Transcript: Transforming a Shipping Container Into a DIY Solar Power Station! #NATO

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**[00:00:00]** This 20-foot one-time use shipping container   
has ten 540 watt solar panels installed.

**[00:00:06]** This thing, coupled with its batteries, inverters,

**[00:00:09]** and a generator, has enough juice to run   
an entire town. If you want to learn more,

**[00:00:13]** stay tuned in this video. We are going to show   
you our modular system to mount these panels

**[00:00:18]** in a fully adjustable way that transports   
down the highway. Hope ya learn somethin!

**[00:00:29]** To give you a little back story on this project,   
this is a $450,000 modified 20-foot container.

**[00:00:35]** This isn't your everyday container that's   
going to be available to every person in

**[00:00:39]** their backyard but what we're going to   
learn from this job will transfer over

**[00:00:42]** to the DIY Market in future kits released by   
Container Modification World. This specific

**[00:00:47]** unit here is going to have two different rooms.   
There's going to be a mechanical room and then

**[00:00:52]** a climate controlled room for all the sensitive   
equipment. The mechanical room is going to have

**[00:00:56]** a transformer and the outside condenser boxes   
which are going to condensate. Because of that,

**[00:01:02]** we're going to remove the plywood wood flooring   
that's traditionally in the containers. And, we

**[00:01:07]** do that by using a wood skill saw first and then   
we go over it with a metal blade in a circular saw

**[00:01:14]** just to make sure that we don't nick any of the   
cross-members. And then remove the wood flooring

**[00:01:19]** and we replace that with inch and a quarter bar   
grating. We secure the bar grading with grating

**[00:01:24]** clips (there's special clips) right back to the   
original cross members of the shipping container.

**[00:01:29]** Once that mechanical room is kind of prepped,   
we need to separate that room from the sensitive

**[00:01:34]** equipment area and we do that with our traditional   
partition wall. So, we will mount that to our

**[00:01:41]** strut channel framing. We do the strut channel   
framing in this instance so we can get a very

**[00:01:47]** nice vapor barrier all around the framing members.   
And then we also install our strut strapping on

**[00:01:55]** the back of the strut channel and that strut   
strapping allows us to secure our PVC white

**[00:02:00]** re-line wall panels to. Which gives a nice Class   
A flame spread interior finish and it's a super

**[00:02:06]** bright interior as you'll see later. The only   
other thing to talk about is that partition wall.

**[00:02:12]** It's our traditional galvanized partition   
wall that we utilize but then we also put

**[00:02:16]** in some... We put four 10 inch intake dampers   
(something we might change in the future) but

**[00:02:21]** we put them there. And then on the inside (the   
finished portion of that) we also have some

**[00:02:25]** grates that are closable. So if it does hit minus   
40, and we don't want to be pulling any air in,

**[00:02:30]** the operator can close those right off. What's   
going to tug on those intake dampers is the T16

**[00:02:36]** exhaust fan. So this is the second or third time   
that we've utilized this and it works so great

**[00:02:41]** with our strut lined interiors when we're strut   
lining it every second corrugation. That fan

**[00:02:46]** fits in there perfectly and then right beside that   
for egress is a man door to access this sensitive

**[00:02:51]** equipment room here and so we've used Container   
Modification World's Dual Swinger Man Door.

**[00:02:58]** So once we got the whole building envelope   
modified, it was time to jump outside and figure

**[00:03:02]** out how to mount the solar panels to both the   
sidewall and the roof of the shipping container.

**[00:03:07]** So we ended up installing these panels on   
this shipping container three different times

**[00:03:11]** before we actually finally delivered it to the   
customer. And the very first time that we did it,

**[00:03:17]** we were just kind of going into it blind. A big   
problem that we had is we were expecting one meter

**[00:03:22]** by two meter panels and larger panels showed up.   
So when we thought we were gonna get six panels

**[00:03:27]** wide on the side and six wide across the ceiling,   
there's only enough room for five panels. Which

**[00:03:32]** ended up being a positive in the long run but   
at the start it threw us for a little bit of

**[00:03:37]** a tizzy and affected our design. And so what we   
did is we ended up having to have like an 11 foot

**[00:03:43]** panel section and a seven foot panel section.   
Which is three panels and two panels which is

**[00:03:49]** different than we originally wanted just a nine   
foot and a nine foot section to lift up three

**[00:03:55]** panels at a time. So four different sections on   
this container. So four different times to flare

**[00:04:00]** them all outwards. But, what we learned in the   
first go around is for One, we didn't utilize

**[00:04:06]** deep enough strut channels. We used shallow strut   
instead of the deep strut on probably the most

**[00:04:13]** important part where they mount to the frame that   
we built. And that, we were noticing we had flex

**[00:04:18]** in the panels a bit and so we had to address that.   
But, furthermore, they were just very heavy. So,

**[00:04:24]** when we went to pull the panel sections out it was   
like a four-person job to do that. And that's just

**[00:04:32]** unsafe and we knew that it was something we needed   
to address. So we went back to the drawing board.

**[00:04:36]** And the second time that we did this, we added   
some... they're wheels that go inside of strut

**[00:04:42]** channel. They're little bearings basically and   
that kept the arms in line and in the the strut

**[00:04:49]** channel as it goes up and it it made everything   
a little less floppy so to speak and a bit more

**[00:04:55]** safe. But still we, we still had the panels in   
the three panel and two panel configuration.

