the owner.

Table 1

Case Study Enterprise Tax Zone Credit Calculation

1. Amount of cash contributions (Contract to Deconstruct)	\$35,000
2. Value of in kind contributions (Appraisal Value of Property)	\$54,600
3. Total of lines 1 and 2	\$89,600
4. Smaller of \$100,000 or 25% of line 3	\$22,400
5. Limitation on in kind credit, 50 percent of line 4	\$11,200
6. Allowable in kind credit, line 4 minus line 5	\$11,200
7. Limitation on cash credit, line 4 minus line 5	\$11,200
8. Allowable cash credit, smaller of line 1 or line 7	\$11,200
9. Total credit, line 6 plus line 8	\$22,400

Source: Colorado Department of Revenue, Income Tax E, October 2010

To benefit to the property owner for deconstruction equals the combined tax deductions and credits minus the deconstruction contract price. If the result of this calculation is positive, than the property owner receives more in tax deductions and credits than it costs to deconstruct netting a positive return. If the resulting number is negative, then the cost of deconstruction exceeds the tax incentives. The combined in-kind material donation deduction (\$19,110), cash donation deduction (\$12,250), and enterprise zone tax credit (\$22,400) for this case study equals \$53,760. The contract price to deconstruct is \$35,000. The benefit to deconstruct equals \$18,760 (or \$53,760 - \$35,000). The resulting positive number indicates that the owner of the property nets a benefit of \$18,760 to deconstruct the buildings.

In addition to the direct benefit of deconstruction, the financial return for the property owner includes an opportunity cost. An opportunity cost is the true cost of something including what you give up to get it. This includes not only the money spent on something, but also the economic benefits that you did without because you decided on that particular something and thus no longer need something else (Economist, Terms beginning with O, October 2010). In this study, the project owner's goal is removal of the buildings and the decision to use deconstruction eliminates the need for demolition on the site. Therefore, the cost of demolition is factored in to determine the actual net benefit of deconstruction. The net benefit of deconstruction equals the benefit to deconstruct minus the demolition contract amount. In this equation, the demolition contract price is a negative number because the demolition service is an out of pocket expense to the property owner. If the equation result is positive, the owner nets a positive return making the cost of deconstruction less than demolition. If the result is negative, the cost of deconstruction exceeds the alternative cost of demolition. For the case study, the competing demolition bid for this project is (-\$20,000). The benefit of deconstruction is \$18,760. The net benefit of deconstruction for this project is \$38,760 or [\$18,760 - (-\$20,000)].

Return on investment (ROI) is determined by the incremental gain of an action divided by the cost of that action (Solution Matrix, Return on Investment, October 2010). A simple and commonly used equation to determine ROI is (Gains - Investment Costs) / Investment Costs (Solution Matrix, Return on Investment, October 2010). For the NCC deconstruction model, ROI equals (Tax Deductions and Credits - Contract Cost to Deconstruct) / Contract Cost to Deconstruct. In this case study, the total tax deductions and credits equal \$53,760 and the contract cost for NCC to deconstruct the two buildings on the site is \$35,000. Therefore, the owner's ROI equals 53.6% or [(\$53,760 - \$35,000) / \$35,000]. A summary of these calculations is provided in Table 2.

Table 2

The Property Owner Benefit Using The NCC Deconstruct Model

Owner Income Tax Bracket*	35%
Competing Demolition Bid*	\$20,000
Cost of Deconstruct Contract*	\$35,000
Appraised Value of In-kind Material Donation*	\$54,600
Tax Incentives	
Cash Contribution Deduction Value	\$12,250
In-kind Materials Deduction Value	\$19,110
Enterprise Zone Tax Credit	\$22,400
Subtotal: Deductions & Credit Benefits	
	\$53,760
Benefit to Deconstruct	\$18,760
Net Benefit to Deconstruct	\$38,760
Return on Investment	53.6%

* Input variables received from The National Center for Craftsmanship

Discussion of Risk

A risk to property owners that is inherent to deconstruction is schedule impact, which can take two to ten times longer than demolition (Chini & Breuning, 2003). This case study does not have time constraints as new construction is not scheduled to occur immediately after completion of deconstruction. In other applications, however, time can be a factor and a disadvantage to deconstruction if new improvements are to take place. On every potential deconstruction project, the schedule should be determined and the impact analyzed financially to identify the true benefit or cost of deconstruction. For deconstruction to be successful, it is critical that stakeholders clearly understand the duration of the deconstruction process.

