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COUNTERFEIT CONSTRUCTION PRODUCTS FROM LOW-COST SOURCING COUNTRIES

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Abstract
Counterfeiting has been around since ancient times. Counterfeiting in modern times was once widespread and not confined to any geographic region. With the globalization efforts following World War II, counterfeiting became an international problem, much of it emanating from Japan's developing manufacturing-based economy. As Japan's economy matured in the late 1960s, the epicenter of the counterfeiting industry moved to Korea. As Korea's economy improved, the bulk of the problem moved to China, where it resides today. A research project was funded by the Construction Industry Institute in Austin, TX to answer four questions: 1) Has the worldwide counterfeiting problem extended into construction materials, equipment and other products?; If so, how large is the problem?; If so, what countries or regions are the source of the counterfeit goods?; If so, what countries or regions are the destination of the counterfeit goods? Results showed that counterfeiting of construction goods is a problem that the problem is large and dangerous, that, like counterfeiting as a whole, China is the primary source of counterfeit construction goods, and the destination of the counterfeit goods is most often the U.S., but can be any place that the counterfeiter thinks that a profit can be made. The team was also asked to make recommendations to industry to mitigate the problem.

Key Words: Counterfeit, Construction, Materials, Equipment, China

INTRODUCTION

In the mid-1980s, U.S. Customs estimated that counterfeit products comprised nine percent of total world trade in manufactured goods. Even though many countries have signed agreements to protect intellectual property rights, counterfeit products are more available than ever in both world and national markets. According to the World Trade Organization (WTO), world trade increased by 47 percent from 1990 to 1995, but during this same period the trade of counterfeit products increased by 150 percent. Since 1995, the problem has continued to grow. As of 2003, the total value of counterfeit products marketed in the world was estimated to be more than $1 trillion annually; this total includes counterfeit products that are produced and marketed domestically within countries.

A 2009 report by the Anti-Human Trafficking and Emerging Crimes Unit of the United Nations Interregional Crime and Justice Research Institute acknowledged the link between organized crime and counterfeiting. Their research indicates that organized crime benefits from counterfeiting through the use of trade routes that have been previously and successfully exploited for other illegal activities. Moreover, the globalization of markets and the widespread distribution of technologies present new opportunities for expansion of organized criminal activities through international alliances between criminal organizations (UNICRI 2009). The research revealed that the level of profitability in counterfeiting is relatively high while the level of risk is relatively low. The opinion of experts interviewed as part of this research project is that this is due to the fact that law enforcement tends to focus less on these types of crimes and penalties are less severe. While the team did not established a link between organized crime and construction counterfeiting, its research strongly suggests that the industry's global supply chain is vulnerable to infiltration by these increasingly globalized criminal networks.

In a 2009 report, the U.S. Immigration and Customs Enforcement (ICE) agency estimated that each year, counterfeiting costs U.S. industry about 750,000 jobs, with thousands more jobs at risk around the world. ICE and the Customs and Border Protection agency made more than 14,000 seizures of counterfeit goods in 2008, valued at more than $272.7 million, a 38 percent value increase over 2007.

In recent years, as news stories have surfaced on counterfeit retail products such as baby food, dog food, jeans, handbags, DVDs, and other popular items, questions have emerged as to whether counterfeiting was a problem in the construction industry. A single incident in 2006 involving the construction of a U.S. government installation in Europe by a prominent U.S. construction contractor provided the impetus for this research project.

The facility design for this installation included 48 name-brand telecommunication routers that the contractor purchased from a U.S. Fortune 500 authorized distributor of such products. Within the first few months of service, 12 of the devices progressively failed. Upon investigation of what was clearly an epidemic failure rate, all 48 devices were found to be counterfeits of Chinese origin. Not only were they counterfeit, but when the serial numbers were examined, they were all valid. The counterfeiters were so sophisticated that they had applied serial numbers of genuine identical devices that had not been registered by the original purchaser(s).