**[00:05:01]** Also at the second time that we installed them,   
we knew that the panel sections were heavy. So

**[00:05:05]** we purchased some torsion springs and we put them   
in the joints of the framing kit that holds the

**[00:05:12]** panels thinking that that would reduce the weight   
to pull these things out. But they were still

**[00:05:16]** heavy and it was still dangerous. So we knew that   
is something we needed to address in this kit.

**[00:05:21]** So after the second time installing the solar   
panels, we had to deliver the unit to our

**[00:05:27]** customers so they could install all the sensitive   
equipment in the interior and we were fortunate

**[00:05:33]** enough to be able to follow the truck as it was   
driving to the customer's location. We noticed

**[00:05:38]** right away that the panel sections were catching   
wind and it was flexing them. Thank goodness that

**[00:05:43]** my horn's really loud. So I got on the horn and   
warned the driver that they need to slow down.

**[00:05:50]** This brought up another issue and something that   
we kind of resolved (but we need to resolve more

**[00:05:54]** in the future) is just how to fasten and clamp   
these individual panel sections down so that

**[00:06:01]** during transport they can handle highway speeds.  
Which again, it was all the time that we had. We

**[00:06:08]** had to send this thing off to the customer and   
get that off to them and and let them do their

**[00:06:14]** interior finishing. But the third time when these   
panels came back, we had time to figure it out and

**[00:06:21]** we mastered the individual panel kits. That was a   
huge breakthrough for us. So that, what we learned

**[00:06:29]** there, is what's going to help people in the   
future. The DIYer, where potentially, it's a very

**[00:06:36]** modular system, and it's an expandable system.   
So if you have a 40-foot shipping container at

**[00:06:40]** home facing South, and you want to purchase solar   
panels, and you don't want to put them on the roof

**[00:06:46]** of your home, you can just purchase a kit at a   
time. So every paycheck you buy a panel and a

**[00:06:51]** kit and you just slowly start expanding your solar   
array. And eventually, you're potentially off the

**[00:06:57]** grid or just tied to the grid but supplementing   
your power bill each month. So that's something

**[00:07:03]** great that we've learned from this project.  
Once the customer was semi-finished with the

**[00:07:08]** work that they had to do we had to go to their   
site winch this thing up and then bring it back to

**[00:07:12]** our yard. The transport, and that, went a little   
smoother (from what we learned prior) but we still

**[00:07:18]** had to get container back to our facility to   
make a lot of the adjustments for the third

**[00:07:24]** time that we're going to install these panels.  
Again, here we're under a major time crunch. We

**[00:07:28]** only had a few business days to get everything   
upgraded and up to par to transport the full

**[00:07:35]** distance. I'm very glad our team was able   
to do what they were able to do and get

**[00:07:42]** these things so much improved. They're so much   
better the third time around. Every panel was

**[00:07:48]** individually operated. They were so light to flare   
out and mount either in the folded-out 45 degree

**[00:07:56]** position or the flat position. So that, we really   
learned something there. What we did change is,

**[00:08:03]** we're noticing the flex on the panels, so we   
went to the full length strut channel where

**[00:08:07]** they mount. And then we also switched from   
a 12 gauge strut channel to a 14 gauge strut

**[00:08:13]** channel which is actually a bit lighter (and say   
a little bit weaker) but still way stronger than

**[00:08:19]** the initial narrow shallow strut. But the   
Container Modification World strut channel

**[00:08:26]** that we've ordered direct and specific for our   
mods, it has little ribs in the in the inside of

**[00:08:32]** the channel and the spring nut grabs those ribs   
and doesn't allow the spring nut to slide down.

**[00:08:37]** Whereas we've experienced that lots when we're   
installing shelving or whatever desks inside

**[00:08:41]** of containers that are finished with the strut   
Channel interior. And so that was a huge bonus

**[00:08:46]** and also the grab handles. We put handles at the   
bottom of the panels and that allows a place for

**[00:08:51]** them to sit. And I also did the same thing on the   
top but it's also a place for us to clamp down.

**[00:08:56]** And so with that grab handle in the future we can   
integrate that into the design (potentially) and

**[00:09:02]** utilize that to really make sure these things are   
just held nice and snug against the container.

**[00:09:07]** Another huge aha moment that we had is these   
panels were 44 and 5/8 of an inch wide and

**[00:09:13]** the corrugation panels on a shipping container   
on this 20-foot container there's five 44 inch

**[00:09:18]** wide panel sections of the corrugation. So the   
panels match the corrugations spacing perfectly.

**[00:09:24]** So we're thinking to ourselves, there's four   
corrugations in every corrugation panel,

**[00:09:31]** we could probably just do a strut channel in two   
of those for every corrugation section and that

**[00:09:37]** will give us a perfect individual mounting kit. So   
now, we originally had eight vertical sections to

**[00:09:45]** hold the whole array. We've jumped up to 10 but   
adding that extra material made this thing way

**[00:09:51]** more modular, way more simple to use, way safer,   
such a better design. Even as is. It's I think,

**[00:10:00]** perfected enough for me. For my home, I would   
utilize these the way they are. But that's how

**[00:10:05]** we roll around here, we're going to keep working   
on things. We're going to make it perfect.

**[00:10:10]** Before I get you a final tour of this thing,   
I just like to reflect on a few things that

**[00:10:14]** I would like to change. I would change the   
saddle brackets. Potentially there's a way

**[00:10:18]** that we could have it so that we could just   
pin them at certain degrees of angles. The