Potential schedule risks can be minimized if deconstruction occurs prior to the local jurisdiction's planning and building departments final approved plans. Every commercial project requires a building permit and depending on the jurisdiction, size, and scope of the proposed project, the process of getting approval from local planning and building departments can take from a month to years. During this time, a separate demolition or deconstruction permit can typically be submitted for, allowing deconstruction to be performed without impacting the new construction schedule. The challenge of this method is upfront cost of deconstruction and the ability for property owners to make the cash payments (or to get financing prior to final approved development plans). The ideal situation would have new construction starting within a couple of days after the permit is issued and deconstruction completed by the time the permit is released. In this scenario, the possibility of the permitting process being delayed does create an additional risk to owners of leased property since delays will cause loss of income. Other risks in the deconstruction process would be the same as those in the demolition process.

Parameters of the NCC Deconstruct Model

The critical parameters for NCC's deconstruction model to create positive financial returns on investment for the property owner are tax deductions and credits and the income tax bracket of property owners. It is necessary for the property owner to be a taxable entity so tax deductions and credits can be realized. It is also necessary that property owners create enough income taxes to exceed tax deductions to realize a benefit. Although, many tax deductions and credits can be forwarded over a span of several years making deductions valuable against several years of taxable income. For example, the enterprise zone tax credit can be realized over a span of up to five years (Colorado Department of Revenue, Income Tax E, October 2010). The enterprise zone tax credit is a critical element that makes the financial return on investment for NCC significantly high. Many states currently have enterprise zone tax incentives and requirements would need to be researched in order to use the NCC model outside of Northern Colorado. Another parameter unique to the NCC model is the tax deduction of deconstruction contract prices. This is allowed because of the training focus of NCC as a non-profit organization. The tax deduction for contract price is

unique to the NCC deconstruct model compared to other non-profit deconstruct models that do not focus on education. Another parameter important to the success of the NCC deconstruct model is scheduling. The increased time requirements for deconstruction make planning and scheduling for deconstruction tasks critical as increasing the duration of financing has negative impacts on the financial ROI. Communication with the owner, financing institution, and new construction general contractor must be clear and effective so scheduling and financing impacts are known to all stakeholders involved in the project. The appraisal value of a building being donated for deconstruction determines and influences the in-kind material donation as well as the enterprise zone tax credit. Therefore, an appraiser experienced with deconstruction appraisals becomes significant requirement in the success of the non-profit deconstruction model.

Comparison of Deconstruction Models

The following comparisons are between the NCC deconstruction model and the four models currently being used in the deconstruction industry. Comparing the first three for-profit deconstruction models to the case study (table 3), the value of the salvaged materials is the variable needed to offset the increased cost of the deconstruction process. Since the NCC deconstruction model does not rely on the salvage or sale of materials from buildings these materials can be quickly sold to interested parties, recycled or donated to reuse retail stores affectively eliminating overheads costs associated with the storage and marketing of these materials. The lack of reliance on salvaged materials directly benefits property owners because the model can provide a positive financial return on a broader range of building types.

The total revenue from sale of salvaged materials and recycling in the case study is \$2,356. It is reasonable to assume that more revenue could have been generated from the salvaged materials if more time was dedicated to sales, but it is unknown if the cost of sales, inventory, and transportation would exceed the additional revenue. It is very unlikely that the sale of materials would equal the appraisal value of the materials and therefore cover the cost of deconstruction. The cost of salvaged materials is not included in the NCC deconstruct model and subsequent ROI because the owner will not receive revenue from these materials since these materials were donated and given a tax deduction. To summarize, the salvage materials revenue is not significant for this project because (1) the larger building had been vacant since 2001, (2) the structures were built in 1958, and (3) there were minimal salvageable high value finish materials. The lack of high value salvageable materials would most likely prevent the use of any of the for-profit deconstruction models since the owner would pay significantly more than demolition as shown in the comparison in Table 3.