Following are other examples of counterfeiting documented by the research team:

- In 1987 and 1998, two crane accidents killed two people in the United States. In each case, counterfeit bolts were suspected. In the 1987 case, counterfeit bolts appear to have been tied directly to the death of a worker at the mammoth Saturn automobile factory, then under construction in Spring Hill, Tennessee (DOE 1992). The worker was tightening a bolt when it cracked and caused him to fall to his death. In the second case, counterfeit fasteners were used in the 700-foot-tall hoist that peeled off the scaffold of an office tower under construction in Manhattan. While counterfeit bolts were identified in the boom, investigators could not determine whether the failure of the counterfeit fasteners caused the collapse (Post 1999).
- According to an industry safety alert discovered during the research, a counterfeit steel pipe manufactured in China in 2007, stamped in the United States, and

- An insurance executive interviewed as part of the research stated that in 2007 a counterfeit cement kiln from India ruptured while in operation in Canada, killing two employees.
- In an interview with the National Electrical Manufacturers Association it was learned that in 2006, one million counterfeit Square D circuit breakers entered the United States in one shipment from China.
- The Electric Power Research Institute (EPRI) posted a report on their website of two counterfeit five-inch (5") stop-check valves being found at a Southeastern U.S. nuclear power plant in 2007. One had been installed in a non-safety application, and another was in inventory. This report was confirmed in a later interview by the research team with an executive of the company that owns the power plant referenced. (EPRI 2009)
- The research team was told by two interviewees, one with the National Manufacturers Association and one with the U.S. State Department, of the U.S. Military buying thousands of counterfeit military grade microchips for use in sophisticated weapons systems aboard nuclear submarines and fighter aircraft. The team verified the truth of these reports by discovering a 2008 videotaped investigative report by Bloomberg BusinessWeek magazine that documents this kind of military sourcing of chips (DOJ 2009).

Although there are many areas of concern related to product integrity, the potential impact of counterfeit products to plant performance, plant life cycle, safety, structural and product integrity was the focus of this investigation. While there is much literature on counterfeiting in general, there is almost nothing documented on counterfeiting relative to the construction industry. For example, the counterfeit "industry" does hundreds of billions of dollars of business annually; however, the scope of counterfeiting within construction is unknown. What is known is that counterfeit products have caused significant negative impacts to safety, project schedules, overall costs and quality of construction.

RESEARCH METHODOLOGY

Since the Principal Investigator (PI) and the research sponsor were located in the U.S., it was imperative to document any problem in the U.S. construction industry. With counterfeiting being an international problem, interests outside the U.S. must also be consulted. Canada was immediately chosen as a target for interviews. The decision was then made to assume that countries that were proven to be a source of non-construction counterfeit goods would likely be a source for counterfeit construction goods. Therefore, investigative teams were formed in the five countries reported as the source countries for the most counterfeit goods seized by the U.S. Immigration and Customs Enforcement service (ICE). These countries were China, Hong Kong, Taiwan, Pakistan, and The U.K. Table 1 shows the breakdown of interviews by country.

Table 1. *Breakdown of Interviewees by Country*

Country	No. Interviews	Percent of Interviews
United States	78	40.6
China	70	36.5
Taiwan	16	8.3
Canada	10	5.2
United Kingdom	8	4.2
Pakistan	8	4.2
Hong Kong	2	1.0

The research was carried out using face-to-face interviews almost exclusively. Five telephone interviews were conducted out of the 192 total interviews executed. No surveys were disseminated and all interviews were conducted by PIs and National Coordinators, none by Research Assistants. The interviews were carried out using interview instruments customized for both the culture and the type of organization that employed the interviewee. Interviewees were chosen by type of organization and the level within the organization held by the interviewee. Each participant answered approximately 40 questions, meaning the research ended up with approximately 8000 data points. Only individuals from large organizations were interviewed. The types of organizations asked to participate in the project were construction owners, contractors, suppliers, insurance companies, manufacturers, and government / quasi-government agencies. Table 2 shows the breakdown of interviewees by organization type.
Below are the research results, summarized by country/region. North America was a major thrust. China was a major thrust, since it was by far the number one country on the ICE list. The U.K., Pakistan, Hong Kong, and Taiwan were the subject of more limited analyses due to resource limitations.

SUMMARY OF U.S. / CANADA

Eighty eight interviews were conducted in the United States and Canada. All but four were face-to-face, with four being accomplished via telephone. These interviews consisted of suppliers, manufacturers, distributors, government agencies, insurance providers, and contractors. Seventy-six percent of these respondents identified at least one case of counterfeiting, and collectively described 141 cases of counterfeiting in the construction industry. Some of the most

Table 2. *Breakdown of Interviewees by Organization Type*

Organization Type	No. Interviews	Percent of Interviews
Contractors	66	34.3
Manufacturers	36	18.8
Government/Quasi-Government	36	18.8
Owners	27	14.1
Suppliers / Distributors	20	10.4
Insurers / Re-insurers	7	3.6

common items identified were valves, fasteners, pipe, and steel. The most common detection method was failure of the component (31% of the cases). This was followed by inspection

(26%) and testing (10%). The interviewees were asked to identify where the item entered the supply stream. Forty six percent of the respondents identified the source as the manufacturer, with the remainder listing the source as either the supplier or distributor.