**[00:10:23]** stoppers so to speak that we utilize to hold   
these things in place at that specific angle,

**[00:10:28]** we need to have a more refined solution for that.   
And also just the way that these things tie down.

**[00:10:35]** I'd like to come up with a better solution   
where they would just clamp and tie down

**[00:10:39]** to the container. But other than that, I think   
they worked out perfectly. Let's check it out.

**[00:10:44]** I'm Channing McCorriston, The Container Guy.   
As I said, we have done this three times with

**[00:10:49]** this one job. We are hopefully going to be   
building a couple more of them. We're gonna

**[00:10:53]** have this thing fully refined. But yeah, we're   
gonna jump down and show you exactly how we put

**[00:10:58]** all this together. Yeah, we're gonna lay these   
panels down right away here and this thing is

**[00:11:02]** transporting with the panels attached. That's   
right, we're gonna be able to lay the top ones

**[00:11:07]** down and the side panels vertically. It's going   
about 500 kilometers (300 miles)/ And yeah,

**[00:11:12]** I guess we'll see uh what kind of condition   
they're in when they get there. Follow along.

**[00:11:18]** So before we pull these things down, I   
just want to show a few of the changes

**[00:11:22]** that we've made. We still have the, column   
bearing wheels in the strut channel that

**[00:11:28]** allow this thing very nicely to open   
up and close. We have, we put like a

**[00:11:34]** 45 degree open (a stop) right here. So it's just a   
spring nut, a bolt, and a square washer. And that

**[00:11:40]** allows us to pull the panel out, hit that stop,   
and then we'll put another one here to hold it.

**[00:11:44]** So now, these things are solid. Actually one   
thing we're going to do, and we (doesn't look

**[00:11:51]** like we did) is we're going to put some silicone   
in behind here just to stop... We don't want to

**[00:11:55]** fasten through the wall and puncture the envelope.   
That's what everything that we are against so we

**[00:12:00]** don't want to do that. We do want to get rid of   
any of that rattle if it was windy. We put some

**[00:12:05]** grab handles down on the bottom of the panels   
and the panels now rest on those grab handles

**[00:12:11]** so as they're traveling down the road that's   
holding the weight of it. And we just used our

**[00:12:15]** MSS angle brackets and then I see they just put   
a couple of small screws through the bottom of

**[00:12:21]** the panel just to hold that there and so now   
these things are locked in and held. These

**[00:12:25]** are the ones we're more worried about (the   
ones that are running vertically down the

**[00:12:28]** highway). And we've added some eye bolts here   
as well. We've replaced the bottom bolt with

**[00:12:33]** this and this is going to allow us to strap the   
panels right tight against the container during

**[00:12:38]** transport. So we feel this is going to work.  
We were racing the clock in developing all this

**[00:12:45]** or getting this adjusted. We didn't have much time   
with the container here and so we're going to go

**[00:12:50]** back to the drawing board now. We'll get this   
in our 3D model - the changes that we made and

**[00:12:56]** try to just refine things. Like maybe some caps   
for the ends of the strut. Or, if some of these

**[00:13:02]** generically purchased hardware, if we can   
actually get them laser cut and folded and

**[00:13:07]** maybe a different design that's more user friendly   
or just more common sense to the first time user.

**[00:13:13]** But yeah, this thing is awesome!   
We had all the panels daisy-chained

**[00:13:17]** together and ran into the inside   
of this and they were generating

**[00:13:21]** power. So let's jump in there and see   
what it looks like all finished up.

**[00:13:26]** Before we jump in, we can see the system   
information here. And so what I said earlier,

**[00:13:30]** it's 135 kilowatt max output,   
three-phase 480 volt system.

**[00:13:37]** Yeah it's.. There's a ton of power in   
here. I feel like when I'm in there...

**[00:13:41]** it's almost like you're in the room with your   
favorite celebrity or something. It makes me

**[00:13:47]** giddy. There's so much cool stuff in there and...   
yeah, it's expensive so let's check it out.

**[00:13:56]** Wow! Look at this all. Like this breaker panel,   
it's great to see. All the electricians or people

**[00:14:03]** that know this stuff that are are looking at this   
can know what kind of value that it's sitting

**[00:14:07]** in this can. And there's not just one. Come over   
here. There's two of these bad boys in here. So,

**[00:14:13]** two huge panel setups. We got both of our air   
conditioners working great. They're so quiet in

**[00:14:20]** here and totally keeping the heat down right now.   
All the batteries and everything are charging and

**[00:14:25]** it's cold in here. I think these things are   
producing some heat, but the inverters aren't

**[00:14:29]** hooked to an entire solar field like they   
could be, which would be producing way more.

**[00:14:33]** This here is awesome this automation board that   
we have. Inside of here is the whole PLC and the

**[00:14:40]** system. And so this thing not only runs everything   
inside of here but it also is programmed to run

**[00:14:45]** the climate which is what I'm really excited about   
for our Channel and for other uses of shipping

**[00:14:50]** containers in commercial and Industrial spaces.   
Maybe they'll still have some sort of play when we

**[00:14:56]** do a container home (if we do a container home).  
What this will do is, it'll.. It knows the

**[00:15:00]** ambient temperature outside, it knows   
the relative humidity, and it'll utilize

**[00:15:04]** outside temperature to cool this place rather   
than just constantly relying or utilizing

**[00:15:08]** the air conditioners which are only going to   
produce more heat in the other side of this.

**[00:15:12]** That's awesome. It'll use.. it's got three   
cool settings and three heat settings

**[00:15:16]** and use the most efficient source of heating or   
cooling that's available to it. That's something