Table 3

Comparison of Deconstruction Models

Parameter/ Model	Deconstruct Service (owner retains materials)	Deconstruct (split material ownership)	Deconstruct (contractor retains materials)	Deconstruct (non-profit model)	Deconstruct (NCC model)	Demo
Demolition Cost	-	-	-	-	-	(\$20,000)
Deconstruction Cost	(\$35,000)	(\$35,000 – contractor material benefit)	(\$32,644 – salvaged material value)	(\$35,000)	(\$35,000)	-
Salvaged Materials Revenue	\$2,356 - \$54,600	\$2,356 - \$54,600	-	-	-	-
In-kind Material Donation Deduction	-	-	-	\$19,110	\$19,110	-
Cash Donation Deduction	-	-	-	-	\$12,250	-
Enterprise Tax Credit	-	-	-	-	\$22,400	-
Net gain or loss	(\$32,644) - \$19,600	(\$32,644) - \$19,600	(\$32,644) - \$19,600	(\$15,890)	\$18,760	(\$20,000)

It is reasonable to assume that the cost of deconstruction for an experienced for-profit deconstruction contractor would be less than the cost for the education focused NCC work crew. The for-profit deconstruction contractor would have an experienced workforce, requiring less labor hours to complete the project. However, the deconstruction contract would still be more than the demolition contract due to the additional time and labor requirements of deconstruction when compare to demolition, making the for-profit deconstruction contract in the range between the NCC deconstruction contract of \$35,000 and the competing demolition bid of \$20,000. Additionally, the net cost would be significantly more than demolition because of the low value of salvageable materials. Had the owner chosen to use any of the first three models, he would have incurred significant expenses for the deconstruction because of the low value of the salvageable materials contained in the building. This finding highlights the necessity of high value salvageable materials in order for a for-profit business model to net a positive return.

The most common non-profit deconstruction model utilizes tax incentives and deductions based on appraisal value of salvageable materials that are donated to non-profits. The appraisal value in this case study is \$54,600 with a subsequent tax credit of \$19,110. The tax credit provides a reasonable financial alternative to demolition as this model would cost the owner \$15,890, or \$4,110 less than the \$20,000 to demolish the structures. While this non-profit model does save compared to demolition, the relatively small savings of \$4,110 may not be worth the additional time needed for deconstruction and potential schedule impacts to the owner. It is also possible that the deconstruction contract could be less if using a non-profit organization that does not focus on training, increasing the savings to the owner; however, some tax incentives would be lost as a result. The demolition alternative is less expensive than the for-profit deconstruction models in this case study, but more expensive than the non-profit deconstruction models. Although the demolition process is more expensive compared to the non-profit models, demolition has the least amount of impact on schedule as it is the fastest possible alternative. In this case study, the added time needed to deconstruct the buildings did not adversely impact the owner's decision to use deconstruction since the owner did not place any value on having a quicker removal of the buildings. This likely will not be the case on other potential deconstruction projects; therefore owners need to access the value of schedule extensions compared to ROI when considering using the deconstruction alternative.

Conclusion

The positive financial return on investment of 53.6% for the commercial property owner in this case study demonstrates the financial feasibility of deconstruction in the Northern Colorado commercial construction market. It is a benefit that the buildings are not creating significant income and new construction is not immediately scheduled after deconstruction, eliminating any schedule impact of the deconstruction process. The owner in the case study was exposed to very little risk as the appraisal value of the donated buildings and the cash contribution tax credits were all known prior to deconstruction commencing. The National Center for Craftsmanship's deconstruction model proved to have the most reliable and positive financial return on investment in this case study. The reliability of the results is due to the lack of reliance on the salvageable materials and the consistent ability to realize tax credits for donations to non-profit organizations. The NCC's focus on training and education provides an additional tax deduction on the cost of the deconstruction contract and a tax credit for an enterprise zone which are unique and provide a higher return on investment compared to other non-profit deconstruction models.

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