Attitude of Government

Forty three people addressed the question of the local government's attitude towards counterfeiting. In these questions the local government refers to the source country of the counterfeiter. Twenty eight percent of the respondents felt that the local government is aware of counterfeiting, but tolerates it because counterfeiting produces hard currency through exports and creates jobs. Twenty six percent of the respondents stated that the local government is officially against counterfeiting, but rarely takes action to stop it unless the counterfeiting produces bad publicity or results in deaths. Twenty one percent of the respondents stated that the local government realizes the problem of counterfeiting, and actively fights counterfeiting through legislation. Twelve percent stated that the local government is not concerned with the export of counterfeit items and nine percent think that local government is unable to deal with counterfeiting.

Reaction of Counterfeiters

The respondents were asked to describe the reaction of the source of the counterfeit product when confronted with the facts. Forty five of the respondents noted that the supplier or manufacturer responded and took action to fix the problem. However, 43% of the respondents noted that the counterfeiter denied that the item was counterfeit, denied supplying the counterfeit item, or never responded to inquiries. This statistic is important to remember when dealing with an overseas supplier or manufacturer. In this situation there is little recourse for the purchaser, other than blacklisting the organization. Even blacklisting is not extremely effective, since the counterfeiter can simply not respond and then re-brand their company. It is then very difficult for a company in the U.S. or Canada to know that a new company is not the same organization that supplied them with counterfeit items earlier.

SUMMARY OF CHINA

Seventy construction professionals were interviewed in China. Of these, only one was done by telephone with the remainder being face-to-face interviews. These interviews consisted of individuals of the same demographics as the ones interviewed in the U.S. and Canada. Sixty-four percent of the interviewees had either experienced counterfeiting or knew from a reliable source of a case of counterfeiting. The results demonstrate how cultural differences can affect transactions with foreign companies.

Factors Driving Counterfeiting

Cost is one of the driving factors for counterfeiters in China. One interviewee noted that using low grade steel in place of structural steel will cut material costs in half, while another noted that using low-grade material will increase profit by 20 percent. Chinese manufacturers know that their competitive advantage in the global market is cost. This aligns with the results of the U.S. interviews that showed that companies purchase from low-cost sourcing countries to gain a competitive advantage. Even the domestic procurement market within China drives costs to rock

bottom through competitive bidding. One interviewee noted that China is not suited for the competitive bid market because a contractor will win the bid on price and then provide a "jerry-rigged" project full of counterfeit products to meet the budget.

One source of the problem is that wherever a legitimate factory is established, smaller factories producing non-branded knock-offs will soon be established near the legitimate factory. These are often started by former technicians of the legitimate factory. As these smaller factories lack the skills and equipment to produce quality products, the resulting products are substandard. Also, the smaller company cannot compete with the legitimate company unless costs are kept low through using sub-quality materials and non-skilled workers. The Chinese interview results showed that 20% of the cases of counterfeiting described by the interviewees came directly from the manufacturers. The bulk of the cases (80%) were from distributors, or stockists as they are referred to in China. This concurs with the comments in the interviews that counterfeiting is generally the result of a distributor purchasing sub-standard products from these smaller factories and re-branding them as legitimate products. One interviewee noted that the legitimate factories will purchase and re-brand products from these smaller factories when their orders exceed their capacity.

Another source of counterfeiting is a lack of knowledge and understanding of foreign standards on the part of Chinese manufacturers. Although a project may dictate U.S. or E.U. material standards, one interviewee noted that Chinese manufacturers will often continue to use their national standards regardless of whether they meet the project standards. The attitude is that products that meet national standards are good enough. Other interviewees related thoughts, one noting that Chinese manufacturers are used to supplying products according to their standards, not their clients' standards.

Most of the interviewees thought that counterfeiting would be profitable in the short-term. Counterfeit goods cost less and can be used to meet tight project schedules. However, the consensus is that counterfeiting will increase costs in the long term with increased costs of inspections and loss of buyer confidence.