**[00:15:24]** that's really cool. We're working on it. And   
potentially, you know, the actual hardware

**[00:15:28]** that's inside of there, isn't very expensive   
so it could be commercially available maybe

**[00:15:32]** as a The Container Guy product or Container   
Modification World product and available for

**[00:15:36]** manufacturing generator shacks, or water treatment   
plants wastewater treatment plants, or you know,

**[00:15:43]** solar powered inverter battery storage hubs such   
as this. You're gonna really appreciate that.

**[00:15:49]** One thing that you'll notice here is that   
there's a Schneider homeline panel which

**[00:15:55]** is very surprising you got these iline panels   
and then a homeline. You'd think they'd put a

**[00:15:59]** Square D there but, whatever. We didn't do the   
electrical in here. I wish we had a part of it.

**[00:16:05]** But we are going to be working with this customer   
on additional projects. Two more similar to this

**[00:16:11]** and we're going to be a lot more involved in that   
one. And so we're gonna use that as a learning

**[00:16:16]** experience to you know... even small smaller   
versions of this we'll be able to commercialize

**[00:16:20]** this or make it available for the general public.  
I want to show you the other side of this.

**[00:16:24]** So here: look how many inverters there are. These   
Sol-Ark inverters, there's nine of them inside of

**[00:16:30]** this thing and then two Storz battery packs as   
well. So there's not a ton of battery capacity

**[00:16:36]** in this, but they got the generator that kicks in.  
We had a customer comment in the comment section

**[00:16:40]** below of one of our videos telling us oh   
if you're gonna do this make sure you use

**[00:16:45]** the Sol-Ark inverters and we did. So whoever   
that was, if you're watching there you go.

**[00:16:53]** There's a ton of wiring in here I really   
like how they did the finger track style

**[00:16:59]** cable trays to be able to run all the the low   
voltage. That very nicely mounted horizontally

**[00:17:06]** across our vertical strut channels. Also, if   
you look up you see all the tech cable running

**[00:17:11]** to everything and how they're able to use the   
the Cobra P straps to strap everything it's just

**[00:17:16]** so neat and tidy in here. There's a lot going   
on in here. It does look very busy but I mean,

**[00:17:21]** look how much stuff's inside of here.  
And so the user interface here also

**[00:17:25]** allows an operator... I think it's a very simple   
dashboard... so you can see everything that's

**[00:17:30]** going on here. I don't really want to touch   
anything because there's a camera right there

**[00:17:33]** and they can actually monitor this thing all   
the time. They have two different sources of

**[00:17:37]** internet and they can access that wheneverm. Maybe   
they're even watching us right now hope there's

**[00:17:41]** no audio. But yeah, this thing's awesome and   
it's gonna be that interface for the thermostat

**[00:17:47]** to run all the the three heat settings and   
the three cool settings inside this thing.

**[00:17:53]** And when talking about the heat and cool   
setting number one, that's this. This is

**[00:18:00]** our 16 inch exhaust fan so we use the AC   
Infinity T16 exhaust fan and we've built

**[00:18:05]** our custom framefor it for shipping containers.   
That frame is perfectly designed to fit between

**[00:18:10]** two strut channels so these strut channels are two   
corrugations apart (which is about 22 inches) and

**[00:18:15]** then this fits just inside of here and gives us   
something to finish up to. So we really like how

**[00:18:19]** that turns out. That's a very clean industrial   
method of installing these exhaust fans in the

**[00:18:25]** containers. And then this thing here is going to   
use the four intake dampers on the partition wall.

**[00:18:30]** We can jump over the other side and   
show you what it looks like in there.

**[00:18:33]** We got a generator running beside   
me.Sorry if it's a litle bit loud.

**[00:18:38]** But we'll try to do this.  
We'll get you guys

**[00:18:41]** a little tour of here. So inside of here, we got   
a transformer. Took two tries to get this. I think

**[00:18:47]** the first one didn't have a neutral but we got the   
proper transformer in here. And a huge disconnect.

**[00:18:52]** There's leads that are very simple for people   
to hook up generators into this thing. And then

**[00:19:00]** we do have an exhaust fan in here too to take   
care of some of that heat and it can pull air

**[00:19:05]** either through the passive vents that are on the   
container doors or straight through the floor.

**[00:19:11]** So in this thing we've removed the shipping   
container floor and we put the bar grading in

**[00:19:14]** place and that allows both air to come up and   
in as intakes, but also any condensation that

**[00:19:21]** happens from the condenser boxes or from the   
head units that are inside of here drips down.

**[00:19:26]** So I can show you these here and you can actually   
see water. I don't know. If might be hard to see

**[00:19:31]** but you can see water inside this line already   
and there's some dripping out down at the bottom

**[00:19:37]** which is kind of cool. So they're already   
keeping me nice and cool over there.

**[00:19:41]** Up here there's emergency stops. Lights for   
the operator inside of here. If we jump over

**[00:19:48]** (it's tight) we have the two condenser units so   
there would be a primary and then a secondary.

**[00:19:55]** So cooling stage two and then cooling stage   
three so if for some reason the first condenser

**[00:20:01]** unit wasn't keeping up we'd kick on the second   
separate unit. And that also gives us redundancy

**[00:20:05]** too so one of these things did go down the other   
one can pick up where it left off. That's about

**[00:20:10]** it and here it's just basically the mechanical   
room of it. Things that can dissipate heat or

**[00:20:14]** produce too much heat keep them separated from the   
inverters and all the other sensitive equipment

**[00:20:18]** inside the main compartment of this unit.  
So I'm really excited to show this thing off.

**[00:20:24]** It's amazing we're going to be doing two more   
I'm so excited for that as well because we can

**[00:20:28]** continue to learn (myself and our team) and maybe   
come up with a more affordable version of this for

**[00:20:36]** the everyday person to help supplement some of   
their power or potentially go right off grid.

**[00:20:40]** So now that these are ready for transport I'm   
actually really curious I haven't measured this

**[00:20:45]** yet but I want to see... seven inches extra!   
So this would be eight foot seven inches from

**[00:20:53]** this side and then we have the man door handle   
on the other side. So we're still under we're

**[00:20:58]** under nine feet overall width which is very   
fair I think other than in Europe there's

**[00:21:05]** no problem transporting a little over width.   
So should be fine down the highway and yeah

**[00:21:11]** just amazing how quick we could have set   
these things down and and redeploy them on

**[00:21:17]** that perfectly defined 45 degree angle now.   
We're really happy with the way that these

**[00:21:22]** panels turned out now that they're all   
individually operated. It's not too heavy for

**[00:21:28]** the operator to open them up and close them down.   
Way less risk of injury to whoever's using them.

**[00:21:36]** That pretty much wraps up this. We're going   
to continue to work on this product and

**[00:21:40]** hopefully share with you more videos so if   
you enjoyed this video, please help us out,

**[00:21:44]** give it a like. If you'd like to see more   
please subscribe to our Channel and ring

**[00:21:48]** that Bell for notification and as always, check   
us out at tcg.ca - hope you learned something!

# Full Text (without timestamps)

This 20-foot one-time use shipping container   
has ten 540 watt solar panels installed.  This thing, coupled with its batteries, inverters,   and a generator, has enough juice to run   
an entire town. If you want to learn more,   stay tuned in this video. We are going to show   
you our modular system to mount these panels   in a fully adjustable way that transports   
down the highway. Hope ya learn somethin! To give you a little back story on this project,   
this is a $450,000 modified 20-foot container.   This isn't your everyday container that's   
going to be available to every person in   their backyard but what we're going to   
learn from this job will transfer over   to the DIY Market in future kits released by   
Container Modification World. This specific   unit here is going to have two different rooms.   
There's going to be a mechanical room and then   a climate controlled room for all the sensitive   
equipment. The mechanical room is going to have   a transformer and the outside condenser boxes   
which are going to condensate. Because of that,   we're going to remove the plywood wood flooring   
that's traditionally in the containers. And, we   do that by using a wood skill saw first and then   
we go over it with a metal blade in a circular saw   just to make sure that we don't nick any of the   
cross-members. And then remove the wood flooring   and we replace that with inch and a quarter bar   
grating. We secure the bar grading with grating   clips (there's special clips) right back to the   
original cross members of the shipping container.   Once that mechanical room is kind of prepped,   
we need to separate that room from the sensitive   equipment area and we do that with our traditional   
partition wall. So, we will mount that to our   strut channel framing. We do the strut channel   
framing in this instance so we can get a very   nice vapor barrier all around the framing members.   
And then we also install our strut strapping on   the back of the strut channel and that strut   
strapping allows us to secure our PVC white   re-line wall panels to. Which gives a nice Class   
A flame spread interior finish and it's a super   bright interior as you'll see later. The only   
other thing to talk about is that partition wall.   It's our traditional galvanized partition   
wall that we utilize but then we also put   in some... We put four 10 inch intake dampers   
(something we might change in the future) but   we put them there. And then on the inside (the   
finished portion of that) we also have some   grates that are closable. So if it does hit minus   
40, and we don't want to be pulling any air in,   the operator can close those right off. What's   
going to tug on those intake dampers is the T16   exhaust fan. So this is the second or third time   
that we've utilized this and it works so great   with our strut lined interiors when we're strut   
lining it every second corrugation. That fan   fits in there perfectly and then right beside that   
for egress is a man door to access this sensitive   equipment room here and so we've used Container   
Modification World's Dual Swinger Man Door. So once we got the whole building envelope   
modified, it was time to jump outside and figure   out how to mount the solar panels to both the   
sidewall and the roof of the shipping container.   So we ended up installing these panels on   
this shipping container three different times   before we actually finally delivered it to the   
customer. And the very first time that we did it,   we were just kind of going into it blind. A big   
problem that we had is we were expecting one meter   by two meter panels and larger panels showed up.   
So when we thought we were gonna get six panels   wide on the side and six wide across the ceiling,   
there's only enough room for five panels. Which   ended up being a positive in the long run but   
at the start it threw us for a little bit of   a tizzy and affected our design. And so what we   
did is we ended up having to have like an 11 foot   panel section and a seven foot panel section.   
Which is three panels and two panels which is   different than we originally wanted just a nine   
foot and a nine foot section to lift up three   panels at a time. So four different sections on   
this container. So four different times to flare   them all outwards. But, what we learned in the   
first go around is for One, we didn't utilize   deep enough strut channels. We used shallow strut   