Attitude of Government

The counterfeiters of low-tech products present a difficult challenge for both the government and industry. These companies produce counterfeit products as a means of economic survival. Their guerrilla tactics include frequently changing their company name and address. One government official said that "the government should lead the market and make it grow healthily. Recently, the market has become over expanded. The development of companies' management capabilities is not balanced with product quality requirements. This results in a chaotic market and disorderly competition."

Sixty-three interviewees believe that the Chinese government would like to crack down on the counterfeiting industry, but 15 of them think the government lacks the power to enforce their decisions and 18 interviewees think that government does not have enough knowledge of the counterfeiting market.

Reaction of Counterfeiters

When counterfeiting is detected within China, the most common reaction of the party responsible is to actively respond to the problem with the owner either rejecting the items, the party replacing the items, or the owner adjusting the cost to meet the quality of the item. One interviewee from an EPC firm said, "Services such as to change, recall, reconstruct, or repair

unqualified items is quite common and easy to obtain or perform in China. However, if it occurs on an overseas project, the cost will increase several times." Foreign companies need to inspect goods within China before shipping overseas.

SUMMARY OF HONG KONG, PAKISTAN, TAIWAN, AND THE U.K.

Only two interviews were conducted in Hong Kong. While these are invaluable as aggregate data, the opinions and experiences of only two experts are not sufficient to form any conclusions regarding the Hong Kong construction industry.

United Kingdom

The United Kingdom research team interviewed eight participants to gauge their understanding of counterfeiting. Of the eight, one was determined to be invalid by the U.K. team, leaving seven interviews for analysis. Of these seven, one was from a governmental/quasi-governmental official, two from insurers, and four from contractors.

The primary results of the investigation into counterfeiting in the U.K. are two-fold. First, it was determined that there is not currently a problem of counterfeit products being manufactured in the U.K. Second, the U.K. is used by international counterfeiters to "launder" their illicit goods before shipment to their final destination, most often the U.S.

When it became apparent that the U.K. was not the home of significant counterfeit manufacturing, the question immediately arose – "then why is the U.K. ranked in the Top Five Countries for importing counterfeit goods into the U.S.?" Further research led to the discovery that counterfeiters from low-cost sourcing countries commonly transship counterfeit goods from country to country, usually ending up in a western European country or Canada before shipment to the U.S. In this way, a counterfeit product is laundered and the authorities in the U.S. will be less likely to closely scrutinize the shipment than if it had come directly from a low-cost sourcing country.

Taiwan

The Taiwan team conducted sixteen interviews, fifteen of which were deemed acceptable for further analysis. Eight were an owner, design professional, or contractor. Five were a manufacturer or supplier. The remaining two were an insurer and a governmental or quasi-governmental agency. The results showed that construction customers in Taiwan are aware of counterfeiting and are concerned about this issue during procurement. Clients will choose legitimate products in accordance with the project specifications; however, it was pointed out that the low-price bid rules of procurement encourage counterfeiting.

Most participants think that the local government is officially against counterfeiting but doesn't actively take action to reduce counterfeiting. The government will only conduct an investigation if there are claims, instead of taking proactive measures to thwart counterfeiting. In regards to using third party verification, nine out of 15 participants showed a positive attitude toward using a third party to verify product integrity. Although one interviewee noted that they would exclude China as a source for certain materials, overall the interviewees tend to rely on determining if a particular company can meet national material standards rather than adopting a list of approved or banned source countries.

Fifty-three percent of the interviewees (eight of fifteen) had either experienced counterfeiting, or were affiliated with a project that experienced counterfeiting. In most of the cases where the

participants encountered counterfeit products, the counterfeiting was discovered through testing. Of the eight cases of counterfeiting discussed, two of the counterfeiters refused to take responsibility while five of the remaining cases were dealt with according to contractual terms.
The interviewees recommend that the government issue clear legal and practical standard quality control processes, implement product certification regulations, make information transparent, establish product information networks, and publicize the discovery of counterfeit items once confirmed. For individual companies, respondents advised them that more quality control measures should be put into place. Clients should be aware of counterfeiting and should procure materials from reputable and qualified suppliers. Strengthening self-inspection and quality control is important to the client.