instead of the deep strut on probably the most   important part where they mount to the frame that   
we built. And that, we were noticing we had flex   in the panels a bit and so we had to address that.   
But, furthermore, they were just very heavy. So,   when we went to pull the panel sections out it was   
like a four-person job to do that. And that's just   unsafe and we knew that it was something we needed   
to address. So we went back to the drawing board.   And the second time that we did this, we added   
some... they're wheels that go inside of strut   channel. They're little bearings basically and   
that kept the arms in line and in the the strut   channel as it goes up and it it made everything   
a little less floppy so to speak and a bit more   safe. But still we, we still had the panels in   
the three panel and two panel configuration.  Also at the second time that we installed them,   
we knew that the panel sections were heavy. So   we purchased some torsion springs and we put them   
in the joints of the framing kit that holds the   panels thinking that that would reduce the weight   
to pull these things out. But they were still   heavy and it was still dangerous. So we knew that   
is something we needed to address in this kit.  So after the second time installing the solar   
panels, we had to deliver the unit to our   customers so they could install all the sensitive   
equipment in the interior and we were fortunate   enough to be able to follow the truck as it was   
driving to the customer's location. We noticed   right away that the panel sections were catching   
wind and it was flexing them. Thank goodness that   my horn's really loud. So I got on the horn and   
warned the driver that they need to slow down.   This brought up another issue and something that   
we kind of resolved (but we need to resolve more   in the future) is just how to fasten and clamp   
these individual panel sections down so that   during transport they can handle highway speeds.  
Which again, it was all the time that we had. We   had to send this thing off to the customer and   
get that off to them and and let them do their   interior finishing. But the third time when these   
panels came back, we had time to figure it out and   we mastered the individual panel kits. That was a   
huge breakthrough for us. So that, what we learned   there, is what's going to help people in the   
future. The DIYer, where potentially, it's a very   modular system, and it's an expandable system.   
So if you have a 40-foot shipping container at   home facing South, and you want to purchase solar   
panels, and you don't want to put them on the roof   of your home, you can just purchase a kit at a   
time. So every paycheck you buy a panel and a   kit and you just slowly start expanding your solar   
array. And eventually, you're potentially off the   grid or just tied to the grid but supplementing   
your power bill each month. So that's something   great that we've learned from this project.  
Once the customer was semi-finished with the   work that they had to do we had to go to their   
site winch this thing up and then bring it back to   our yard. The transport, and that, went a little   
smoother (from what we learned prior) but we still   had to get container back to our facility to   
make a lot of the adjustments for the third   time that we're going to install these panels.  
Again, here we're under a major time crunch. We   only had a few business days to get everything   
upgraded and up to par to transport the full   distance. I'm very glad our team was able   
to do what they were able to do and get   these things so much improved. They're so much   
better the third time around. Every panel was   individually operated. They were so light to flare   
out and mount either in the folded-out 45 degree   position or the flat position. So that, we really   
learned something there. What we did change is,   we're noticing the flex on the panels, so we   
went to the full length strut channel where   they mount. And then we also switched from   
a 12 gauge strut channel to a 14 gauge strut   channel which is actually a bit lighter (and say   
a little bit weaker) but still way stronger than   the initial narrow shallow strut. But the   
Container Modification World strut channel   that we've ordered direct and specific for our   
mods, it has little ribs in the in the inside of   the channel and the spring nut grabs those ribs   
and doesn't allow the spring nut to slide down.   Whereas we've experienced that lots when we're   
installing shelving or whatever desks inside   of containers that are finished with the strut   
Channel interior. And so that was a huge bonus   and also the grab handles. We put handles at the   
bottom of the panels and that allows a place for   them to sit. And I also did the same thing on the   
top but it's also a place for us to clamp down.   And so with that grab handle in the future we can   
integrate that into the design (potentially) and   utilize that to really make sure these things are   
just held nice and snug against the container.  Another huge aha moment that we had is these   
panels were 44 and 5/8 of an inch wide and   the corrugation panels on a shipping container   
on this 20-foot container there's five 44 inch   wide panel sections of the corrugation. So the   
panels match the corrugations spacing perfectly.   So we're thinking to ourselves, there's four   
corrugations in every corrugation panel,   we could probably just do a strut channel in two   
of those for every corrugation section and that   will give us a perfect individual mounting kit. So   
now, we originally had eight vertical sections to   hold the whole array. We've jumped up to 10 but   
adding that extra material made this thing way   more modular, way more simple to use, way safer,   
such a better design. Even as is. It's I think,   perfected enough for me. For my home, I would   
utilize these the way they are. But that's how   we roll around here, we're going to keep working   
on things. We're going to make it perfect.  Before I get you a final tour of this thing,   
I just like to reflect on a few things that   I would like to change. I would change the   
saddle brackets. Potentially there's a way   that we could have it so that we could just   
pin them at certain degrees of angles. The   stoppers so to speak that we utilize to hold   
these things in place at that specific angle,   we need to have a more refined solution for that.   
And also just the way that these things tie down.   I'd like to come up with a better solution   
where they would just clamp and tie down   to the container. But other than that, I think   
they worked out perfectly. Let's check it out. I'm Channing McCorriston, The Container Guy.   
As I said, we have done this three times with   this one job. We are hopefully going to be   
building a couple more of them. We're gonna   have this thing fully refined. But yeah, we're   
gonna jump down and show you exactly how we put   all this together. Yeah, we're gonna lay these   
panels down right away here and this thing is   transporting with the panels attached. That's   
right, we're gonna be able to lay the top ones   down and the side panels vertically. It's going   
about 500 kilometers (300 miles)/ And yeah,   I guess we'll see uh what kind of condition   
they're in when they get there. Follow along. So before we pull these things down, I   
just want to show a few of the changes   that we've made. We still have the, column   
bearing wheels in the strut channel that   allow this thing very nicely to open   
up and close. We have, we put like a   45 degree open (a stop) right here. So it's just a   
spring nut, a bolt, and a square washer. And that   allows us to pull the panel out, hit that stop,   
and then we'll put another one here to hold it. So now, these things are solid. Actually one   
thing we're going to do, and we (doesn't look   like we did) is we're going to put some silicone   
in behind here just to stop... We don't want to   fasten through the wall and puncture the envelope.   
That's what everything that we are against so we   don't want to do that. We do want to get rid of   
any of that rattle if it was windy. We put some   grab handles down on the bottom of the panels   
and the panels now rest on those grab handles   so as they're traveling down the road that's   
holding the weight of it. And we just used our   MSS angle brackets and then I see they just put   
a couple of small screws through the bottom of   the panel just to hold that there and so now   
these things are locked in and held. These   are the ones we're more worried about (the   
ones that are running vertically down the   highway). And we've added some eye bolts here   
as well. We've replaced the bottom bolt with   this and this is going to allow us to strap the   
panels right tight against the container during   transport. So we feel this is going to work.  
We were racing the clock in developing all this   or getting this adjusted. We didn't have much time   
with the container here and so we're going to go   back to the drawing board now. We'll get this   
in our 3D model - the changes that we made and   try to just refine things. Like maybe some caps   
for the ends of the strut. Or, if some of these   generically purchased hardware, if we can   
actually get them laser cut and folded and   maybe a different design that's more user friendly   
or just more common sense to the first time user.  But yeah, this thing is awesome!   
We had all the panels daisy-chained   together and ran into the inside   
of this and they were generating   power. So let's jump in there and see   
what it looks like all finished up. Before we jump in, we can see the system   
information here. And so what I said earlier,   it's 135 kilowatt max output,   
three-phase 480 volt system.   Yeah it's.. There's a ton of power in   
here. I feel like when I'm in there...   it's almost like you're in the room with your   
favorite celebrity or something. It makes me   giddy. There's so much cool stuff in there and...   
yeah, it's expensive so let's check it out. Wow! Look at this all. Like this breaker panel,   
it's great to see. All the electricians or people   that know this stuff that are are looking at this   
can know what kind of value that it's sitting   in this can. And there's not just one. Come over   
here. There's two of these bad boys in here. So,   two huge panel setups. We got both of our air   
conditioners working great. They're so quiet in   here and totally keeping the heat down right now.   
All the batteries and everything are charging and   it's cold in here. I think these things are   
producing some heat, but the inverters aren't   hooked to an entire solar field like they   
could be, which would be producing way more.  This here is awesome this automation board that   
we have. Inside of here is the whole PLC and the   system. And so this thing not only runs everything   
inside of here but it also is programmed to run   the climate which is what I'm really excited about   
for our Channel and for other uses of shipping   containers in commercial and Industrial spaces.   
Maybe they'll still have some sort of play when we   do a container home (if we do a container home).  
What this will do is, it'll.. It knows the   ambient temperature outside, it knows   
the relative humidity, and it'll utilize   outside temperature to cool this place rather   
than just constantly relying or utilizing   the air conditioners which are only going to   
produce more heat in the other side of this.  That's awesome. It'll use.. it's got three   
cool settings and three heat settings   and use the most efficient source of heating or   
cooling that's available to it. That's something   that's really cool. We're working on it. And   
potentially, you know, the actual hardware   that's inside of there, isn't very expensive   
so it could be commercially available maybe   as a The Container Guy product or Container   
Modification World product and available for   manufacturing generator shacks, or water treatment   
plants wastewater treatment plants, or you know,   solar powered inverter battery storage hubs such   
as this. You're gonna really appreciate that.  One thing that you'll notice here is that   
there's a Schneider homeline panel which   is very surprising you got these iline panels   
and then a homeline. You'd think they'd put a   Square D there but, whatever. We didn't do the   