Pakistan
The Pakistan team completed eight interviews that included two government organizations, three contractors, a consultant, and two hybrids whose companies and duties encompass two or more of the entity types. Five of the respondents (63%) had experienced counterfeiting either directly or through another party on a project they were affiliated with. The sources of counterfeit materials were noted as mostly local. Notably the Punjab province was frequently identified. China and the U.A.E. were also mentioned prominently.
The types of counterfeit materials discovered included floor tiles, water supply fixtures, steel bars, electric cable and paint. The Shershah Bridge over the Karachi Northern Bypass was referenced by one respondent. That bridge collapsed 25 days after its inaugural opening, killing five and injuring many others.
Half of the respondents noted that when the counterfeiters were confronted, the offenders behaved badly, in one instance insisting that the counterfeit product was genuine. Others, after interrogation, accepted responsibility and replaced the offending items.

RECOMMENDATIONS

The following list of recommendations were developed by the research team as a means of providing owners, contractors, and suppliers with techniques to minimize the opportunity for counterfeit and suspect goods to enter their supply chains. A second list presents a composite of key indicators of potential counterfeit and/or suspect goods and materials, and offers more comprehensive advice based on the findings of the research. Both will help industry procurement and field personnel identify any counterfeit goods that have entered their supply chains and prevent any further entry. These are presented as guidelines; following these guidelines cannot guarantee the discovery of all counterfeit goods purchased, nor can it prevent all purchases of counterfeit goods.

Training / Education

- Train purchasing personnel about the hazards of counterfeit goods and the most common ways these goods and materials enter the supply chain.
- Educate and train Customs officials and those from other law enforcement agencies regarding construction goods and materials – not just the higher-profile retail products. These agencies are open to helping the industry, but they don't know what to look for.

Supply Chain Issues

- NEVER buy anything from those not on the AVL, unless the subject of any such deviation has been afforded similar evaluation as the products of those companies on the AVL.
- Specify all base metal requirements in P.O. Requisition per project/industry code requirements.
- If possible, use distributors and/or suppliers who have documentation systems and receiving inspection systems that ensure the traceability of their parts / materials to an approved source
- In foreign countries, where there may be *state-owned* suppliers, it is recommended that the qualified source inspector should be from another country to lessen the chances of intimidation of the source inspector when making sensitive calls regarding quality.

Testing and Inspection

- Consider connections (fasteners) such as bolts as pressure equipment and not just as "commodities.''
- The PMI program should include witness and/or monitoring from a quality stand-point.
- In foreign countries it is actually preferable to have a qualified ex-patriot perform the source inspection when possible. Minimally, supervisory visits from a qualified ex-patriot should be made.
- Consult specialists (i.e., Materials and Corrosion Engineers) whenever in doubt about product integrity.
- Material Test Reports (MTR) should be requested for materials. The MTRs should be matched to the heat numbers or heat codes on the materials.
- If the investigation leads you to believe the goods or materials are counterfeit, or alternatively if the integrity of the goods or materials cannot be verified, all members of the project (purchasing, inspection, engineering etc.) should be made aware of the issue and a conscious decision must be made as to the potential risks and the disposition of the goods and/or materials. This evaluation and final determination should be documented and communicated for lessons learned.

General

- Adopt a "zero tolerance" policy regarding counterfeiting. Report all incidences of counterfeiting and NEVER fail to support any law enforcement agency's effort to prosecute.
- Caution is urged when determining that goods and/or materials will be accepted if a discount in the pricing is granted. In some low-cost sourcing countries accepting a discount is tantamount to a tacit agreement that whatever goods are delivered will be deemed suitable for service. Thus, the supplier or manufacturer will feel sufficient justification for stating that the goods provided are not counterfeit.
- Encourage *victims* of confirmed counterfeiting to share the information with others within the industry to raise awareness and to help reduce the chances of that particular counterfeiting effort to continue.
- Recommend establishment of a repository for documented cases of counterfeit goods and materials in construction supply chains. If photographs and other comparisons between real and counterfeit items are available these should be posted. These could be useful

Key Indicators of Potential Counterfeit and/or Suspect Goods and Materials

At the industry level, the corporate level, and project level, there are things that can be done to help ensure product integrity. This is different than ensuring product quality. Product integrity means that the buyer is receiving what the buyer is paying for – not something else of equal quality, but exactly what is paid for. In some situations a counterfeit item may be of equal or greater quality to the real thing. However, a supply chain that can be infiltrated by high-quality counterfeit goods is more likely to be infiltrated by low-quality counterfeit goods than a supply chain that not only checks for quality, but also checks for integrity. To that end, the research team presents the following Key Indicators that an item may be, or a shipment may contain, (a) counterfeit item(s).

Supplier Behaviors

- Supplier too eager to make sale.
- Salesman / Representative doesn't ask questions when you explain a complicated requirement, but repeatedly says "no problem," or words to that affect, when he is told what is needed. A salesman that asks a lot of knowledgeable questions, while not appearing overconfident, is preferred.

Documentation/ Supporting Information

- Generic invoices and documentation received with goods (not normal specific documentation).
- Shipment contains no, or insufficient, paperwork

Appearance

- Product appearance looks "off', something different about appearance. (Sometimes the counterfeited item or its packaging looks "better" than the real thing.)
- Items from a known supplier not packaged as usual.
- Obliteration of, or alterations to, markings or logos.
- Inconsistent dimensions against a known standard.

General

- Goods are offered from a resource outside of the normal supply chain or typical procurement methods, or from a source not known to you or an experienced procurement staff.
- Normal receiving and/or NDE (non-destructive examination) methods reveal deficiencies or other non-conformance in goods or materials.

SUMMARY OF CONCLUSIONS

Counterfeiting, as defined in this research, is a large and growing problem in the industry, and its ramifications are almost unlimited. Besides the United States and Canada, five other nations were scrutinized. The research team retained the services of experts within each of the five countries to carry out research on counterfeiting in the construction industry within the confines of their assigned nation. Each National Coordinator was also assigned the task of determining the perceived impact that the export of counterfeit goods manufactured within their country

might have on the local and international construction industries. The countries chosen were the five countries that had been the import nations for the most counterfeit goods confiscated by the U.S. Immigration and Customs Enforcement Service (ICE). The nations were China, Hong Kong, Taiwan, Pakistan, and The U.K.

China is the epicenter of today's worldwide counterfeiting industry. This is true of non-construction and construction items. Hong Kong, Taiwan, and Pakistan all seem to be places that have an illicit counterfeit manufacturing industry, though most of those interviewed in those countries fear imports from China. The U.K. seems to be a place that counterfeiters from around the world send their products to "launder" them before they are transshipped to the U.S.

The causes of the counterfeiting problem are many, but some insight can be gleaned from the interviews. Several Chinese interviewees suggested that many of the reasons for the proliferation of counterfeit goods in construction supply chains are grounded in differences in the way business is practiced in developing nations and in the developed world. Other reasons revolve around such issues as the West's focus on getting the least expensive materials and equipment to maximize profits. Whatever the root causes are, the problem is massive and the threat is potentially calamitous. However daunting it may be, the industry's best short-term defense is to question its implicit trust in suppliers, manufacturers, and distributors, and to address its ignorance of how sophisticated today's counterfeiters can be.

Ignorance can be cured by training. The research team recommends that the industry make a priority of training its procurement, quality, and field personnel in how to prevent and mitigate the damage from counterfeit items in the supply chain. The industry must also systematically train the people hired to protect the public. The port master of the largest port in the United States urged the research team to impress upon the industry their need for training. He explained that construction items were off the radar of his customs inspectors because [they] don't know what to look for. He emphatically requested assistance in training them to inspect for counterfeit construction materials.

Finally, more research is needed. Although international in scope, this research project has just scratched the surface of the problem. Indeed, many interviewees expressed their concern that this research has only been able to look at the tip of the iceberg and that the world will eventually see a series of disasters attributable to counterfeit goods.

Future research could make another attack on a broad front, as this project has done, using these results to identify and focus on the areas that need the most attention or that show the most potential for progress. Or, future research could choose a limited number of strategic areas to investigate. The areas of focus could be determined by product type, such as steel, piping, or circuit breakers. Areas of future focus could also be determined by lines of defense, such as the following:

- third-party verification
- inspection of materials or of the manufacturing process at the point of origin, during the improvement or development process, at shipping, or at delivery
- inspection of the finished product, including country of origin and country of destination
- investigation into the ways construction goods are imported into and exported out of key countries in which large international construction firms build projects. This would include U.S. Customs inspection.

Other future research should involve the development of training materials for companies to train their procurement, quality, and field personnel in how to prevent and mitigate the damage from counterfeit items in the supply chain. Training materials and courses should also be developed to train those hired to protect workers and the general population (e.g., Inspection and Customs Enforcement (ICE), the FBI, port authority personnel, and customs warehouse personnel).

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