electrical in here. I wish we had a part of it.   But we are going to be working with this customer   
on additional projects. Two more similar to this   and we're going to be a lot more involved in that   
one. And so we're gonna use that as a learning   experience to you know... even small smaller   
versions of this we'll be able to commercialize   this or make it available for the general public.  
I want to show you the other side of this.  So here: look how many inverters there are. These   
Sol-Ark inverters, there's nine of them inside of   this thing and then two Storz battery packs as   
well. So there's not a ton of battery capacity   in this, but they got the generator that kicks in.  
We had a customer comment in the comment section   below of one of our videos telling us oh   
if you're gonna do this make sure you use   the Sol-Ark inverters and we did. So whoever   
that was, if you're watching there you go. There's a ton of wiring in here I really   
like how they did the finger track style   cable trays to be able to run all the the low   
voltage. That very nicely mounted horizontally   across our vertical strut channels. Also, if   
you look up you see all the tech cable running   to everything and how they're able to use the   
the Cobra P straps to strap everything it's just   so neat and tidy in here. There's a lot going   
on in here. It does look very busy but I mean,   look how much stuff's inside of here.  
And so the user interface here also   allows an operator... I think it's a very simple   
dashboard... so you can see everything that's   going on here. I don't really want to touch   
anything because there's a camera right there   and they can actually monitor this thing all   
the time. They have two different sources of   internet and they can access that wheneverm. Maybe   
they're even watching us right now hope there's   no audio. But yeah, this thing's awesome and   
it's gonna be that interface for the thermostat   to run all the the three heat settings and   
the three cool settings inside this thing.   And when talking about the heat and cool   
setting number one, that's this. This is   our 16 inch exhaust fan so we use the AC   
Infinity T16 exhaust fan and we've built   our custom framefor it for shipping containers.   
That frame is perfectly designed to fit between   two strut channels so these strut channels are two   
corrugations apart (which is about 22 inches) and   then this fits just inside of here and gives us   
something to finish up to. So we really like how   that turns out. That's a very clean industrial   
method of installing these exhaust fans in the   containers. And then this thing here is going to   
use the four intake dampers on the partition wall.  We can jump over the other side and   
show you what it looks like in there. We got a generator running beside   
me.Sorry if it's a litle bit loud.   But we'll try to do this.  
We'll get you guys   a little tour of here. So inside of here, we got   
a transformer. Took two tries to get this. I think   the first one didn't have a neutral but we got the   
proper transformer in here. And a huge disconnect.   There's leads that are very simple for people   
to hook up generators into this thing. And then   we do have an exhaust fan in here too to take   
care of some of that heat and it can pull air   either through the passive vents that are on the   
container doors or straight through the floor.  So in this thing we've removed the shipping   
container floor and we put the bar grading in   place and that allows both air to come up and   
in as intakes, but also any condensation that   happens from the condenser boxes or from the   
head units that are inside of here drips down.   So I can show you these here and you can actually   
see water. I don't know. If might be hard to see   but you can see water inside this line already   
and there's some dripping out down at the bottom   which is kind of cool. So they're already   
keeping me nice and cool over there.  Up here there's emergency stops. Lights for   
the operator inside of here. If we jump over   (it's tight) we have the two condenser units so   
there would be a primary and then a secondary.   So cooling stage two and then cooling stage   
three so if for some reason the first condenser   unit wasn't keeping up we'd kick on the second   
separate unit. And that also gives us redundancy   too so one of these things did go down the other   
one can pick up where it left off. That's about   it and here it's just basically the mechanical   
room of it. Things that can dissipate heat or   produce too much heat keep them separated from the   
inverters and all the other sensitive equipment   inside the main compartment of this unit.  
So I'm really excited to show this thing off.   It's amazing we're going to be doing two more   
I'm so excited for that as well because we can   continue to learn (myself and our team) and maybe   
come up with a more affordable version of this for   the everyday person to help supplement some of   
their power or potentially go right off grid. So now that these are ready for transport I'm   
actually really curious I haven't measured this   yet but I want to see... seven inches extra!   
So this would be eight foot seven inches from   this side and then we have the man door handle   
on the other side. So we're still under we're   under nine feet overall width which is very   
fair I think other than in Europe there's   no problem transporting a little over width.   
So should be fine down the highway and yeah   just amazing how quick we could have set   
these things down and and redeploy them on   that perfectly defined 45 degree angle now.   
We're really happy with the way that these   panels turned out now that they're all   
individually operated. It's not too heavy for   the operator to open them up and close them down.   
Way less risk of injury to whoever's using them.  That pretty much wraps up this. We're going   
to continue to work on this product and   hopefully share with you more videos so if   
you enjoyed this video, please help us out,   give it a like. If you'd like to see more   
please subscribe to our Channel and ring   that Bell for notification and as always, check   
us out at tcg.ca - hope you learned something!